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## A lichenicolous species of *Pleospora* (Ascomycota) and a key to the fungi invading *Physcia* species

Josef HAFELLNER & Erich ZIMMERMANN

**Abstract:** HAFELLNER, J. & ZIMMERMANN, E. 2012. A lichenicolous species of *Pleospora* (Ascomycota) and a key to the fungi invading *Physcia* species. – *Herzogia* 25: 47–59.

The new combination *Pleospora physciae* (Brackel) Hafellner & E.Zimm. (bas. *Merismatium physciae* Brackel 2010) is introduced. An emended description is given and the species, which is a pathogen on various epiphytic *Physcia* species is newly reported for the mycoflora of Austria, Slovenia and Switzerland. Two further nomenclatural novelties are proposed, the new name *Pleospora tretiachii* Hafellner (bas. *Pleospora aquatica* Tretiach & Nimis 1999 non Griffiths 1899) and the new combination *Lichenochora physciicola* (Ihlen & R.Sant.) Hafellner (bas. *Telogalla physciicola* Ihlen & R.Sant.). A key to the lichenicolous fungi occurring on *Physcia* species is provided.

**Zusammenfassung:** HAFELLNER, J. & ZIMMERMANN, E. 2012. Eine lichenicole *Pleospora*-Art (Ascomycota) und ein Bestimmungsschlüssel für die Pilze, die *Physcia*-Arten befallen. – *Herzogia* 25: 47–59.

Die neue Kombination *Pleospora physciae* (Brackel) Hafellner & E.Zimm. (Bas. *Merismatium physciae* Brackel 2010) wird eingeführt. Für die Art, die pathogen auf verschiedenen epiphytischen *Physcia*-Arten wächst und erstmals für die Mykoflora von Österreich, Slowenien und der Schweiz nachgewiesen wird, kann eine verbesserte Beschreibung vorgelegt werden. Außerdem werden zwei weitere nomenklatorische Neuheiten vorgeschlagen, der neue Name *Pleospora tretiachii* Hafellner (Bas. *Pleospora aquatica* Tretiach & Nimis 1999 non Griffiths 1899) und die neue Kombination *Lichenochora physciicola* (Ihlen & R.Sant.) Hafellner (Bas. *Telogalla physciicola* Ihlen & R.Sant.). Ein Bestimmungsschlüssel für die lichenicolen Pilze, die auf *Physcia*-Arten vorkommen, ist angefügt.

**Key words:** Dothideomycetes, Pleosporales, Eurotiomycetes, Chaetothyriomycetidae, taxonomy.

### Introduction

*Pleospora* is a well known genus of bitunicate ascomycetes, for which already WEHMEYER (1961) had offered a world monograph. It is very rich in species with most of them developing on vascular plants. There are only a few *Pleospora* species that have been reported as living obligately on lichens. The majority of them are now treated in other genera, such as *Dacampia*, *Leptosphaerulina*, *Merismatium*, *Norrlinia* and *Protothelenella* (CRIVELLI 1983, HENSSEN 1995, RIEDL 1969, THEISSEN & SYDOW 1918, MAYRHOFER 1987). For some of these species, the taxonomic position is so far unsettled (e.g. *Pleospora collematum* Zukal, *P. crozalsii* Vouaux).

We study here a lichenicolous fungus, recently described as *Merismatium physciae* Brackel (BRACKEL 2010), and bring strong arguments that the original placement is wrong and for a transfer of this species to *Pleospora*.

## Methods

Dried herbarium specimens were studied. External morphology was studied using a dissecting microscope (WILD M3, 6.4–40×), anatomical studies of the thallus and the ascomata were carried out by using a light microscope (Leica DMRE and DMLS2, both 100–1000×). Sectioning was performed with a freezing microtome (Leitz, sections of 12–15 µm) but squash preparations were also used especially for measurements of conidia. Preparations were mounted in water. When necessary, contrasting was performed by a pretreatment with lactic acid-cotton blue (MERCK 13741, abbreviation: CB). Sections and squash preparations were not pretreated with potassium hydroxide solution (abbreviation: K), unless otherwise stated. Amyloid reaction was tested by the use of Lugol's solution alone (abbreviation: I<sub>(Lugol)</sub>) or with pretreatment of potassium hydroxide solution (abbreviation: K/I). Measurements refer to dimensions in tap water. For the habit photograph a dissecting microscope (Leica M165C) equipped with a camera (Jenoptik ProgResC5-CCD) was used. A transmission-LM (Leica DMLS2) equipped with a camera (Jenoptik ProgResC7) was used for the other photographs. Better depth of focus was achieved by using a free stacking software.

Abbreviations for institutional herbaria follow HOLMGREN et al. (1990). Author's abbreviations are those proposed by BRUMMITT & POWELL (1992). Host species are indicated by numbers in round brackets (n) as assigned in the list of the hosts. Additional geographic terms and data not given on the labels are sometimes added in squared brackets, e.g. [latitude/longitude]. Hosts given in the protologue are indicated by (T).

Reference material examined:

***Dacampia hookeri*** (Borrer) A.Massal. (all on *Solorina bispora* agg. but host sometimes not recognizable anymore): **Europe: Austria:** Steiermark (Styria), Nördliche Kalkalpen, Dachstein-Gruppe, Ramsau, Weg von der Dachsteinsüdwandhütte in Richtung Hunerscharte, unterhalb des Scheiblingsteins, 2000–2100 m, GF 8547/2, 7.VIII.1993, J. Poelt 93-415 & M. Grube (GZU). – Steiermark, Nördliche Kalkalpen, Dachstein-Gruppe, Grimming W von Stainach, im Gipfelbereich, 47°31'15"N/14°01'00"E, 2350 m, GF 8450/3, alpine Matten und Kalkfelsen, in erdgefüllten Felsspalten von Kalkschrofen, 10.VI.2000, J. Hafellner 51491 & A. Hafellner (GZU). – Steiermark, Nördliche Kalkalpen, Dachstein-Gruppe, Stoderzinken, N-exponierte Hänge knapp unter dem Gipfel, [47°27'30"N/13°49'40"E], 2040 m, GF 8548/2, Caricetum firmæ über triadischen Kalkschrofen, in Erdspalten, 24.VII.1985, J. Hafellner (GZU). – Steiermark, Nördliche Kalkalpen, Mürtzsteger Alpen, Veitsch Alpe, Großer Wildkamm, am SE-Grat ober der Gingatzwiese, 1850 m, 47°39'40"N/15°24'30"E, GF 8358/1, Kalkschrofen mit Caricetum firmæ-Fragmenten, auf alpinem Rohboden in erdigen Fugen, 17.V.1997, J. Miądlikowska & J. Hafellner 40382 (GZU). – Tirol (Tyrol), Nördliche Kalkalpen, Lechtaler Alpen, S-exponierte Hänge des Gatschkopfes über der Augsburger Hütte, NW von Landeck, 2600–2900 m, GF 8828, Mergelkalke, 8.VII.1982, H. Mayrhofer & J. Poelt (GZU). – Tirol, Tuxer Alpen, Wattener Lizum S von Wattens, am W-Fuß der Kalkwand SSE ober der Lizumer Hütte, 2200 m, GF 8835/4, Kalkblockschutthalde, in erdigen Spalten großer Blöcke, 7.VII.1992, J. Hafellner 23449 (GZU). – Tirol, Osttirol, Nationalpark Hohe Tauern, Glockner-Gruppe, Teischnitztal N von Kals, untere NW-Hänge des Fiegerhorns, SW ober der Teischnitzeben, 47°02'N/12°39'40"E, 2200 m, GF 8941/4, alpine Matten, auf Erdblößen über Kalkschiefer, 16.VII.1997, J. Hafellner 46901 (GZU). – Tirol, Osttirol, Nationalpark Hohe Tauern, Glockner-Gruppe, Ködnitztal NE ober Kals, kurz N ober der Lucknerhütte, 47°02'35"N/12°41'30"E, 2300 m, GF 8942/3, niedere Kalkschieferschrofen und Rasen am Westhang, auf kleinen Erdblößen, 4.IX.1998, J. Hafellner 46765 (GZU). – Tirol, Osttirol, Nationalpark Hohe Tauern, Glockner-Gruppe, Ködnitztal NE ober Kals, kurz S ober der Pfortschscharte hoch E ober der Lucknerhütte, 47°02'35"N/12°42'20"E, 2840 m, GF 8942/3, niedere, E-exponierte Kalkschieferschrofen, auf kleinen Erdblößen, 4.IX.1998, J. Hafellner 46658 (GZU). – Vorarlberg, Rätikon, Lünkerinne E über dem Lünensee, ca. 12 km SSW von Bludenz, Felsköpfe entlang des Grates kurz SE über dem Steig über den Sattel, 47°03'30"N/09°46'15"E, 2150 m, GF 8924/2, Felschrofen aus mergeligen Triaskalken in alpiner Vegetation, auf Erde in Felsspalten und auf Blößen in *Dryas*-Spalieren, 5.VIII.2008, J. Hafellner 72937 (GZU). – Vorarlberg, Rätikon, Hänge zwischen Lünensee und Gafalljoch, ca. 14 km SSW von Bludenz, Geländerippe an den E-Abhängen der Kanzelköpfe, W gegenüber der Zollhütte, 47°02'35"N/09°45'10"E, 2150 m, GF 8924/4, kleine Kalkausbisse in zwergstrauchreichen Weiderasen, auf Erde in N-exponierten Felsspalten, 29.VIII.2008, J. Hafellner 73125 (GZU). – Vorarlberg, Rätikon, Berge W über Gargellen, kurz E unter dem St. Antönier Joch, etwas SE vom kleinen namenlosen See, 46°58'00"N/09°52'40"E, 2300 m, GF 9025/1, Kalkschieferlinse umgeben von alpinen Rasen, auf Erde in breiten Felsspalten, 7.VIII.2008, J. Hafellner 73063 (GZU). – **Italy:** Piemonte, Prov. Cuneo, Alpi Cozie, crest SW above Colle dell' Agnello, 44°40'55"N/

06°58'35"E, 2830 m; outcrops of calcareous schists on steep slope exposed to the SE, on soil, 25.VII.2000, J. Hafellner 59370 (with P. L. Nimis & M. Tretiach) (GZU). – Trentino-Alto Adige, Prov. Bolzano (Südtirol), Southern Alps, Dolomiti, M. Seceda (Geisler Spitzen) NE of Ortisei (St. Ulrich), on the ridge just W above Forc Pana (Pana Scharte), 46°36'05"N/11°44'05"E, 2500 m; low outcrops of limestone in alpine vegetation, on soil in crevices, 2. X.2002, J. Hafellner 61239 (GZU). – Trentino-Alto Adige, Prov. Bolzano (Südtirol), Southern Alps, Dolomiti, M. Seceda (Geisler Spitzen) NE of Ortisei (St. Ulrich), on the ridge just S of the mountain station of the cableway, 46°35'50"N/11°43'25"E, 2470 m; low outcrops of intermediary schist in alpine vegetation on slope exposed to the NW, on soil, 2.IX.2002, J. Hafellner 61208 (GZU). – Trentino-Alto Adige, Prov. Trento, Dolomiten, Pordoi-Joch, N-Fuß des Sass Beccle, [46°29'05"N/11°48'40"E], 2300 m; Hänge mit niedrigen Dolomitschrofen, 25.X.1984, J. Hafellner 11971 (GZU). – Friuli-Venezia Giulia, Prov. Belluno, [Südalpen], Karnische Alpen: am Sattel zwischen Col Marende und M. Tiarfin, S über der Casera Razzo, ca. 9 km W von Sauris di Sopra, [46°28'15"N/12°35'50"E], 2000 m; Werfener Schiefer, in erdigen Spalten, 27.VII.1993, J. Hafellner 32747 (GZU). – **Liechtenstein:** Eastern Alps, Rätikon, mountain ridge between Augstenberg and Nospitz, SSW above the village Malbun, S above Vaduzer Täli, 47°05'20"N/09°36'15"E, elevation c. 2060 m, small cliffs of calcareous rock in alpine vegetation, on soil, exposed to the N, 27.VIII.2008, J. Hafellner 72867 (GZU). – **Switzerland:** Kanton Graubünden, Rhätische Alpen, Sertig-Tal bei Davos, Hänge um Wasserfall – Cheren, 1900–2000 m, Lärchen-reicher Mischwald, in Felsspalten von Kalkschieferausbissen, 24.VIII.1980, J. Poelt (GZU). – **North America: Greenland:** W-Grönland, Gem. Umanak, Hänge über Marmorilik, N- bis E-exponiert, 50–300 m, Kalke und Kalkschiefer, VIII.1983, J. Poelt & H. Ullrich (GZU). – W-Grönland, Gem. Umanak, Hänge S über dem kleinen „Sydsø“ SE von Marmorilik, Kalke, 480–550 m, VIII. 1983, J. Poelt & H. Ullrich (GZU).

**Lichenocodium lichenicolum** (P.Karst.) Petr. & Syd.: **France:** Corsica, Dept. Haute-Corse, an der Straße von Corte nach Ajaccio, ca. 1,5 km S von Venaco, 460 m, SE-exp., Flaumeichenwald, auf Zweigen von *Crataegus* spec., auf *Physcia adscendens*, 6.XI.1993, J. Hafellner 31854 (GZU). – Ibid., auf *Physcia leptalea*, J. Hafellner 31853 (GZU).

**Lichenocodium usneae** (Anzi) D.Hawksw. coll. (all on *Physcia stellaris*): **Austria:** Kärnten (Carinthia), [Zentralalpen], Nationalpark Hohe Tauern, Aichhorn ca. 4 km SE von Heiligenblut, orographisch rechtes Ufer der Möll W des Ortes, [47°00'40"N/12°52'05"E], 1100 m, GF 8943/3, Grauerlenau, an *Alnus incana*, 21.XI.1987, J. Hafellner 19853 & M. Walther (herb. Hafellner). – Steiermark (Styria), [Nordalpen, Nördliche Kalkalpen, Ennstaler Alpen], Gesäuse-Gebiet, Johnsbach, ca. 0,5 km E des Gasthofs Kölbl, 47°31'50"N/14°37'10"E, 875 m, GF 8453/4, an *Fraxinus excelsior*, 20.V.1988, J. Hafellner 20307 & E. Schreiner (herb. Hafellner). – Steiermark, [Nordalpen, Nördliche Kalkalpen], Hochschwab-Gruppe, Seetal W von Seewiesen, ca. 10 km NE von Aflenz, [47°37'15"N/15°15'20"E], 930 m, GF 8357/4, Baumreihe am Rand einer Mähwiese, an alten, freistehenden *Salix*-Sträuchern, 19.I.1985, J. Hafellner 12588 & A. Ochsenhofer (herb. Hafellner). – Tirol (Tyrol), Ötztaleralpen, Nauderer Berge, W- exponierte Hänge E ober Nauders, 1500 m, GF 9129, an *Prunus padus*, 14.IV.1984, J. Hafellner 12492 (herb. Hafellner).

**Merismatium nigrillum** (Nyl.) Vouaux: See HAFELLNER (2011)!

**Phoma physciicola** Keissl.: **Europe: Albania:** Northern Albania, Shkodër [Malësi e Madhe] distr., near the village Lëpushë, 42°31'30"N/19°44'E, 1000 m, outcrops in a pasture, on twigs of undetermined tree, on *Physcia stellaris*, 23.VI.2000, L. Kashta, det. J. Hafellner 54495 (GZU). – **Austria:** Steiermark (Styria), Nördliche Kalkalpen, [Ybbstaler Alpen], Lassing Alpen, Greith im Salzthal, E des Ortes an der Straße von Gußwerk nach Weichselboden, 47°42'35"N/15°13'20"E, 720 m, GF 8257/3, am Rand einer Mähwiese an freistehenden *Fraxinus excelsior*, auf *Physcia aipolia*, 2.VI.1987, J. Hafellner 15999 (GZU). – Steiermark, Nördliche Kalkalpen, Ennstaler Alpen, Gesäuseberge, Reichenstein-Massiv ca. 7,5 km SE von Admont, Schneide zwischen Totenköpfel und Pfarrmauer, S-Hänge N über der Mödlinger Hütte, 47°32'50"N/14°33'00"E, 1950 m, GF 8453/3, kurze Felsrippe in alpinen Rasen, Triaskalk, auf Moosen und Pflanzenresten, auf *Physcia* sp., 22.IX.2007, J. Hafellner 69810, L. Muggia & A. Hafellner (GZU). – Steiermark, [Nördliche Kalkalpen], Hochschwab-Gruppe, Hinterberg ca. 2,5 km SE von Aflenz, an der Straße entlang des Stübmingbaches, 700 m, an einem Zaun, auf *Physcia adscendens*, 1.XI.1986, S. Sitzwohl 817, det. J. Hafellner (GZU). – Steiermark, Nördliche Kalkalpen, Eisenerzer Alpen, Johnsbachtal ca. 15 km SE von Admont, am Eingang des Bärengrabens, 1000 m, 47°31'30"N/14°37'20"E, GF 8453/4, Fichten-Tannen-Lärchenforst, auf morschen Baumstümpfen, auf *Physcia stellaris*, 9.V.1998, J. Hafellner 42721 (GZU). – Steiermark, [Zentralalpen, Gurktaler Alpen], Predlitzwinkel S von Predlitz, ca. 4 km N von Turrach, am Ufer der Turrach, [47°00'25"N/13°54'00"E], 1120 m, GF 8949/3, Ufergehölzstreifen, an *Alnus incana*, auf *Physcia stellaris*, 24.X.1989, J. Hafellner 22380 & E. Schreiner (GZU). – Steiermark, [Zentralalpen], Steirisches Randgebirge, Fischbacher Alpen, im Waisenbachgraben ca. 5,5 km NNW von Birkfeld, 47°23'50"N/15°39'15"E, 710 m, GF 8659/2, einzelne Laubbäume am Bachufer, auf unteren Kronenzweigen von *Fraxinus excelsior*, auf *Physcia adscendens*, 16.X.1999, J. Hafellner 50618 (GZU). – Steiermark, [Zentralalpen], Steirisches Randgebirge, Fischbacher Alpen, im Feistritzal zwischen Ratten und Rettenegg, kurz SW der Einmündung des Klaffenegbaches, 47°30'20"N/15°46'10"E, 800 m, GF 8460/4, Ufergehölzstreifen, auf Zweigen von *Salix* sp., auf *Physcia stellaris*, 22.X.1989, J. Hafellner 46316 (GZU). – **Italy:** Friuli-Venezia Giulia, Prov. Belluno, [Südalpen], Karnische Alpen: an der Straße von Sauris di Sopra zur Casera Razzo, [46°28'20"N/12°38'45"E], 1700 m; lichter Wald über Werfener Schiefer, auf Borke von *Salix caprea*, auf *Physcia stellaris*, 27.VII.1993, J. Hafellner 32639 (GZU).

*Pleospora herbarum* (Pers.) Rabenh.: **Europe: Austria:** Burgenland, Nord-Burgenland, St. Margarethen SE von Eisenstadt, am Rand des großen Steinbruchs, Trockenrasen, auf *Trinia glauca*, VI.1980, H. Hager (GZU). – Steiermark (Styria), Oststeirisches Hügelland, Riegersburg, in den Burganlagen, auf *Salvia* sp., 12.X.1993, C. Scheuer (GZU). – **Great Britain:** England, Devon, E of Sidmouth, Branscombe, S von South Down Common, Küstenfelsen mit Bergsturzgebiet, on *Lathyrus sylvestris*, 23.II.1989, C. Scheuer 347 (GZU). – **Sweden:** Bohuslän, Koster-Archipel SW von Strömstad, Insel Sör-Koster, S der Ortschaft Ekenäs, unmittelbare Umgebung von Bergdalen 1 km SSW von Ekenäs, auf *Aster tripolium*, 11.VI.1990, C. Scheuer 2489 (GZU).

## Results

*Pleospora physciae* (Brackel) Hafellner & E.Zimm. **comb.nov.** [Mycobank No. 564871]

Bas.: *Merismatium physciae* Brackel, Ber. Bayer. Bot. Ges. 80: 15 (2010).

**Type:** Germany: Bayern (Bavaria), Kreis Eichstätt, Parkplatz Gelbensee (W) an der BAB 9, 48°57'04"N/11°25'49"E, 520 m, MTB 7034/2, an gepflanzter Esche in lockerer Baumgruppe, auf *Physcia adscendens* und *P. tenella*, 12.III.2010, W. v. Brackel (M – Holotypus) n.v., fide BRACKEL (2010).

**Icon.:** BRACKEL (2010): 16, Fig. 5 (photograph of infested *Physcia* thallus), 17, Fig. 6 (drawing of asci, ascospores); Fig. 1 in this publication.

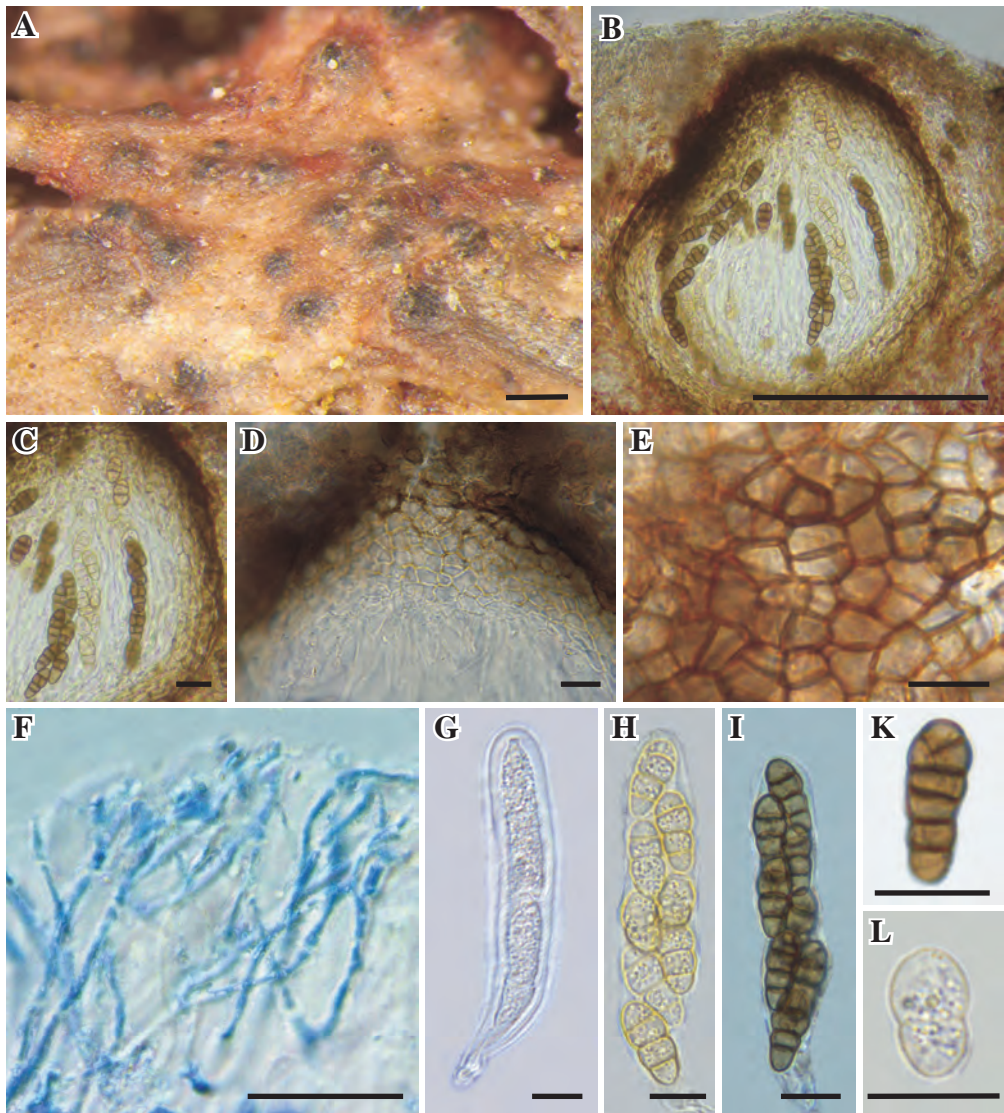
**Description: Infection** not gall-inducing, causing a discoloration of the host thallus, the colour of which becomes pale ochreous with a reddish tinge (even purplish around the ascomata), finally the infested lobes collapse and turn pale brown. Usually one to a few lobes constitute one infection spot. Vegetative hyphae inconspicuous. **Pseudothecia** blackish, scattered (usually a few per lobe), globose, immersed, protruding with the ostiolar region, flanks of ascomata obstructed by the decaying upper cortex of the host, 100–150 × 100–150 µm in diam. **Ascomatal wall** medium to dark brown, laterally consisting of 2–4 layers of tangentially flattened cells, polygonal in surface view, pigmentation fading towards the centre. **Hymenium** hyaline, not interspersed. **Paraphysoids** persistent, with ramifications and anastomoses, c. 1.5 µm thick. **Asci** cylindrical to slightly ventricose, 65–90 × 11–14 µm, fissitunicate, endoascus apically with small ocular chamber, ascus wall and periascal gel  $I_{(Lugol)}^-$ , usually 8-spored, but some with reduced spore numbers (4). **Ascospores** at first pale brown, later brown, upper half somewhat broader than the lower one, slightly constricted at the septa, with 3–4 transsepta and 0–1 longisepta per level, 4–7 cells visible in optical section, 14.5–16.5 × 6–7 µm, with a thin perispore that is not always clearly visible. Conidiomata not observed.

**Notes:** 1. Concerning the characters of ascomatal elements, *Pleospora physciae* is a hardly variable species. Somewhat variable is only the colour of the infested thallus lobes, the size of the ascomata and the ascospore septation (see also BRACKEL 2010: 17, Fig. 6, and Fig. 1 in this publication).

2. When *Merismatium nigrillum*, a heterotypic synonym of the type species *M. lopadii*, is compared with the species treated here, it is evident that both do not belong to the same genus but are taxonomically rather distant. *Merismatium* as well as other genera of Chaetothyriomycetidae including phaeo-phragmo- to dictyospored species (*Halospora*, *Phaeospora*) can be excluded by morphoanatomic and biochemical characters (features of hamathecium,  $I_{(Lugol)}$  reaction of ascus gel) (TRIEBEL 1989, HAFELLNER 2011). Furthermore for ascomata of *Merismatium* the presence of a brown pigment of a peculiar reddish tinge is also diagnostic.

3. Judging from some morphoanatomic characters (ascus type, features of hamathecium, features of ascospores) *Dacampia* would also be an option. However, comparing *Dacampia hookeri*,





**Fig. 1:** *Pleospora physciae* (Zimmermann LF090). **A** – habit, scale = 100µm, **B** – ascoma in longitudinal section, scale = 100µm, **C** – hymenium, scale = 10µm, **D** – submedian section of ostiolar region, scale = 10µm, **E** – ascumatal wall in surface view, scale = 10µm, **F** – paraphysoids in CB, scale = 10µm, **G, H, I** – asci of various age, scale = 10µm, **K, L** – ascospores of various age provided with thin perispore, scale = 10µm (all photographs by E. Zimmermann, Nov. 2011).

the type species, with the species treated here, it is evident that both do not belong into the same genus although the differences are not as fundamental as to *Merismatium*. Diagnostic for *Dacampia* s.str. are the relatively large ascomata with the ostiolar region forming a distinct neck lined by paraphysoids, the ascomata connected to distinct, brown vegetative hyphae, the ascus apex provided with a “nasse apicale”, and the ascospores often having paler terminal cells (CRIVELLI 1983, HENSSEN 1995).

**Table 1:** Genera of fissitunicate perithecioid ascomycetes with (phragmospored to) muriform ascospores, in which lichenicolous species are known. Abbreviations: pe – periphysoids, pa – persistent paraphysoids, 0 – lacking, 1 – present.

Genus	Type species * = lichenicolous	Taxonomic position	Representative lichenicolous species if not type	Ascoma	Hama-thecium	Ascus wall and reaction with I <sub>(Lugol)</sub> resp. K/I	Asco-spores
<i>Pleospora</i>	<i>P. herbarum</i>	Pleosporales	<i>P. physciae</i>	without distinct neck	pe (1), pa 1	I–, KI–	brown
<i>Dacampia</i>	<i>D. hookeri</i> *	Pleosporales		with distinct neck	pe 1, pa 1	I–, KI–	brown
<i>Lepto-sphaerulina</i>	<i>L. australis</i>	Pleosporales	<i>L. peltigerae</i>	without distinct neck	pe (1), pa 1	I–, KI–	hyaline
<i>Merismatium</i>	<i>M. lopadii</i> *	?Chaetothyriales or Verrucariales		without distinct neck	pe 1, pa 0	I+ pale blue then orange, KI+ blue	brown, wall thin
<i>Halospora</i>	<i>H. diminuta</i> *	Verrucariales		without distinct neck	pe 1, pa 0	I+ pale blue then orange, KI+ blue	brown, wall thick
<i>Phaeospora</i>	<i>P. rimosicola</i> *	Verrucariales		without distinct neck	pe 1, pa 0	I+ pale blue then orange, KI+ blue	brown, wall thick

4. Between *Pleospora herbarum*, the type species, and the species treated here only morpho-anatomic differences commonly used for the circumscription of species exist.

**Hosts:** *Physcia adscendens* (thallus) (1, T), *P. tenella* (thallus) (2, T), *P. stellaris* (BRACKEL 2010).

**Distribution:** The species is so far known only from Europe. Specimens have been seen from lower altitudes in Central Europe (Austria, Germany, Slovenia, Switzerland). BRACKEL (2010) recorded it from several localities in southern Germany and one locality in southern Italy. As the host lichens are common and widely distributed both in Europe and in other continents in the Holarctic region, we expect *P. physciae* to be a frequently overlooked species.

**Specimens examined:** **Austria:** Steiermark (Styria), Oststeirisches Hügelland, Graz, Botanischer Garten NW der Schubertstraße, Postgrund, 47°04'58"N/15°27'25"E, 380 m, GF 8958/2, Streuobstwiese mit alten Obstbäumen im Umfeld des Bauerngartens, auf jüngst zu Boden gefallen, abgestorbenen Zweigen von *Juglans regia*, (1), 24.IX.2011, J. Hafellner 78970 (herb. Hafellner). – Steiermark, Oststeirisches Hügelland, Graz, eastern suburban area, Ragnitztal, near the rivulet "Ragnitzbach" at lower end of Dr. Hanischweg, 47°04'35"N/15°28'50"E, 380 m, GF 8958/2, old orchard, on canopy branches of recently felled *Juglans regia*, (1), 1.VII.2010, J. Hafellner 78196 (GZU). – **Germany:** Bayern (Bavaria), Allgäu, Bayerniederhofen NE vom Bannwaldsee, ca. 10 km NE von Füssen, am SE Ortsrand, 47°37'25"N/10°48'15"E, 800 m, Streuobstwiese neben einem Gehöft, an Ästen von *Sambucus nigra*, (1), 6.IX.2004, J. Hafellner 78388 (GZU, herb. Hafellner). – **Slovenia:** Central Alps, Kobansko, Korralpe, Bistrica (Feistritz) valley c. 9 km NW of Muta (Hohenmauthen), close to the border to Austria, surroundings of former border station on E (= orographically left) river bank, 46°39'15"N/15°07'10"E, 460 m, orchard, on twigs of *Sambucus nigra*, (1), 5.X.2008, J. Hafellner 77111 & L. Muggia (GZU). – **Switzerland:** Kanton Bern, Wengi bei Büren, Naturschutzgebiet Wengimoos, 47°05'50"N/07°23'50"E, 700 m ü. M., an dürren Ästen von *Salix* sp., (2), 29.X.2011, E. Zimmermann LF090 (herb. Zimmermann).

## Discussion

The fissitunicate perithecioid lichenicolous ascomycetes are still in a need of a critical revision. A rather schematic generic system putting the ascospore septation into the focus is still frequently applied and in a number of cases the placement of species in one or the other genus is therefore still formalistic. However, already a careful check of some character states would help to place a species in a genus being more likely than others. Especially in focus should be the nature of hamathecial filaments and the reactivity of the ascal gel. Especially the latter is a useful phenotypic character to distinguish between pleosporoid (gel non amyloid) and chaetothyrioid (gel hemiamyloid) fungi with fissitunicate asci. Relevant data of selected characters, as seen in the type species of several genera including dictyosporoid lichenicolous species are summarized in Table 1.

Because of the morphoanatomic characters, *Merismatium physciae* cannot be a member of the Chaetothyriomycetidae. Therefore *Merismatium* is not an option and also the verrucarialean genera *Halospora* and *Phaeospora* can be excluded. The species perfectly fits in *Pleospora* both regarding the morphoanatomic characters and the reaction pattern of the ascal gel. Of the *Pleospora* species growing on vascular plants, for instance *P. pellita* (Fr.) Rabenh. [syn. *Pyrenophora p.* (Fr.) Sacc.] appears to be morphoanatomically similar (MÜLLER 1951, WEHMEYER 1961, CRIVELLI 1983). However, a position within *Pyrenophora* can be excluded, as this genus is now more precisely circumscribed and contains only graminicolous pleosporoid fungi with *Drechslera* anamorphs (ZHANG & BERBEE 2001).

Lichenicolous species were not known in *Pleospora* s.str. so far. All lichenicolous species previously classified in this genus by various authors (e.g. WEHMEYER 1961) have later on been transferred to other genera or have an unsettled taxonomic position (*P. collematum* Zukai, *P. crozalsii* Vouaux).

Most pleosporoid lichenicolous fungi are now commonly treated in *Dacampia* (HALICI & HAWKSWORTH 2008). However, a proper circumscription of that genus will lead to an exclusion of some of the species.

Judging from the septation pattern of some of the ascospores (a few with transsepta only), also the genus *Phaeosphaeria* would be an option, however, the shape and predominantly submuriform septation of the ascospores does not fit to that genus, most species of which grow upon grasses and other monocots (LEUCHTMANN 1984, SHOEMAKER & BABCOCK 1989, CÂMARA et al. 2002a).

As no anamorphic state has been detected so far, that doubtlessly belongs to *Pleospora physciae*, a further question is, if one of the coelomycetes known to infest *Physcia* species could represent such an anamorphic state. Apart from the polyphagous *Licheniconium usneae* agg., two more specialized coelomycetes are occasionally found on *Physcia* species, *Licheniconium lichenicolum* (P.Karst.) Petr. & Syd. and *Phoma physciicola* Keissl.

In the light of results recently published by LAWREY et al. (2011), who were able to sequence several *Licheniconium* species, it appears unlikely that *Pleospora physciae* and one of the two *Licheniconium* species constitute a holomorph. In a *Dothideomycetes* phylogeny presented there (LAWREY et al. 2011: 180, Fig. 2), *Licheniconium* does not group together with members of Pleosporales but comes out as a separate lineage.

The core group of *Pleospora* (*P. herbarum* group) is characterized by the presence of *Stemphylium* anamorphs (CÂMARA et al. 2002b, Inderbitzin et al. 2009). On the other hand for a long time *Phoma* species have been well known as anamorphs of a number of



Pleosporales (SIVANESAN 1984) confirmed by molecular data (SCHOCH et al. 2006, ZHANG et al. 2009). In this fungal order *Phoma* anamorphs are known in various families, including Phaeosphaeriaceae, Pleosporaceae, Leptosphaeriaceae and Didymellaceae (KODSUEB et al. 2006, GRUYTER et al. 2009, AVESKAMP et al. 2010). Therefore it would be worth to check if *Phoma physciicola* and *Pleospora physciae* belong to the same biological species. Of course, a proof of this hypothesis would need single spore cultures and a comparison of DNA-sequences of all morphs/taxa involved. But these data are not available currently.

We take the opportunity to publish a legitimate name for another lichenicolous ascomycete:

***Pleospora tretiachii*** Hafellner **nom.nov.** [MycoBank No. 564872]

for *Pleospora aquatica* Tretiach & Nimis, Cryptogamie, Mycologie 20(4): 284 (1999) non *Pleospora aquatica* Griffiths, Bull. Torrey Bot. Club 26: 443 (1899).

**Typus:** Russia: Siberia, Burjatya, Tunkinsky range, springs of Tubota river, NW of Zun Murino, 1500 m s. m., in a creek on *Aspicilia supertegens*, 6.VII.1997, M. Tretiach & P. L. Nimis (TSB 30733, holotypus)!

**Note:** The new name replaces a basionym which unfortunately turned out to be illegitimate. Judging from morphoanatomic characters the species is best placed in *Pleospora*, although the ascomatal wall in section is atypical.

### A key to the lichenicolous fungi invading *Physcia* species

Note: The publications cited under "Lit." refer to selected full descriptions of the species.

- |    |  |  |
|----|--|--|
| 1  | Spores produced in meiosporangia (asci, basidia) .....   | 2  |
| 1* | Spores not produced in meiosporangia, with conidia or bulbils .....  | 27   |
| 2  | Meiosporangia are asci .....   | 3  |
| 2* | Meiosporangia are basidia .....  | 23   |
| 3  | Ascomata are apothecia or apothecoid pseudothecia .....  | 4  |
| 3* | Ascomata are perithecia or perithecioid pseudothecia .....   | 7  |
| 4  | Ascomata apothecia; asci functionally unitunicate .....  | 5  |
| 4* | Ascomata apothecoid pseudothecia; asci arthonialean, fissitunicate .....   | 6  |
| 5  | Apothecia black, naked or pruinose; asci lecanoralean, 8-spored; ascospores brown, finally 3-septate, 16–21 × 6.5–8.5 μm. Lit.: HAFELLNER (1979), NORDIN (2000) .....                            | <i>Tetramelas pulverulentus</i> (Anzi) A.Nordin & Tibell |
| 5* | Apothecia yellow, hairy on the outside; asci helotialean, 4-spored; ascospores hyaline, 1-septate, 15–18 × 5–8.5 μm. Lit.: VOUAUX (1914) .....   | " <i>Lachnella</i> " <i>tetraspora</i> (P.Henn.) Vouaux  |
| 6  | Ascoma in longitudinal section with yellowish pigments, K+ purplish violet, dissolving; ascospores becoming brown and verrucose, 10.5–17 × 5–7 μm, oblong-ovoid. Lit.: GRUBE et al. (1995) ..... | <i>Arthonia destruens</i> Rehm ex Rabenh.                |
| 6* | Ascoma in longitudinal section without yellowish pigments, K– or K+ dull; ascospores hyaline, 11–12 × 4–5 μm, with shape of grape seeds. Lit.: NYLANDER (1875) .....                             | <i>Arthonia epiphyscia</i> Nyl.                          |
| 7  | Ascomata immersed in galls .....   | 8  |
| 7* | Ascomata immersed or sessile, but not in galls .....   | 12   |
| 8  | Ascospores dark brown, 1-septate, rugulose, with perispore, 15–18 × 7–9 μm. Lit.: VĚZDA (1969) ...   | <i>Polycoccum pulvinatum</i> (Eitner) R.Sant.            |
| 8* | Ascospores hyaline, sometimes brownish with age .....  | 9  |
| 9  | Asci usually 4-spored; ascospores 12.5–14.5 × 6–7 μm. Lit.: ETAYO & NAVARRO-ROSINÉS (2008) ...   | <i>Lichenochora aipoliae</i> Etayo, Nav.-Ros. & Coppins  |

9*	Asci mostly 8-spored .....	10
10	Ascospore cells of unequal size, 12–14 × 8–9 μm. Lit.: HAFELLNER (1989) .....	
	..... <i>Lichenochora polycoccoides</i> Hafellner & R.Sant.	
10*	Ascospore cells of more or less equal size .....	11
11	Ascospores 11–13 × 7–9 μm. Lit.: IHLEN & WEDIN (2005) .....	
	..... <i>Lichenochora physciicola</i> (Ihlen & R.Sant.) Hafellner	
11*	Ascospores 9–11 × 6–8 μm. Lit.: HAFELLNER (1989) ...	
	<i>Lichenochora galligena</i> R.Sant. & Hafellner	
12	Ascomata black, dark brown in section .....	13
12*	Ascomata white to orange or flesh-coloured .....	18
13	Ascospores hyaline .....	14
13*	Ascospores brown .....	17
14	Ascomata catathecoid, peridial cells around ostiole in radial rows; ascospores 13–15 × 5–5.5 μm. Lit.: APTROOT et al. (1997) .....	
	..... <i>Lichenopeltella physciae</i> Diederich	
14*	Ascomata not catathecoid, peridial cells not in radial rows .....	15
15	Interascal filaments lacking; ascospores 9–13 × 3–7 μm. Lit.: MATZER & HAFELLNER (1990) .....	
	..... <i>Stigidium pumilum</i> (Lettau) Matzer & Hafellner	
15*	Interascal filaments present .....	16
16	Ascospores smooth, 18–22 × 5.5–6.5 μm. Lit.: ALSTRUP (1993) .....	
	..... <i>Zwackhiomyces physciicola</i> Alstrup	
16*	Ascospores verrucose, 18–22 × 8–9.5 μm. Lit.: KOCAKAYA et al. (2011) .....	
	..... <i>Zwackhiomyces turcicus</i> Kocakaya, Halici & Aksoy	
17	Asci polyspored; ascospores (1–)3-septate, 7–11 × 2–3 μm. Lit.: DIEDERICH (1986) .....	
	..... <i>Capronia triseptata</i> (Diederich) Etayo	
17*	Asci 8-spored or rarely with reduced spore numbers; ascospores 3-septate to submuriform, 14.5–16.5 × 6–7 μm. Lit.: this publication .....	
	<i>Pleospora physciae</i> (Brackel) Hafellner & E.Zimm.	
18	Asci fissitunicate; ascospores acicular, multiseptate, 130–150 × 3–4 μm. Lit.: ETAYO (2002) .....	
	..... <i>Tubeufia heterodermiae</i> Etayo	
18*	Asci unitunicate; ascospores of different shape and septation .....	19
19	Ascomata superficial .....	20
19*	Ascomata immersed .....	22
20	Ascospores muriform with pointed ends, 28–36 × 9–11 μm. Lit.: SAMUELS (1976) .....	
	..... <i>Paranectria oropensis</i> (Ces.) D.Hawksw. & Piroz.	
20*	Ascospores 1-septate .....	21
21	All ascospores of more or less equal size, broadly ellipsoid, 14.5–18 × 5.5–8 μm. Lit.: EARLAND- BENNETT et al. (2006) .....	
	<i>Nectriopsis physciicola</i> D.Hawksw. & Earl.-Benn.	
21*	Ascospores of two size classes, macrospores 33–50 × 12–23 μm, microspores 11–15 × 4.5–6 μm. Lit.: ETAYO (2010) .....	
	<i>Ovicuculispora parmeliae</i> (Berk. & M.A.Curtis) Etayo	
22	Ascomatal wall lactic acid+ yellow; ascospores becoming pale-brown, 8–12 × 6.5–8 μm, with tuber- culate wall. Lit.: ROSSMAN et al. (1999) .....	
	<i>Xenonectriella leptaleae</i> (J.Steiner) Rossman & Lowen	
22*	Ascomatal wall lactic acid–; ascospores hyaline, 12–14 × 5.5–8 μm, spinulose. Lit.: ROSSMAN et al. (1999) .....	
	<i>Pronectria echinulata</i> Lowen	
23	Holobasidia in floccose basidiomata .....	24
23*	Basidia in fleshy swellings or galls .....	26
24	Basidioma white to cream-coloured, often accompanied by brown sclerotia; basidiospores 8–11 × 4–5.5 μm. Lit.: JÜLICH (1972) .....	
	<i>Athelia arachnoidea</i> (Berk.) Jülich	
24*	Basidiomata orange or pink .....	25
25	Basidiomata orange, always accompanied by numerous orange bulbils; holobasidia with 4 sterig- mata, basidiospores 13–17.5 × 8–11.5 μm. Lit.: DIEDERICH et al. (2003) .....	
	..... <i>Marchandiobasidium aurantiacum</i> Diederich & Schultheis	

- 25\*Basidiomata pink, never accompanied by bulbils; holobasidia with 2 sterigmata, basidiospores 14.5–18.5×10.5–12.5µm. Lit.: DIEDERICH et al. (2011) .....  
 ..... *Laetisaria lichenicola* Diederich, Lawrey & Van den Broeck
- 26 Basidia non-septate; basidiomata convex, immarginate; basidiospores 7.5–11×3.5–6.5µm. Lit.: DIEDERICH (1996) ..... *Syzygospora physciacearum* Diederich
- 26\*Basidia with 1 longitudinal septum; basidiomata raised, with thalline margin; basidiospores 9–12×8.5–10.5µm. Lit.: DIEDERICH (1996) ..... *Tremella christiansenii* Diederich
- 27 Conidia present ..... 28
- 27\*Conidia lacking, with bulbils ..... 35
- 28 Conidia developing in closed conidiomata (coelomycetes), conidia non-septate ..... 29
- 28\*Conidia developing on free conidiophores, sometimes arranged in compact sporodochia (hyphomycetes) ..... 31
- 29 Conidia hyaline, smooth, 4–5.5×2.5–3.5µm. Lit.: HAWKSWORTH (1981) .....  
 ..... *Phoma physciicola* Keissl.
- 29\*Conidia brown, verruculose ..... 30
- 30 Conidia roundish, 3–4µm in diam. Lit.: HAWKSWORTH (1977) .....  
 ..... *Lichenocodium usneae* (Anzi) D.Hawksw.
- 30\*Conidia ellipsoid to clavate, with a distinctly tapering and truncate base, 6–8×3–4µm. Lit.: HAWKSWORTH (1977) ..... *Lichenocodium lichenicolum* (P.Karst.) Petr. & Syd.
- 31 Conidia hyaline ..... 32
- 31\*Conidia grey to brown ..... 34
- 32 Conidia in dense pink aggregations, conidia helicoid, 17–30×3–5µm. Lit.: LOWEN et al. (1986) ....  
 ..... *Illosporiopsis christiansenii* (B.L.Brady & D.Hawksw.) D.Hawksw.
- 32\*Conidia not so ..... 33
- 33 Conidia non-septate, truncate at the base and apically rounded, 7–9×4.5–6µm. Lit.: HAWKSWORTH (1979) ..... *Dendrodochium subeffusum* Ellis & Galloway
- 33\*Conidia 1-septate, pointed at both ends, 18–20×4–6µm. Lit.: COLE & HAWKSWORTH (2001) .....  
 ..... *Patriciomyces valentinianus* D.Hawksw.
- 34 Conidia 1(–3)-septate, dark brown, ellipsoid, 6.5–8×3.5–4µm. Lit.: ETAYO & BREUSS (1998) .....  
 ..... *Feltgeniomyces physciae* Etayo & Breuss
- 34\*Conidia non-septate, grey to brownish, subglobose, 2.5–4×2.5–4µm. Lit.: CALATAYUD & ETAYO (2001) ..... *Feltgeniomyces dichotomus* Etayo & Calat.
- 35 Bulbils whitish to translucent, 100–250×80–150µm. Lit.: DIEDERICH & LAWREY (2007) .....  
 ..... *Burgoa angulosa* Diederich, Lawrey & Etayo
- 35\*Bulbils orange to pink to red ..... 36
- 36 Bulbils orange. Lit.: ETAYO & DIEDERICH (1996) .....  
 ..... *Marchandiobasidium aurantiacum* Diederich & Schultheis (anamorphic state)
- 36\*Bulbils pink to red. Lit.: ETAYO & DIEDERICH (1996) .....  
 ..... *Marchandiomyces corallinus* (Roberge) Diederich & D.Hawksw.

For one of the fungi included in the key we propose a combination in a different genus:

*Lichenochora physciicola* (Ihlen & R.Sant.) Hafellner **comb.nov.** [MycoBank No. 564873]  
 Bas.: *Telogalla physciicola* Ihlen & R.Sant. in Ihlen & Wedin, Nova Hedwigia 81: 497 (2005).

**Typus:** Sweden: Medelpad, Alnö socken, Slädaviken. På sjenityta av flyttblock (fågeltupp) vid stranden av havsvik, stormsbeltet [On the zenith side of a boulder (birdtop) by the beach of the bay, the stormbelt], on *Physcia dubia* (thallus), 21.VII.1935, Efr. Eriksson (UPS, holotypus) n.v. Locality data from protologue.

**Note:** Characters mentioned in the protologue exclude the species from the verrucarialean genus *Telogalla*. As seen from the photographs published with the protologue, the species belongs to *Lichenochora* (HAFELLNER 1989, NAVARRO-ROSINÉS et al. 1998).

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