

Additions to the flora of the Khentei, Mongolia

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Source: Willdenowia, 33(1) : 149-158

Published By: Botanic Garden and Botanical Museum Berlin (BGBM)

URL: <https://doi.org/10.3372/wi.33.33114>

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CHOIMAA DULAMSUREN & MICHAEL MÜHLENBERG

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Abstract

Dulamsuren, C. & Mühlenberg, M.: Additions to the flora of the Khentei, Mongolia. – Willdenowia 33: 149-158. 2003. – ISSN 0511-9618; © 2003 BGBM Berlin-Dahlem

Forty-four species of vascular plants are reported as new for the phytogeographical region Khentei in northern Mongolia. Five of them, i.e., *Carex chordorrhiza*, *C. praecox*, *Cinna latifolia*, *Matteuccia struthiopteris* and *Milium effusum* are new for Mongolia.

Introduction

Grubov (1982) compiled a first flora of Mongolia (in Russian), which has recently been edited in English translation (Grubov 2001). After 1982 numerous additions were published primarily in the Mongolian journals “Biologijn khureelengijn buteel”, edited by the Biological Academy of Mongolia, and “Erdem shinjilgeenii buteel (Biologi)”, edited by the National University of Mongolia, as well as in the Russian journals “Botaničeskii žurnal” (Botanical journal) and “Novosti sistematiki vysšik rastenii” (News in the systematics of vascular plants). Nevertheless, the flora of some parts of Mongolia is still poorly known. Among others, this applies to the Khentei Mountains northeast of the capital Ulaanbaatar. Compared to the eastern parts of the Khentei Mountains (Tsedendasch 1995, Savin & al. 1998), knowledge of the flora of the western Khentei is particularly scanty. During ecological studies in the northwestern Khentei (Mühlenberg & al. 2000), botanical investigations were carried out in the scope of the first author’s dissertation “Floristic diversity, vegetation and site conditions in the mountain taiga of the western Khentei (Khonin Nuga, Eröögiin Khaluun Rashaan)”. New species for the phytogeographical region Khentei or new species for Mongolia found during these studies are reported in the present paper.

Study area

The Khentei Mountains form the transitional zone between the Eurasian boreal forests and the Mongolian Dauria Subregion of the Eurasian Steppe Region (Fig. 1). They are the southernmost part of the Transbaikal mountain system, which mainly consists of Proterozoic and Palaeozoic rocks (Hilbig & Knapp 1983). With a length of 200 km, they range from the Russian border in the northeast to the capital Ulaanbaatar in the southwest. The highest peaks exceed 2000 m and



Fig. 1. Location of the study area in the Khentei Mountains, northern Mongolia. – The arrow indicates the location of the Khonin Nuga Research Station of the National University of Mongolia and the University of Göttingen, Germany; redrawn by H. Funke after the Physical Map of Mongolia (Ulsyn Geodezi 2001).

are covered by subalpine vegetation, but most summits are located in the montane belt at an elevation between 1500 and 1700 m. Valley bottoms mostly have an elevation of about 900 m.

The Khentei Mountains are characterized by a small-scale pattern of coniferous forests on northern slopes and of steppe vegetation on southern slopes. Subalpine forests are dominated by dense stands of *Pinus sibirica* Turcz., often intermixed with *Picea obovata* Ledeb. and *Abies sibirica* Ledeb. In the montane belt, the northern slopes are stocked with larch taiga of *Larix sibirica* Ledeb., *Picea obovata* and *Abies sibirica*; the two latter species dominate in narrow valleys with relatively high water supply. At sites disturbed by logging or wildfires, forests of *Betula platyphylla* Sukaczew and *Larix sibirica* occur. Steep and relatively dry eastern slopes, and partly even southern slopes, are stocked with *Pinus sylvestris* L. The dominating vegetation of the southern slopes are high-growing, dense meadow steppe or steppe meadows on deep soils and low-growing, gappy mountain steppe on shallow soil layers. River valleys are stocked with

swamps of *Betula fusca* Secmen, with willow shrubberies (*Salix rorida* Lacksch., *S. bebbiana* Sorg., *S. schwerinii* E. Wolf, *S. miyabeana* Pall. and *S. rhamnifolia* Pall.), with stands of *Padus asiatica* Komarov, as well as with tall herb meadows, e.g., formed by *Filipendula palmata* Maxim., *Heracleum dissectum* Ledeb., *Carex arnellii* Christ, *Iris sibirica* L., *Geranium pratense* L. and *Achillea asiatica*.

The humid Siberian climate of the Khentei Mountains is characterized by cold, dry winters and short, warm summers combined with strong permafrost. Mean temperatures are 12 °C in July and -24 °C in January. Mean precipitation amounts to 400-500 mm with a maximum in summer (Oršik & Morgunova 1990).

The records reported in the present paper are from the surroundings of the Khonin Nuga Research Station run by the National University of Mongolia and by the University of Göttingen, Germany (Fig. 1). The Khonin Nuga Research Station (49°04'48"N, 107°17'15"E) is located 250 km north of Ulaanbaatar in a valley, where the rivers Scharlan gol and Khongiin gol flow together and become the Eröö river. The latter flows into the Orkhon river, then into the Selenge river and finally into Lake Baikal. Politically the study area belongs to the Mandal somon and Zuun Kharaa somon, which are part of the Selenge aimak.

New records for the Khentei Mountains

The records of new plant species for the Khentei Mountains are listed together with their known distribution in Mongolia. Specifications to the distribution of species in Mongolia refer to Grubov (1955, 1982), who divided Mongolia in 16 phytogeographical regions: 1. Khubsugul; 2. Khentei; 3. Khangai; 4. Mongolian Dauria; 5. Great Khingan; 6. Khobdo; 7. Mongolian Altai; 8. Middle Khalkha; 9. East Mongolia; 10. Depression of Great Lakes; 11. Valley of Lakes; 12. East Gobi; 13. Gobi-Altai; 14. Dzungarian Gobi; 15. Transaltai Gobi; 16. Alasgan Gobi. Habitat types preferred by the species in Mongolia are characterized according to Grubov (1982, 2001) and Gubanov (1996). Nomenclature is based on Gubanov (1996) and Grubov (2001). Nomenclature of *Carex chordorrhiza* Ehrh., *C. praecox* Schreb., *Cinna latifolia* (Trev.) Griseb., *Matteuccia struthiopteris* (L.) Tod. and *Milium effusum* L. refers to Malyshev & Peshkova (1979). All specimens cited have been collected by the first author (unless otherwise stated) and are deposited in her private herbarium; duplicates are being deposited in the herbarium of the National University of Mongolia. Geographical coordinates are cited in the text when a location is mentioned for the first time.

Alchemilla gubanovii V. Tichomirov – Sangatai (49°08'18"N, 107°18'36"E), 8.5 km N Khonin Nuga, 30.6.2000.

On gravelly soil in a clearing in subalpine *Pinus sibirica* forest. Endemic to northern Mongolia. Formerly only known from the Khangai from overgrown pebbles on the bottom of mountain gorges in the forest belt (Bjazrov & al. 1989).

Alchemilla pavlovii Juz. – Sangatai, 16.6.2002.

Endemic to northern Mongolia. Previously found in montane and subalpine forest meadows and boggy meadows near streams in the central Khangai (Grubov 2001).

Alisma plantago-aquatica L. – Khonin Nuga (49°04'48"N, 107°17'15"E), 21.7.2002.

On floodplain meadow at the river Eröö. All previous findings from Mongolia are from the same habitat type: Khangai, Mongolian Dauria (Orkhon River), East Mongolia (River Khalkhiin-Gol), Depression of Great Lakes (Grubov 2001), Great Khingan, Dzungarian Gobi (Gubanov 1996).

Athyrium filix-femina (L.) Roth – Khonin Nuga, 25.7.2001; Sangatai, 14.8.2001; Hot Springs (Eröögiin khaluun rashaan) (49°01'03"N, 107°32'57"E), 21.5 km E Khonin Nuga Research Station, 23.8.2001.

In *Larix sibirica*-*Betula platyphylla* stand, in *Pinus sibirica* forest and in mixed forest of *Abies sibirica*, *Picea obovata* and *Larix sibirica*. According to Grubov (2001) in uremas (i.e. riverine deciduous forest strips) in the phytogeographical regions Khubsugul, Khangai, Mongolian Dauria (northwest) and Great Khingan (upper reaches of Nömrögiin Gol).

Batrachium eradicatum (Laest.) Fries – 4 km SW Khonin Nuga (49°03'15"N, 107°15'15"E), 26.6.2000.

Found in a shallow lake surrounded by moist meadow. Previously known from lakes (sometimes bogged ones), river backwaters and old river beds in the phytogeographical regions Great Khingan, Khobdo (Suok river), East Mongolia and Depression of Great Lakes (Hyargas Nuur, Har Nuur; Gubanov 1996, Grubov 2001).

Calamagrostis inexpansa A. Gray – Hot Springs (Eröögiin khaluun rashaan), 4.7.2001.

On floodplain meadow. Grubov (2001) reported *C. inexpansa* from damp and swampy meadows in Khuntu somon, Great Khingan.

Calypso bulbosa (L.) Oakes – Sangastai, 22.5.2002.

In moss-rich *Pinus sibirica* forest. According to Grubov (2001) the species occurs in shady, moss-rich coniferous forests of Mongolian Dauria.

Capsella bursa-pastoris (L.) Medik. – 2 km SW Khonin Nuga (49°03'39"N, 107°16'55"E), 20.8.1999.

Meadow near building of the research station. *C. bursa-pastoris* occurs along roads and river banks and as a weed in crops and has already been recorded from the central Khangai as well as from the regions Mongolian Dauria (Noyon Uul), Khobdo, Mongolian Altai (northwest), Depression of Great Lakes and Dzungarian Gobi (Hilbig & Jamsran 1980, Grubov 2001).

Carex chordorrhiza Ehrh. – Khonin Nuga, Ulaan Burgas, 49°03'53"N, 107°15'50"E, 6.7.2002.

New for Mongolia. Abundant in boggy meadow, where *C. chordorrhiza* occurred with a cover of about 80 %. Previous findings outside Mongolia are mainly from *Sphagnum* bogs in the Caucasus (Ciscaucasia), in western and eastern Siberia, in the Russian Arctic, in Russian Central Asia (Mugodzhary and Dzhungarian Alatau) and in the Russian Far East (Egorova in Fedorov 1999b). Further, *C. chordorrhiza* is known from the Japan-China phytogeographical region (north of the Korean Peninsula) as well as in North America (Egorova in Fedorov 1999b).

Carex praecox Schreb. – On road to Sangastai, 20.7.2000.

New for Mongolia. In meadow steppe on southern slope. From Russia, the species is known from sandy soils in steppes on slopes, dry valley meadows, edges of pine groves, river banks, roadsides and slopes of trenches (Egorova in Fedorov 1999b). *C. praecox* has its main occurrence in continental areas of Eurasia. The distribution of the species ranges to Central Europe in the west and to the Mediterranean Sea and the Caucasus in the south (Sebald & al. 1998).

Chenopodium strictum Roth (= *C. album* var. *striatum* Krasan) – 1.5 km E Hot Springs (49°01'06"N, 107°35'25"E), 22.8.2001.

In meadow steppe on two neighbouring southern slopes. Previously known from river banks and lake shores, from screes and boulder fields, from waterside salt meadows in semideserts, from margins of sayrs (i.e. gravelly semidesert in old riverbeds), from *Achnatherum splendens* communities, but most often found as weed in populated areas, nomad camp sites, along roads, wells and springs. Moreover in fields, including abandoned ones. In Gubanov (1996) listed from Mongolian Dauria, East Mongolia and Dzungarian Gobi.

Cimicifuga dahurica (Turcz.) Maxim. – Sangastai, 3.9.2001.

On a forest meadow within a forest dominated by *Larix sibirica* and *Betula platyphylla*. The species was only known so far from the phytogeographical region Great Khingan (Grubov 2001), where it is found in forest meadows, fringes, birch groves, shrubberies and forb valley meadows.

Cinna latifolia (Trev.) Griseb. – Sangastai, 20.7.2000, 14.8.2001; Khonin Nuga, 4.9.2001.

New for Mongolia. In subalpine *Pinus sibirica* forest and in montane *Larix sibirica*-*Betula platyphylla* forest. *C. latifolia* has a circumboreal distribution with a focus in North America (Hultén 1962), where it occurs in the boreal region from British Columbia to Newfoundland. In the Rocky Mountains, it ranges southwards to Colorado and Utah and in the Appalachians to North Carolina (Britton & Brown 1913). In Eurasia, its distribution ranges from Scandinavia over Siberia and northeast China to Japan (Hultén 1962, Cvelev in Fedorov 1999a). In Mongolia, it reaches the southern border of its Eurasian range. Cvelev (1976) reported *C. latifolia* from Mongolia, however, without citing a locality (Gubanov 1996).

Cirsium pendulum Fisch. – 1.7 km SW Khonin Nuga (49°04'12"N, 107°17'05"E), 30.7.2001.

Moist meadow near building of the research station. Previously known from floodplain meadows in Mongolian Dauria (mouth of the river Orkhon), Great Khingan and East Mongolia (Grubov 2001).

Cirsium vlassovianum Fisch. – Sangastai, 18.7.1999.

On a clearing in subalpine *Pinus sibirica* forest. Already known from the phytogeographical regions Great Khingan and East Mongolia from forb meadows and meadow slopes (Grubov 2001).

Crepis tectorum L. – 1.7 km SW Khonin Nuga (49°04'12"N, 107°17'05"E), 30.7.2001.

Moist meadow near building of the research station. According to Grubov (2001) it grows as a weed in ploughed fields in Mongolian Dauria (valley of the river Herlen), Mongolian Altai, Depression of Great Lakes (near Lake Ulaangom) and Dzungarian Gobi.

Dryopteris dilatata (Hoffm.) A. Gray – Sangastai, 15.8.2001.

In subalpine *Pinus sibirica* forest. Grubov (2001) quoted the species from birch-aspen forests and groves in Nömrögiin gol, Great Khingan.

Elytrigia geniculata (Trin.) Nevski – 0.7 km N Khonin Nuga (49°05'33"N, 107°17'35"E), 20.7.1999.

Mountain steppe on stony southern slope. Known from the phytogeographical regions Mongolian Dauria, Mongolian Altai (valley of the river Uliastay gol) and Dzungarian Gobi from stony slopes, rocks and screes (Grubov 2001).

Euphrasia syreitschikovii Govor. – Khonin Nuga, 19.6.2000.

River banks near the river Eröö. Outside the Khentei the species has been found in Khubsugul, Khangai, Great Khingan, Khobdo, Mongolian Altai, and Middle Khalkha (upper reaches of the river Jargalant gol, Ust Uul) in alpine meadows, screes, stony places and waterside pebbles (Grubov 2001).

Filipendula ulmaria (L.) Maxim. – 1 km SW Khonin Nuga (49°04'39"N, 107°16'40"E), 20.7.1999.

Floodplain meadow rich in herbs. Otherwise known from Khangai and Mongolian Dauria (northwest) from floodplain meadows and bogged meadows, bog margins, waterside shrubberies, river banks as well as damp birch and aspen forests and groves (Grubov 2001).

Galium uliginosum L. – Hot Springs (Eröögiin khaluun rashaan), Ilchlegiin gol, 29.7.2001. Khonin Nuga, River Eröö, 20.6.2001.

On river banks. According to Grubov (2001) in waterside shrubberies, river banks and damp meadows in the forest belt in Khubsugul, Khangai, Mongolian Dauria (northwest: Dzuunmod mine) and Depression of Great Lakes (Har-Us Nuur).

Hieracium echioides Lumn. – Burmiin Khar Torlog (49°01'52"N, 107°18'55"E), 7.5 km S Khonin Nuga Research Station, 24.8.1999.

Forest meadow in *Larix sibirica*-*Betula platyphylla* forest. Previously known from Mongolian Dauria (Noyon Uul) from similar habitats (light larch forests and forest meadows; Grubov 2001).

Hieracium virosum Pall. – Bayantogol (49°09'15"N, 107°19'45"E), 8.5 km N Khonin Nuga Research Station, 19.7.2001; Sharlangiin guur (49°05'09"N, 107°23'35"E), 7.5 km E Khonin Nuga Research Station, 25.7.2001.

In dry *Pinus sylvestris* forests on steep eastern slopes. In Grubov (2001) recorded from the phytogeographical regions Khangai (near Tsetserleg), Mongolian Dauria (northwest), Great Khingan, Mongolian Altai, East Mongolia (left bank of Halhyn Gol) from meadow slopes as well as from forest meadows and fringes.

Juncus grubovii V. Novikov – Hot Springs (Eröögiin khaluun rashaan), 21.8.2001.

Moist river bank. Previously known from Khubsugul and Khangai, where it grows on damp sandy river banks and lake shores (Grubov 2001).

Malva verticillata L. – Bayantogol, 5.8.2001.

On roadside in subalpine *Pinus sibirica* forest. According to Grubov (2001) in vegetable gardens and ruderal places in the phytogeographical regions Khangai, Mongolian Dauria (west), Mongolian Altai, Middle Khalkha and Depression of Great Lakes (city of Hovd).

Matteuccia struthiopteris (L.) Tod. – Khonin Nuga, Ulaan Burgas, 4.7.2002.

New for Mongolia. In riparian forest of *Picea obovata*, *Betula platyphylla*, *Pinus sylvestris*, and *Populus laurifolia*. *M. struthiopteris* is widespread in Eurasia (from Scandinavia, temperate Europe and the Mediterranean region to the Russian Far East). It occurs in shady habitats near streams and edges of swamps (Bobrov in Fedorov 1999a).

Milium effusum L. – Sangastai, 14.8.2001; Bayantogol, 23.6.2000.

New for Mongolia. In subalpine *Pinus sibirica* forest. In Russia, *M. effusum* occurs in forests, forest clearings and among shrubs (Cvelev in Fedorov 1999a). The species has its main occurrence in suboceanic regions of Eurasia (Sebald & al. 1998).

Myriophyllum spicatum L. – 4 km SW Khonin Nuga (49°03'15"N, 107°15'15"E), 26.6.2000.

In shallow lake surrounded by a moist meadow. According to Grubov (2001) in backwaters, old river beds, lakes and slow rivers in the regions Khubsugul, Khangai, Middle Khalkha, East Mongolia, Depression of Great Lakes, Valley of Lakes and Dzungarian Gobi (lower reaches of Bulgan gol).

Nepeta sibirica L. – Tailagt Uul (49°05'06"N, 107°38'25"E), 10.5 km E Hot Springs, 5.8.1999.

In subalpine meadow steppe on southern slope. According to Grubov (2001) the species occurs in the phytogeographical regions Khangai, Khobdo, Mongolian Altai, Depression of Great Lakes, Gobi-Altai and Dzungarian Gobi in waterside meadow slopes of mountains, in shaded screes, at the base of rocks, in the bottom of creek valleys and in waterside pebbles in the montane-steppe and forest-steppe belts. Further, found by us in Mongolian Dauria in subalpine scree (Gyalalzhakh Uul, 20.6.1997).

Nonea pulla DC. – Khotongiin davaa (48°57'00"N, 107°04'42"E), 36 km SW Khonin Nuga, 25.6.1999

On roadside in montane coniferous forest. Previously known from abandoned fields, wastelands and roadside in Mongolian Dauria, Middle Khalkha, East Mongolia, and Dzungarian Gobi (Grubov 2001).

Poa tianschanica (Rgl.) Hack. ex O. Fedtsch. – Hot Springs (Eröögiin khaluun rashaan), 4.7.2001.

In floodplain meadow. In Khubsugul, Khangai, Mongolian Dauria (west), Great Khingan, Khobdo (Böhmörön river), Mongolian Altai, East Mongolia, Depression of Great Lakes (southern slope of Tannu-Ola) and Gobi-Altai in forest meadows and fringes, in birch groves, on meadow slopes and on river banks (Grubov 2001).

Rhamnus erythroxylon Pall. – 0.7 km N Khonin Nuga (49°05'33"N, 107°17'35"E), 31.7.2001.

Stony southern slope with mountain steppe. According to Grubov (2001) on rocks, stony slopes and granite residual mountains in the phytogeographical regions Khangai, Mongolian Dauria (mouth of Orchon river; Dulaanhaan), Middle Khalkha, East Mongolia, East Gobi and Gobi-Altai (Gurvan-Bogd).

Saussurea acuminata Turcz. – 1 km E Sharlangiin guur (49°04'36"N, 107°25'05"E), 21.6.2001; Sangastai, 21.7.2000

Floodplain meadow. Previously found in Mongolian Dauria and Great Khingan in similar habitats on damp floodplain meadows and river banks (Grubov 2001).

Saussurea controversa DC. – Bayantogol, 20.6.2000.

At the edge of *Picea obovata*-*Pinus sibirica* forest on southern slope. According to Grubov (2001) known from *Larix sibirica* forests, forest meadows and meadow slopes in the subalpine belt from Khubsugul (east and south), Khangai (centre: Tsetserleg) and Great Khingan.

Schizachne callosa (Turcz. ex Griseb.) Ohwi – Hot Springs (Eröögiin khaluun rashaan), 1.7.2001. Khonin Nuga, 24.7.2001.

In *Pinus sylvestris* forest, in scree in mixed coniferous forest and on floodplain meadow. Already known from Mongolia from Khangai (Egiyn Gol basin, Hangay somon, terrain feature Shivertin-Dugan; Grubov 2001) and Great Khingan, where it was found in larch forests and shrubberies (Gubanov 1996).

Scirpus radicans Schkuhr – Hot Springs (Eröögiin khaluun rashaan), 29.7.2001.

On regularly flooded river bank. Previously found in Mongolia on river banks, old river beds and lake shores in Khangai, Mongolian Dauria (northwest: lower reaches of Orchon river; north-east: Dadal somon) and East Mongolia (Grubov 2001).

Senecio asiaticus Schischk. & Serg. – Sharlangiin guur, 27.6.2001, leg. Sanchir Ch.

In montane meadow steppe. Already known from Khubsugul (east), Khangai and Mongolian Altai (northwest: upper reaches of Tsagaan Gol) from meadow steppes and mountain steppes in the montane belt as well as from light *Larix sibirica* forests and alpine meadows (Grubov 2001).

Senecio sukaczewii Schischk. – Hot Springs (Eröögiin khaluun rashaan), 2.8.2000.

On floodplain meadow. Already known from Mongolian Dauria (floodplain of Orchon river near Shamaar) and East Mongolia from damp and swampy floodplain meadows and river pebbles (Grubov 2001).

Taraxacum mongolicum Hand.-Mazz. – Khonin Nuga Research Station, 1.7.1999.

On floodplain meadow on roadside. Samples of *T. mongolicum* were formerly often misidentified as *T. officinale* (Gubanov 1996). Grubov (2001) lists *T. mongolicum* from Khubsugul, Khangai, Mongolian Dauria, Khobdo, Depression of Great Lakes, and Valley of Lakes, where it occurs in forest meadows, floodplain meadows, shubberies, forest fringes, as weed in ploughed fields, along roads as well as in wastelands in settlements and towns.

Thalictrum squarrosus Steph. ex Willd. – Between Hot Springs (Eröögiin khaluun rashaan) and Minjiin Davaa, 25.5 km E Hot Springs (49°00'57"N, 107°25'15"E), 1.8.2000.

In montane mountain steppe. Previously found on steppe debris and stony slopes, in sandy deserts and near rocks in Khangai, Mongolian Dauria, Great Khingan, Middle Khalkha, and East Mongolia (Grubov 2001).

Vicia japonica A. Gray – Hot Springs (Eröögiin khaluun rashaan), 21.5 km E Khonin Nuga Research Station, 2.8.2001; river Minj (49°00'02"N, 107°02'39"E), 30.6.2001, leg. *Sanchir Ch.*

On river bank and floodplain meadow. So far only known from Great Khingan from forests and waterside pebbles (Grubov 2001).

Vincetoxicum sibiricum (L.) Decne. – Hot Springs (Eröögiin khaluun rashaan), 25.8.2001.

Mountain steppe on dry southern slope in the montane belt. Widespread in Mongolia in the phytogeographical regions Khangai, Mongolian Dauria, Great Khingan, Mongolian Altai, Middle Khalkha, East Mongolia, Depression of Great Lakes, Valley of Lakes, East Gobi, Gobi-Altai, Dzungarian Gobi, Transaltai Gobi, and Alashan Gobi, growing on steppe debris, stony slopes, screes, bottom of small says, and sandy steppes (Grubov 2001).

Viola brachysepala Maxim. – Ikh Bayantogol (49°05'45"N, 107°17'47"E), 1 km N Khonin Nuga Research Station, 18.7.2001; Hot Springs (Eröögiin khaluun rashaan), 23.8.2001.

In forest meadows and gappy *Larix sibirica*-*Betula platyphylla* forests and in mixed stands of *Pinus sibirica* in the montane belt. Previously known from Great Khingan from upland meadows and steppe meadows (Grubov 2001).

Viola patrinii Ging. – Khonin Nuga, 30.7.2001.

On moist floodplain meadow. According to Grubov (2001) on damp and swampy meadows as well as on inundated floodplain meadows in the phytogeographical regions Great Khingan, Mongolian Altai, Depression of Great Lakes (lower reaches of Hovd river) and Dzungarian Gobi.

Discussion

In three vegetation periods (from 1999 to 2001), 44 vascular plant species were found that are new for the phytogeographical region of Khentei. Five of them (i.e. *Carex chordorrhiza*, *C. praecox*, *Cinna latifolia*, *Matteuccia struthiopteris* and *Milium effusum*) are recorded from Mongolia for the first time. In the case of *Cinna* and *Milium* also the genera are new to Mongolia. The records are from an area of about 500 km² in the surrounding of the Khonin Nuga Research Station. Some of the species, which were not known from the Khentei so far, were even shown to be frequent in the study area, such as *Filipendula ulmaria*, *Euphrasia syreitschikovii* and *Galium uliginosum* in floodplain meadows and on river banks as well as *Athyrium filix-femina*, *Hieracium echinoides* in mixed forests of either *Larix sibirica*, *Abies sibirica* and *Picea obovata* or of *Larix sibirica* and *Betula platyphylla*. Further, *Cirsium vlassovianum* and *Hieracium virosum* turned out to be frequent in forest meadows. *Taraxacum mongolicum* has a wide ecological amplitude and grows frequently in moist meadows, forest meadows, around shrubs and along forest roads. These findings indicate that the flora of the western Khentei Mountains has been particularly poorly investigated so far.

In northern Mongolia, the southern Siberian taiga borders directly on the Central Asian steppe. As the Khentei Mountains are part of this transitional zone, both boreal and Central Asian floral elements occur in the area and are, thus, responsible for a high floristic diversity (Hilbig & Knapp 1983, Hilbig 1990). This high floristic diversity can be attributed to a small-scale pattern of different habitat types such as dry mountain steppes, moist floodplain meadows and forests, river banks, forest meadows as well as different montane and subalpine coniferous and mixed coniferous forests. Especially the woodlands in the western Khentei Mountains are more diverse in habitat types than most areas of Mongolia including the eastern Khentei Mountains (Savin & al. 1988). In the western Khentei Mountains, forests comprise a mixture of numerous tree species such as *Larix sibirica*, *Pinus sibirica*, *P. sylvestris*, *Picea obovata*, *Abies sibirica*, *Betula platyphylla* and *Populus tremula*. This mixture is characteristic for the southern Siberian taiga (Mühlenberg & al. 2000) and lacks in the eastern Khentei Mountains, where forest vegetation is relatively uniform, consisting of only a few dominating tree species such as *Larix sibirica* and *Pinus sylvestris* (Treter 1993). In accordance with the high diversity of tree species and, with it, of habitat types, most species listed in the present paper are inhabitants of woodlands, forest meadows and forest edges (Grubov 2001). This applies to *Dryopteris dilatata*, *Athyrium filix-femina*, *Galium uliginosum*, *Cimicifuga dahurica*, *Alchemilla gubanovii*, *Cirsium vlassovianum*, *Hieracium echinoides*, *H. virosum*, *Cinna latifolia*, *Milium effusum*, *Poa tianschanica*, *Schizachne callosa*, *Taraxacum mongolicum*, *Vicia japonica* and *Viola brachysepala*. As both forest and steppe habitats were studied equally, this suggests a higher similarity of the steppe vegetation than of the forest vegetation between the western and the eastern Khentei Mountains.

Acknowledgements

We thank Prof. Dr Sanchir Ch. (Biological Academy of Mongolia, Ulaanbaatar) and Prof. Dr E. Jäger (University of Halle, Germany) for their kind assistance with identifying the specimens. Prof. Dr M. Runge and Dr M. Hauck (University of Göttingen, Germany) are thanked for their helpful comments on the manuscript.

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