Additions to the lichen flora of Mongolia: records from Khentey and Khangay

Abstract


Seventy-eight lichen species are added to the known lichen flora of the N Mongolian province Khentey and six lichen species are reported for the first time from the province and phytogeographical region Khangay, which covers parts of central and NW Mongolia. One lichen species is new to the Mongolian Altay in W Mongolia. Seven crustose epiphytic lichens are new to Asia, viz. Caloplaca thuringiaca, Candelariella riae-lactae, Hypocenomyce leucococca, Lecidea leprarioides, Pyrrhospora cinnabarina, Rinodina degeliana, and Strangospora microhaema. Thirty-one further species are first records for Mongolia, viz. Arthonia apathetica, Buellia badia, B. triphragmioides, Caloplaca cerinella, C. chrysophthalma, Chaenotheca chrysocephala, C. trichialis, Cladonia humilis, Colema subflacida, Graphis scripta, Lecanora circumborealis, L. intricata, Lecidea nylanderi, Lepraria jackii, Micarea pellucida, Mycobilimbia tetramera, Parmeliopsis hyperopta, Phaeophyscia rubropulchra, Physcia adscendens, Physciella chloantha, P. melanchra, Porpidia macrocarpa, Ramalina calicaris, Rhizocarpon hochstetteri, Schismatomma pericleum, Tuckermannopsis americana, Usnea articulata, Verrucaria margacea, V. praetermissa, Xanthoria fulva, X. ulophyllodes.

Key words: lichenes, phytogeography, Central Asia, NE Asia.

Introduction


The survey of Cogt (1995) is well suited as a basis for further research. Own studies in his herbarium at the Institute of Biological Sciences of the Mongolian Academy of Science in Ulaanbaatar (UBA) revealed that Cogt’s identifications are generally very reliable. Moreover, Cogt (1995), as did Golubkova (1981), provided information on the regional distribution of all lichen
species. For regionalization they used Grubov’s (1982, 2001) classification of Mongolia, separating 16 phytogeographical provinces. While Cogt (1995) provided with his catalogue an excellent overview of the state of knowledge at that time, the lichen flora of such a huge country as Mongolia, where only a few lichenologists have been working, is of course still only incompletely known. Hence, in the present paper, we compiled data of 85 lichen species new to the flora of Mongolia or new to one of the phytogeographical provinces, respectively.

Most records given are from the two adjacent provinces Khentey and Khangay in northern and central Mongolia. Sites studied in the Khangay (Tamir River, Khorgo-Terkhiyn Tsagaan Nuur National Park) and the southern Khentey (near Ulaanbaatar) belong to the forest steppe belt, which is characterized by Larix sibirica dominated forests on northern slopes and grasslands on southern slopes and in valleys (Vostokova & Gunin 2005). The northern Khentey (Eroo valley) is located in the mountain taiga. Northern slopes and valley bottoms of lower elevations in this area are primarily covered with Betula platyphylla-Larix sibirica subtaiga (= light taiga) forests, whereas steppes occur on southern slopes (Dulamsuren & al. 2005a-b). Pinus sibirica, Abies sibirica and Picea obovata form the dark taiga forests of the upper montane belt (Dulamsuren & al. 2005a).

The data compiled in the present paper result from five travels through the country in 2002-05. Specimens cited are deposited in the personal herbarium of the first author (presently at GOET).

The species

**Acarospora oligospora** (Nyl.) Arnold – Khentey, Eroo valley, Baziin Am (49°2’N, 107°15’E), c. 1100 m, 3.8.2005, M. Hauck.

Common on small stones of siliceous rock scattered on the ground of open, herb-rich shortgrass meadow steppes in the western Khentey Mts (Pulsatilla ambigua meadow steppe sensu Dulamsuren & al. (2005a-b)). Often associated with Caloplaca arenaria and Sarcogyne picea. Previously *A. oligospora* was only reported from E Mongolia (phytogeographical regions Khingan and Eastern Mongolia; Cogt 1995).

**Anamylopsora pulcherrima** (Vainio) Timdal – Khentey, Eroo valley, Ulaan Burgas (49°4’N, 107°16’E), c. 1000 m, 11.8.2004, M. Hauck.

This species is discussed here to smooth out taxonomic confusion in the literature dealing with the lichens of Mongolia. Cogt (1995) listed *A. pulcherrima* only from two localities in the Mongolian Altay and the Khangay. In addition, he included Lecidea hedini H. Magn. from several phytogeographical regions in his checklist. Timdal (1991), however, recognized the Central Asian *L. hedini* as a synonym of the more widely distributed *A. pulcherrima*. Samples listed in Cogt (1995) as *A. pulcherrima* or *L. hedini*, respectively, do not represent different lichen taxa (if both species were accepted), but are in fact records from different authors meaning the same taxon. *A. pulcherrima* is a frequent inhabitant of hard siliceous rock in Mongolia.

**Arthonia apatetica** (Massal.) Th. Fr. – Khentey, Eroo valley, Baziin Am (49°2’N, 107°15’E), c. 1100 m, 4.8.2005, M. Hauck.

On bark of the shrub Spiraea aquilegifolia on southern slope with mountain steppe; associated with Caloplaca holocarpa and Lecidella elaeochroma. First record of an Arthonia species from Mongolia. The distribution of *A. apatetica* is insufficiently known because the species is inconspicuous and often confused with closely related Arthonia species, such as *A. leucodontis* and *A. muscigena* (Coppins 1989). Published records of *A. apatetica* are from Europe (Wirth 1995), NW Siberia (Sedelnikova & Taran 2000) and North America (Brodo 1995).

**Aspicila contorta** (Hoffm.) Kremp. – Khentey, Eroo valley, Ulaan Burgas (49°4’N, 107°16’E), c. 1000 m, 11.8.2004, M. Hauck.

On slate in montane meadow steppe. Already known from Mongolia from the phytogeographical provinces Khangay, Mongolian Dauria, Khingan and Eastern Mongolia (Cogt 1995).
Baeomyces rufus (Huds.) Rebent. – Khentey, Ilchlegiyn Gol, Eroogiyn Khaluun Rashaan (49°1'N, 107°32'E), 1230 m, 2.8.2002, M. Hauck.

On loamy soil of a forest road. Biazrov (1983) already found the species in Mongolia in the Khangay.

Biatora chrysantha (Zahlbr.) Printzen – Khentey, Sangastay (49°10'N, 107°18'E), 1570 m, 29.7.2005, M. Hauck & S. Javkhlan;
Khentey, Tsansai (48°10'N, 106°53'E), c. 20 km N Ulaanbaatar, c. 1500 m, 10.9.2005, M. Hauck.


Biatora vernalis (L.) Fr. – Khentey, Sangastay (49°10'N, 107°18'E), 1570 m, 28.7.2005, M. Hauck & S. Javkhlan.

Over bryophytes on trunk bases of Picea obovata in the dark taiga. B. vernalis has already been collected in Mongolia in Larix sibirica forests of the Khovsgol area and the Khangay (Cgot 1995).

Buellia badia (Fr.) Massal. – Khangay, Arkhangay district, eastern shore of Terkhiyn Tsagaan Nuur (48°11'N, 99°49'E), 2070 m, 29.7.2004, M. Hauck.


Buellia griseovirens (Turner & Borrer ex Sm.) Almb. – Khentey, Sangastay (49°10'N, 107°18'E), 1570 m, 30.7.2005, M. Hauck & S. Javkhlan.


On twigs of Larix sibirica in larch forest of a northern slope in the forest steppe. New to Mongolia. Our record links two previously known localities from Asia in N Siberia (Jennisey) and India (Himalayas; Nordin 2000). B. triphragmioides has been most often sampled in N Europe and W North America on Alnus, Betula, Picea, Populus, Salix and Sorbus (Nordin 2000).


Common on small, siliceous stones in open Pulsatilla ambigua meadow steppe of the western Khentey Mts, usually associated with Acarospora oligospora and Sarcogyne picea. More rarely on rock outcrops together with, e.g., Xanthoparmelia conspersa, X. pulla and X. stenophylla. In Mongolia, previously found in Mongolian Dauria and in the Khangay (Cgot 1995).

Caloplaca cerinella (Nyl.) Flagey – Khentey, Eroo valley, Bazii Am (49°2'N, 107°15'E), c. 1100 m, 7.8.2005, M. Hauck.

Frequent on Spiraea aquilegifolia and Ulmus pumila in mountain steppes and Ulmus pumila open woodlands on southern slopes of the western Khentey Mts. Furthermore, on Salix schwerinii in floodplain forest. New to Mongolia. C. cerinella is widespread in Eurasia and further known from N Africa and Australia (Khodosovtsev & al. 2004). The similar C. cerinelloides (Eriksen) Poelt with 8 instead of 12-16 ascospores per ascus was already reported from Larix bark from the Khangay Mts by Schubert & Klement (1971).
Caloplaca chrysophthalma Degel. – Khentey, Eroo valley, Khonin Nuga (49°5’N, 107°17’E), 950 m, 3.8.2002, M. Hauck.


Abundant in the western Khentey Mts on the bark of Ulmus pumila and Spiraea aquilegifolia in U. pumila open woodlands and mountain steppes of southern slopes, often growing together with C. cerina, C. cerinella and Candelaria concolor. Previous records of C. holocarpa from Mongolia are from the Mongolian Altay, the Khangay and Middle Khalka, where C. holocarpa occurs as an epiphyte of Caragana and Larix (Cogt 1995).

Caloplaca saxicola (Hoffm.) Nordin – Khentey, Eroo valley, Khonin Nuga (49°4’N, 107°17’E), 950 m, 18.8.2005, M. Hauck.

On concrete. The species has already been found in E Mongolia in the phytogeographical region Khingan (Golubkova 1981).


On plant debris, e.g. Artemisia, close to the soil surface in open meadow steppe, locally common, sometimes associated with Amandinea punctata, C. cerina or Diploschistes muscorum. New to Asia. So far known from xerothermic European grasslands with relatively continental climate (Germany, Austria, Switzerland, Italy), where C. thuringiaca occurs in similar microhabitats and with the same accessory species as in Mongolia (Søchting & Stordeur 2001, Stordeur 2003). A frequent substrate of C. thuringiaca in Europe is decaying Artemisia campestris. Geological preferences are vague, as C. thuringiaca was found over gypsum, lime and calcarenite in Europe, but over slate in Mongolia. The discovery of C. thuringiaca in Mongolia suggests that this recently described species (Søchting & Stordeur 2001) might be widespread throughout the Eurasian steppe belt.

Candelariella viae-lacteae Thor & V. Wirth – Khangay, Arkhangay district, Tamir river (46°51’N, 103°23’E), c. 18 km WSW Kharkhorin, 25.7.2004, M. Hauck.

On Populus bark, in a strip of Salix-Populus floodplain forest in the meadow steppe; associated with Physcia stellaris, Physciella melanchra, Xanthoria fallax and X. fulva. C. viae-lacteae is new to Asia. Its known range is considerably enlarged by the record from Mongolia, as all findings published so far are from S and Central Europe (Spain, Italy, Hungary, Greece, Germany), where C. viae-lacteae is a rare epiphyte of various tree species including Populus (Thor & Wirth 1990, Wirth 1995, Tretiach 1997, Aragón & Martínez 2002).

Candelariella xanthostigma (Pers. ex Ach.) Lettau – Khentey, Eroo valley, Bayantogol (49°5’N, 107°17’E), c. 1100 m, 8.8.2005, M. Hauck.

On trunks of Betula platyphylla in B. platyphylla-Larix sibirica subtaiga forests. Previously known in Mongolia from Khovd, the Mongolian Altay and the Khangay (Schubert & Klement 1971, Golubkova 1981).

Cetrelia cetrarioides (Del. ex Duby) W. Culb. & C. Culb. – Khentey, Eroo valley, Bayantogol (49°5’N, 107°17’E), c. 1100 m, 12.8.2005, M. Hauck.

On inclined trunk of Betula platyphylla in B. platyphylla-Larix sibirica subtaiga forest. Furthermore, on branches of Abies sibirica and Picea obovata in Pinus sibirica dominated dark taiga forest. Associated species were, among others, Bryoria nadvornikiana, Collema nigrescens, Lepogonium saturninum and Nephroma helveticum. C. cetrarioides has already been reported for Mongolia from the Khangay (Biazrov 1983).
Chaenotheca chrysocephala (Turner ex Ach.) Th. Fr. – Khentey, Sangastay (49°10'N, 107°18'E), 1570 m, 30.7.2005, M. Hauck & S. Javkhlan.


Chaenotheca trichialis (Ach.) Th. Fr. – Khentey, Sangastay (49°10'N, 107°18'E), 1570 m, 30.7.2005, M. Hauck & S. Javkhlan.

On trunks of Abies sibirica and Picea obovata in the dark taiga, rarer than C. chrysocephala, which was always associated with C. trichialis. First record for Mongolia, but already known from S Siberia (Sedelnikova & al. 1989, Sedelnikova & Lashchinskiy 1991, Urbanavicene 1998). C. trichialis occurs on all continents except Antarctica (Nimis 1993).

Chrysothrix candelaris (L.) J. R. Laundon – Khentey, Sangastay (49°10'N, 107°18'E), 1510 m, 26.7.2002, M. Hauck.

In the dark taiga on trunk bases of Picea obovata and Pinus sibirica. Schubert & Klement (1971) reported C. candelaris from siliceous rock in the Khangay. Because of the substratum, which would be unusual for C. candelaris, this record is questionable (like many identifications by Klement; Hauck 1996).

Cladonia crispata (Ach.) Flotow – Khentey, tributary to the river Ilchlegiyn Gol, 4 km SW Eröogiyn Khaluu Rashaan (49°9'N, 107°31'E), 1100 m, 31.7.2002, M. Hauck.

On acidic soil in open situation. In Mongolia only known from the Khangay so far (Biazrov 1974).

Cladonia humilis (With.) J. R. Laundon – Khentey, Eroo valley, Bayantogol (49°5'N, 107°17'E), c. 1100 m, 16.8.2005, M. Hauck.

Terricolous at the edge of dry Pinus sylvestris subtaiga forest bordering on montane meadow steppe. New to Mongolia. C. humilis has a wide distribution with occurrences in Europe, Asia, North America and New Zealand (Purvis & James 1992a). Abbas & al. (1991) and Wei (1991) reported C. humilis from China, where it was, among others, found in the provinces of Xinjiang, Inner Mongolia and Heilongjiang, which border on Mongolia.

Cladonia mongolica Ahti – Khentey, Eroo valley, Bayantogol (49°5'N, 107°17'E), c. 1100 m, 12.8.2005, M. Hauck.

On logs of Larix sibirica in subtaiga forest of Betula platyphylla and Larix sibirica, together with other Cladonia species, such as C. amaurocraea, C. cenotea and C. coniocraea. Previously only published from Mongolia from Lake Khovsgol (type locality) and the Khangay (Huneck & al. 1987, Palka & Śliwa 2006). C. mongolica differs from the similar, oceanic C. ramulosae (With.) J. R. Laundon by the ecorticate base of the podetia. Specimens from Mongolia named as C. ramulosae (Biazrov 1983, Cogt 1995) probably all belong to C. mongolica (Huneck & al. 1987). Outside Mongolia, C. mongolica has been reported from the Russian Far East (Ahti 1992), China (Ahti 1991), India (Himalayas), Nepal and Bhutan (Ahti & al. 2002).


On open soil in montane Pulsatilla ambigua meadow steppe, together with Psora globifera, Cladonia pyxidata and Xanthoparmelia camtschadalis. Outside the Khentey, C. crispum has already been reported from various parts of Mongolia (Mongolian Altay, Khangay, Mongolian Dauria, Eastern Mongolia).
Collema nigrescens (Huds.) DC. – Khentey, Eroo valley, Bayantogol (49°5’N, 107°17’E), c. 1100 m, 12.8.2005, M. Hauck.

In Betula platyphylla-Larix laricina subtaiga forest on trunks of B. platyphylla and on dead wood with, e.g., L. saturninum and Nephroma helveticum. Moreover, on Salix, in floodplains of the Eroo valley. Schubert & Klement (1971) and Biazrov (1983) already found C. nigrescens in Mongolia in the Khangay. The specimens of C. nigrescens from the Eroo valley differ from the similar C. subnigrescens, which is already known from the Khentey (Cög 1995), by their narrower, 4-5 µm wide, acicular ascospores. Makryi (1990) reported C. nigrescens and C. subnigrescens from S Siberia near Lake Baikal.

Collema subflaccidum Degel. – Khentey, Eroo valley, Bayantogol (49°5’N, 107°17’E), c. 1100 m, 8.8.2005, M. Hauck.

On trunk of living Betula platyphylla in B. platyphylla-Larix sibirica subtaiga forest, together with, e.g., Candelariella xanthostigma, Parmelia sulcata and Physcia stellaris. First record for Mongolia. The species is widespread in Asia including Siberia and China (Degelius 1974). Furthermore, C. subflaccidum is found in Europe, North America and Australia (Degelius 1974).

Collema tenax (Sw.) Ach. – Khentey, Eroo valley, Ulaan Burgas (49°4’N, 107°16’E), c. 1000 m, 11.8.2004, M. Hauck.

Between terricolous bryophytes on southern slope in the Pulsatilla ambigua meadow steppe. C. tenax was already known from W and central Mongolia (Khovd, Mongolian Altay, Khangay, Valley of Great Lakes; Cög 1995).

Diploschistes scruposus (Schreb.) Norman – Khentey, Eroo valley, Bayantogol (49°5’N, 107°17’E), c. 1100 m, 8.8.2005, M. Hauck.

On siliceous rock in mountain steppe. D. scruposus has already been published from N, W and central Mongolia (Mongolian Altay, Khovsgol, Khangay; Cög 1995).


Widespread in the canopy of Betula platyphylla-Larix laricina subtaiga forests in the valley of the river Eroo, more rarely on Picea obovata in the dark taiga of the upper montane belt. Records from Mongolia were so far published from the phytogeographical regions Khovsgol and Khangay (Cög 1995).


At trunk basis of Ulmus pumila in U. pumila open woodland surrounded by mountain steppe. F. flaventior was previously found in Mongolia in the Khangay (Biazrov 1987). The closely related F. soredica is frequent in the subtaiga of the western Khentey Mts.

Fuscopannaria leucophaea (Vahl) P. M. Jørg. – Khentey, Eroo valley, Okhin Tolgoi (49°5’N, 107°17’E), c. 1000 m, 8.8.2004, M. Hauck.

On quartzite stones on the forest floor in Betula platyphylla-Larix sibirica subtaiga forest on steep northern slope. F. leucophaea has already been known from central Mongolia (Khangay, Middle Khalka; Cög 1995).


At trunk bases of Abies sibirica and more rarely Picea obovata in Pinus sibirica dominated dark taiga forest of the upper montane belt. First record of a Graphidaceae species from Mongolia. G. scripta is widespread throughout the temperate zone of the northern hemisphere (Staiger 2002). The range of G. scripta in Russia includes S Siberia, north of the Mongolian Khentey (Urbana-vicenc 1998).

On trunk of Abies sibirica and Picea obovata in the dark taiga. First record for Asia. The distribution of H. leucococca is insufficiently known, however, published records from Europe and North America (Tønsberg 1992) as well as the present record from the N Mongolian mountain taiga suggest a circumboreal range.


On conifer wood (logs, branches) of, e.g., Pinus sibirica in the dark taiga. Already known from similar substrate from Mongolian Dauria (Golubkova 1981).

Lecanora cenisia Ach. – Khentey, Eroo valley, Baziiin Am (49°2’N, 107°15’E), c. 1100 m, 7.8. 2005, M. Hauck.

On rock outcrops of quartzite on southern slope with mountain and meadow steppe. Biazrov (1983) reported L. cenisia from the Khangay.


On trunks and more rarely branches of Abies sibirica, Picea obovata and Pinus sibirica in the dark taiga. New to Mongolia. As indicated by its name, L. circumborealis is widely distributed in the northern coniferous forests of Eurasia and North America (Makarevicz 1971, Brodo 1984, Brodo & Vitikainen 1984).

Lecanora intricata (Ach.) Ach. – Khentey, Sangastay (49°10’N, 107°18’E), 1520 m, 10.8.2004, M. Hauck.

Together with Rhizocarpon hochstetteri on hard, sun-exposed siliceous rock in the upper montane belt in a clearing within the dark taiga. New to Mongolia. As indicated by its name, L. intricata is a widely distributed species, which is, amongst others, known from Siberia and China (Makarevicz 1971, Makryi 1990, Sedelnikova 1990, Wei 1991).

Lecanora piniperda Körber – Khentey, Eroo valley, Bayantogol (49°5’N, 107°17’E), c. 1100 m, 8.8.2005, M. Hauck.

On trunk bases and branches of Larix sibirica at sun-exposed, dry sites at the edge of a Betula platyphylla-L. sibirica subtaiga forest. Previously reported for Mongolia from the Mongolian Altay and the Khangay (Schubert & Klement 1971, Golubkova 1981).

Lecanora polytropa (Ehrh. ex Hoffm.) Rabenh. – Khentey, Sangastay (49°10’N, 107°18’E), 1520 m, 10.8.2004, M. Hauck.

On sun-exposed, hard siliceous rock in a clearing of the dark taiga, together with Aspicilia cinerea, Rhizocarpon geographicum and R. hochstetteri. L. polytropa is widespread throughout N, W and central Mongolia (Khovd, Mongolian Altay, Khovsgol, Khangay; Cogt 1995).


On trunk base of Pinus sibirica in dark taiga forest, together with L. nylanderi. New to Mongolia. L. leprarioides has probably a circumboreal range, but records have only been published from boreal and oroboreal forests of Europe (Tønsberg 1992, Türk & Berger 1999) and North America (Tønsberg 1993, Schmull & al. 2002, Hauck & Spribille 2005). Andreev (1998) reported L. leprarioides as L. turgidula var. pulveracea Th. Fr. from Russia without mentioning any localities. Therefore, our record is the first substantiated one of L. leprarioides from Asia.


Frequent in dark taiga forests of the western Khentey Mts, primarily on trunk bases of *Abies sibirica*, *Picea obovata* and *Pinus sylvestris*. First records for Mongolia. *L. jackii* is widespread in the coniferous forests of the northern hemisphere. Records have been published from Europe (including Russia) and North America (Tønsberg 1992, Kümmerling & al. 1995, Kukwa & al. 2003). Single collections of saxicolous populations of *L. jackii* were made in N Korea and Australia (Kümmerling & al. 1995).

*Leptogium hildenbrandii* (Garov.) Nyl. – Khentey, Eroo valley, Bayantogol (49°5’N, 107°17’E), c. 1100 m, 12.8.2005, M. Hauck.

On *Ulmus pumila* on southern slopes in small *U. pumila* open woodlands, which are surrounded by mountain steppe; associated with, e.g., *Melanelixia albertana* and *Phaeophyscia ciliata*. Furthermore, on *Salix rorida* and *Betula platyphylla* in riverine birch forest. The range of *L. hildenbrandii* comprises W and S Europe, Siberia, Mongolia, N India, China and Japan (Jørgensen 1997). *L. hildenbrandii* has already been known from central and N Mongolia (Khangay, Mongolian Dauria; Cogt 1995).

*Lichinella stipatula* Nyl. – Khentey, Eroo valley, Bayantogol (49°5’N, 107°17’E), c. 1100 m, 16.8.2005, M. Hauck.

On siliceous rock in mountain and meadow steppes of southern slopes. *L. stipatula* is widespread throughout Mongolia and has already been reported from the phytogeographical regions of Mongolian Altay, Khangay, Valley of the Great Lakes, Mongolian Dauria, Middle Khalka, Eastern Gobi and Eastern Mongolia (Cogt 1995).


Repeatedly found on trunks of *Ulmus pumila* in *U. pumila* open woodlands on southern slopes. *M. albertana* is listed here to summarize its status in Mongolia, as it had been dubious until recently. The species is not included in Cogt (1995). Ahti (1977) mentioned it as “recently detected in Mongolia”, but did neither quote a locality nor a specimen. The reference given by Ahti (1977) in this context only contains records from North America (Ahti 1969), where it is found in the northern Great Plains of Alberta, Saskatchewan, Manitoba and Minnesota (Brodo & al. 2001). Actually, Ahti’s report of *M. albertana* for Mongolia is based on a sample he took near Terelsh in the Khentey Mts, 75 km NE Ulaanbaatar. Later, this specimen was cited by Urbanavichene & Urbanavichus (1998), who also quoted a collection of *M. albertana* sampled by Biazrov in the Khanhay. The collector himself published this specimen at a later date as new to the Khanhay (Biazrov 2001). In Russia, Urbanavichene & Urbanavichus (1998) found *M. albertana* in S Siberia in the Lake Baikal area and Poryadina (2006) in Yakutia. *M. albertana* is a continental, boreal to temper-
ate species. Its world distribution reflects similarities in climate and vegetation of the northern margin of the interior prairies of North America with the forest steppe and ultracontinental taiga forests of N Mongolia, Transbaikalia and Yakutia.

Melanelixia fuliginosa (Fr. ex Duby) O. Blanco & al. (= Melanelia fuliginosa (Fr. ex Duby) Essl., M. glabrata (Lamy) Essl.) – Khangay, Arkhangay district, Khorgo Volcano, 4 km E Terkhyn Tsagaan Nuur (48°11'N, 99°51'E), c. 2700 m, 26.7.2004, M. Hauck.

On twigs of Larix sibirica in open larch forest on volcanic rock. So far only known from a L. sibirica forest in the Khentey near Ulaanbaatar (Cogt 1995). The superficially similar Melanohalea exasperatula is much more frequent in the coniferous forests of Mongolia.

Melanelixia subaurifera (Nyl.) O. Blanco & al. (= Melanelia subaurifera (Nyl.) Essl.) – Khentey, Eroo valley, Baziin Am (49°2'N, 107°15'E), c. 1100 m, 4.8.2005, M. Hauck.

On Ulmus pumila on southern slope in U. pumila woodland surrounded by mountain steppe. Previously recorded from the Khangay (Biazrov 1983).


Mycobilimbia tetramera (De Not.) Vitik. & al. – Khentey, Eroo valley, Bayantogol (49°5'N, 107°17'E), c. 1100 m, 12.8.2005, M. Hauck.


On branch of Picea obovata in the dark taiga, together with, e.g., Bryoria nadvornikiana, Buellia schaereri, Japewia tornoenis, Lecanora symmicta and Parmelia squarrosa. Biazrov (1983) and Huneck & al. (1987) already found M. sanguinarius in Mongolia in the Khangay. M. sanguinarius is also known from S Siberia (Urbanavicene 1998).

Nephroma parile (Ach.) Ach. – Khentey, Sangastay (49°9'N, 107°17'E), 1510 m, 25.7.2002, M. Hauck.

On bryophyte cushions in boulder field of siliceous rock in the upper montane belt. Already found by Biazrov (1983) in Mongolia in the Khangay.

Nephroma resupinatum (L.) Ach. – Khentey, Sangastay (49°10'N, 107°18'E), 1570 m, 30.7.2005, M. Hauck & S. Javkhlan.


Ochrolechia arborea (Kreyer) Almb. – Khentey, Sangastay (49°10'N, 107°18'E), 1570 m, 10.8.2004, M. Hauck.

On branches and trunks in the dark taiga of the upper montane belt of the western Khentey Mts. Most often found on Abies sibirica and Picea obovata, more rarely on Pinus sibirica. Locally abundant. Already known from the mountain taiga and forest steppe in N and central Mongolia (Khovsgol, Khangay, Mongolian Dauria; Golubkova 1981).

Parmelia squarrosa Hale – Khentey, Sangastay (49°10'N, 107°18'E), 1570 m, 10.8.2004, M. Hauck.
Locally frequent on trunks and branches of *Abies sibirica*, *Picea obovata* and *Pinus sibirica* in dark taiga forest of the western Khentey Mts; often associated with *P. sulcata*, *Hypogymnia bitteri* and *H. physodes*. Already reported for Mongolia from the Khangay by Biazrov (2001). *P. squarrosa* occurs in E Asia (China, Korea, Japan), North America and Europe (Hyvönen 1985, Kurokawa 1994).

**Parmeliopsis hyperopta** (Ach.) Arnold – Khentey, Sangastay (49°10′N, 107°18′E), 1570 m, 29.7.2005, M. Hauck & S. Javkhlan.

On *Picea obovata* and *Pinus sibirica* in the dark taiga. New to Mongolia. *P. hyperopta* is known from Europe, Asia as well as North and South America (Purvis 1992, Calvelo & Adler 2001). For S Siberia reported from Lake Baikal (Urbanaviciene 1998).

**Phaeophyscia ciliata** (Hoffm.) Moberg – Khentey, Eroo valley, Baziin Am (49°2′N, 107°15′E), c. 1100 m, 14.8.2005, M. Hauck.

Dominant epiphyte of *Ulmus pumila* in the western Khentey, usually associated with *Xanthoria fallax*, s. str. and lower amounts of *Caloplaca cerina*, *C. holocarpa*, *Candelaria concolor* and *Melanelia albertana*. Rarely on *Spiraea aquilegifolia* in *Ulmus pumila* open woodlands and mountain steppe of southern slopes devoid of light or dark taiga forests. Furthermore, on *Salix* in riverine forests. Despite its abundance in the western Khentey, only single collections of *P. ciliata* from the Mongolian Altay and the Khangay have been published from Mongolia so far. Sedelnikova (1985, 1993), Makryi (1990), Sedelnikova & Lashchinskiy (1991) and Urbanaviciene (1998) found the species in S Siberia.

**Phaeophyscia rubropulchra** (Degelius) Moberg – Khentey, Eroo valley, Bayantogol (49°5′N, 107°17′E), c. 1100 m, 14.8.2005, M. Hauck.

Over bryophytes on siliceous rock on southern slope with mountain and montane meadow steppe. New to Mongolia. Previously known from, e.g., China (including Xinjiang, Abbas & al. 1991), Japan (Kurokawa 2003) as well as E and (rarely) W North America (Neitlich & McCune 1997, Brodo & al. 2001).

**Physcia adscendens** (Fr.) Oliv. – Mongolian Altay, Khobdo valley, 2.7.1971, U. Cogt & N. S. Golubkova, det. N. S. Golubkova (sub *P. tenella*), rev. M. Hauck (UBA); Khentey, Eroo valley, Bayantogol (49°5′N, 107°17′E), c. 1100 m, 11.8.2005, M. Hauck.

New to Mongolia. A recent collection from the Khentey Mts is from *Spiraea aquilegifolia* on a sunlit slope covered with *Ulmus pumila* open woodland. An older specimen from a twig of *Picea obovata* had been mistaken for *P. tenella* by Golubkova. *P. adscendens* has a nearly worldwide distribution in the temperate and boreal zones and has been found on all continents except Antarctica (Nimis 1993).

**Physcia dimidiata** (Arnold) Nyl. – Khentey, Eroo valley, Baziin Am (49°2′N, 107°15′E), c. 1100 m, 3.8.2005, M. Hauck.

On rock outgroup of schist on southern slope with mountain and montane meadow steppe. Previously known from one site of the Mongolian Altay (Golubkova 1981).

**Physcia tenella** (Scope) DC. – Khentey, Eroo valley, Bayantogol (49°5′N, 107°17′E), c. 1100 m, 12.8.2005, M. Hauck.

Since the collection of Golubkova & Cogt, which is now ascribed to *P. adscendens* (see above), was the only sample deposited as *P. tenella* in UBA (and samples from LE were not studied), the status of *P. tenella* in Mongolia (Golubkova 1981, Cogt 1995) became dubious. Therefore, the recent specimen of *P. tenella* from the western Khentey Mts is cited. The sample is from *Betula platyphylla*.

**Physciella chloantha** (Ach.) Essl. – Khentey, Eroo valley, Baziin Am (49°2′N, 107°15′E), c. 1100 m, 5.8.2005, M. Hauck.
On *Ulmus pumila* together with, e.g., *Caloplaca holocarpa* on southern slope with *U. pumila* open woodland and mountain steppe. New to Mongolia. Previously known in Central Asia from Kazakhstan (Moberg 1996) and China (Wei 1991). The world range further comprises E Asia, Europe and North America (Nimis 1993).

*Physciella melanchra* (Hue) Essl. – Khangay, Arkhangay district, Tamir river (46°51’N, 103°23’E), c. 18 km WSW Kharkhorin, 25.7.2004, M. Hauck.

On *Populus* bark, in a strip of *Salix- Populus* floodplain forest in the meadow steppe. New to Mongolia. The range of *P. melanchra* comprises E Asia (Japan, Taiwan) and North America (Esslinger & Egan 1995, Aptroot & al. 2002, Kurokawa 2003).

*Physconia detersa* (Nyl.) Poelt – Khentey, Eroo valley, Bayantogol (49°5’N, 107°17’E), c. 1100 m, 12.8.2005, M. Hauck.

On inclined trunk of living *Betula platyphyllo*- *Larix sibirica* subtaiga forest. Associated species were, e.g., *Candelaria concolor*, *Collema nigrescens*, *Lecanora chlorotera*, *Leptogium saturninum*, *Nephroma helveticum* and *Phaeophyscia ciliata*. Schubert & Klement (1971) published *P. detersa* from a *Populus densa* floodplain forest of the Khangay.


*Placynthiella uliginosa* (Schrad.) Coppins & P. James – Khentey, Eroo valley, Bayantogol (49°5’N, 107°17’E), c. 1100 m, 3.8.2005, M. Hauck.

On twig of *Ulmus pumila*. Earlier collections from Mongolia are from the Mongolian Altay, where Schubert & Klement (1971) reported *P. uliginosa* from soil, as well as from bark and soil of *Larix sibirica* at Lake Khovsgol (Palka & Šiliwa 2006).


On gravel of siliceous rock on a forest road. Biazrov (1989) reported *P. crustulata* from the Khangay, however, without providing a location.

*Porpidia macrocarpa* (DC.) Hertel & Schwab – Khentey, Sangastay (49°10’N, 107°18’E), 1520 m, 10.8.2004, M. Hauck.


On trunks of *Abies sibirica* in the dark taiga. New to Asia. Records from boreal and oroboreal forests of Europe and North America (Tønsberg 1992, Hauck & Sprible 2005) combined with the occurrence in the N Mongolian mountain taiga suggest that *P. cinnabarina* has a circumboreal distribution.

*Ramalina calicaris* (L.) Fr. – Khentey, Eroo valley, Khonin Nuga (49°5’N, 107°17’E), 950 m, 3.8.2002, M. Hauck.

listed *R. calicaris* for China. Other findings of *R. calicaris* are from Europe and North America (Nimis 1993, Esslinger & Egan 1995).

**Ramalina capitata** (Ach.) Nyl. – Khentey, Eroo valley, Bazin Am (49°2′N, 107°15′E), c. 1100 m, 7.8.2005, M. Hauck.

On siliceous rock outcrops in mountain steppe. Previously known in Mongolia from the phytogeographical regions of Khovd, Khangay and Eastern Mongolia (Cogt 1995).

**Ramalina sinensis** Jatta – Khentey, Eroo valley, Bazin Am (49°2′N, 107°15′E), c. 1100 m, 7.8.2005, M. Hauck.

On *Spiraea aquilegifolia* and *Ulmus pumila* in mountain steppe and *U. pumila* open woodland as well as on *Salix* sp. and *Betula platyphylla* in riverine forest. Cogt (1995) reported *R. sinensis* from central Mongolia (Middle Khalkha), where it was found on *Salix*. Urbanavice (1998) published the species from S Siberia.

**Rhizocarpon geographicum** (L.) DC. – Khentey, Sangastay (49°10′N, 107°18′E), 1520 m, 10.8.2004, M. Hauck.

On sun-exposed siliceous rock. Already known in Mongolia from the phytogeographical regions of Mongolian Altay, Khovsgol and Khangay.

**Rhizocarpon hochstetteri** (Körb.) Vainio s. str. – Khentey, Sangastay (49°10′N, 107°18′E), 1520 m, 10.8.2004, M. Hauck.

On sun-exposed, hard siliceous rock in the upper montane belt. New to Mongolia. Previously known from Europe, Siberia, North America and New Zealand (Fryday 2002).

**Rinodina degeliana** Coppins – Khentey, Eroo valley, Bayantogol (49°5′N, 107°17′E), c. 1100 m, 8.8.2005, M. Hauck.

On inclined trunk of a living tree of *Betula platyphylla* in *B. platyphylla-Larix sibirica* subtaiga forest. Associated species were, e.g., *Bryoria nadvornikiana*, *Hypogymnia physodes*, *Lecanora symmicta*, *Nephroma helveticum*, *Nephromopsis laureri* and *Parmelia sulcata*. *R. degeliana* is new to Asia. It was previously recorded from Europe, where it is known from the British Isles (Coppins 2002), Sweden (Coppins 1983), Norway (Tønsberg 1992), Estonia (Aptroot & al. 2005) and Austria (Tønsberg & al. 2001), and from North America (Esslinger & Egan 1995). In Europe and North America, the species grows on various deciduous trees including *Betula*.

**Sarcogyne clavus** (DC.) Kremp. – Khentey, Eroo valley, Baziin Am (49°2′N, 107°15′E), c. 1100 m, 3.8.2005, M. Hauck.

On small pieces of quartzite on the ground of open *Pulsatilla ambigua* meadow steppe on southern slope. More common on other small stones of the same area was the Central Asian endemic species *S. picea* with smooth apothecial margins and a hyaline to light brown exciple. *S. clavus* was already known from Mongolian Dauria and the Khingan (Schubert & Klement 1971, Golubkova 1981).

**Schismatomma periculum** (Ach.) Branth & Rostrup – Khentey, Sangastay (49°10′N, 107°18′E), 1570 m, 29.7.2005, M. Hauck & S. Javkhlan.

On small pieces of quartzite on the ground of open *Pulsatilla ambigua* meadow steppe on southern slope. More common on other small stones of the same area was the Central Asian endemic species *S. picea* with smooth apothecial margins and a hyaline to light brown exciple. *S. clavus* was already known from Mongolian Dauria and the Khingan (Schubert & Klement 1971, Golubkova 1981).

**Schizotomma microhaema** (Norman) R. A. Anderson – Khentey, Eroo valley, Baziin Am (49°2′N, 107°15′E), c. 1100 m, 10.8.2005, M. Hauck.

**Trapeliopsis granulosa** (Hoffm.) Lumbsch – Khentey, Eroo valley, Bayantogol (49°5’N, 107°17’E), c. 1100 m, 12.8.2005, **M. Hauck**.

On conifer logs in light and dark taiga forests of the western Khentey Mts. The species has been found in Mongolia before in the Khangay (Biazrov 1989).

**Tuckermannopsis americana** (Spreng.) Hale – Khentey, Ilchlegiyn Gol, Eroogiyn Khaluun Rashaan (49°1’N, 107°32’E), 1230 m, 2.8.2002, **M. Hauck**.

Common on *Abies sibirica*, *Betula platyphylla*, *Larix sibirica*, *Picea obovata* and *Pinus sylvestris* in light and dark taiga forests of the western Khentey Mts. More frequent on branches than on trunks. New to Mongolia. *T. americana* is the most widespread species of the *T. ciliaris* group with occurrences in W and E North America, Finland, European Russia, Siberia and Japan (Culberson & Culberson 1967, Randlane & Saag 1992, Kärnefelt & Thell 2001). *T. ciliaris* (Ach.) Gyeln. should be deleted from the Mongolian lichen flora, as samples named *Cetraria ciliaris* Ach. by Biazrov (1987, 1989) probably belong to *T. americana*, which is suggested both by Randlane & Saag (1992) and our own records of *T. americana*.

**Usnea articulata** (L.) Hoffm. – Khentey, Sangastay (49°10’N, 107°18’E), 1570 m, 30.7.2005, **M. Hauck & S. Javkhlan**.


**Verrucaria funckii** (Spreng.) Zahlbr. – Khentey, Eroo valley, Khonin Nuga (49°5’N, 107°17’E), 950 m, 11.8.2004, **M. Hauck**.

On regularly submerged granite stones at the bank of the river Eroo, together with *V. margacea* and *V. praetermissa*. *V. funckii* has already been collected in the Khangay by Schubert & Klement (1971).

**Verrucaria margacea** (Wahlenb.) Wahlenb. – Khentey, Eroo valley, Khonin Nuga (49°5’N, 107°17’E), 950 m, 11.8.2004, **M. Hauck**.


**Verrucaria praetermissa** (Trevis.) Anzi – Khentey, Eroo valley, Khonin Nuga (49°5’N, 107°17’E), 950 m, 11.8.2004, **M. Hauck**.

On regularly submerged granite. New to Mongolia; already known from China (Hongkong; Aptroot & Seaward 1999).

**Xanthoria fallax** (Hepp) Arnold s. str. – Khangay, Arkhangay district, Tamir river (46°51’N, 103°23’E), c. 18 km WSW Kharkhorin, 25.7.2004, **M. Hauck**; Khentey, Eroo valley, Bazin Am (49°2’N, 107°15’E), c. 1100 m, 3.8.2005, **M. Hauck**.

Records of *X. fallax* by Cogt (1995) do apparently not refer to the species in the strict sense, but to the whole *X. fallax* group, which has been recently revised by Poelt & Petutschng (1992) and Kondratyuk & Kärnefelt (2003). This is inferred from the lack of any other species of the *X. fallax* group in the list of Cogt (1995). Therefore, the cited samples from the Khangay and the Khentey, were the species was found on *Populus, Ulmus pumila* and *Spiraea aquilegifolia*, are presently the only records of *X. fallax* s. str. from Mongolia.

**Xanthoria fulva** (Hoffm.) Poelt & Petutschng – Khangay, Arkhangay district, Tamir river (46°51’N, 103°23’E), c. 18 km WSW Kharkhorin, 25.7.2004, **M. Hauck**.
This species of the X. fallax group was found on Populus in a riverine Salix-Populus forest in the meadow steppe. First record of X. fulva from Mongolia. The range of X. fulva comprises North America and Eurasia including Russia (Kondratyuk 2004).

Xanthoria ulophyllodes Räsänen – Khentey, Erkoo valley, Ulaan Burgas (49°4’N, 107°16’E), c. 950 m, 11.8.2004, M. Hauck.

On trunk of Betula platyphylla in a birch-dominated floodplain forest. New to Mongolia. Like X. fulva, X. ulophyllodes is found both in Eurasia and North America (Kondratyuk 2004).

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