

Lichens of Oran Dosh protected area in the Lake Khubsugul National Park (Mongolia) Part 2: Saxicolous and terricolous species

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Abstract: WILK, K. 2007. Lichens of Oran Dosh protected area in the Lake Khubsugul National Park (Mongolia). Part 2: Saxicolous and terricolous species. – *Herzogia* 20: 209–219.

The work presents the data on Mongolian lichens collected in the Lake Khubsugul National Park in August 2000. Hereby, 30 saxicolous and 68 terricolous lichens are compiled. Eight species are reported as new to Mongolia, viz. *Caloplaca bohlinii*, *C. crenulatella*, *C. fraudans*, *C. lactea*, *Protoblastenia incrustans*, *P. rupestris*, *Rinodina immersa*, and *Toninia athallina*. Further 23 species are new records to the lichen flora of Khubsugul region, i.e., *Aspicilia farinosa*, *Buellia geophila*, *Caloplaca citrina*, *C. tirolensis*, *Cladonia mitis*, *Collema tenax*, *Fulgensia bracteata*, *Lecanora intricata*, *Miriquidica complanata*, *Parmeliella triptophylla*, *Peltigera polydactylon*, *P. venosa*, *Pertusaria glomerata*, *P. subobducens*, *Physcia caesia*, *Placidium squamulosum*, *Psora globifera*, *Rhizocarpon eupetraeoides*, *Rinodina roscida*, *Solorina bispora*, *S. spongiosa*, *Toninia alutacea*, and *Trapeliopsis granulosa*.

Zusammenfassung: WILK, K. 2007. Flechten im Schutzgebiet Oran Dosh im Lake Khubsugul National Park (Mongolei). Teil 2: Gesteins- und bodenbewohnende Arten. – *Herzogia* 20: 209–219.

Es werden Daten mongolischer Flechten, die im August 2000 im Lake Khubsugul National Park gesammelt wurden, präsentiert. Dabei werden Funde von 30 gesteinsbewohnenden und 68 bodenbewohnenden Flechtenarten vorgelegt. Acht Arten sind neu für die Mongolei, nämlich *Caloplaca bohlinii*, *C. crenulatella*, *C. fraudans*, *C. lactea*, *Protoblastenia incrustans*, *P. rupestris*, *Rinodina immersa* und *Toninia athallina*. Weitere 23 Arten sind Erstnachweise für die Flechtenflora der Khubsugul-Region. Bei ihnen handelt es sich um *Aspicilia farinosa*, *Buellia geophila*, *Caloplaca citrina*, *C. tirolensis*, *Cladonia mitis*, *Collema tenax*, *Fulgensia bracteata*, *Lecanora intricata*, *Miriquidica complanata*, *Parmeliella triptophylla*, *Peltigera polydactylon*, *P. venosa*, *Pertusaria glomerata*, *P. subobducens*, *Physcia caesia*, *Placidium squamulosum*, *Psora globifera*, *Rhizocarpon eupetraeoides*, *Rinodina roscida*, *Solorina bispora*, *S. spongiosa*, *Toninia alutacea* und *Trapeliopsis granulosa*.

Key words: Taiga forest, mountain tundra, Khubsugul region.

Introduction

The Mongolian lichens have been a subject of interest to many lichenologists. To summarize the lichenological studies in the country, it is worth noting that they started at the beginning of the 20th century (e.g., ELENKIN 1902, FEDCHENKO 1902, SAVICZ 1924), and were most intensive in the 1970s and 1980s (e.g., GOLUBKOVA 1971, 1981, 1983, SCHUBERT & KLEMENT 1971, GOLUBKOVA & COGT 1974a, b, COGT 1976, AHTI 1976, BIAZROV 1978, OLECH 1979, 1982, HUNECK et al. 1987). The most recent contributions are those by AHTI & BIAZROV

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(2001), BIAZROV (2001), BIAZROV & VITIKAINEN (2001), GOLUBKOVA (2001), BIAZROV & ZHURBENKO (2004), PALKA & ŚLIWA (2004) and HAUCK & JAVKHLAN (2006). Despite these studies, the lichenological knowledge of the Khubsugul region remains insufficient. The existing data were supplied from the region by several of the above mentioned authors, e.g. ELENKIN (1902), GOLUBKOVA (1971, 1981), COGT (1976), HUNECK et al. (1987, 1992), PALKA & ŚLIWA (2004). Of these papers, only that by COGT (1976) is focused exclusively on lichens of Khubsugul area reporting 88 terricolous lichen species from mountain taiga forests and high mountain tundra. A detailed overview of the national and local lichenological bibliography was provided in the previous additions to the lichen flora of the Khubsugul area (PALKA & ŚLIWA 2004, 2006).

The Lake Khubsugul National Park is situated in north-central Mongolia in Khubsugul Aimak (= Khubsugul State). Moreover, the park territory is located within Khubsugul plant-geographical region (GRUBOV 2001). Lake Khubsugul National Park plays an important role for the preservation of Mongolia's biological diversity (GOULDEN et al. 2000, GOULDEN & BOLGDIV 2002).

The present paper is the second part of a contribution to the knowledge of lichen diversity in the Lake Khubsugul National Park. The work is based on a collection made in Oran Dosh protected area in the Park in August 2000. The previous paper supplied data on 26 corticolous and 53 lignicolous species, of which one was new to Asia, and two were new to Mongolia (PALKA & ŚLIWA 2006). The current paper deals with 30 saxicolous and 68 terricolous lichens and provides further new national and regional records.

Material and methods

The studied material originates from Oran Dosh Specially Protected Area in the Lake Khubsugul National Park. This area is located at the western shore of the lake, 45 km north of the town of Khatgal. Vegetation types studied included mountain taiga forests and high mountain tundra. Geologically, the study area is dominated by limestone, primarily dolomites (KUZNETSOV & SULBIN 1976, GOULDEN et al. 2000). For further information on the study area and a map confer PALKA & ŚLIWA (2006).

The collecting sites are as follows:

1. Bayan Ula Mts, shore of lake Khubsugul, 1645 m above sea level; sparsely wooded area.
2. Bayan Ula Mts, NE slope of Khunzlun Mt., 1800 m; mountain taiga forest dominated by *Larix sibirica*.
3. Bayan Ula Mts, peak of Khunzlun Mt., 2648 m; stony *Dryas* tundra.
4. Bayan Ula Mts, highly elevated plateau located west of the peak of Mt. Khunzlun, c. 2500 m; mountain forest-tundra transitional zone.

Lichen species new to Mongolia are marked with "?!", and new to Khubsugul region with "?!". The numbers following collecting sites refer to the authors collecting numbers. Herbarium specimens are deposited at KRAM and KRA. The complete Mongolian distribution is listed in case of species also known from phytogeographical provinces other than the Khubsugul area. The Mongolian distribution cited in the list follows COGT (1995), and is supplemented with the most recent literature. Plant-geographical regions are named after GRUBOV (2001). The nomenclature of species mainly follows SANTESSON et al. (2004).

Species list

- Alectoria ochroleuca*** (Hoffm.) A.Massal. – on soil among mosses and other lichens; collecting site: 4, coll. no. 672 (KRA, dupl. in KRAM).
Mongolian distribution: Khubsugul, Khentei, Khangai, Khobdo, Mongolian Altai.
- Asahinea chrysantha*** (Tuck.) W.L.Culb. & C.F.Culb. – on soil among other lichens; collecting site: 3, 4, coll. no. 331 (KRA), 430 (KRAM), 629 (KRA).
Mongolian distribution: Khubsugul, Khentei, Khangai.
- Aspicilia cinerea*** (L.) Körb. – on siliceous rock; collecting site: 3, coll. no. 462 (KRAM).
Mongolian distribution: Khubsugul, Khentei, Khangai, Khobdo, Mongolian Altai, Middle Khalkha, Gobi-Altai.
- ! *Aspicilia farinosa*** (Flörke) Arnold – on calcareous rock; collecting site: 3, coll. no. 409 (KRAM).
Mongolian distribution: Khubsugul, Khangai.
- Bilimbia lobulata*** (Sommerf.) Hafellner & Coppins – on calcareous soil; collecting site: 3, coll. no. 350, 363 (KRA).
- ! *Buellia geophila*** (Flörke ex Sommerf.) Lynge – on dead leaves of *Larix sibirica*; collecting site: 2, coll. no. 792 (KRA).
Mongolian distribution: Khubsugul, Khangai.
- Caloplaca ammiospila*** (Wahlenb.) H.Olivier – over mosses and plant debris on soil; collecting site: 3, coll. no. 356 (KRAM), 359, 442 (KRA), 451 (KRAM).
Mongolian distribution: Khubsugul, Khangai (BIAZROV 1998), Khobdo, Mongolian Altai.
- !! *Caloplaca bohlinii*** H.Magn. – on calcareous rock; collecting site: 3, coll. no. 388 (KRAM).
Note: *Caloplaca bohlinii* is a rather rare, central Asian species (BREDKINA 1988). It is known from China (MAGNUSSON 1940), Tajikistan (KUDRATOV & MAYRHOFER 2002), Kyrgyzstan (BAIBULATOVA 1988), Azerbaijan and Russia, where it is recorded from the Altai and the eastern Sayan Mts (KONDRATYUK et al. 2004).
- Caloplaca cerina*** (Ehrh. ex Hedw.) Th.Fr. – over plant debris on soil; collecting site: 3, coll. no. 345 (KRAM), 367 (KRA).
Mongolian distribution: Khubsugul (PALKA & ŚLIWA 2006), Khentei, Khangai, Great Khingan, Khobdo.
- ! *Caloplaca citrina*** (Hoffm.) Th.Fr. – over mosses and plant debris on soil; collecting site: 3, coll. no. 344 (KRAM), 459 (KRA).
Mongolian distribution: Khubsugul, Khentei, Khangai, Middle Khalkha.
- !! *Caloplaca crenulatella*** (Nyl.) H.Olivier – on calcareous rock; collecting site: 1, coll. no. 801 (KRAM).
Note: *Caloplaca crenulatella* is recorded from many countries in Europe and from the Russian Far East (e.g. NIMIS 1993, LLIMONA & HLADUN 2001, BIELCZYK et al. 2004, KHODOSOVTSSEV et al. 2004, SANTESSON et al. 2004).
- Caloplaca flavovirescens*** (Wulfen) DT. & Sarnth. – on calcareous rock; collecting site: 1, coll. no. 799 (KRAM).
Mongolian distribution: Khubsugul, Khangai, Mongolian Dauria, Great Khingan.
- !! *Caloplaca fraudans*** (Th.Fr.) H.Olivier – on siliceous rock; collecting site: 2, coll. no. 770 (KRAM).
Note: *Caloplaca fraudans* has a circumpolar distribution and occurs mainly in the arctic-boreal region. It is known from the Eurasian arctic (LYNGE 1928, SOCHTING 1989, ANDREEV et al. 1996, SANTESSON et al. 2004), Siberia (AFONINA et al. 1979), Romania (MORUZI et al. 1967), Canada (THOMSON 1997), the USA and Greenland (LYNGE 1937, HANSEN et al. 1987, ARUP 1995).
- Caloplaca jungermanniae*** (Vahl) Th.Fr. – over mosses and plant debris on soil; collecting site: 2, coll. no. 525, 840 (KRAM).
Mongolian distribution: Khubsugul, Khangai, Mongolian Altai.
- !! *Caloplaca lactea*** (A.Massal.) Zahlbr. – on calcareous rock; collecting site: 3, coll. no. 468 (KRAM).
Note: *Caloplaca lactea* is widely distributed in Europe and has a central European-Mediterranean distribution pattern (WIRTH 1995). Furthermore, the species has been reported from the USA (MAGNUSSON 1944b), Greenland (HANSEN et al. 1987), Morocco (EGEA 1996), Tunisia (SEAWARD 1996) and Australia (MCCARTHY 2006). In Asia, *C. lactea* is known from Russia (SEDELNIKOVA 1996, ANDREEV et al. 1996), Kazakhstan (WAGNER & SPRIBILLE 2005), Kyrgyzstan (BRIEDKINA 1981), Iran (NIMIS 1993) and Israel (ALON & GALUN 1971).
- ! *Caloplaca tiroliensis*** Zahlbr. – over terricolous mosses; collecting site: 4, coll. no. 637 (KRAM).
Mongolian distribution: Khubsugul, Khangai.

- Candelariella aurella* (Hoffm.) Zahlbr. – over mosses and plant debris on soil; collecting site: 3, coll. no. 445 (KRA).
Mongolian distribution: Khubsugul, Khentei, Khangai, Mongolian Dauria, Great Khingan, Khobdo, Mongolian Altai, Middle Khalkha.
- Cetraria islandica* (L.) Ach. – on soil among mosses and other lichens; collecting site: 4, coll. no. 611, 628 (KRA), 660 (KRAM), 661, 643, 644, 649, 650 (KRA).
Mongolian distribution: Khubsugul, Khentei, Khangai, Khobdo, Mongolian Altai.
- Cladonia amaurocraea* (Flörke) Schaer. – on soil; collecting site: 2, coll. no. 321, 486, 518, 533, 556 (KRA), 601 (KRA, dupl. in KRAM), 852 (KRA).
Mongolian distribution: Khubsugul, Khentei, Khangai, Mongolian Dauria, Khobdo, Mongolian Altai, Middle Khalkha.
- Cladonia arbuscula* (Wallr.) Flot. – on soil; collecting site: 2, 3, 4, coll. no. 342, 626, 853 (KRA).
Mongolian distribution: Khubsugul, Khentei, Khangai, Mongolian Dauria.
- Cladonia cariosa* (Ach.) Spreng. – over terricolous mosses and on bare soil; collecting site: 2, coll. no. 712, 761 (KRA), 784 (KRAM), 841 (KRA).
Mongolian distribution: Khubsugul, Khentei, Khangai, Mongolian Dauria, Mongolian Altai.
- Cladonia cenotea* (Ach.) Schaer. – on humus and soil; collecting site: 2, coll. no. 531, 760, 850 (KRA).
Mongolian distribution: Khubsugul, Khentei, Khangai, Mongolian Dauria.
- Cladonia cervicornis* (Ach.) Flot. – on humus; collecting site: 3, coll. no. 408 (KRA).
Mongolian distribution: Khubsugul, Khentei, Khangai, Mongolian Dauria.
- Cladonia chlorophaea* (Flörke ex Sommerf.) Spreng. – on calcareous soil and on humus; collecting site: 2, coll. no. 796, 847 (KRA).
Mongolian distribution: Khubsugul, Khentei, Khangai, Khobdo, Mongolian Altai, East Mongolia.
- Cladonia cornuta* (L.) Hoffm. – on soil; collecting site: 2, coll. no. 845 (KRA).
Mongolian distribution: Khubsugul, Khentei, Khangai, Khobdo, Mongolian Altai.
- Cladonia digitata* (L.) Hoffm. – on soil; collecting site: 2, coll. no. 694 (KRA).
Mongolian distribution: Khubsugul, Khentei, Khangai, Khobdo, Mongolian Dauria.
- Cladonia furcata* (Huds.) Schrad. – on soil among mosses; collecting site: 1, 2, coll. no. 315, 488, 546, 548, 846, 849, 851, 863 (KRA).
Mongolian distribution: Khubsugul, Khentei, Khangai, Mongolian Dauria, Great Khingan, Khobdo.
- Cladonia macroceras* (Delise) Hav. – on soil; collecting site: 2, 4, coll. no. 508 (KRA), 559, 669 (KRAM), 676, 696b (KRA).
Mongolian distribution: Khubsugul, Khentei, Khangai.
- ! *Cladonia mitis* Sandst. – on soil; collecting site: 2, coll. no. 855 (KRA, dupl. in KRAM).
Mongolian distribution: Khubsugul, Khentei, Khangai.
- Cladonia mongolica* Ahti – over terricolous mosses on humus, collecting site: 2, coll. no. 522 (KRAM).
Mongolian distribution: Khubsugul, Khentei (HAUCK & JAVKHLAN 2006), Khangai (AHTI 1991).
- Cladonia phyllophora* Hoffm. – on soil among mosses and on humus; collecting site: 2, 4, coll. no. 512, 563, 639 (KRA).
Mongolian distribution: Khubsugul, Khentei, Khangai, Mongolian Altai.
- Cladonia pleurota* (Flörke) Schaer. – on humus; collecting site: 4, coll. no. 618 (KRA).
Mongolian distribution: Khubsugul (HUNECK et al. 1992), Khentei, Khangai, Mongolian Dauria.
- Cladonia pocillum* (Ach.) Grognot – over mosses, plant debris on soil and on humus; collecting site: 2, 3, 4, coll. no. 326 (KRAM), 622, 675, 775, 812 (KRA).
Mongolian distribution: Khubsugul, Khentei, Khangai, Khobdo, Mongolian Altai.
- Cladonia pyxidata* (L.) Hoffm. – over terricolous mosses; collecting site: 2, coll. no. 515, 834 (KRA).
Mongolian distribution: Khubsugul, Khentei, Khangai, Mongolian Dauria, Great Khingan, Khobdo, Mongolian Altai, Middle Khalkha, East Mongolia.
- Cladonia rangiferina* (L.) F.H.Wigg. – on soil among mosses; collecting site: 2, 4, coll. no. 478, 619 (KRA), 673 (KRA, dupl. in KRAM).
Mongolian distribution: Khubsugul, Khentei, Khangai, Mongolian Dauria.

- Cladonia stellaris*** (Opiz) Pouzar & Vězda – on soil among mosses; collecting site: 4, coll. no. 671 (KRA, dupl. in KRAM).
Mongolian distribution: Khubsugul, Khentei, Khangai, Mongolian Dauria.
- Cladonia uncialis*** (L.) F.H. Wigg – on soil; collecting site: 2, 4, coll. no. 620, 696a (KRA).
Mongolian distribution: Khubsugul, Khentei, Khangai.
- Collema cristatum*** (L.) F.H. Wigg. – on calcareous rock; collecting site: 4, coll. no. 687, 691 (KRAM).
Mongolian distribution: Khubsugul, Khangai.
- ! ***Collema tenax*** (Sw.) Ach. em. Degel. – over mosses and plant debris on soil; collecting site: 3, coll. no. 372, 443 (KRA).
Mongolian distribution: Khubsugul, Khentei (HAUCK & JAVKHLAN 2006), Khangai, Khobdo, Mongolian Altai, Valley of Lakes.
- Dimelaena oreina*** (Ach.) Norman – on siliceous rock; collecting site: 3, coll. no. 410, 422, 470 (KRAM).
Mongolian distribution: Khubsugul, Khentei, Khangai, Mongolian Dauria, Great Khingan, Khobdo, Mongolian Altai, Middle Khalkha, East Mongolia, Gobi-Altai.
- Evernia perfragilis*** Llano – on soil among mosses; collecting site: 3, coll. no. 432 (KRAM), 454 (KRA).
Mongolian distribution: Khubsugul, Khentei, Khangai, Khobdo, Mongolian Altai, Depression of Great Lakes.
- Flavocetraria cucullata*** (Bellardi) Kärnefelt & Thell – on soil among mosses; collecting site: 1, 4, coll. no. 625, 802 (KRA).
Mongolian distribution: Khubsugul, Khentei, Khangai, Khobdo, Mongolian Altai.
- Flavocetraria nivalis*** (L.) Kärnefelt & Thell – on soil and humus; collecting site: 3, 4, coll. no. 370, 655 (KRA).
Mongolian distribution: Khubsugul, Khentei, Khangai, Khobdo, Mongolian Altai.
- ! ***Fulgensia bracteata*** (Hoffm.) Räsänen – on calcareous soil; collecting site: 3, coll. no. 335 (KRA).
Mongolian distribution: Khubsugul, Khangai, Mongolian Altai.
- Fulgensia fulgens*** (Sw.) Elenkin – on calcareous soil; collecting site: 3, 4, coll. no. 333, 657 (KRA).
Mongolian distribution: Khubsugul, Mongolian Altai.
- Lecanora crenulata*** Hook. – on calcareous rock; collecting site: 3, coll. no. 385 (KRAM).
Mongolian distribution: Khubsugul, Khangai, Mongolian Altai, Dzungarian Gobi.
- Lecanora epibryon*** (Ach.) Ach. – over mosses and plant debris on soil; collecting site: 3, 4, coll. no. 354, 365, 648, 651 (KRA).
Mongolian distribution: Khubsugul, Khentei, Khangai, Mongolian Altai.
- ! ***Lecanora intricata*** (Ach.) Ach. – on siliceous rock; collecting site: 2, coll. no. 762 (KRAM).
Mongolian distribution: Khubsugul, Khentei (HAUCK & JAVKHLAN 2006).
- Lecanora polytrapa*** (Ehrh. ex Hoffm.) Rabenh. – on siliceous rock; collecting site: 2, coll. no. 798 (KRAM).
Mongolian distribution: Khubsugul, Khentei (HAUCK & JAVKHLAN 2006), Khangai, Khobdo, Mongolian Altai.
- Lecanora rupicola*** (L.) Zahlbr. – on siliceous rock; collecting site: 3, coll. no. 403 (KRAM).
Mongolian distribution: Khubsugul, Khentei, Khangai, Khobdo, Mongolian Altai.
- Lecanora semipallida*** H. Magn. – on calcareous rock; collecting site: 3, coll. no. 389 (KRAM).
Mongolian distribution: Khubsugul (PALKA & ŠLIWA 2004 as *L. flotoviana*), Gobi-Altai.
Note: The species has been recently recognized as a member of *L. dispersa* group. *Lecanora semipallida* is characterized by a yellowish apothecial disc and pale margin, C+ and K+ yellow reactions of disc and apothecial margin, which are also UV+ yellow to orange. The positive reactions are due to the presence of vinetorin. A detailed description of the species and its known world distribution are being published by L. ŠLIWA.
- Lecanora zosteræ*** (Ach.) Nyl. – over plant debris on soil; collecting site: 3, coll. no. 352 (KRA).
- Megaspora verrucosa*** (Ach.) Hafellner & V. Wirth – over mosses and plant debris on soil; collecting site: 3, coll. no. 325, 440 (KRA).
Mongolian distribution: Khubsugul, Khentei, Khangai (BIAZROV 1998), Khobdo, Mongolian Altai, Middle Khalkha.

- Melanelia hepatizon*** (Ach.) Thell – on siliceous rock; collecting site: 4, coll. no. 690 (KRAM).
Mongolian distribution: Khubsugul, Khentei, Khangai.
- Melanelia stygia*** (L.) Essl. – on siliceous rock; collecting site: 4, coll. no. 621 (KRAM).
Mongolian distribution: Khubsugul, Khentei, Khangai, Khobdo, Mongolian Altai.
- ! ***Miriquidica complanata*** (Körb.) Hertel & Rambold – on siliceous rock; collecting site: 3, coll. no. 411 (KRAM).
Mongolian distribution: Khubsugul, Khangai (BIAZROV et al. 1989).
- Ochrolechia frigida*** (Sw.) Lynge – over mosses and plant debris on soil; collecting site: 3, coll. no. 330 (KRA).
Mongolian distribution: Khubsugul, Khangai.
- Ochrolechia upsaliensis*** (L.) A.Massal. – over mosses and plant debris on soil; collecting site: 3, 4, coll. no. 343, 431, 441, 444, 448, 458, 646 (KRA).
Mongolian distribution: Khubsugul, Khentei, Khangai, Mongolian Altai.
- Ophioparma ventosa*** (L.) Norman – on siliceous rock; collecting site: 4, coll. no. 689 (KRAM).
Mongolian distribution: Khubsugul, Khentei, Khangai.
- ! ***Parmeliella triptophylla*** (Ach.) Müll.Arg. – over mosses and plant debris on soil; collecting site: 4, coll. no. 679 (KRA).
Mongolian distribution: Khubsugul, Khangai.
- Peltigera canina*** (L.) Willd. – over terricolous mosses; collecting site: 2, coll. no. 835 (KRA).
Mongolian distribution: Khubsugul, Khentei, Khangai, Mongolian Dauria, Great Khingan, Khobdo, Mongolian Altai.
- Peltigera didactyla*** (With.) J.R.Laundon – on soil among mosses; collecting site: 2, coll. no. 793a (KRA), 570 (KRAM).
Mongolian distribution: Khubsugul, Khentei, Khangai, Mongolian Dauria, Great Khingan, Khobdo, Middle Khalkha.
- Peltigera leucophlebia*** (Nyl.) Gyeln. – on soil among mosses; collecting site: 2, coll. no. 833 (KRA).
Mongolian distribution: Khubsugul, Khentei, Khangai, Mongolian Dauria, Great Khingan, Khobdo, Mongolian Altai.
- ! ***Peltigera polydactylon*** (Neck.) Hoffm. – on soil among mosses; collecting site: 2, coll. no. 697, 700 (KRA).
Mongolian distribution: Khubsugul, Mongolian Altai.
- ! ***Peltigera venosa*** (L.) Hoffm. – on soil among mosses; collecting site: 2, coll. no. 497, 734 (KRA).
Mongolian distribution: Khubsugul, Khangai, Mongolian Altai.
- ! ***Pertusaria glomerata*** (Ach.) Schaer. – over mosses and plant debris on soil; collecting site: 3, coll. no. 346 (KRA).
Mongolian distribution: Khubsugul, Khangai.
- ! ***Pertusaria subobducens*** Nyl. – over mosses and plant debris on soil; collecting site: 3, 4, coll. no. 337, 633 (KRA).
Mongolian distribution: Khubsugul, Khangai.
- ! ***Physcia caesia*** (Hoffm.) Fűrnr. – on calcareous rock; collecting site: 3, coll. no. 402 (KRAM).
Mongolian distribution: Khubsugul, Khentei, Khangai, Mongolian Dauria, Great Khingan, Khobdo, Mongolian Altai, Middle Khalkha.
- Physcia phaea*** (Tuck.) J.W.Thomson – on siliceous rock; collecting site: 2, coll. no. 703 (KRAM).
Mongolian distribution: Khubsugul, Khangai, Khobdo, Middle Khalkha, East Mongolia.
- Physconia muscigena*** (Ach.) Poelt – over terricolous mosses; collecting site: 3, coll. no. 439, 447 (KRA).
Mongolian distribution: Khubsugul, Khentei, Khangai, Khobdo, Mongolian Altai, Depression of Great Lakes, Gobi-Altai.
- ! ***Placidium squamulosum*** (Ach.) Breuss – on bare calcareous soil; collecting site: 3, coll. no. 327, 338, 449 (KRA).
Mongolian distribution: Khubsugul, Khobdo, Middle Khalkha, Gobi-Altai.

- Placynthiella icmalea*** (Ach.) Coppins & P.James – over terricolous mosses; collecting site: 2, coll. no. 793b (KRA).
- Placynthiella uliginosa*** (Schrad.) Coppins & P.James – on calcareous soil; collecting site: 2, 3, coll. no. 752, 457 (KRA).
Mongolian distribution: Khubsugul (PALKA & ŠLIWA 2006), Mongolian Altai.
- !! ***Protoblastenia incrustans*** (DC.) J.Steiner – on calcareous rock; collecting site: 3, coll. no. 394 (KRAM).
Note: *Protoblastenia incrustans* is scattered through Europe from the Arctic to the Mediterranean zone (NIMIS 1993). It is also known from North America (ESSLINGER & EGAN 1995), Bolivia (FEUERER et al. 1998) and Morocco (EGEA 1996). In Asia, the species has been recorded from Russia (SEDELNIKOVA 1996).
- !! ***Protoblastenia rupestris*** (Scop.) J.Steiner – on calcareous rock; collecting site: 3, coll. no. 429 (KRAM).
Note: *Protoblastenia rupestris* is a frequent species in Europe, where it has a boreal-Mediterranean type of distribution (WIRTH 1995). The species is also widespread in the Arctic (ANDREEV et al. 1996, ELVEBAKK & HERTEL 1996, THOMSON 1997). Furthermore, it is known from North America (ESSLINGER & EGAN 1995, THOMSON 1997, BRODO et al. 2001), Morocco (EGEA 1996) and New Zealand (GALLOWAY 1985). In Asia, it occurs in Kyrgyzstan (BRIEDKINA 1981, BAIBULATOVA 1988), Tajikistan (KUDRATOV 2004) and Russia (SEDELNIKOVA 1996).
- Pseudophebe minuscula*** (Nyl. ex Arnold) Brodo & D.Hawksw. – on siliceous rock; collecting site: 3, coll. no. 419 (KRAM).
Mongolian distribution: Khubsugul, Khobdo, Mongolian Altai.
- Psora decipiens*** (Hedw.) Hoffm. – on calcareous soil; collecting site: 4, coll. no. 627, 636 (KRA).
Mongolian distribution: Khubsugul, Khentei, Khangai, Great Khingan, Khobdo, Mongolian Altai, Middle Khalkha, East Mongolia, Valley of Lakes, East Gobi, Gobi-Altai, Transaltai Gobi.
- ! ***Psora globifera*** (Ach.) A.Massal. – on calcareous soil; collecting site: 3, coll. no. 336 (KRA).
Mongolian distribution: Khubsugul, Khentei, Khangai, Mongolian Dauria, Great Khingan, Khobdo, Mongolian Altai, Middle Khalkha, East Mongolia.
- ! ***Rhizocarpon eupetraeoides*** (Nyl.) Blomb. & Forssell – on siliceous rock; collecting site: 4, coll. no. 638 (KRAM).
Mongolian distribution: Khubsugul, Khangai.
- Rhizocarpon geographicum*** (L.) DC. – on siliceous rock; collecting site: 3, coll. no. 420 (KRAM).
Mongolian distribution: Khubsugul, Khentei (HAUCK & JAVKHLAN 2006), Khangai, Mongolian Altai.
- Rhizoplaca chrysoleuca*** (Sm.) Zopf – on siliceous rock; collecting site: 3, 4, coll. no. 452, 617 (KRAM).
Mongolian distribution: Khubsugul, Khentei, Khangai, Khobdo, Mongolian Altai, Middle Khalkha, Depression of Great Lakes, East Mongolia, Gobi-Altai.
- !! ***Rinodina immersa*** (Körb.) Zahlbr. – on calcareous rock; collecting site: 3, coll. no. 391 (KRAM).
Note: In Europe, *R. immersa* is rather rare and has a subboreal-Mediterranean distribution pattern (WIRTH 1995). Outside Europe, it is known from Asian Russia (SEDELNIKOVA 1996, DAVYDOV 2001), Israel (TEMINA et al. 2002), Syria (JOHN et al. 2004), Morocco (EGEA 1996) and New Zealand (GALLOWAY 1985).
- ! ***Rinodina roscida*** (Sommerf.) Arnold – over dead mosses on calcareous soil; collecting site: 3, coll. no. 368 (KRA).
Mongolian distribution: Khubsugul, Khangai.
- Rinodina turfacea*** (Wahlenb.) Körb. – over terricolous mosses; collecting site: 2, coll. no. 590, 780 (KRA).
Mongolian distribution: Khubsugul (PALKA & ŠLIWA 2006), Khangai, Khobdo.
- ! ***Solorina bispora*** Nyl. – on calcareous soil; collecting site: 4, coll. no. 647 (KRA).
Mongolian distribution: Khubsugul, Khangai.
- ! ***Solorina spongiosa*** (Ach.) Anzi – over mosses and plant debris on humus; collecting site: 4, coll. no. 680 (KRAM).
Mongolian distribution: Khubsugul, Khangai.
- Stereocaulon alpinum*** Laurer – on soil among mosses; collecting site: 4, coll. no. 668 (KRA).
Mongolian distribution: Khubsugul, Khentei, Khangai, Khobdo.

Stereocaulon paschale (L.) Hoffm. – on soil among mosses; collecting site: 4, coll. no. 667 (KRA).

Mongolian distribution: Khubsugul, Khentei, Khangai, Middle Khalkha.

Thamnolia vermicularis (Sw.) Schaer. – on soil among mosses; collecting site: 3, 4, coll. no. 436, 670 (KRA).

Mongolian distribution: Khubsugul, Khentei, Khangai, Khobdo, Mongolian Altai.

! ***Toninia alutacea*** (Anzi) Jatta – on calcareous soil; collecting site: 3, coll. no. 438 (KRA).

Mongolian distribution: Khubsugul, Mongolian Altai.

!! ***Toninia athallina*** (Hepp) Timdal – on calcareous rock; collecting site: 3, coll. no. 405 (KRAM).

Note: *Toninia athallina* occurs in arctic and temperate zones of the northern hemisphere (TIMDAL 1991). In Asia, it is known from Iraq (KILIAS 1981), China (MAGNUSSON 1944a), Tajikistan (KUDRATOV & MAYRHOFER 2002) and Russia (Yana and Kolyma areas; ANDREEV et al. 1996).

Toninia sedifolia (Scop.) Timdal – on calcareous soil; collecting site: 3, 4, coll. no. 437, 677 (KRA).

Mongolian distribution: Khubsugul, Khangai, Mongolian Altai, Dzungarian Gobi.

! ***Trapeliopsis granulosa*** (Hoffm.) Lumbsch – over mosses on humus; collecting site: 4, coll. no. 630, 632 (KRA).

Mongolian distribution: Khubsugul, Khentei (HAUCK & JAVKHLAN 2006), Khangai.

Umbilicaria cylindrica (L.) Delise ex Duby – on siliceous rock; collecting site: 3, coll. no. 369 (KRAM).

Mongolian distribution: Khubsugul, Khangai.

Vulpicida tubulosus (Schaer.) J.-E. Mattsson & M.J. Lai – on soil among mosses; collecting site: 3, 4, coll. no. 332, 373, 610 (KRA), 645 (KRA, dupl. in KRAM).

Xanthoparmelia camtschadalis (Ach.) Hale – on soil; collecting site: 3, coll. no. 324 (KRA).

Mongolian distribution: Khubsugul, Khentei, Khangai, Mongolian Dauria, Great Khingan, Khobdo, Mongolian Altai, Middle Khalkha, East Mongolia, Depression of Great Lakes, Valley of Lakes, East Gobi, Gobi-Altai, Dzungarian Gobi, Transaltai Gobi, Alasgan Gobi.

Xanthoria elegans (Link) Th. Fr. – over plant debris on soil and on siliceous and calcareous rocks; collecting site: 3, coll. no. 383, 401, 404, 425 (KRAM), 460 (KRA).

Mongolian distribution: Khubsugul, Khentei, Khangai, Mongolian Dauria, Great Khingan, Khobdo, Mongolian Altai, Middle Khalkha, East Mongolia, Depression of Great Lakes, Valley of Lakes, East Gobi, Gobi-Altai, Dzungarian Gobi, Transaltai Gobi, Alasgan Gobi.

Discussion

The lichen flora of the Khubsugul region is fairly diverse, as the area is located in a transitional zone between taiga forest and steppe vegetation. Additionally, the mountain topography of the territory provides many specific microhabitats and thereby stimulates lichen diversity. In total, 150 lichen species are noted from the Oran Dosh protected area. The lichen species found during the studies of the Khubsugul region (PALKA & ŚLIWA 2006 and present paper) primarily represent boreal or arctic-alpine geographical elements. Boreal lichen species include *Calicium abietinum*, *Usnea subfloridana*, *Vulpicida pinastri* and members of the genera *Bryoria*, *Buellia*, *Cladonia*, *Hypogymnia*, *Parmelia*, and some *Lecanora* species. Arctic-alpine species are, for example, *Alectoria ochroleuca*, *Bilimbia lobulata*, *Caloplaca fraudans*, *C. jungermanniae*, *Flavocetraria nivalis*, *Fulgensia bracteata*, *Hypogymnia subobscura*, *Ochrolechia upsaliensis*, *Ophioparma ventosa*, *Pertusaria glomerata*, *Rinodina roscida*, *Solorina bispora*, and *Toninia alutacea*. Bipolar species are also well represented in the study area, such as *Caloplaca ammiospila*, *Cladonia gracilis*, *Japewia tornoensis*, *Lecanora epibryon*, *L. intricata*, *Megaspora verrucosa*, *Ochrolechia frigida*, *Physconia muscigena*, *Pseudophebe minuscula*, *P. pubescens*, *Solorina spongiosa*, *Stereocaulon alpinum*, and *Xanthoria elegans*. Lichen species typical of arid climate play generally the most important role in the Mongolian lichen flora (GOLUBKOVA 1983), but have only few representatives in the Khubsugul region, viz.

Aspicilia farinosa, *Dimelaena oreina*, *Fulgensia fulgens*, *Psora decipiens*, *P. globifera* and *Xanthoparmelia camtschadalis*. This is attributed to the geographical position of the study area in northernmost Mongolia, which is influenced by a more humid, boreal climate. Further, the location of collecting sites on mostly forested northern slopes as well as the close vicinity of Lake Khubsugul contributed to the low number of species characteristic of arid regions. An interesting group of lichens found in the study area are species with Asian (*Caloplaca bohlinii*, *Cladonia mongolica*, *Evernia esorediosa*) or Asian-North American (*Asahinea chrysantha*, *Evernia perfragilis*, *Pertusaria subobducens*) distribution ranges. The findings of several species new to Mongolia in the course of the study suggest that it would be worth conducting further research on the lichen flora of Khubsugul region.

Acknowledgements

I am warmly grateful to Dr L. Śliwa (Krakow, Poland), Dr M. Hauck (Göttingen, Germany) and anonymous reviewers for valuable comments on the manuscript. I also wish to thank L. Coiffait (Newcastle upon Tyne, UK) for linguistic correction of the text. The work was supported by Polish national funds for scientific research in the years 2005–2006 (MNIł, grant no. 2 P04G 097 28).

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Manuscript accepted: 12 March 2007.

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