Protoblastenia szaferi (lichenized Ascomycotina) – new to the Alps

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Abstract: HAFELLNER, J. 2006. *Protoblastenia szaferi* (lichenized Ascomycotina) – new to the Alps. – Herzogia **19**: 23–33.

Protoblastenia szaferi is newly recorded from several localities in the Eastern Alps in Austria, and displays now the distribution pattern of an eastern alpine-carpathian endemic taxon. Data on its morphological variability, distribution, autecology and accompanying species are presented. *Protoblastenia calvella* and *Merismatium deminutum* represent new records for Styria.

Zusammenfassung: HAFELLNER, J. 2006. *Protoblastenia szaferi* (lichenisierte Ascomycotina) – neu für die Alpen. – Herzogia **19**: 23–33.

Protoblastenia szaferi wird von mehreren Fundpunkten in den Ostalpen (Österreich) nachgewiesen und zeigt damit nun den Arealtyp eines ostalpin-karpathischen Endemiten. Die morphologische Variabilität der Art, ihre Verbreitung, Autökologie und Vergesellschaftung werden dargestellt. *Protoblastenia calvella* und *Merismatium deminutum* werden erstmals in der Steiermark nachgewiesen.

Key words: Austria, chorology, endemism, lecanoralean fungi, Psoraceae

Introduction

Protoblastenia was described originally as section of *Blastenia* (ZAHLBRUCKNER 1908). The diagnostic character for the segregation was the presence of one-celled ascospores, whereas sect. *Eublastenia* was defined by two-celled ascospores and sect. *Xanthocarpia* by the spores being four-celled. Having one-celled ascospores, *Protoblastenia* was considered by Zahlbruckner (l.c.) as being formally similar with *Lecidea* sect. *Biatora* or *Lecanora*, from which it was distinguished by the position of the conidiogenous cells ("endobasidiale Fulkren") and the presence of certain pigments ("Chrysophansäure") around the pycnidia. Originally the taxon was placed in the Caloplacaceae, the counterpart family to the Teloschistaceae for genera with crustose thallus organisation (ZAHLBRUCKNER, l.c.). The only species mentioned in the protologue was *Protoblastenia rupestris* which thus represents the holotype taxon.

Protoblastenia was later raised to genus level by STEINER (1911: 47, foot note) who regarded the position of the conidiogenous cells as the only diagnostic character. In addition to *P. rupestris*, he recognized *P. siebenhaariana* as belonging to the genus and, at the same time, widened the generic concept by the inclusion of *Lecidea monticola* (now *Clauzadea*). Nevertheless, the species listing in STEINER (l.c.) is incomplete, as these taxonomic annotations and nomenclatural changes were only included in a floristic study.

Subsequently a number of additional taxa have been described in or combined into *Protoblastenia*, some of which have then been removed again and transferred to other genera, that is, the *P. immersa*/*monticola* group to *Clauzadea* Hafellner & Bellem. (HAFELLNER 1984), and the *P. cinnabarina*/*russula* group to *Pyrrhospora* Körb. (HAFELLNER 1993). In the strict sense, *Protoblastenia* comprises only species with apothecia encrusted by anthraquinones and with *Psora*-type asci containing non-septate ascospores. All species grow on limestone or other substrates with at least a low content of calcium.

For much of the 20th century, *Protoblastenia* was regarded as closely related to *Caloplaca* (e.g. ZAHLBRUCKNER 1908, 1926, SANTESSON 1970, POELT 1973, HENSSEN & JAHNS 1974), and therefore classified together with other genera of the Teloschistaceae. Interestingly, STEINER (1911) listed the species of *Protoblastenia* between *Lecidea* and *Catillaria*, and not together with *Blastenia* and *Caloplaca*, indicating that he regarded *Protoblastenia* as a member of Lecideaceae s. ampl. Finally, after correlations between apothecial characters, including ascus structure, were recognized, the genus proved to be much closer to *Psora*. *Psora* species have similar substrate preferences (Ca-rich soils) but all display a squamulose thallus organisation (POELT & HAFELLNER 1980, HAFELLNER 1984, TIMDAL 1984, 1986). Both genera form the core of the family Psoraceae. Although thallus organisation alone would probably not be sufficient for the acceptance of two genera, according to TIMDAL (1987), *Protoblastenia* is well separated from *Psora* by the upper cortex of the thallus always being rather weakly developed and by the consistent absence of Ca-oxalate crystals in the hypothecium.

The total number of accepted taxa in *Protoblastenia* ranges from 11 (KIRK et al. 2001) to 30 taxa (KAINZ & RAMBOLD 2004: 267), and although some are widely distributed on the world, the majority is known only from Europe, with the Alps evidently being the centre of diversity for this genus.

Keys to the European species were published by POELT & VĚZDA (1977) and CLAUZADE & ROUX (1985). KAINZ & RAMBOLD (2004) have undertaken a phylogenetic study based on sequence data achieved from the central European material at their disposal resulting in the recognition of 11 taxa in the area.

Whereas some *Protoblastenia* species are very common on suitable substrates and are evidently widely distributed, others seem to be much rarer. One of the species that so far was recorded only from the Polish Tatra Mountains, *P. szaferi*, has proved to be widely distributed in the Eastern Alps. As it has not been treated by KAINZ & RAMBOLD (2004), data on its variability, distribution, ecological requirements and associated species are presented here.

Material and methods

External morphology was studied with a dissecting microscope (WILD M3, 6.4–40×). Anatomical analyses of the thallus and the apothecia were carried out with a light microscope (LEICA DMRE, 100×–1000×). Sectioning was performed with a freezing microtome (LEITZ, sections of 12–15 µm) but squash preparations were also used, especially for ascus analysis. Preparations were mounted in water. When necessary, contrasting was performed by a pretreatment with lactic acid-cotton blue (MERCK 13741). Amyloid reactions in hymenia were observed both progressively and regressively by the use of Lugol's reagent (MERCK 9261). Conidiogenesis of pycnoconidia was studied in erythrosin B (ALDRICH 19,826-9) in 10 % ammonia. Sections and squash preparations were not pretreated with KOH unless otherwise stated. Measurements refer to dimensions in tap water.

Abbreviations for institutional herbaria follow HOLMGREN et al. (1990). Abbreviations of author names are those proposed by BRUMMITT & POWELL (1992).

In addition to the specimens cited resulting from own field work, the following comparative material was also examined:

Protoblastenia szaferi: Poland: Holotype (for collection data see below). – West Tatra Mts., Magury peak, c. 1680 m, N slope, on vertical limestone rocks, 24.VII.1975, leg. J. Nowak (KRAM-L-24776).

Results

Protoblastenia szaferi J.Nowak, Fragmenta Floristica et Geobotanica 20(4): 529 (1974).

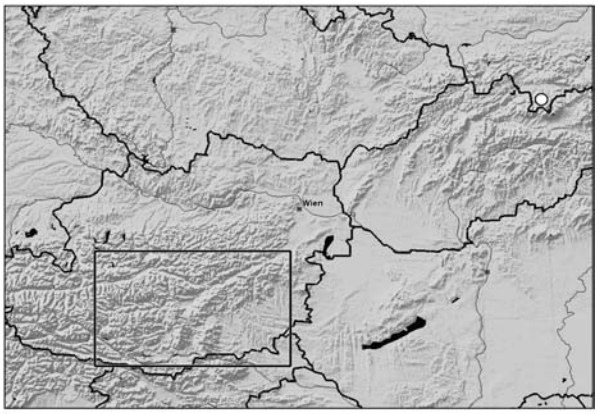
Typus: "Polonia meridionalis, montes Tatri Occidentales (distr. Nowy Targ), in monte Kopa Magury prope pratum [sub]alpinum Hala Gasienicowa, alt. c. 1700 m s. m., in saxo calcareo, 12.VII.1955, leg. J. Nowak" (KRAM-L-5756, holotype)!

Icon.: Nowak 1974, figs 1, 2 (habitus); fig. 3 in this publication (habitus), figs 4–7 in this publication (longitudinal section of apothecium, marginal part of apothecium, hymenium, ascus).

Exs.: Obermayer: Lichenotheca Graecensis no. adhuc ined.; Obermayer: Dupla Graecensia Lichenum no. adhuc ined.

Thallus endolithic, visible in surface view as whitish to slightly creamy spots, 10–20(–25) mm diam., with individual thalli sometimes fusing into larger patches several cm in diam.; *photobiont* cells endolithic, chlorococcalean, in scattered agglomerations. *Apothecia* sunken in the limestone substratum, with the hymenial surface more or less level with the rock surface (Fig. 3), later somewhat protruding, persistently more or less flat, vividly orange, c. 0.4–0.8 mm diam., separated from the rock by a marked cleft when dry, leaving shallow holes in the substrate after destruction; *margin* usually permanently visible as a rim, slightly to markedly paler than the disc, more rarely rudimentary, even or somewhat prominent; *excipulum* rudimentary, adjacent to the hymenium composed of subparallel hyphae with the intercellular spaces filled with a mixture of anthraquinone crystals and oxalate crystals, towards the outside composed of some interwoven hyphae with the intercellular spaces filled with oxalate crystals (Fig. 5); *hypothecium* hyaline, composed of interwoven hyphae, with scattered clusters of oxalate crystals (Fig. 4); *hymenium* hyaline, with the orange appearance due to deeply penetrating anthraquinone crystals here and there, c. 60–70 µm high (Fig. 6); *paraphyses* shortly septate, with some branches and anastomoses, c. 2.5–3 µm thick, with barely enlarged tips surrounded by masses of anthraquinone crystals; *asci* lecanoralean, of the *Psora*-type: outer ascal wall layer hemiamyloid, apical internal wall layer (tholus) euamyloid showing a slightly more reactive tube structure, 45–55 × 15–20 µm, commonly 8-spored (Fig. 7); *ascospores* one-celled, ellipsoid to subglobose, 9–10.6–12(–15) × 5–5.8–7 µm (8.5–12–15 × 4.5–6 µm after NOWAK & TOBOLEWSKI 1975), without a perispore layer discernable in LM. *Pycnidia* not observed with certainty, possibly the punctiform structures sunken in the limestone, usually in small depressions, with a protruding peak encrusted with anthraquinone crystals somewhat below the level of the rock surface; conidiophores and pycnoconidia not observed.

Secondary chemistry: bacillar anthraquinone crystals present in the ascomatal ascigerous layer, penetrating rather deeply into the hymenium; ascomatal disc K+ red; thallus K–.



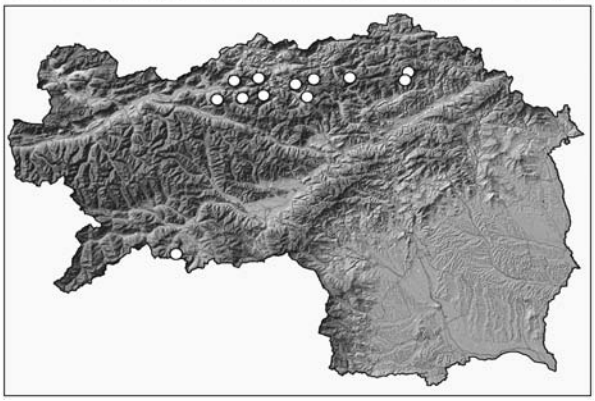
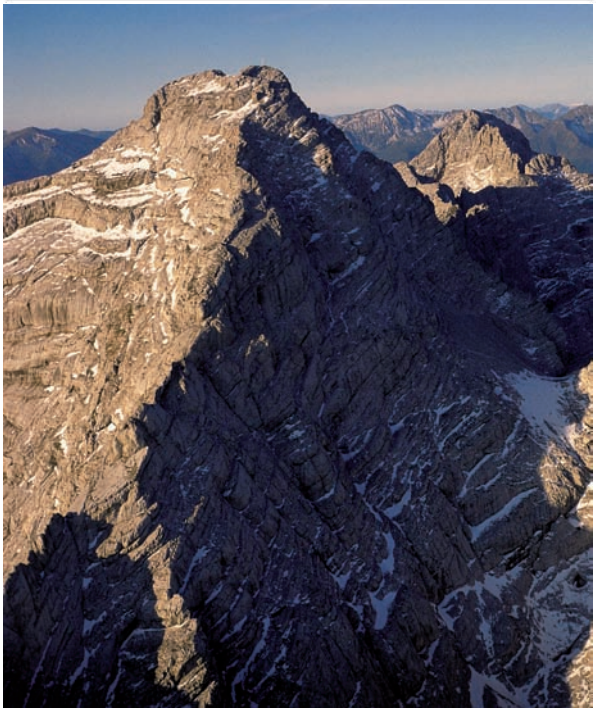


Fig. 1: The distribution of *Protoblastenia szaferi*: Above: Relief map of eastern part of Eastern Alps and western part of Carpathian Mountains, showing the geographic position of the locality in Poland. The frame indicates the position of the detailed map (below), however, no localities in the Alps are indicated at this scale. Below: Relief map of the Austrian province Styria with dots indicating the geographic position of the localities so far known. The two localities on Großer Buchstein are merged into one dot. (designed by W. Obermayer).

Fig. 2: An example of the environment, in which *Protoblastenia szaferi* can be found: the mountain Hochtor, seen from the east. *Protoblastenia szaferi* was found close to the summit on rock faces exposed to the north (on the photograph in the shadow).



Figs 3–7 (see page 27):

Fig. 3: *Protoblastenia szaferi*: view under dissecting microscope. Note the narrow marginal rim. The apothecia on the right belong to an adjacent over-mature individual. (from Hafellner no. 65408, GZU-specimen of Lichenotheca Graec. no. adhuc ined., phot. W. Obermayer).

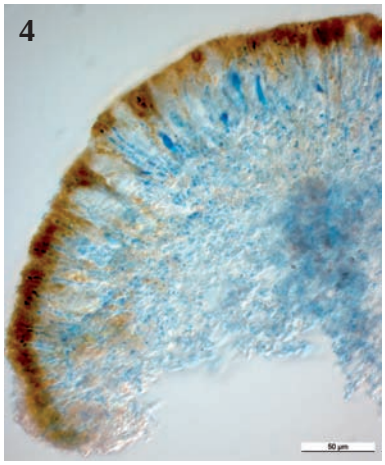
Fig. 4: *Protoblastenia szaferi*: longitudinal section of apothecium. The convex shape is due to swelling with the uptake of water. (from Hafellner no. 64157, after staining with lactic acid-cotton blue, phot. by the author).

Fig. 5: *Protoblastenia szaferi*: longitudinal section of apothecial margin. Note the masses of oxalate crystals. (from Hafellner no. 64157, after staining with lactic acid-cotton blue, phot. by the author).

Fig. 6: *Protoblastenia szaferi*: longitudinal section of hymenium. (from Hafellner no. 64157, after staining with lactic acid-cotton blue, phot. by the author).

Fig. 7: *Protoblastenia szaferi*: mature ascus. (from Hafellner no. 64157, after staining with Lugol, phot. by the author).


3
1 mm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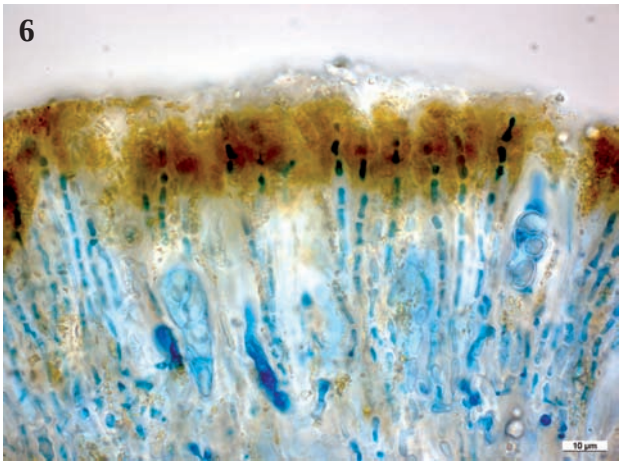
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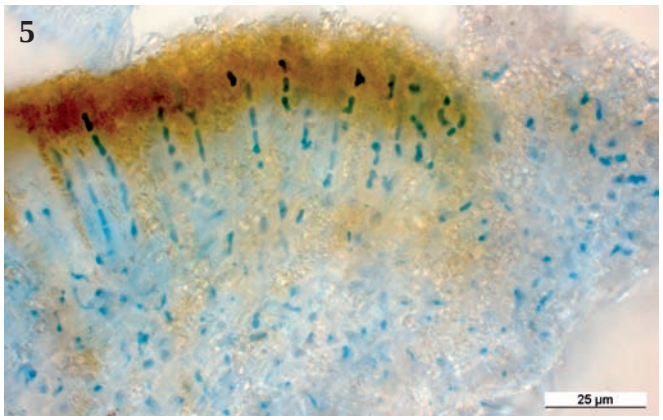
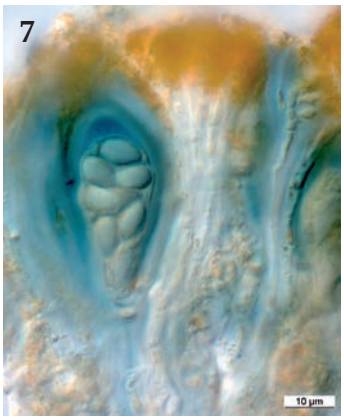

5
25 µm


7

Further specimens seen (all localities in the E'oberen Bereich der N-Hänge etwas E vom Gipfel, 47°36'37"N/14°35'50"E, ca. 2200 m, GF 8353/4; Polsterseggen-Silberwurzspaliere und niedere Kalkausbisse, auf Steilflächen, 19.VI.2005, leg. J. Hafellner no. 65412 & A. Hafellner (GZU). – Ennstaler Alpen, **Tamischbachturm** NW von Hieflau, auf dem Gipfel, kurz NE unter dem Gipfelkreuz, 47°36'55"N/14°42'00"E, ca. 2030 m, GF 8354/3; Kalkschrofen und Rasenfragmente, auf N-exponierten Steilflächen, 23.VII.2005, leg. J. Hafellner no. 65409 (GZU). – Ennstaler Alpen, Gesäuseberge SE von Admont, **Admonter Kalbling**, am Steig N unter dem Gipfel, 47°33'00"N/14°31'20"E, ca. 2100 m, GF 8453; Fragmente von Polsterseggen-Silberwurzspalieren zwischen niederen Kalkblöcken, auf kleinen Kalkblöcken, 23.VIII.2002, leg. J. Hafellner no. 64157 & J. Miądlikowska (GZU). – Ennstaler Alpen, Gesäuseberge E von Admont, **Hochtor**, am W-Grat kurz unter dem Gipfel, 47°33'40"N/14°37'55"E, ca. 2330 m, GF 8453/2; niedere Kalkschrofen und Fragmente von Spalierweiden-Matten, N-exponiert auf Vertikalflächen niederer Kalkschrofen, 24.IX.2005, leg. J. Hafellner no. 64367 (GZU). – Ennstaler Alpen, **Lugauer** SW von Hieflau, W-Gipfel, in der Umgebung des Gipfelkreuzes, 47°33'12"N/14°43'20"E, ca. 2210 m, GF 8454/1; Caricetum firmae-Fragmente und Kalkschrofen, NW-seitig auf steilen Neigungsflächen niederer Schrofen, 3.VII.2005, leg. J. Hafellner no. 65408 (GZU) = to be distributed in Lichenotheca Graecensis. – Hochschwab-Gruppe, **Kaltmauer** ca. 6,5 km N von Eisenerz, Bergrücken 0,7 km E vom Gipfel, 47°36'02"N/14°52'45"E, ca. 1900 m, GF 8355/3; Kalkschrofen zwischen *Pinus mugo*-Gruppen über den S-exponierten Felsabbrüchen, N-seitig auf niederen Kalkschrofen, 6.IX.2003, leg. J. Hafellner no. 64156 (GZU). – Hochschwab-Gruppe, **Brandstein** ca. 9,5 km NE von Eisenerz, kurz N unter dem Gipfel, 47°36'05"N/14°59'00"E, ca. 1990 m, GF 8355/4; Kalkschrofen am oberen Rand der E-exponierten Abbrüche, auf Neigungsflächen niederer Kalkschrofen, N-exponiert, 5.VIII.2004, leg. J. Hafellner no. 64159 (GZU). – Hochschwab-Gruppe, **Pfaffenstein** N von Eisenerz, auf dem sanft nach N abfallenden Gipfelplateau kurz NE vom Gipfel, 47°33'35"N/14°54'35"E, ca. 1860 m, GF 8455/1; niedere Kalkschrofen zwischen Latschengebüsch, N-seitig an niederen Kalkschrofen, 3.VIII.2004, leg. J. Hafellner no. 64160 (GZU). – Hochschwab-Gruppe, **Zagelkogel** ca. 11 km NE von Aflenz, N-Hänge kurz N unter dem Gipfel, 47°36'40"N/15°07'25"E, ca. 2240 m, GF 8356/4, auf niederen Kalkschrofen im Caricetum firmae, 18.IX.2004, leg. J. Hafellner no. 64155 (GZU). – Mürzsteger Alpen, Rauschkogel NE von Turnau, **Sattelmauer** am SW-Grat zum Roßkogel, am NE-Fuß der Felsabbrüche, 47°36'30"N/15°21'55"E, ca. 1540 m, GF 8358/3, Kalkschrofen, auf absonnigen Steilflächen oberhalb der Baumkronen, 19.VIII.2005, leg. J. Hafellner no. 65411 (GZU). – Mürzsteger Alpen, Veitsch Alpe N von Kindberg, am Steig von der Rotsohlalm zum Graf-Meran-Haus, **Rabenstein**, 47°38'05"N/15°23'45"E, ca. 1520 m, GF 8358/3, paläozoische Kalkschrofen am waldlosen Grat, SW-/NW-exponiert auf Kalkschrofen, 26.X.2005, leg. J. Hafellner no. 65410 (GZU). – [Zentralalpen], Gurktaler Alpen, **Grebenzen** SE über St. Lambrecht, im Gipfelbereich, kurz N vom Gipfelkreuz, 47°02'25"N/14°19'50"E, ca. 1870 m, GF 8951/4; kleine W-exponierte Schrofen aus paläozoischen Kalken an der Waldgrenze, bodennah auf Steilflächen, 7.VIII.2003, leg. J. Hafellner no. 64158 (GZU).

Notes

Some minor morphological characters separate *P. szaferi* from most other *Protoblastenia* species: the flat (to barely convex even when old) apothecia, the persistent, relatively distinct apothecial margins and the vividly red colour of the apothecia. *Protoblastenia szaferi* has identical asci (*Psora*-type) to those of *P. rupestris*, the type species of *Protoblastenia*. Hence, analysing phenotypic characters, its generic placement is certain. From other monographic treat-

ments of the genus (e.g. KAINZ & RAMBOLD 2004) it is known, that species of *Protoblastenia* vary mainly by the size, colour and shape of their apothecia.

When well-developed, thalli of *P. szaferi* are almost creamy-milky white and the apothecia are vividly coloured, making it a relatively conspicuous crustose lichen despite of the endolithic habit. Most thalli are smaller than 20 mm in diameter but larger patches may be formed by lateral fusion of individuals that are not delimited by prothallus lines. Such fused thalli are also present on the holotype specimen. Old thalli are sometimes dull greyish due to a slight cover of dust or colonies of epiphytic microorganisms other than lichenicolous fungi. The thalli of the holotype specimen are likewise dull and seem to have passed their optimum stage.

An apothecial margin is commonly discernable in surface view under the dissecting microscope. However, an excipulum is often not very prominent and indicated only by several subparallel hyphae, possibly representing young marginal paraphyses, and, towards the outer edge, a few interwoven hyphae. The outer region in particular is filled with masses of relatively small Ca-oxalate crystals, resulting in a paler zone around the hymenium. Small scattered clusters of Ca-oxalate crystals are also present in the hypothecium, which, according to the observations of TIMDAL (1987), is a rather unusual feature in *Protoblastenia*.

The stainable tube structure in the tholus developed in the ascus tip, is often very faint; that is, the difference in the intensity of the coloration between the body of the tholus and the central tube is rather low. This feature is best seen in very low concentrations of the Lugol's solution.

Several attempts have been made to locate the pycnidia of the species but without success. In addition to apothecia of various age and size, dot-like structures can be observed regularly on the thalli. As the search for conidiophores and pycnospores always failed, it was impossible to clarify whether these organs constitute pycnidia or apothecial primordia.

Autecology

The ecological needs of *P. szaferi* were circumscribed by POELT & VĚZDA (1977) as "on limestone in dry situation". However, this contradicts the information given by NOWAK (1974) who mentions that in the Tatra Mts it grew on a slope facing to the north. Own field observations in the Eastern Alps confirm Nowak's statement. *Protoblastenia szaferi* was regularly found on rock faces exposed to the north. Where the limestone cliffs are on slopes facing other directions, *P. szaferi* still grew mostly on walls with a northerly aspect. On belays it is sometimes also found on inclined faces exposed to other directions.

Associated species

a) The lichen community

NOWAK (1974) mentioned three further lichens that grew together with *Protoblastenia szaferi* at the type locality, of which two were named to species: *Polyblastia amota* (as *Amphoroblastia a.*) and *Hymenelia epulotica* (as *Ionaspis e.*). Additional accompanying species present on the type specimen, according to our own observations, are *Farnoldia jurana* and *Arthonia lapidicola*. With the exception of *P. amota*, all these species were also present with varying constancy at the localities in the Eastern Alps.

Although a survey of the community composition was not undertaken at the localities in the Eastern Alps, a thorough reinvestigation of all available specimens of *P. szaferi* provides an idea of the calcicolous communities in which *P. szaferi* grows (Table 1). Other species that

were collected at each of the localities under similar ecological conditions are not included in the table, as ecological conditions may vary considerably within short distances.

Accompanying species present with the highest constancy values include *Hymenelia coerulea*, *Protoblastenia incrustans* and *Lecanora crenulata*. In general, the lichen community containing *P. szaferi* is not very rich in species, and the number of associated species observed in the specimens ranges from none to eleven. Of course, these numbers are highly dependent on the size and amount of rock surfaces present in the individual specimens.

b) Lichenicolous fungi

Although extensive collections have been screened, lichenicolous fungi have been observed on *P. szaferi* very rarely. This is rather surprising, as other species of *Protoblastenia*, especially *P. incrustans*, are infested rather frequently, either by the hyphomycete *Intralichen christiansenii* or by one of the verrucarealean pyrenomycetes. One of these, *Merismatium discrepans*, has also been detected on the thallus of *P. szaferi* at three localities: that is, on rock faces at the North Saddle of Großer Buchstein (Hafellner no. 65551), on the summit of Lugauer (GZU specimen of Lichenotheca Graec. no. adhuc ined., Hafellner no. 65408), and on the cliffs of Rabenstein (Hafellner no. 65413). According to the observations of TRIEBEL (1989), *Protoblastenia* is the preferred host genus of this ascomycete. *Protoblastenia szaferi* is added herewith to the list of hosts of *Merismatium discrepans*.

The altitudinal distribution of *P. szaferi* in the Eastern Alps

In the Eastern Alps, the localities at which *P. szaferi* was collected are situated within an altitudinal range of 1520 to 2330 metres above sea level: from about the upper montane belt to the tree line ecotone and further up to the lower alpine belt. The localities with a relatively low elevation (Sattelmauer, Rabenstein) exhibit a rather peculiar ecological situation. Although surrounded by coniferous forests, the limestone cliffs on the ridge are large enough for those parts of the rock faces inhabited by *P. szaferi* populations to extend well above the forest canopy, where they are not visibly influenced by the adjacent higher plant vegetation but occur in "pseudo-alpine" conditions.

The horizontal distribution of *P. szaferi*

Until now, this species was known only from the western part of the Tatra Mountains in Poland and all reports (NOWAK 1974, NOWAK & TOBOLEWSKI 1975, ALSTRUP & OLECH 1992, BIELCZYK 2003, FALTYNOWICZ 2003, LISICKÁ 2005) refer to the original collection by J. Nowak. A second collection from a locality nearby or from the locus classicus is kept in the herbarium KRAM in Kraków (see above). So far, the species is not known from the rest of the Carpathian bow (KONDRATYUK et al. 2003, BIELCZYK et al. 2004).

Because *P. szaferi* is relatively widely distributed in the Styrian parts of the Northern Limestone Alps, it is very likely to also occur in the adjacent Austrian provinces of Lower Austria and Upper Austria, although we have no data from these areas until now. Of special interest is the presence of *P. szaferi* on the Grebenzen, because on the one hand, this mountain is not part of the Northern Alps but of the Central Alps, and on the other hand, it is composed not of Triassic but of Devonian limestone.

If the localities from where the species is known, reflect to some degree the real distribution area of the species (Fig. 1), *P. szaferi* could be called an eastern alpine-carpathian endemic

Table 1: Taxa of lichens and lichenicolous fungi found in close neighbourhood with *Protoblastenia szaferi* at selected localities in the Eastern Alps.

Taxon	GB1	GB2	TT	AK	HT	LU	KM	BS	PS	ZK	SM	RS	GR	frequency (%)
Arthonia lapidicola (Taylor) Branth & Rostr.	+*				+	+*								23
Catillaria lenticularis (Ach.) Th.Fr.											+			8
Clauzadea immersa (Weber) Hafellner & Bellem.	+			+										15
Eiglera flavida (Hepp) Hafellner				+										8
Farnoldia hypocrita (A.Massal.) Fröberg				+		+*								15
Farnoldia jurana (Schaer.) Hertel var. *jurana*	+													8
Hymenelia coerulea (DC.) A.Massal.	+	+	+	+	+	+		+	+		+	+	+	85
Hymenelia epulotica (Ach.) Lutzoni	+*					+*								15
Intralichen christiansenii (D.Hawksw.) D.Hawksw. & M.S.Cole (LF)				+[2)]		+[2)]								15
Lecanora crenulata Hook.	+*		+	+	+	+				+			+	54
Lecidella patavina (A.Massal.) Knoph & Hertel													+	8
Merismatium deminutum (Arnold) Cl.Roux & Nav.-Ros. (LF)												+[4)]		8
Merismatium discrepans (Lahm) Triebel (LF)	+[1)]					+[1, 4)]						+[1)]	+[2)]	31
Muellerella pygmaea var. *athallina* (Müll.Arg.) Triebel (LF)				+[3)]	+[2)]									15
Petractis hypoleuca (Ach.) Vězda											+			8
Physcia caesia (Hoffm.) Fürnr.			+											8
Poeltinula cacuminum (Asta, Clauzade & Cl.Roux) Clauzade & Cl.Roux									+					8
Polyblastia albida Arnold										+				8
Polyblastia dermatodes A.Massal.										+				8
Polyblastia ventosa Arnold						+								8
Polycoccum opulentum (Th.Fr. & Almq. ex Th.Fr.) Arnold (LF)											+[4)]			8
Protoblastenia calva (Dicks.) Zahlbr.										+				8
Protoblastenia calvella Kainz & Rambold				+										8
Protoblastenia incrustans (DC.) J.Steiner	+			+	+	+*			+		+	+	+	62
Rhizocarpon umbilicatum (Ramond) Flagey						+								8
Thelidium absconditum (Hepp) Rabenh.				+								+		15
Thelidium decipiens (Nyl.) Kremp.	+													8
Thelidium incavatum Mudd	+					+*								15
number of accompanying species	**10**	**1**	**3**	**10**	**5**	**11**	**0**	**1**	**3**	**4**	**5**	**5**	**5**	

[1)] on *Protoblastenia szaferi*, [2)] on *Protoblastenia incrustans*, [3)] on *Lecanora crenulata*, [4)] on spec. indet. of Verrucariaceae

Accompanying species present in the specimens of *Protoblastenia szaferi* at the localities as listed above. All specimens of *Protoblastenia szaferi* but the duplicates of the exsiccate numbers preserved in GZU. Species present on the samples forming the exsiccates Lichenotheca Graec. no. adhuc ined. from the mountain Lugauer (LU) and Dupl. Graec. Lich. no. adhuc ined. from Großer Buchstein-Nordsattel (GB1) are marked by an asterisk (*). Lichenicolous fungi are indicated by (LF) and hosts are listed as foot notes. Note that the number of accompanying species is highly dependent on the sample size (number of rock pieces forming the single specimens).

Abbreviations of localities: GB1 = Großer Buchstein, Nordsattel, GB2 = Großer Buchstein, Gipfel, TT = Tamischbachturm, AK = Admonter Kalbling, HT = Hochtor, LU = Lugauer, KM = Kaltmauer, BS = Brandstein, PS = Pfaffenstein, ZK = Zagelkogel, SM = Sattelmauer, RS = Rabenstein, GR = Grebenzen. For locality data of the cited mountains see above!

(FISCHER 1994: 113). This distribution pattern is well known from flowering plants growing in environments at higher altitudes, including *Gentiana frigida*, *Saponaria pumila*, *Viola alpina* and *Viola lutea* subspec. *sudetica* (FISCHER 1994, TEPPNER 1982). Even more precisely, among the flowering plants, a distribution pattern linking the Northeastern Limestone Alps with the Western Carpathians is known (NIKLFELD 1973: 56), as exemplified by *Asperula neilreichii*. Interestingly, both in the Alps and the Carpathians, endemism is highest among the flowering plants growing in limestone crevices and alpine meadows over Calcium-rich soils (PAWLOWSKI 1969). *Protoblastenia szaferi* is a first example of a saxicolous lichen species showing this distribution pattern.

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References

ALSTRUP, V. & OLECH, M. 1992. Checklist of the lichens of the Tatra National Park, Poland. – Prace Botaniczne **24**: 185–206.

BIELCZYK, U. 2003. The lichens and allied fungi of the Polish Western Carpathians. – In: BIELCZYK, U. (ed.): The lichens and allied fungi of the Polish Carpathians – an annotated checklist. Biodiversity of the Polish Carpathians, p. 23–232. – Kraków: W. Szafer Institute of Botany, Polish Academy of Sciences.

BIELCZYK, U., LACKOVIČOVÁ, A., FARKAS, E. E., LŐKÖS, L., LIKA, J., BREUSS, O. & KONDRATYUK, S. Y. 2004. Checklist of Lichens of the Western Carpathians. – Biodiversity of the Carpathians, Vol. 1. – Kraków: W. Szafer Institute of Botany, Polish Academy of Sciences.

BRUMMITT, R. K. & POWELL, C. E. 1992. Authors of plant names. – Kew: Royal Botanic Gardens.

CLAUZADE, G. & ROUX, C. 1985. Likenoj de okcidenta Europo. Ilustrita determinlibro. – Bull. Soc. Bot. Centre-Ouest, Nouv. Série, Numéro Spécial **7**: 1–893.

FALTYNOWICZ, W. 2003. The lichens, lichenicolous and allied fungi of Poland – an annotated checklist. – Biodiversity of Poland 6. – Kraków: W. Szafer Institute of Botany, Polish Academy of Sciences.

FISCHER, M. A. (ed.) 1994. Exkursionsflora von Österreich. – Stuttgart, Wien: Ulmer.

HAFELLNER, J. 1984. Studien in Richtung einer natürlicheren Gliederung der Sammelfamilien Lecanoraceae und Lecideaceae. – In: HERTEL, H. & OBERWINKLER, F. (eds), Beiträge zur Lichenologie. Festschrift J. Poelt. – Beih. Nova Hedwigia **79**: 241–371.

HAFELLNER, J. 1993. Die Gattung *Pyrrhospora* in Europa. Eine erste Übersicht mit einem Bestimmungsschlüssel der Arten nebst Bemerkungen zu einigen außereuropäischen Taxa (lichenisierte Ascomycotina, Lecanorales). – Herzogia **9**: 725–747.

HENSSEN, A. & JAHNS, H. M. 1974. Lichenes. – Stuttgart: G. Thieme.

HOLMGREN, P. K., HOLMGREN, N. H. & BARNETT, L. C. (eds) 1990. Index herbariorum. Part I. The herbaria of the world. 8th edition. Regnum Vegetabile **120**. – Bronx, New York: New York Botanical Garden for the International Association for Plant Taxonomy.

KAINZ, C. & RAMBOLD, G. 2004. A phylogenetic study of the lichen genus *Protoblastenia* (Lecanorales, Psoraceae) in Central Europe. – In: DÖBBELER, P. & RAMBOLD, G. (eds), Contributions to lichenology. Festschrift in honour of Hannes Hertel. – Biblioth. Lichenol. **88**: 267–299.

KIRK, P. M., CANNON, P. F., DAVID, J. C. & STALPERS, J. A. (eds) 2001. Ainsworth & Bisby's dictionary of the fungi. 9th ed. – Wallingford: CAB International.

KONDRATYUK, S. Y., POPOVA, L. P., LACKOVIČOVÁ, A. & PIŠÚT, I. 2003. A catalogue of Eastern Carpathian lichens. – Kiev, Bratislava: M. H. Kholodny Institute of Botany.

LISICKÁ, E. 2005. The lichens of the Tatry Mountains. – Bratislava: Veda the Publishing House of the Slovak Academy of Sciences.

NIKLFELD, H. 1973. Über Grundzüge der Pflanzenverbreitung in Österreich und einigen Nachbargebieten. – Verh. Zool.-Bot. Ges. Wien **113**: 53–69.

NOWAK, J. 1974. *Protoblastenia szaferi* n. sp., a new lichen species in the calcareous part of the Polish Tatra Mts. – *Protoblastenia szaferi* n. sp., nowy gatunek porostu w polskich Tatrach wapiennych. – Fragm. Florist. Geobot. **20**: 529–533.

NOWAK, J. & TOBOLEWSKI, Z. 1975. Porosty Polskie. – Warszawa, Kraków: Panstwowe Wydawnictwo Naukowe.

PAWLOWSKI, B. 1969. Der Endemismus in der Flora der Alpen, der Karpathen und der balkanischen Gebirge im Verhältnis zu den Pflanzengesellschaften. – Mitt. Ostalp.-Dinar. Pflanzensoz. Arbeitsgem. **9**: 167–178.

POELT, J. 1973. Classification. – In: AHMADJIAN, V. & HALE, M. E. (eds), The lichens, p. 599–632. – New York, London: Academic Press.

POELT, J. & HAFELLNER, J. 1980. *Apatoplaca* – genus novum Teloschistacearum (Lichenes). – Mitt. Bot. Staatssammlung München **16**: 503–528.

POELT, J. & VĚZDA, A. 1977. Bestimmungsschüssel europäischer Flechten. Ergänzungsheft I. – Biblioth. Lichenol. **9**: 1–258.

SANTESSON, J. 1970. Neuere Probleme der Flechtenchemie. – Vorträge aus dem Gesamtgebiet der Botanik, N. F. [Deutsch. Bot. Ges.] **4**: 5–21.

STEINER, J. 1911. Flechten aus dem italienisch-französischen Grenzgebiete und aus Mittelitalien. – Verh. K. K. Zool.-Bot. Ges. Wien **61**: 29–64.

TEPPNER, H. 1982. Die Pflanzendecke der Steiermark. – In: TEPPNER, H. (ed.), Die Koralpe. Beiträge zur Botanik, Geologie, Klimatologie und Volkskunde. p. 7–14. – Graz: Selbstverlag.

TIMDAL, E. 1984. The delimitation of *Psora* (Lecideaceae) and related genera, with notes on some species. – Nordic J. Bot. **4**: 525–540.

TIMDAL, E. 1986. A revision of *Psora* (Lecideaceae) in North America. – Bryologist **89**: 253–275.

TIMDAL, E. 1987. Problems of generic delimitation among squamiform members of the Lecideaceae. – In: PEVELING, E. (ed.), Progress and problems in lichenology in the eighties. – Biblioth. Lichenol. **25**: 243–247.

TRIEBEL, D. 1989. Lecideicole Ascomyceten. Eine Revision der obligat lichenicolen Ascomyceten auf lecideoiden Flechten. – Biblioth. Lichenol. **35**: 1–278.

ZAHLBRUCKNER, A. 1903–1908 ("1907"). Lichenes (Flechten). B. Spezieller Teil. – In: ENGLER, A. & PRANTL, E. (eds): Die natürlichen Pflanzenfamilien, 1. Aufl., **1(1***): 49–249. – Leipzig: Engelmann. (pp. 49–96, 1903; 97–144, 1905; 145–192, 1906; 193–249, 1908).

ZAHLBRUCKNER, A. 1926. Lichenes (Flechten). B. Spezieller Teil. – In: ENGLER, A. (ed.), Die natürlichen Pflanzenfamilien nebst ihren Gattungen und wichtigeren Arten insbesondere der Nutzpflanzen, 2. Aufl., **8**: 61–263. – Leipzig: Engelmann.

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Errata:

On page 28 erroneously several lines of the text have been cut out during the editing process. The entire text reads as following:

Further specimens seen (all localities in the Eastern Alps): **AUSTRIA**, Styria (Steiermark): Nordalpen (Nördliche Kalkalpen): Ennstaler Alpen, Gesäuseberge E von Admont, **Gr. Buchstein**, Nordsattel zwischen dem Gipfel und der Admonter Frauenmauer, 47°36'50"N/14°35'55"E, ca. 2065 m, GF 8353/4; Polsterseggen-Silberwurzspaliere und niedere Kalkabbrüche, auf W-seitigen Steilflächen, 19.VI.2005, leg. J. Hafellner no. 64388 (GZU) = to be distributed in Dupla Graecensia Lichenum. – Ennstaler Alpen, Gesäuseberge E von Admont, **Gr. Buchstein**, im oberen Bereich der N-Hänge etwas E vom Gipfel, 47°36'37"N/14°35'50"E, ca. 2200 m, GF 8353/4; Polsterseggen-Silberwurzspaliere und niedere Kalkausbisse, auf Steilflächen, 19 VI.2005, leg. J. Hafellner no. 65412 & A. Hafellner (GZU). –…