Remarkable records of lichenized fungi from Slovenia

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Abstract: Mayrhofer, H. & Coppins, B. J. 2013. Remarkable records of lichenized fungi from Slovenia. – Herzogia **26**: 201–206.

Bacidia caesiovirens, *Caloplaca ulcerosa*, *Japewia subaurifera*, *Micarea micrococca* and *Porina hibernica* are new records for Slovenia. *Biatora pontica* and *Lepraria leuckertiana* are reported for the first time from the Dinaric phytogeographical region of Slovenia. Further records are provided for the rare species *Caloplaca coralliza* and *Fuscidea arboricola*.

Zusammenfassung: Mayrhofer, H. & Coppins, B. J. 2013. Bemerkenswerte Flechtenfunde aus Slowenien. – Herzogia **26**: 201–206.

Bacidia caesiovirens, *Caloplaca ulcerosa*, *Japewia subaurifera*, *Micarea micrococca* und *Porina hibernica* sind Neufunde für Slowenien. *Biatora pontica* und *Lepraria leuckertiana* werden erstmals für die Dinarische pflanzengeographische Region Sloweniens nachgewiesen. Weitere Funde der seltenen Arten *Caloplaca coralliza* und *Fuscidea arboricola* werden angegeben.

Key words: Biodiversity, Ascomycota, Eastern Alps, Dinarides.

Introduction

The diversity of lichenized fungi in Slovenia has been investigated in several joint projects between the universities of Graz and Ljubljana for the last twenty years. Suppan et al. (2000) provided an annotated catalogue based on literature data. Mayrhofer (2006) summarized the published records since the publication of the catalogue and evaluated some previously overlooked papers. Since the print of the latter several contributions (Arup & Åkelius 2009, Bilovitz et al. 2007, 2010, 2011, Breuss 2008a, 2008b, Breuss & Berger 2010, Davydov & Printzen 2012 [locality wrongly cited under Austria], Hafellner 2008, Hafellner et al. 2012, Hawksworth et al. 2011, Kukwa 2011, Mayrhofer & Sheard 2007, Muggia et al. 2008, Neuwirth & Aptroot 2011, Obermayer 2007, Obermayer & Mayrhofer 2007, Tretiach et al. 2009), and two interesting older overlooked contributions (Accetto 1995, Keissler 1933) record altogether 58 new species for the country.

Much attention has been given to the Julian Alps (Bilovitz et al. 2010, Breuss 2008a, 2008b, Breuss & Berger 2010, Hafellner et al. 2012, Obermayer & Mayrhofer 2007) and especially to the Slovenian part of Kobansko (=Koralpe) (Hafellner 2008). However, our collections come from other parts of Slovenia.

We report about nine crustose sorediate and/or isidiate species including fife new for the country and two new for the Dinaric phytogeographical region. Six species come from the Dinaric mountain range with precipitation maxima up to 3500 mm (Manohin 1957). With these new records the Slovenian lichen biota comprises 1058 taxa (1022 species, 10 subspecies, 25 varieties and one form).

Material and methods

The presented records are mainly based on collections made by the first author and/or his students and collaborators in the Pohorje mountain range and in the Snežnik region during several field trips between 1992 and 1999. The specimens have been identified with routine microscopy techniques. Some of the identifications required verification by using standardized thin-layer chromatography (TLC) following the protocols of White & James (1985) and Orange et al. (2010). The specimens are preserved in the herbarium GZU.

The species

Bacidia caesiovirens S.Ekman & Holien

Slovenia: Snežnik-Javorniki, c. 7 km N Veliki Snežnik, c. 4 km SSW Kozarišče, SE Leskovi Laz, W Jazben vrh, beech-fir forest, 865 m, 45°38'52.78"N/14°27'7.71"E, MTB: 0352/2, on bark of *Fagus sylvatica*, 5.10.1997, J. Prügger, U. Suppan, H. Mayrhofer & F. Batič (GZU, two specimens).

New for Slovenia and Central Europe. This species was previously known only from Scotland, Northern Ireland and Norway (Ekman & Holien 1995, Coppins & Aptroot 2009).
It is characterized by a blue-green granular-isidiate thallus, composed of discrete or aggregated granules. The granules are globose, shortly cylindrical, or clavate and often blue, dark grey-blue, or blue-black at the top, with the pigment reacting N+ red in slide preparations. The cited specimens are sterile and no lichen substances were detected with TLC.

Biatora pontica Printzen & Tønsberg

Slovenia: Medvedjekov Gozd E Goteniška Gora, W of Grčarice, W of Kočevje, c. 750 m, on *Acer pseudoplatanus*, 15.6.1995, H. Mayrhofer 12513, F. Batič, M. Grube & U. Suppan (GZU, det. C. Printzen 2012, associated with *Phlyctis argena* and *Thelotrema lepadinum*). Goteniška Gora, NE-exposed slopes of Goteniški vrh NW of Gotenica, W of Kočevje, c. 1020 m, on *Fagus sylvatica*, 15.6.1995, H. Mayrhofer 12550, F. Batič, M. Grube & U. Suppan (GZU, det. C. Printzen 2012).

This species was known only from one locality in the Pohorje mountain range which belongs to the alpine phytogeographical region of Slovenia (Printzen & Tønsberg 2003). The nearest records in Central Europe come from the bordering Austrian province Styria (Printzen & Tønsberg 2003, Hafellner et al. 2008, Santesson 2008), and from the Carnic Alps in Italy (Tretiach 2004).
The thalli of the cited specimens form a green leprose crust. The second specimen (12550) is fertile with numerous rounded to slightly deformed, flat, single apothecia immersed between the soralia.

Caloplaca coralliza Arup & Åkelius

Slovenia: Snežnik-Javorniki, Javorniki, c. 3 km NE Palčje, near farmhouse Vrh korena, 885 m, 45°41'43.8"N/14°19'48.8"E, MTB 0251/4; on bark of *Tilia* sp., 24.10.1998, J. Prügger & B. Surina (GZU, two specimens, one specimen det. Arup & Åkelius 2008). Slopes near Pokojišče SW Laibach (Ljubljana), c. 600–700 m, on fruit-trees, 12.11.1972, J. Poelt (GZU, associated with *C. herbidella*, det. Arup & Åkelius 2008). Surroundings of Ljubljana, Karst-plateau near the upper end of the gorge Pekel near Borovnica, c. 720 m, 12.11.1972, H. Pittoni (GZU, associated with *C. herbidella* and *C. ferruginea*, det. Arup & Åkelius 2008). Krokar Area, Borovška Dolina N Krokar, c. 500 m S Ravne, c. 840 m, 10.10.1992, M. Grube (GZU, det. Arup & Åkelius 2008).

Arup & Åkelius (2009) report the species from two localities in Slovenia. It is remarkable that the species is known only from the Dinaric phytogeographical region of Slovenia south of Ljubljana. The only Austrian record is from the Southern Alps close to the border of Slovenia (Arup & Åkelius 2009). A thorough revision of more than 200 *Caloplaca herbidella* specimens from Austria kept in GZU did not reveal any further specimens of *C. coralliza*.
Typical *C. coralliza* is sterile as in the cited material or has just a few apothecia and a light beige to orange, rarely grey or green thallus with isidia. The isidia are thin and coralloid. Typical *C. herbidella* has abundant apothecia, a grey thallus and irregularly distributed thick granular-coralloid isidia.

Caloplaca ulcerosa Coppins & P.James

Slovenia: Kras, Lipica, solitary deciduous trees, c. 400 m, 45°40'N/13°53'E, MTB: 0349/1, on bark of *Tilia* sp., 9.4.1999, H. Mayrhofer 15136 (GZU, det. J. Vondrák 2012).

New to Slovenia. Vondrák et al. (2009) summarized its distribution in Europe, the Near East and North Africa in a map. It is a mostly maritime species widely distributed in western and southern Europe with a remarkable record from the Czech Republic. The closest known records to the Slovenian locality are from Italy and the Istrian peninsula in Croatia.
Caloplaca ulcerosa possesses an inconspicuous thin, grey thallus with crater-like, greyish to pale green soralia forming farinose soredia. The cited specimen is fertile.

Fuscidea arboricola Coppins & Tønsberg

Slovenia: Pohorje, SE-exposed slopes of Lamprehtov vrh above Lamprehtov potok above Činžat, c. 1060 m, MTB 9458/4, on *Abies alba*, 11.6.1996, H. Mayrhofer 13002, Z. Belec & M. Suanjak (GZU, associated with *Japewia subaurifera*).

The species was known only from one locality in the southern Julian Alps (Mrak et al. 2004). It is rare in Central Europe; in Austria it is recorded only from the neighboring province Carinthia (van den Boom et al. 1996).
The green-brown, rarely greyish sorediate thallus contains fumarprotocetraric and protocetraric acids.

Japewia subaurifera Muhr & Tønsberg

Slovenia: Pohorje, SE-exposed slopes of Lamprehtov vrh above Lamprehtov potok above Činžat, c. 1060 m, MTB 9458/4, on *Abies alba*, 11.6.1996, H. Mayrhofer 13002, Z. Belec & M. Suanjak (GZU, associated with and filed under *Fuscidea arboricola*).

New to Slovenia. *Japewia subaurifera* is known from Scotland and northern Europe (Tønsberg 1990, James 2009). In Europe it is also recorded from Upper Austria (Priemetzhofer & Berger 2001) and Tyrol (Tønsberg et al. 2001) in Austria, Switzerland (Clerc 2004) and France (Roux 2012).
The soralia of the cited specimen are confluent, forming a leprose brown crust between *Hypogymnia physodes* and *Fuscidea arboricola*.

Lepraria leuckertiana (Zedda) L.Saag

Slovenia: Snežnik-Javorniki, Javorniki, c. 1.5 km SW Otok (Cerkniško jezero), NE Sovinšček, beech-fir forest, 790 m, 45°42'59,29"N/14°21'58,28"E, MTB 0252/3, on bark of *Acer pseudoplatanus*, 5.10.1997, J. Prügger, U. Suppan, H. Mayrhofer & F. Batič (GZU).

This sorediate species was known only from the Pohorje mountain range of the alpine phytogeographical region of Slovenia and from the Classic Karst in the submediterranean phytogeographical region (Mayrhofer et al. 2006, as *Lecanora leuckertiana*). It is the first record from the Dinarides.

Micarea micrococca (Körb.) Gams ex Coppins

Slovenia: Snežnik-Javorniki, c. 7 km N Veliki Snežnik, c. 4 km SSW Kozarišče, SE Leskovi Laz, W Jazben vrh, beech-fir forest, 865 m, 45°38'52.78"N/14°27'7.71"E, MTB: 0352/2, on bark of *Abies alba*, 5.10.1997, J. Prügger, U. Suppan, H. Mayrhofer & F. Batič (GZU).

New to Slovenia. According to Coppins (2009) it is the commonest member of the *M. prasina* group widely distributed in the British Isles and much of Europe. It is one of the most frequent species of the genus in Poland (Czarnota 2007, Czarnota & Guzow-Krzemińska 2010) but known only from two samples in Austria (Türk & Hafellner 2010).
The species is extremely variable and frequently sterile. It is often confused with *M. prasina* from which it differs by the presence of methoxymicareic acid instead of micareic acid.

Porina hibernica P.James & Swinscow

Slovenia: Snežnik-Javorniki, SE Snežnik, forest reserve Ždrocle, E-exposed slopes of Ždrocle; beech-fir forest, 1380 m, 45°34'6,20"N/14°28'34,43"E, MTB 0452/2, on *Fagus sylvatica*, 23.10.1998, J. Prügger & B. Surina (GZU).

New to Slovenia. *Porina hibernica* occurs scattered in ancient woodlands and parklands in the British Isles and Ireland (Orange et al. 2009). It is not known from Austria and Germany but it is reported from southern Italy (Nimis 1993) and the Ukrainian Carpathians (Coppins et al. 1998, as *Zamenhofia hibernica*).
The species is characterized by its grey-green to grey-ochre or pale orange isidiate thallus. The fragile isidia become cylindrical and branched. They remain discrete or form nodular-coralloid mats as in the cited material.

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References

Accetto, M. 1995. Frostbedingte Naturfichtenwälder im Gebiet von Kocevsko (Slowenien). – Sauteria **6**: 7–20.

Arup, U. & Åkelius, E. 2009. A taxonomic revision of *Caloplaca herbidella* and *C. furfuracea*. – Lichenologist **41**: 465–480.

Bilovitz, P. O., Arup, U. & Mayrhofer, H. 2010. Contribution to the lichen biota of Slovenia XII. Some lichens from Logarska dolina. – Hladnikia **26**: 15–20.

Bilovitz, P. O., Batič, F. & Mayrhofer, H. 2011. Epiphytic lichen mycota of the virgin forest reserve Rajhenavski Rog (Slovenia). – Herzogia **24**: 315–324.

Bilovitz, P. O., Harutyunyan, S. & Mayrhofer, H. 2007. Belege zur „Flora von Istrien" aus anderen Herbarien. – In: Starmühler, W. (ed.). Vorarbeiten zu einer Flora von Istrien, Teil X. – Carinthia II **197/117**: 456–460.

van den Boom, P. P. G., Breuss, O., Spier, L. & Brand, A. M. 1996. Beitrag zur Flechtenflora Kärntens. Ergebnisse der Feldtagung der Bryologischen und Lichenologischen Arbeitsgruppe der KNNV in Weißbriach 1994. – Linzer Biologische Beiträge **28**: 619–654.

Breuss, O. 2008a. Bemerkungen zu einigen Arten der Flechtengattung *Verrucaria.* – Sauteria **15**: 121–138.

Breuss, O. 2008b. Neue Funde pyrenocarper Flechten aus den Julischen Alpen (Slowenien und Italien). – Herzogia **21**: 85–92.

Breuss, O. & Berger, F. 2010. Die *Verrucaria*-Arten mit braunem Lager in den österreichischen Kalkalpen. Eine vorläufige Übersicht mit Bestimmungsschlüssel. – Bibliotheca Lichenologica **104**: 77–116.

Clerc, P. 2004. Les champignons lichénisés de Suisse. – Cryptogamica Helvetica **19**: 5–314.

Coppins, B. J. 2009. *Micarea* Fr. (1825). – In: Smith, C. W., Aptroot, A., Coppins, B. J., Fletcher, A., Gilbert, O. L., James, P. W. & Wolseley, P. A. (eds.). The lichens of Great Britain and Ireland. Pp. 583–606. – London: British Lichen Society.

Coppins, B. J. & Aptroot, A. 2009. *Bacidia* De Not. (1846). – In: Smith, C. W., Aptroot, A., Coppins, B. J., Fletcher, A., Gilbert, O. L., James, P. W. & Wolseley, P. A. (eds.). The lichens of Great Britain and Ireland. Pp. 189–207. – London: British Lichen Society.

Coppins, B. J., Kondratyuk, S. Y., Khodosovtsev, A. Y., Zelenko, S. D., Coppins, A. M., Wolseley, P. A. & Virchenko, V. M. 1998. Diversity of lichens and mosses of regional landscape park "Stuzhytzia" (Ukrainian part of the international biosphere reserve "Eastern Carpathians"). – In: Kondratyuk, S. Y. & Coppins, B. J. (eds.). Lobarion lichens as indicators of the primeval forests of the Eastern Carpathians. Pp. 139–161. – Kiev: Phytosociocentre.

Czarnota, P. 2007. The lichen genus *Micarea* (Lecanorales, Ascomycota) in Poland. – Polish Botanical Studies **23**: 1–199.

Czarnota, P. & Guzow-Krzemińska, B. 2010. A phylogenetic study of the *Micarea prasina* group shows that *Micarea micrococca* includes three distinct lineages. – Lichenologist **42**: 7–21.

Davydov, E. A. & Printzen, C. 2012. Rare and noteworthy boreal lichens from Altai Mountains (South Siberia, Russia). – Bryologist **115**: 61–73.

Ekman, S. & Holien, H. 1995. *Bacidia caesiovirens*, a new lichen species from Western Europe. – Lichenologist **27**: 91–98.

Hafellner, J. 2008. Zur Diversität lichenisierter und lichenicoler Pilze im Gebiet der Koralpe (Österreich: Kärnten und Steiermark, Slowenien). – Mitteilungen des Naturwissenschaftlichen Vereines für Steiermark **138**: 29–112.

Hafellner, J., Herzog, G. & Mayrhofer, H. 2008. Zur Diversität von lichenisierten und lichenicolen Pilzen in den Ennstaler Alpen (Österreich: Steiermark, Oberösterreich). – Mitteilungen des Naturwissenschaftlichen Vereines für Steiermark **137**: 131–204.

Hafellner, J., Muggia, L. & Obermayer, W. 2012. *Rinodina candidogrisea*, a new sorediate species from high altitudes in the Alps. – Bibliotheca Lichenologica **108**: 75–102.

Hawksworth, D. L., Divakar, P. K., Crespo, A. & Ahti, T. 2011. The checklist of parmelioid and similar lichens in Europe and some adjacent territories: additions and corrections. – Lichenologist **43**: 639–645.

James, P. W. 2009. *Japewia* Tønsberg (1990). – In: Smith, C. W., Aptroot, A., Coppins, B. J., Fletcher, A., Gilbert, O. L., James, P. W. & Wolseley, P. A. (eds.). The lichens of Great Britain and Ireland. Pp. 448–449. – London: British Lichen Society.

Keissler, K. 1933. *Thelopsis lojkana* Nyl., eine diskocarpe Flechte. – Hedwigia **73**: 252–254 + Taf.

Kukwa, M. 2011. The lichen genus *Ochrolechia* in Europe. – Gdańsk: Fundacja Rozwoju Uniwersytetu Gdańskiego.

Manohin, V. 1957. Podnebje Snežnika in okolice (Climat de la region de Snežnik). – In: Prebiralni gozdovi na Snežniku (Futaies jardinées de Snežnik). – Stroknova in Znanstvena dela **4**: 17–22.

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.

Mayrhofer, H. & Sheard, J. W. 2007. *Rinodina archaea* (Physciaceae, lichenized Ascomycetes) and related species. – Bibliotheca Lichenologica **96**: 229–246.

Mayrhofer, H., Mešl, R., Batič, F. & Bilovitz, P. O. 2006. Remarkable records of lichenized and lichenicolous fungi from Slovenia. – In: Lackovičová, A., Guttová, A., Lisická, E. & Lizon, P. (eds.). Central European lichens – diversity and threat. Pp. 165–178. – Ithaca: Mycotaxon.

Mrak, T., Mayrhofer, H. & Batič, F. 2004. Contributions to the lichen flora of Slovenia XI. Lichens from the vicinity of Lake Bohinj (Julian Alps). – Herzogia **17**: 107–127.

Muggia, L., Grube, M. & Tretiach, M. 2008. A combined molecular and morphological approach to species delimination in black-fruited, endolithic *Caloplaca*: high genetic and low morphological diversity. – Mycological Research **112**: 36–49.

Neuwirth, G. & Aptroot, A. 2011. Recognition of four morphologically distinct species in the *Graphis scripta* complex in Europe. – Herzogia **24**: 207–230.

Nimis, P. L. 1993. The lichens of Italy. An annotated catalogue. – Museo Regionale di Scienze Naturali Torino Monografie **12**: 1–897.

Obermayer, W. 2007. Dupla Graecensia Lichenum (2007, nos 481–580). – Fritschiana (Graz) **60**: 7–34.

Obermayer, W. & Mayrhofer, H. 2007. Hunting for *Cetrelia chicitae* (lichenized Ascomycetes) in the Eastern European Alps. – Phyton (Horn, Austria) **47**: 231–290.

Orange, A., James, P. W. & White, F. J. 2010. Microchemical methods for the identification of lichens. – London: British Lichen Society.

Orange, A., Purvis, O. W. & James, P. W. 2009. *Porina* Ach. (1809). – In: Smith, C. W., Aptroot, A., Coppins, B. J., Fletcher, A., Gilbert, O. L., James, P. W. & Wolseley, P. A. (eds.). The lichens of Great Britain and Ireland. Pp. 729–737. – London: British Lichen Society.

Priemetzhofer, F. & Berger, F. 2001. Neufunde und bemerkenswerte Flechten aus Oberösterreich, Österreich. – Beiträge zur Naturkunde von Oberösterreich **10**: 371–392.

Printzen, C. & Tønsberg, T. 2003. Four new species and three new apothecial pigments of *Biatora*. – Bibliotheca Lichenologica **86**: 133–145.

Roux, C. 2012. Liste des lichens et champignons lichénicoles de France. – Bulletin de la Société Linnéenne de Provence. Numero Special **16**: 3–220.

Santesson, R. 2008. Fungi lichenicoli exsiccate. Fascicles 15 & 16 (Nos 351–400). – Thunbergia **36**: 1–18.

Suppan, U., Prügger, J. & Mayrhofer, H. 2000. Catalogue of the lichenized and lichenicolous fungi of Slovenia. – Bibliotheca Lichenologica **76**: 1–215.

Tønsberg, T. 1990. *Japewia subaurifera*, a new lichen genus and species from north-west Europe and western North America. – Lichenologist **22**: 205–212.

Tønsberg, T., Türk, R. & Hofmann, P. 2001. Notes on the lichen flora of Tyrol (Austria). – Nova Hedwigia **72**: 487–497.

Tretiach, M. 2004. Further additions to the Italian lichen flora. – Cryptogamie Mycologie **25**: 173–183.

Tretiach, M., Muggia, L. & Baruffo, L. 2009. Species delimitation in the *Lepraria isidiata-Lepraria santosii* group: a population study in the Mediterranean-Macaronesian region. – Lichenologist **41**: 1–15.

Türk, R. & Hafellner, J. 2010. Nachtrag zur Bibliographie der Flechten in Österreich. – Biosystematics and Ecology Series No. **27**: I–III, 1–381. – Wien: Österreichische Akademie der Wissenschaften.

Vondrák, J., Šoun, J., Arup, U., Aptroot, A. & Redchenko, O. 2009. *Caloplaca ulcerosa*, a maritime species in Europe with a remarkable occurrence in the Czech Republic. – Bryonora **44**: 1–7.

White, F. J. & James, P. W. 1985. A new guide to microchemical techniques for the identification of lichen substances. – British Lichen Society Bulletin **57** (Supplement): 1–41 + tab.

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