



The saxicolous lichens of Munich (Germany) – a preliminary evaluation

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Abstract: 87 species of saxicolous lichens are listed for the city of Munich, 23 of which have not been seen since the 19th century and were thought to be extinct; 17 species are listed for the first time, and 41% of the current flora is threatened to varying degrees, in some cases only being represented by a single specimen.

Zusammenfassung: 87 Arten gesteinsbewohnender Flechten werden für das Stadtgebiet von München aufgelistet, 23 davon konnten seit dem 19. Jahrhundert nicht mehr nachgewiesen werden und werden als ausgestorben eingestuft. 17 Arten werden das erste Mal für die Stadt genannt. 41% der aktuellen Flora sind in unterschiedlicher Intensität gefährdet, von einigen Arten ist nur eine einzige Aufsammlung bekannt.

Keywords: checklist, Munich, urban lichens, saxicolous

Introduction

The saxicolous lichen flora of cities has rarely been investigated. Out of 80 lichenologically investigated cities in Germany, only three have been treated in respect of their saxicolous lichens (ARNOLD 1891, 1901, FEUERER & ERNST 1995, SEAWARD 1985). As regards Munich, the corticolous and lignicolous species have been listed recently (FEUERER et al. 2003), the area of investigation, as for this study, covering the City of Munich ('Stadt München') within its actual political borderlines.

The categories of threat to the lichen flora applied here are in accordance with the standardisation widely used in Germany (LUDWIG et al. 2005, 2006), but do not exactly coincide with the IUCN Red List categories (MACE & STUART 1994), namely regionally extinct (ausgestorben oder verschollen), almost extinct (vom Aussterben bedroht), critically endangered (stark gefährdet), endangered (gefährdet), vulnerable (extrem selten) and not threatened (nicht gefährdet). The classification has to be regarded as preliminary since only 198 of the 274 1 x 1 km squares of Munich have been investigated.

Material and methods

Herbarium specimens on which this study is based are deposited in Hamburg (HBG) and Munich (M). A special mode by which saxicolous species may be sampled in cities is described in FEUERER & ERNST (1995), but Eppendorf tubes (rather than small plastic boxes) have been used to store crustose lichens without their substrata in recent years. Although fieldwork is usually undertaken during fair weather, searching for *Myriospora heppii* has to be carried out shortly after rainfall – and thus proved to be a very common species in Munich!

Some problematic groups are insufficiently investigated and only provisionally registered here; there remain short-comings in respect of sterile crustose lichens, especially *Lepraria* s.l. as well as the genera *Caloplaca*, *Lecanora* and *Verrucaria*. Chemical races have not been treated. The nomenclature of the taxa mentioned follows WIRTH et al. (2011) in most cases.

Species list

Acarospora fuscata (Schrad.) Th.Fr. – Not threatened.

Acarospora glaucocarpa (Wahlenb. ex Ach.) Körb. – A specimen in M (Pasing, 1891, Lederer) has not been previously published. – Most likely extinct.

Acarospora moenium (Vain.) Räsänen – This inconspicuous crustose lichen has been brought to general knowledge only recently, being regarded as very rare by the authors of earlier floristic studies and rated as “data insufficient” in the 1996 Red List of Lichens of Germany (WIRTH et al. 1996: 326). Since then it has been recorded from many localities. In Munich it occurs mostly on vertical concrete walls, more rarely on flat surfaces or on small pebbles. – Not threatened. – New record for Munich.

Acarospora oligospora (Nyl.) Arnold – Cited for Munich by HERTEL et al. (2000: 473). – Most likely extinct.

Arthonia fusca (A. Massal.) Hepp – Cited for Munich by HERTEL et al. (2000: 474). – Most likely extinct.

Aspicilia cinerea (L.) Körb. – There is a single published record: HERTEL et al. (2000: 475) “Westlich beim Bahnwärter zwischen Mittersending und Großhesselohe, Sandsteine am Waldsaum, Arnold 1888 (sub: *Rinodina confragosa*)”. – Most likely extinct.

Bacidina chlorotricula (Nyl.) Vězda & Poelt – The species has been mentioned from one location on bark and one on stone by FEUERER et al. (2003: 331), but has been found recently on railway stones in several locations. – Selected record: Stadtteil Johanneskirchen, Bahntrasse wenig östlich der Brücke der abgebauten Güterbahn über die Apenrader Straße, 2003, Feuerer & v. Brackel (Herb. v. Brackel). – Not threatened.

Bacidina egenula (Nyl.) Vězda – Stadtteil Solln, Sandsteine in der Kiesgrube zwischen Großhesselohe und Solln, 1891, Arnold (M – rev. C. Coenen); Stadtteil Giesing, auf den von Bäumen beschatteten Ziegeln der nördlichen Gartenmauer der Kreisirrenanstalt in Giesing, 1891, ARNOLD: Lich. Monac. 182 sub *Bacidia inundata*, rev. C. Coenen (M). – A single new record: Stadtteil Thalkirchen, Flaucher, on limestone, 2001, Feuerer & Thell 64173 (HBG). – Almost extinct.

Bacidina inundata (Fr.) Vězda – All the 19th century collections, revised by C. Coenen, from our study area and preserved in M, proved to be *B. egenula* (see above). – A single record: Stadtteil Nymphenburg, Schloßpark unweit des Museums “Mensch und Natur”, Dachziegel, 2000, Feuerer (HBG). – Almost extinct.

Buellia aethalea (Ach.) Th. Fr. – This common species has not been recorded from Munich before. It occurs in most graveyards on granite tombstones all over Germany. Selected record: Stadtteil Mengerschwaige, Tonziegel der Gartenmauer des Anwesens Meichelbeckstraße 4, 2005, Feuerer (No sample). – Not threatened. – New record for Munich.

Caloplaca citrina (Hoffm.) Th. Fr. – ARUP (2006) showed that specimens which have formerly been named as the common *C. citrina* belong to at least five, partially at that time, undescribed species. Some of these may be found in Munich in the future, including *C. arcis* which has recently been found in the city of Hamburg [Stadtteil Blankenese, an der Gartenmauer des Anwesens Strandweg 54, 5 m, 29.3.2007, Feuerer, 2424/2, GKR 5236 (HBG)]. Material of *C. citrina* s.str. from a concrete wall of a building in the Botanical Garden Nymphenburg was distributed in *Lichenes Alpium*, no. 328 (HERTEL 1979). – Not threatened.

Caloplaca crenulatella (Nyl.) H. Olivier – Not threatened. . – New record for Munich.

Caloplaca dalmatica (A. Massal.) H. Olivier – Not threatened. – New record for Munich.

Caloplaca decipiens (Arnold) Blomb. & Forssell – Not threatened.

Caloplaca flavovirescens (Wulfen) Dalla Torre & Sarnth. – A single record: Stadtteil Fürstenried, Kriegsgräberstätte, 2008, Feuerer (HBG). – New record for Munich.

Caloplaca holocarpa (Hoffm.) A. E. Wade – Not threatened.

Caloplaca lactea (A. Massal.) Zahlbr. – Not threatened.

Caloplaca luteoalba (Turner) Th. Fr. – ARNOLD (1891: 47 sub *Gyalolechia luteoalba*): “Auf Mörtel an der Mauer der Mühle in Nymphenburg”. – Most likely extinct.

Caloplaca pusilla (A. Massal.) Zahlbr. – Not threatened.

Caloplaca teicholyta (Ach.) J. Steiner – Two records: Stadtteil Feldmoching, Friedhof, Mauer, 490 m, 1999, Feuerer (No sample); Stadtteil Nymphenburg, Geländer der Brücke vor dem Marstallmuseum im Nymphenburger Schloß, 515 m, 2002, Feuerer (HBG). – Almost extinct. – New record for Munich.

Caloplaca variabilis (Pers.) Müll. Arg. – WUNDER (1974: 109) cites two records: “Schwabing, v. *Krempelhuber* (M)” and “Grenzstein bei Thalkirchen, 6.VII.1886, F. Arnold (M)”. Today known from two localities: Stadtteil Neuaußing, Friedhof Aubing, Grenzstein 8, 1998, Feuerer (HBG); Stadtteil Nymphenburg, Geländer der Brücke vor dem Marstallmuseum im Nymphenburger Schloß, 2002, Feuerer (HBG). – Almost extinct.

Candelariella aurella (Hoffm.) Zahlbr. – Not threatened.

Candelariella medians (Nyl.) A. L. Sm. – Stadtteil Hasenberg, Kalksäule, Grenzstein, wo die Strasse von der Schleißheimer Strasse gegen Feldmochung abzweigt, 1891, *Arnold* (M). – Most likely extinct.

Candelariella vitellina (Hoffm.) Müll. Arg. – Not threatened.

Catillaria chalybeia (Borrer) A. Massal. – KILIAS 1981: 322 “Auf Ziegeln an der Nordseite des Kirchendaches in Mittersendling bei München, 1895, *F. Arnold* (M)”. – Selected records: Stadtteil Mittersendling, Sandstein-Abdeckplatten der Umgrenzungsmauer des Anwesens Passauerstraße 119, 2006, *Feuerer* (HBG); Stadtteil Obersendling, Bahnschotter östlich des Südendes der Siemens-Sportanlage, 2002, *Feuerer* (HBG). – Critically endangered.

Catillaria lenticularis (Ach.) Th. Fr. – A single record: Stadtteil Nymphenburg, Friedhof Nymphenburg, auf Kalk-Grabstein, 2000, *Feuerer* (HBG). – New record for Munich.

Circinaria calcarea (L.) A. Nordin et al. – A single record: Stadtteil Riem, Nordende der Aussichtsterrasse des ehemaligen Flughafens, 2006, *Feuerer* (No sample).

Circinaria contorta (Hoffm.) A. Nordin et al. – Not threatened.

Collema fuscovirens (With.) J. R. Laundon – Two records: Stadtteil Menterschwaige, Uferverbauung der Isar nördlich der Großhesseloher Brücke, 1998, *Feuerer* (HBG); Stadtteil Riem, Südteil der Aussichtsterrasse des ehemaligen Flughafens, Nagelfluhplatten der Brüstung, 2006, *Feuerer* (HBG). – Almost extinct.

Collema tenax (Sw.) Ach. em. Degel. – Most Munich collections come from soil, but only saxicolous samples are fruiting in the city. – Not threatened.

Diplotomma venustum Körb. – There are various 19th century records by Arnold in M, all on tiles usually of church or cemetery walls: Mühle in Nymphenburg, 1889; Kirchendach in Allach, 1892; Kirchhof in Obermenzing, 1891; Kirchhof in Ramersdorf, 1891; Kirchhof in Johanneskirchen, 1891; Kirchhof in Thalkirchen, 1891. – Most likely extinct.

Gyalecta jenensis (Batsch) Zahlbr. – Not threatened.

Lecania erysibe (Ach.) Mudd – Not threatened.

Lecania nylanderiana A. Massal. – Stadtteil Oberföhring, Kirchenmauer in Oberföhring, Nordseite, 1891, *Arnold* (M); Mörtel an der Nordseite der Kirche in Aubing, 1891, *Arnold* (M); Nymphenburg, alte Mauer, 1892, *Lederer* (M); Hartmannshofen, alte Mauer, 1892, *Lederer* (M). – Most likely extinct.

Lecania rabenhorstii (Hepp) Arnold – M. MAYRHOFER (1988) cites two Munich records: “Auf Ziegeln der Kirchhofmauer in Harthausen, 1891, *Arnold* (M)” and “[Stadtteil] Perlach, [an] Hohlziegeln, [1891], *Lederer* (M)”. – Most likely extinct.

Lecanora albescens (Hoffm.) Branth & Rostr. – The neotype, selected by SLIWA (2006), is number 212 of Arnold: *Lichenes Exsiccatæ* from Thalkirchen. The thalli occur on roof tiles of a churchyard wall. These tiles, produced in local clay pits in the 19th century, are of poor quality, being rich in limestone. The calciphilous *Lecanora albescens* would hardly grow on modern tiles made from pure clay. – Not threatened.

Lecanora crenulata (Dicks.) Hook. – Selected record: Stadtteil Giesing, auf der Deckplatte aus Kalkstein des Zauns des Anwesens Grödnerstraße 6, 540 m, 2000, *Feuerer* (No sample). – Vulnerable. – New record for Munich.

Lecanora dispersa (Pers.) Röhl. – Not threatened.

Lecanora polytropa (Ehrh. ex Hoffm.) Rabenh. – Not threatened.

Lecanora rupicola (L.) Zahlbr. – A single record: Stadtteil Johanneskirchen, Bahntrasse über die Apenrader Straße, 2003, *Feuerer* (HBG). – New record for Munich.

Lecanora saxicola (Pollich) Ach. – Not threatened.

Lecanora semipallida H. Magn. – Not threatened.

Lecidea fuscoatra (L.) Ach. – Not threatened.

Lecidella carpathica Körb. – Not threatened.

Lecidella asema (Nyl.) Knoph & Hertel – LEUCKERT et al. (1992: 8 as *Lecidella elaeochromoides*) mention a specimen from Munich: “Chemotyp II: Zwischen München und Georgenschwaige (heute im Stadtgebiet von München), 7.1854, *F. Arnold* (M; 228)”. In contrary to WIRTH et al. (2011) we regard *Lecidella elaeochromoides* as a synonym of *Lecidella asema* (see KNOPH et al. 1995: 312). – Most likely extinct.

Lecidella stigmatea (Ach.) Hertel & Leuckert – Not threatened.

Lepraria lobificans Nyl. – To date, the Munich specimens of the genus *Lepraria* have not been sufficiently investigated, and more species will undoubtedly be discovered in the future. – Selected record: Stadtteil Untermenzing, Friedhof Untermenzing, Eversbuschstr. 9, an Mauer südlich der Kirche, 1999, *Feuerer* (HBG). – Not threatened.

Leptogium plicatile (Ach.) Leight. – Selected record: Stadtteil Prinz-Ludwig-Höhe, Ortsteil Hinterbrühl, an der Betonmauer des Biergartens der Gaststätte Hinterbrühl, massenhaft, 2006, *Feuerer* (HBG). – Not threatened. – New record for Munich.

Micarea lynceola (Th. Fr.) Palice – “Glimmerstein am Waldsaum südwestlich von Obersendling, XI.1890, leg. *F. Arnold*” (M, intermixed with *M. polycarpella*, rev. Z. Palice). PALICE (1999: 314) cites another record just outside the city: “Sandsteine in einer Kiesgrube südlich bei Laufzorn, 12.VI.1892, leg. *F. Arnold*, M”. – Most likely extinct.

Micarea polycarpella (Erichsen) Coppins & Palice – According to PALICE (1998), the records determined as “*Lecidea atomaria* Th. Fr.” by ARNOLD (1891: 81) belong to this taxon: “An kleinen Sandsteinen eines Grabenaufwurfs am Waldsaum westlich bei Obersendling; an einem Glimmersteine im Fichtengehölze zwischen Pasing und Lochham”. – Most likely extinct.

Myriospora heppii (Nägeli ex Hepp) Hue – This species is common but inconspicuous. It has been considered as rare and potentially endangered in Germany (WIRTH et al. 1996: 324 as *Acarospora heppii*), but in Munich it occurs almost everywhere when limestone pebbles are available. It is best searched for when the substrate is wet, typically after rainfall. The species develops rapidly on newly created pebbled areas after removal of the mother soil during construction

works. It occurs in abundance at the Panzerwiese in the quarter Harthof and the Fröttmaninger Heide in the quarter Freimann. It is hardly affected by treading. – Not threatened.

Petractis clausa (Hoffm.) Kremp. – The distribution statement of ARNOLD (1891: 64 “Auf Nagelfluhe des Isarthals von der Menterschwaige bis Schäftlarn”) includes the city area. There are no collections inside the city limits in the Botanische Staatssammlung (M), but in the immediate neighbourhood from Geiseltasteig, 1864, v. *Krempelhuber* and Schwaneck, 1855, *Arnold*. – Most likely extinct.

Phaeophyscia nigricans (Flörke) Moberg – Not threatened.

Phaeophyscia orbicularis (Neck.) Moberg – Not threatened.

Physcia caesia (Hoffm.) Füllr. – Not threatened.

Placynthium nigrum (Huds.) Gray – Selected record: Stadtteil Mittersending, Friedhof Sendling, liegender Grabstein, 2007, *Feuerer* (No sample). – Vulnerable.

Polysporina simplex (Davies) Vězda – Selected record: Stadtteil Schwabing, Neuer Jüdischer Friedhof, auf Grabstätte Julius Löwenthal (1873-1947), 2001, *Feuerer* (No sample). – Vulnerable.

Porina chlorotica (Ach.) Müll. Arg. – Selected record: Stadtteil Harlaching, Miesbacher Platz, Lesestein, 1999, *Feuerer* (HBG). – Vulnerable. – New record for Munich.

Porpidia crustulata (Ach.) Hertel & Knoph – Selected record: Stadtteil Waldperlach, ehemalige Kiesgrube im Wald, Silikatgeröll, 2000, *Feuerer* (No sample). – Vulnerable.

Porpidia tuberculosa (Sm.) Hertel & Knoph – Selected record: Stadtteil Johanneskirchen, Bahntrasse bei der Apenrader Straße, 2003, *Feuerer* & v. *Brackel* (HBG). – New record for Munich.

Protoblastenia calva (Dicks.) Zahlbr. – A sample from the city area was recently mentioned by HERTEL et al. 2000: 508 “Menterschwaige, an Nagelfluhfels, *Sandtner* 1850”. – Most likely extinct.

Protoblastenia rupestris (Scop.) J. Steiner – Not threatened.

Psilolechia lucida (Ach.) M. Choisy – Selected record: Stadtteil Thalkirchen, Tierpark Hellabrunn, Gedenkstein Heinz Heck, 2006, *Feuerer* (No sample). – New record for Munich.

Psorotichia frustulosa Anzi – This species has a worldwide distribution, but has been rarely recorded. Records from the type locality in the Italian Alps (ANZI 1862, 1864 and Lich. Lang. 388) date back to the 19th century; later records are from Illinois, USA (HYERCZYK 2005), France, Algeria (OZENDA & CLAUZADE 1970: 290), Spain (MORENO & EGEE 1994: 294) including the Canary Islands (EGEE et al. 1987), and South Korea (SCHULTZ & MOON 2011). This inconspicuous crustose species was recorded for Germany the first time by WIRTH (1992: 221) based on a sample from Baden-Württemberg. KNOPH & SCHROECKH (2002: 32) found it in Thuringia on limestone rock. – A single record: Stadtteil Am

Waldfriedhof, Pählstraße, Eternitplatte eines Tonnenhäuschens, 2005, *Feuerer* (HBG). – New record for Munich.

Rhizocarpon distinctum Th. Fr. – Two records: Stadtteil Obersending, Wilbrechtstraße 69, Sandsteinplatte der Gartenmauer, 2001, *Feuerer* (HBG); Stadtteil Johanneskirchen, Bahntrasse wenig westlich der Brücke der abgebauten Güterbahn über die Apenrader Straße, 2003, *Feuerer* & v. *Brackel* (HBG). – Almost extinct.

Rhizocarpon geographicum (L.) DC. – Selected record: Stadtteil Pasing, auf der Ziegelmauer des Anwesens Perlschneiderstraße 3, 2005, *Feuerer* (No sample). – Vulnerable.

Rhizocarpon petraeum (Wulfen) A. Massal. – The sole locality has been destroyed: Stadtteil Milbertshofen, “Georgenschwaige”, Freibad an der Würm, 1853, *Arnold* (M). – Most likely extinct.

Rhizocarpon polycarpum (Hepp) Th. Fr. – The sole locality has been destroyed: Stadtteil Allach, Glimmerstein einer Kiesgrube an der Eisenbahn, 1888, *Arnold* (M). – Most likely extinct.

Rinodina bischoffii (Hepp) A. Massal. – A single record: Stadtteil Moosach, Westfriedhof, Säule mit Vase nördlich der Aussegnungshalle, 510 m, 1998, *Feuerer* (HBG). – Almost extinct.

Rinodina confragosa (Ach.) Körb. – Most likely extinct.

Rinodina oleae Bagl. – Two records: Stadtteil Feldmoching, Friedhof, Dachziegel einer Mauer, 490 m, 1999, *Feuerer* (HBG); Stadtteil Schwabing, Neuer Jüdischer Friedhof, 500 m, 2001, *Feuerer* (No sample). – New record for Munich.

Sarcogyne privigna (Ach.) A. Massal. – A single record: Stadtteil Untermenzing, Botanical Garden, granite stairs leading on the southern and western side from the Botanical Institute into the Botanical Garden München-Nymphenburg, 2000, *Hertel* (No sample). – The erosion of the colonized surface, some 3 mm, of this hard granite-surface is remarkable; since the building was completed in 1914, the age of the large colonies is less than 90 years. – New record for Munich.

Sarcogyne regularis Körb. – Selected record: Stadtteil Harlaching, Athener Platz, Schotterfläche, 1999, *Feuerer* 60444 (HBG). – Not threatened.

Scoliosporum umbrinum (Ach.) Arnold – Besides one record on bark (*FEUERER* et al. 2003), other records are from siliceous stone. – Selected records: Stadtteil Obersending, Wildprechtstraße Ecke Ziehererstraße, auf Sandsteinplatten der Gartenmauer, 2001, *Feuerer* (No sample); Stadtteil Schwabing, Neuer Jüdischer Friedhof, 2001, *Feuerer* (No sample). – Not threatened.

Staurothele frustulenta Vain. – This species regularly occurs along the River Isar, but occasionally on eutrophicated limestone rocks. As it morphologically resembles the common *Verrucaria nigrescens*, it has probably been overlooked in the past. – Selected records: Stadtteil Lehel, am Südende des Wehrsteges zwischen Praterinsel und Museumsinsel, Betonbrüstung, 1999, *Feuerer* (HBG); Stadtteil Thalkirchen, niedrige Betonmauer am Isarkanal gegenüber dem Anwesen Am Isarkanal 30, 2001, *Feuerer* & *Thell* 64178 (HBG). – Not threatened. – New record for Munich.

Thelocarpon laureri (Flot.) Nyl. – All Munich specimens, originally named *Thelocarpon prasinellum* Nyl., have been revised and confirmed by J. KOCOURKOVA-HORAKOVA in 1997. – Most likely extinct.

Trapelia coarctata (Turner ex Sm.) M. Choisy – Selected records: Stadtteil Feldmoching, Findling an der Südwestecke der Regattaanlage, Silikatgestein, 2006, Feuerer (No sample); Stadtteil Untermenzing, Parkfriedhof Untermenzing, Grabstätte Elisabeth Redslob, Lava-Grabstein, 1999, Feuerer (No sample). – Vulnerable.

Verrucaria aquatilis Mudd – This is the only aquatic lichen species in Munich. – Selected record: Stadtteil Schwabing, Englischer Garten, im Bach unterhalb der Brücke auf dem Weg vom Chinesischen Turm in Richtung Tivoli auf der linken Hälfte des Bachbettes, nicht weit vom Ufer entfernt auf untergetauchtem Silikat-Geröll, 1999, Thüs (No sample). – Almost extinct.

Verrucaria asperula Servit – The type specimen of this species was collected in Munich: “Kalkkieselsteine beim alten Kugelfang östlich von Harlaching, 26.4.1896, Arnold”. Only two additional records are known from Austria (BREUSS & BERGER 2010: 90). – Most likely extinct.

Verrucaria elaeomelaena (A. Massal.) Arnold – Cited for Munich by HERTEL et al. (2000: 514). – Most likely extinct.

Verrucaria hochstetteri Fr. – Arnold (1891: 113 sub *Amphoridium dolomiticum*): “Auf einem auf begrastem Boden liegenden Tuffblocke unweit der Pagodenburg im Nymphenburger Hofgarten”. – Most likely extinct.

Verrucaria muralis Ach. – Not threatened.

Verrucaria nigrescens Pers. – Not threatened.

Verrucaria polysticta Borrer – Arnold (1881: 109 sub *Lithoidea fuscilla*): “Auf Ziegeln der Kirchhofmauer in Grosshadern”. – Most likely extinct.

Verrucaria viridula (Schr.) Ach. – Cited for Munich by HERTEL et al. (2000: 515) as *V. papillosa*. – Most likely extinct.

Xanthoria elegans (Link) Th. Fr. – Not threatened.

Xanthoria parietina (L.) Th. Fr. – This nitrophilous species occurs on bark and wood as well as on limestone and siliceous stone. Differing from Hamburg, it was growing not only on basic stone substrata in the city centre of Munich in the second half of the 20th century, but also on bark. – Not threatened.

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