

Bryophytes of the High Sudetes (the Czech Republic)

M. Zmrhalová¹, V. Plášek², J. Kučera³, B. Shaw⁴, J. Váňa⁵

¹ Regional Museum in Šumperk, Hlavní tř. 22, CZ-788 31 Šumperk, Czech Republic, e-mail: magda.zmrhalova@seznam.cz; ² Silesian Museum in Opava, Tyršova 1, CZ-746 46 Opava, Czech Republic & Department of Biology & Ecology, Faculty of Science, University of Ostrava, Chittussiho 10, CZ-710 00 Ostrava, Czech Republic, e-mail: vita.plasek@seznam.cz; ³ University of South Bohemia, Faculty of Biological Sciences, Branišovská 31, CZ-370 05 České Budějovice, Czech Republic, e-mail: kucera@bf.jcu.cz; ⁴ Duke University, Department of Biology, Durham, North Carolina, U. S. A., blanka@duke.edu; ⁵ Charles University in Prague, Faculty of Science, Department of Botany, Benátská 2, CZ-128 01 Praha 2, Czech Republic, e-mail: vana@natur.cuni.cz.



High Sudetes have been subject to the intensive bryological survey in 2001-2003. The authors focused on glacial cirques and comparable biotopes in two mountain regions in Czech part of the High Sudetes Mts.: in Krkonoše Mts. (Kotel Mt. with Kotelní jámy cirques, glacial cirques of Labský důl valley and Úpská jáma cirque) and Hrubý Jeseník Mts. (Velká and Malá kotlina cirques and Sněžné Strže ravines).

Glacial cirques, refugia of arctic-alpine bryophyte species, have been chosen for our bryological research as the localities belonging to the most significant centres of biodiversity in the Czech Republic. The Sudetan mountains represent an important connecting bridge between Alpine and Scandinavian floras.

The research included evaluation and revision of historical data (literature search, revision of historical specimens of critical taxa), own bryofloristic survey, assembling basic ecological characteristics and frequencies of occurrence for all of the recorded bryophytes and assembling population-ecological characteristics for selected bryophytes.

During our research ca. 18 500 entries have been excerpted from 340 publications and some 1 200 historical herbarium specimens of critical species have been revised. About 6 000 herbarium specimens have been collected and about 8 300 field notes have been recorded on 160 recording cards, giving together with the herbarium specimens about 100 000 characteristics of substrate, relief, exposition, inclination, moisture, shading, thickness of humus, presence of sporophytes, gemmae production and abundance. In 40 selected species, population size (number of shoots and area covered), shoot density, number of sporophytes, potentially colonizable substrate and phytosociological relevés (80 in total) have been noted in addition to 'standard' record. All collected data have been stored and cross-linked in the relational MS Access database. This enabled us to acquire complex information from studied localities.

About 455 taxa have been found at surveyed sites – 362 in the Krkonoše Mts. and 385 in the Hrubý Jeseník Mts. 10 - 30 % of the number have been recorded from the sites for the first time. Five taxa were found new to the flora of the country, one of them pending the revisions (*Pohlia nutans* subsp. *schimperii*, *Lescurea patens*, *Syntrichia norvegica*, *Isopterygiopsis muelleriana*, *Hypnum sauteri*). Some 20 putatively vanished species have been re-found (e. g. *Haplomitrium hookeri*, *Meesia uliginosa*, *Hypnum callichroum*, *Kiaeria falcata*) and some species have been newly found for the region (e. g.

Pseudoleskella tectorum). About 10-20% of the historically reported taxa have not been confirmed at their localities. Among them, arctic-alpine and epiphytic species proved to be most often among the missing or strongly retreated species. Quantitative data about demography of selected taxa enabled a direct evaluation of the threat status according to the IUCN. Some results have been published (e. g. Blockeel & al. 2003; Kučera, Hradílek, Buryová & Hájek 2003; Kučera & Váňa 2003; Kučera, Zmrhalová, Buryová, Plášek & Váňa 2004; Kučera, Zmrhalová, Buryová, Košnar, Plášek & Váňa 2004; Köckinger, Kučera & Stebel 2005; Kučera, Buryová, Plášek, Váňa & Zmrhalová 2005).

The results of our research confirmed high concentration of threatened taxa in glacial cirques of High Sudetes and extreme bryophyte species richness of these localities. To obtain comprehensive assessment of bryoflora of a certain area, both appropriate survey methods and sufficient number of research team members are essential. The methods are applicable for bryological survey of other habitats in the Czech Republic or abroad.

References:

- Blockeel T. L. & al. (2003): New national and regional bryophyte records, 8. – Journal of Bryology 25: 217-221.
- Köckinger H., Kučera J. & Stebel A. (2005): *Pohlia nutans* subsp. *schimperii* (Müll.Hal.) Nyholm, a neglected Nordic moss in Central Europe. – Journal of Bryology 27: 351- 355.
- Kučera J., Hradílek Z., Buryová B. & Hájek P. (2003): *Hypnum sauteri* and *Lescurea patens*, two additions to the moss flora of the Czech Republic. – Preslia 75: 255-262.
- Kučera J. & Váňa J. (2003): Check- and Red list of bryophytes of the Czech Republic (2003). – Preslia 75: 193-222.
- Kučera J., Zmrhalová M., Buryová B., Košnar J., Plášek V. & Váňa J. (2004): Bryoflora of the glacial cirques of the Western Krkonoše Mts. – Časopis Slezského Zemského Muzea, Ser. A, 53: 1-47.
- Kučera J., Zmrhalová M., Buryová B., Plášek V. & Váňa J. (2004): Bryoflora of the Úpská jáma cirque and adjacent localities of the Eastern Krkonoše Mts. – Časopis Slezského Zemského Muzea, Ser. A, 53: 143-173.
- Kučera J., Buryová B., Plášek V., Váňa J. & Zmrhalová M. (2005): Bryophytes of the glacial cirques in the Giant Mountains and Hrubý Jeseník Mts (the Czech Republic). – In: Štursa J. & al., eds., Geoeckologické problémy Krkonoš. Sborn. Mez. Věd. Konf., Listopad 2003, Szklarska Poręba. Opera Corcontica 41: 170-184.

BRYOPHYTES OF THE HIGH SUDETES (the Czech Republic)

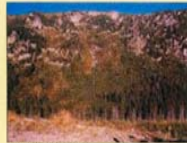
M. Zmrhalová¹, V. Plášek², J. Kučera³, B. Shaw⁴, J. Vána⁵

¹Regional Museum in Šumperk, Hlavní tř. 22, 786 31 Šumperk, magda.zmrhalova@seznam.cz; ²Silesian Museum, Tyrkova 1, 746 46 Opava and Department of Biology & Ecology, Faculty of Science, University of Ostrava, Chittusova 10, 710 00 Ostrava, via.plasek@seznam.cz; ³University of South Bohemia, Faculty of Biological Sciences, Branikova 31, 370 05 České Budějovice, kucera@fou.cz; ⁴Duke University, Department of Biology, Durham, North Carolina, U. S. A., blanka@duke.edu; ⁵Charles University in Prague, Faculty of Science, Department of Botany, Benátská 2, 128 01 Praha 2, vana@natur.cuni.cz

High Sudetes have been subject to the intense bryological survey in 2001-2003. The authors focused on glacial cirques and comparable biotopes in two mountain regions in Czech part of the High Sudetes Mts. in the **Krkonoše Mts.** (cirques at Mt. Kotel, in the Labský důl valley and Úpská jáma cirque) and the **Hrubý Jeseník Mts.** (Velká and Malá kotlina cirques and Sněžné strže ravines).

Significance of glacial cirques

- The most significant centres of biodiversity in the Czech Republic
- Refugium of arctic-alpine species of bryophytes in the territory
- Important connecting bridge between Alpic and Scandinavian floras



Labský důl (Krkonoše)



Úpská jáma (Krkonoše)



Fig. 1. Location of the Europe. Legend: the largest glaciation, the last glaciation, the present glaciation, the present step, the present step. Legend: Krkonoše Mts., Hrubý Jeseník Mts.



Malá kotlina (Hrubý Jeseník)



Velká kotlina (Hrubý Jeseník)



Preview of database

Aims of the research

1. Revision of historical data
2. Own bryofloristic survey
3. Assembling basic ecological characteristics and frequencies of occurrence for all of the recorded bryophytes
4. Assembling population-ecological characteristics for selected bryophytes

Data acquired

1. Excerpton of ca. 18.500 published data excerpted from 340 publications
2. Revision of 1.200 historical herbarium specimens of critical species, ca. 6.000 herbarium specimens collected, ca. 8.300 field notes recorded
3. Characteristics of substrate, relief, exposition, inclination, moisture, shading, thickness of humus, presence of sporophytes, gemmae production, abundance - total ca. 100.000 records
4. For 40 selected species, population size (number of shoots and area covered), shoot density, number of sporophytes, potentially colonizable substrate and phytosociological relevés (80 in total) were noted in addition to 'standard' record

All collected data have been stored and cross-linked in the relational MS Access database. This enables us to acquire complex information from studied localities.

Results

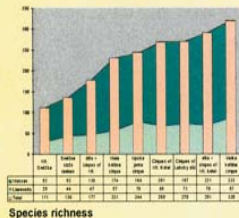
1. 455 bryophyte taxa found at surveyed sites - 362 in the Krkonoše Mts. and 385 in the Hrubý Jeseník Mts.; 10 - 30 % of the number recorded from the sites for the first time
2. Five taxa were found new to the flora of the country, one of them pending the revisions (*Pohlia nutans* subsp. *schimperii*, *Lescuraea patens*, *Syntrichia norvegica*, *Isoeterygiopsis muelleriana*, *Hypnum sauteri*)
3. Some 20 putatively vanished species have been re-found or newly found (e. g. *Haplomitrium hookeri*, *Meesia uliginosa*, *Pseudosclerota lectorum*, *Hypnum callichroum*, *Kiaeria falcata*)
4. 10-20% of the historically reported taxa have not been confirmed at their localities. Among them, arctic-alpine and epiphytic species proved to be most often among the missing or strongly retreated species.
5. Quantitative data about demography of selected taxa enable direct evaluation of the threat status according to the IUCN methods

Conclusions

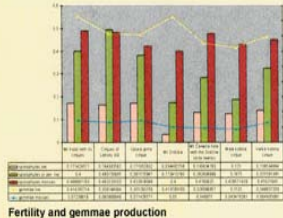
- High concentration of threatened taxa
- Extremely rich localities in bryophyte species
- Both appropriate survey methods and sufficient number of research team members are essential for detailed assessment of bryoflora of a certain area; methods are applicable for bryological survey of other habitats in the Czech Republic or abroad
- Data necessary for future evaluation of changes in the bryoflora assembled



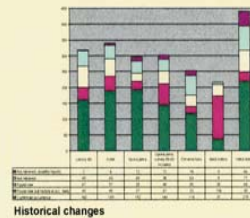
Recording card and label



Species richness



Fertility and gemmae production



Historical changes



Saalenia glaucescens



Hypnum callichroum



Moerckia byttii



Tetralophozia setiformis



Bryum schleicheri



Syntrichia norvegica



Lescuraea mutabilis

Project supported by Czech Science Foundation (GA ČR) sub n. 206/01/0411