

Towards a checklist of the lichens of the Alps

Peter Othmar BILOVITZ and Helmut MAYRHOFER

Abstract: The procedure for the buildup of a transnational lichen inventory of the Alps as well as the projected final products, an annotated printable checklist (open access) and an online database with an extended scope of operation, are described. The importance of this extensive project is briefly discussed.

Keywords: Biodiversity, ecology, inventory, lichenized ascomycetes

1. Introduction

The Alps are one of the largest continuous natural and semi-natural areas in Europe, stretching approximately 1,200 kilometres across eight countries, and including fourteen national parks. The Alpine Convention emphasizes the importance of this area and encourages transnational research and conservation projects.

Lichens as unique models of fungal symbioses with macroscopically recognizable, light-exposed individuals are important colonizers of rock, soil and plant material, and they are a dominant symbiotic life form of higher altitudes in the Alps.

Printed national checklists or catalogues exist for Austria (HAFELLNER & TÜRK 2001, TÜRK & HAFELLNER 2010), France (ROUX 2012, ROUX et al. 2014), Germany (WIRTH et al. 2011, 2013), Italy (NIMIS 1993, NIMIS & MARTELLOS 2003), Liechtenstein (HAFELLNER in prep.), Slovenia (SUPPAN et al. 2000, supplementary data in MAYRHOFER 2006) and Switzerland (CLERC 2004). Updates for Italy (NIMIS & MARTELLOS 2008) and Switzerland (CLERC & TRUONG 2012) are available on the web.

The compilation of a catalogue of the lichenized fungi of the Alps is a long overdue task and has been initiated more than ten years ago, as a multi-authored project by P.L. NIMIS, which has unfortunately come to a standstill. In the course of the project “Lichens of the Alps: diversity and climate change”, the authors of this paper together with P. CLERC (Switzerland), T. FEUERER (Germany), J. HAFELLNER (Austria), P.L. NIMIS (Italy) and C. ROUX (France) have summarized the abundant but scattered baseline information on lichen biodiversity in the Alps, which will lead to a transnational inventory of all lichen taxa, including data on their horizontal and vertical distribution and their ecology. The project has been conducted with financial support by the Austrian Science Fund.

2. Materials and methods

The lichen inventory is based on published records only. National checklists of Austria, France, Germany, Italy, Liechtenstein, Slovenia and Switzerland, as well as the most recent floristic contributions and taxonomic treatments had to be searched for taxa occurring in the Alps. After updating the nomenclature, a database with all the available information of the checklists has been created with the support of S. MARTELOS (Italy). Additions and corrections as well as synonyms and notes were added. Finally, we will generate a printable checklist (open access) with an appendix listing frequently encountered synonyms, and an online database with an extended scope of operation.

3. Distribution data, ecological data, and examples of completed data sets

A completed data set for a taxon will consist of the following information: Accepted name of the taxon, synonyms with special emphasis on those used in the central European literature, distribution data (countries and regions), ecology (substrata and altitudinal range) and a note (distribution, frequency, endangering, nomenclature, taxonomic problems, more detailed information on the ecology of the taxon, etc.).

The online database will provide further features as a query interface which generates lists of species, e.g. for a geographic entity or an altitudinal belt. Furthermore, we are planning to insert distribution maps and photos for a large number of the presented lichen taxa.

Abbreviations of the distribution data:

Austria (AT): Vorarlberg (V), Tirol (T), Salzburg (S), Kärnten (K), Steiermark (St), Oberösterreich (O), Niederösterreich (N), Burgenland (B), Austria without exact information (AT).
France (FR): Alpes-de-Haute-Provence (04), Hautes-Alpes (05), Alpes-Maritimes (06), Drôme (26), Isère (38), Savoie (73), Haute-Savoie (74), Var (83), Vaucluse (84).
Germany (DE): Oberbayern (OB), Schwaben (SW), Bavarian Alps without exact information (BAlp).
Italy (IT): Friuli (Frl), Venetia (Ven), Trentino-Alto Adige (TAA), Lombardia (Lomb), Piemonte (Piem), Val d'Aosta (VA), Liguria (Lig).
Liechtenstein (FL): no subdivision.
Slovenia (SI): Slovenian Alps (SIAlp), Trnovski gozd (Tg).
Switzerland (CH): Appenzell (AP), Bern (BE), Freiburg (FR), Glarus (GL), Graubünden (GR), Luzern (LU), St. Gallen (SG), Schwyz (SZ), Tessin (TI), Uri (UR), Unterwalden (UW), Waadt (VD), Wallis (VS), Switzerland without exact information (CH).

Abbreviations of the ecology data:

Substrata: calcareous rock (cal), intermediate rock (int), metal-rich siliceous rock (met), siliceous rock (sil), terricolous on calcareous soil (ter-cal), terricolous on siliceous soil (ter-sil), muscicolous (bry), plant debris or decaying terricolous mosses (deb), corticolous (cor), lignicolous (xyl), foliicolous (fol), resinicolous (res), algicolous (alg), parasitic on other lichens (-par), submerged or temporarily inundated (-aqu).

Altitudinal range/Phytoclimatic belts: belt of evergreen oak forests (1), belt of deciduous oak forests (2), montane belt (3), subalpine belt (4), alpine belt (5), nival belt (6).

Examples of completed data sets:

***Baeomyces rufus* (HUDS.) REBENT.**

Syn.: *Baeomyces byssoides* (L.) P. GAERTN., B. MEY. & SCHERB., *Baeomyces rufus* (HUDS.) REBENT. var. *subsquamulosus* NYL., *Baeomyces rupestris* PERS. ex ACH., *Biatora byssoides* (L.) FR., *Lichen fungiformis* SCOP., *Lichen rufus* HUDS., *Rinodina humilis* H. MAGN., *Sphyridium byssoides* (L.) BELTR., *Sphyridium fungiforme* (SCOP.) FLOT., *Tubercularia rufa* (HUDS.) KUNTZE

AT: V, T, S, K, St, O, N, B. **FR:** 04, 05, 06, 38, 73, 74, 83, 84. **DE:** OB, SW. **IT:** Frl, Ven, TAA, Lomb, Piem, VA, Lig. **FL:** -. **SI:** SIAlp, Tg. **CH:** BE, GR, LU, SG, SZ, UR, UW, VD, VS. (ter-sil, sil, xyl, bry; 2–5)

Note: a common early colonizer, often found in disturbed sites.

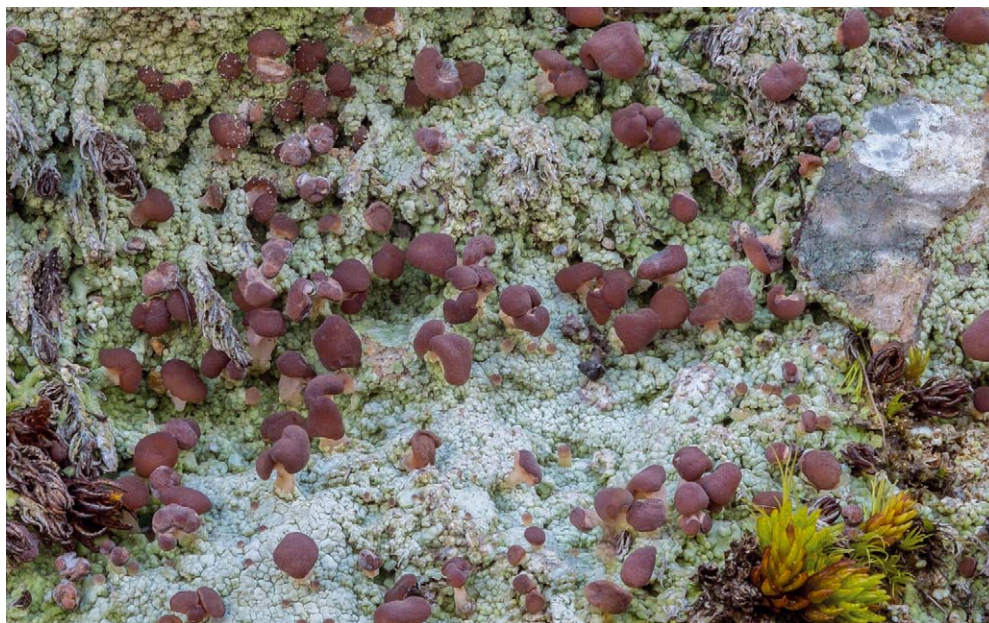


Fig. 1: *Baeomyces rufus* (Photo: P.O. BILOVITZ).

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***Caloplaca anularis* CLAUZADE & POELT**

Syn.: *Caloplaca scrobiculata* auct. non. H. MAGN.

AT: K, St. **FR:** 05, 06. **DE:** -. **IT:** Frl, Ven, TAA. **FL:** -. **SI:** SIAlp. **CH:** -. (cal; 4–5)

Note: a species of the Eurasiatic mountains from the temperate zone southwards, found on steeply inclined, compact limestone and dolomite, perhaps more frequent but undercollected in the Alps because of its preference for sites difficult to access.



Fig. 2: *Caloplaca anularis* (Photo: P.O. BILOVITZ).

***Peltigera leucophlebia* (NYL.) GYELN.**

Syn.: *Peltigera aphthosa* (L.) WILLD. var. *leucophlebia* NYL., *Peltigera aphthosa* (L.) WILLD. var. *variolosa* A. MASSAL., *Peltigera variolosa* (A. MASSAL.) GYELN., *Peltigera vrangiana* GYELN.

AT: V, T, S, K, St, O, N, B. **FR:** 04, 05, 06, 26, 38, 73, 74, 83, 84. **DE:** OB, SW. **IT:** Frl, Ven, TAA, Lomb, Piem, VA, Lig. **FL:** -. **SI:** SIAlp. **CH:** BE, FR, GL, GR, LU, SG, SZ, TI, UR, UW, VD, VS. (ter-cal, ter-sil, bry; 2–5)

Note: a conspicuous foliose lichen.



Fig. 3: *Peltigera leucophlebia* (Photo: P.O. BILOVITZ).

***Pleopsidium chlorophanum* (WAHLENB.) ZOPF**

Syn.: *Acarospora chlorophana* (WAHLENB.) A. MASSAL., *Gussonea chlorophana* (WAHLENB.) TORNAB., *Parmelia chlorophana* WAHLENB., *Pleopsidium flavum* (BELLARDI) KÖRB. var. *chlorophanum* (WAHLENB.) KÖRB.



Fig. 4: *Pleopsidium chlorophanum* (Photo: P.O. BILOVITZ).

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AT: V, T, S, K, St, N. **FR:** 05, 06, 38, 73, 74. **DE:** -. **IT:** Frl, TAA, Lomb, Piem, VA. **FL:** -. **SI:** SIAlp. **CH:** BE, GR, TI, UR, VS. (sil, met; 2–6)

Note: an arctic-alpine, bipolar lichen, found on vertical or overhanging siliceous rocks, in exposed situations.

***Umbilicaria virginis* SCHAER.**

Syn.: *Gyrophora stipitata* (NYL.) BRANTH, *Gyrophora virginis* (SCHAER.) FREY, *Omphalodiscus virginis* (SCHAER.) SCHOL., *Umbilicaria rugifera* NYL., *Umbilicaria stipitata* NYL.

AT: T, S, K. **FR:** 04, 05, 06, 74. **DE:** -. **IT:** TAA, Piem, VA. **FL:** -. **SI:** -. **CH:** BE, GR, TI, UR, VS. (sil; 6)

Note: an arctic-alpine, probably circumpolar lichen, found on wind-exposed siliceous cliffs, often in small niches and under overhangs; apparently \pm limited to the nival belt in the Alps.



Fig. 5: *Umbilicaria virginis* (Photo: P.O. BILOVITZ).

4. Discussion on the importance of check lists

A comprehensive checklist of the lichens of the Alps is long overdue and will enable us to compare, for instance, the genera or species diversity of the Alps with those of other mountain systems of the world (e.g. the Tatry Mountains – LISICKÁ 2005). URBANAVICHUS (in prep.) is conducting a similar study for the Caucasus Mountain Range. Rare and endangered lichen species of the

Alps are potential organisms for protection and monitoring. Species restricted to mountain tops may become more and more threatened in the future due to global warming. This information will be of use for experts, decision-makers, and citizen scientists.

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6. References

- CLERC, P. 2004: Les champignons lichénisés de Suisse. — *Cryptog. Helv.* **19**: 1–314.
- CLERC, P. & TRUONG, C. 2012: Catalogue des lichens de Suisse (Version 2.0, 11.06.2012). (www.ville-ge.ch/musinfo/bd/cjb/cataloguelichen)
- HAFELLNER, J. & TÜRK, R. 2001: Die lichenisierten Pilze Österreichs – eine Checkliste der bisher nachgewiesenen Arten mit Verbreitungsangaben. — *Stapfia* **76**: 3–167.
- LISICKÁ, E. 2005: The lichens of the Tatry Mountains. — Bratislava: Veda.
- MAYRHOFER, H. 2006: Additions and corrections to the catalogue of the lichenized and lichenicolous fungi of Slovenia I. — *Razprave, Slovenska Akademija Znanosti in Umetnosti, Razreda za naravoslovne vede, Classis IV: Historia Naturalis* **47**: 201–229.
- NIMIS, P. L. 1993: The lichens of Italy. — Torino: Museo Regionale di Scienze Naturali.
- NIMIS, P. L. & MARTELOS, S. 2003: A second checklist of the lichens of Italy with a thesaurus of synonyms. – Museo Regionale di Scienze Naturali Saint-Pierre – Valle d’Aosta Monografie **4**: 1–192.
- NIMIS, P. L. & MARTELOS, S. 2008: ITALIC – The information system on Italian lichens. Version 4.0. — Trieste: University of Trieste, Dept. of Biology. (<http://dbiodbs.univ-trieste.it/>)
- ROUX, C. 2012: Liste des lichens et champignons lichénicoles de France. — *Bull. Soc. Linn. Provence, Numéro Spécial* **16**: 1–220.
- ROUX, C. 2014: Catalogue des lichens et champignons lichénicoles de France métropolitaine. — Association française de lichénologie (AFL). — Fougères: Henry des Abbayes.
- SUPPAN, U., PRÜGGER, J. & MAYRHOFER, H. 2000: Catalogue of the lichenized and lichenicolous fungi of Slovenia. — *Biblioth. Lichenol.* **76**: 1–215.
- TÜRK, R. & HAFELLNER, J. 2010: Nachtrag zur Bibliographie der Flechten Österreichs. — *Biosyst. Ecol. Ser.* **27**: 1–381. — Wien: Verlag der ÖAW.

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WIRTH, V., HAUCK, M., BRACKEL, W. v., CEZANNE, R., DE BRUYN, U., DÜRHAMMER, O., EICHLER, M., GNÜCHTEL, A., JOHN, V., LITTERSKI, B., OTTE, V., SCHIEFELBEIN, U., SCHOLZ, P., SCHULTZ, M., STORDEUR, R., FEUERER, T. & HEINRICH, D. 2011: Rote Liste und Artenverzeichnis der Flechten und flechtenbewohnenden Pilze Deutschlands. — Naturschutz und Biolog. Vielfalt **70**(6): 7–122.

WIRTH, V., HAUCK, M. & SCHULTZ, M. 2013: Die Flechten Deutschlands. Bände 1 & 2. — Stuttgart: Ulmer.

Address of the authors:

Dr. Peter Othmar BILOVITZ
Institute of Plant Sciences, NAWI Graz
University of Graz, Holteigasse 6, 8010 Graz, Austria
Email: pe.bilovitz@uni-graz.at

Univ.-Prof. Dr. Helmut MAYRHOFER
Institute of Plant Sciences, NAWI Graz
University of Graz, Holteigasse 6, 8010 Graz, Austria
Email: helmut.mayrhofer@uni-graz.at