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We report 22 lichenised fungi as new to Sweden, of which nine are also new to Fennoscandia and one new to Europe. The newly reported species are *Agonimia flabelliformis*, *Carneothele sphagnicola*, *Lecania madida*, *Lecanora horiza, L. subravida*, *L. subsaligna*, *Lecidea subhumida*, *L. toensbergii*, *Micarea coppinsii*, *M. isidioprasina*, *M. microsorediata*, *M. pseudotsugae*, *M. substipitata*, *Miriquidica majae*, *Protoblastenia calvella*, *P. szaferi*, *Ptychographa xylographoides*, *Ramboldia subcinnabarina*, *Verrucaria hydrophila, V. prominula*, and *V. rosula*. We revised Swedish specimens of *Normandina acroglypta* and found that all but one belong to *N. chlorococca*, which is reported as new to Sweden. We also publish new records of the anamorphic, possibly lichenised fungus *Sphaeronaema truncatum*, a long-forgotten taxon originally described from Sweden 200 years ago.

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Introduction

The first Swedish lichen flora, *Lichenographiae Svecicae Prodromus*, was published in 1798 and contained 345 numbered species (Acharius 1798). The earliest extensive checklist of lichens from Sweden, Denmark, Finland, and Norway appeared eight decades later (Forssell & Blomberg 1880) and listed 999 lichen taxa, from species to formae, from Sweden. It was not replaced until the checklist by Magnusson (1946), which listed 1854 Swedish lichens according to a rather divisive taxonomy. After a four-decade intermission, a checklist project was initiated with Rolf Santesson at the helm. Three consecutive books, approximately a decade apart, marked the start of a new era for Scandinavian lichen taxonomy (Santesson 1984, 1993, Santesson et al. 2004). An updated version of the last printed volume was transformed into a database in the spring of 2009 and is currently found online at https://databas.evolutionsmuseet.uu.se/santesson/home.php. This database, maintained by the Museum of Evolution, allows us to track changes in the number of known lichens and related saprobic fungi as well as lichenicolous fungi in Sweden, Norway and Finland, although

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Sweden is the focus of this paper. The net increase in the number of known species to Sweden since the database was established is 241, which corresponds to almost 17 species per year. The relationship between time (since the database was established on 6 April 2009) and the number of known lichens and associated saprobic fungi fits a linear curve very well (R^2_{adj}=0.946, F=2303, p=1.489×10^{-84}, n=132, where n is the number of times species were added to the database). The same holds true for lichenicolous fungi (R^2_{adj}=0.986, F=9573, p=1.269×10^{-123}, n=132), and consequently also for the sum of the two. Obviously, the long-term relationship cannot realistically be linear, and the recent discovery rate should only be interpreted to mean that there is currently no obvious sign that we are approaching an asymptote. Prior to the publication of this paper, the database held 2262 known Swedish lichens and related saprobes as well as 431 lichenicolous fungi recognised at the species level. This paper reports another 22 species of lichens as new to Sweden, in a few cases also new to Fennoscandia and Europe. It is part of a series of reports, recent contributions including Ekman et al. (2019), Svensson et al. (2020), and Westberg et al. (2022, 2023).

Material and Methods

Specimens were initially studied using a dissecting microscope. Anatomical features were examined on hand-cut apothecial sections and squash preparations mounted in water using a compound microscope. Ascospore dimensions and other anatomical measurements were made in water. HPTLC was performed following the method described by Arup et al. (1993), using solvent systems A, C and G (Orange et al. 2010). The nomenclature follows Westberg et al. (2021).

We extracted DNA and performed PCR: s following the methods described in Svensson & Fryday (2022) and generated new sequences from the internal transcribed spacer region of the nuclear ribosomal RNA gene (hereafter ITS) and the small subunit of the mitochondrial ribosomal RNA gene (hereafter mtSSU). Genbank IDs for newly generated sequences from *Lecania madida*, *Lecanora subravida*, *L. subsaligna*, *Micarea coppinsii*, *M. isidioprasina*, *M. microsorediata*, *M. pseudotsugae*, *Protoblastenia calvella*, *Verrucaria hydrophila*, *V. prominula*, and *V. rosula* are reported under each species.

To determine the phylogenetic position of Swedish specimens of *Lecanora subravida* and *L. subsaligna*, we chose a taxon sampling based on a reduced version of the analysis by Ivanovich et al. (2021). We included all species appearing in the same clade as *L. subravida* and *L. subsaligna* (see Fig. 1 in Ivanovich et al. 2021) and used two species from a sibling clade (*L. sarcopidoides* and *L. subintricata*) as outgroup. To this, we added mtSSU and ITS from three Swedish specimens of *L. subravida* and ITS from three Swedish and one Norwegian specimen of *L. subsaligna* (see Specimens examined for these species). Specifically, we included two terminals of *Lecanora albellula* (1: mtSSU = GenbankID MT939219, ITS = GB-ID MT938990; 2: MT939166, MT938936), two of *L. anopta* (1: MT939206, MT938979; 2: MT939156, MT938926), two of *L. saligna* (1: MT939225, MT938996; 2: MT939160, MT938930), one of *L. sarcopidoides* (MT939221, MT938992), one of *L. subintricata* (MT939158, MT938928), eight of *L. subravida* 1: MT939188, MT938960; 2: OR773053, OR773063; 3: OR773052, OR773062; 4: OR773051, OR773061; 5: MT939154, MT938924; 6: MT939194, MT938968; 7: MT939155, MT938925; 8: MT939229, MT939000), and eleven of *L. subsaligna* 1: MT939231, MT9390902; 2: OR578382 (ITS); 3: MT939235, MT93900; 4: MT939172, MT938941; 5: MT939167, MT938937; 6: OR578380 (ITS); 7: OR578381 (ITS); 8: MT939179, MT938949; 9: MT939230, MT939001; 10: OR578383 (ITS); 11: MT939180, MT939950).

The ITS and mtSSU matrices were aligned separately using PASTA (Mirarab et al. 2015) with default settings. After terminal trimming, the aligned matrices were concatenated into one alignment

and analysed using maximum likelihood as implemented in IQTree 2.0.7 (Minh et al. 2020). The ITS and mrSSU alignments were submitted to the analysis (proportional model) as four partitions (ITS1 + 5.8S + ITS2 + mtSSU) but allowing merging if this improved model fit. The assessment of branch support was calculated using 400 non-parametric bootstrap replicates.

The Species

Agonimia flabelliformis J.P. Halda, Czarnota & Guzow-Krzem.

in Guzow-Krzemińska et al., *Lichenologist* **44**: 63 (2011) [2012]. – Type: Czech Republic, Bohemia, Novohradské hory, ad marginem sylvae senectae 'Žofínský prales', 48°39.90'N 14°42.51'E, ad ligni arboris basis *Fagi*, alt. 805 m, 28 October 2009, Z. Palice 12763 & J. Malíček (PRA, holotype, seen by ZP).

New to Fennoscandia. *Agonimia flabelliformis* is recognised by its bright green thallus composed of up to 150 µm long, flabelliform to coralloid squamules, globose perithecia and 8-spored asci with colourless, muriform spores. It was described by Guzow-Krzemińska et al. (2012) and was originally reported from the Czech Republic, Germany, and Great Britain. It has since then been reported from additional countries in Europe, viz. Lithuania, Poland, Russia, Slovakia, Switzerland, and Ukraine (Czarnota 2012, Dietrich et al. 2019, Malíček & Palice 2013, Malíček et al. 2018, Motiejūnaitė & Grochowski 2014, Stepanchikova et al. 2020). Outside Europe it is known from Asian Russia (Urbanavichus 2013), the Azores (Breuss 2018), and New Jersey in the United States (Waters & Lendemer 2019). *Agonimia flabelliformis* typically grows on bark, wood, detritus or over bryophytes in humid and shaded situations in deciduous forests (Guzow-Krzemińska et al. 2012, own observations).

Specimens examined: **Sweden.** *Gotland*: Fide par., W of Fide Prästäng, 1.2 km NW Fide church, 57.083°N 18.3°E, on *Malus* in overgrown dense woodland meadow, 1997, P. Johansson 67 (UPS L-098402). Kräklingbo par., Torsburgen, 57.41133°N 18.73167°E, on base of *Corylus avellana*, 16 Feb. 2022, R. Vicente (UPS L-1028395). *Uppland*: Vänge par., Fiby urskog, close to the brook in SW part of the reserve, 59.883°N 17.35°E, elev. 41 m., on roots of *Alnus incana*, 20 Apr. 2002, A. Nordin 5399 (UPS L-120399).

Carneothele sphagnicola Fryday, M. Svensson & Holien **Fig. 1**

in Spribille et al., *Lichenologist* **52**: 91 (2020). – Type: United States, Alaska, Petersburg Borough, Mitkof Island, "Towers muskeg", 56.672750°N 132.918500°W, elev. 10 m, *Sphagnum* bog (muskeg) with *Oxycoccus oxycoccos*, 1 Sept. 2014, A. Fryday 10667, K. Dillman & T. Spribille (MSC, holotype, not seen).

New to Sweden. *Carneothele sphagnicola* was described based on a type from Alaska and at the same time reported from a few localities in Sør- and Nord-Trøndelag in Norway (Spribille et al. 2020). During fieldwork in 2021, it was encountered relatively close to the Norwegian localities also on the Swedish side of the border, in three sites in western Jämtland. This distinctive species exclusively inhabits *Sphagnum* hummocks and is readily identified by its brick-red, up to 0.3 mm wide perithecia that often have a yellow pruina around the ostiole. The ascospores are unicellular and in excess of 200 per ascus and the ascomatal wall reacts with KOH to form magenta-coloured crystals (Spribille et al. 2020).

The initial finds in Alaska as well as Norway and adjacent Jämtland are consistent with a preference for oceanic areas with high annual precipitation. An additional find in Ångermanland in northeastern Sweden, however, suggests that the species has a substantially wider ecological amplitude. The average annual precipitation during the current millennium at the closest meteorological station from the Ångermanland site (Bredbyn D) is 648 mm, compared to 955 mm

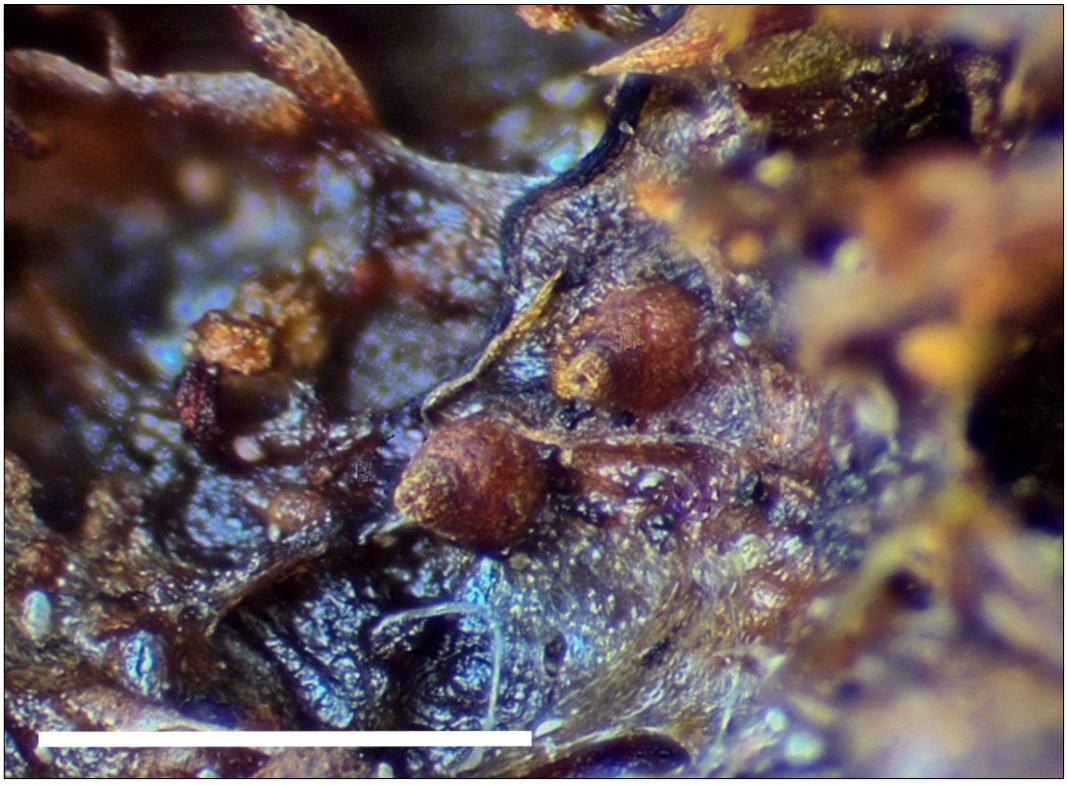

Figure 1. *Carneothele sphagnicola*, two perithecia with yellow pruina around the ostiole (UPS L-1033355). Bar = 1 mm.

and 1059 mm at the two closest stations to the sites in Jämtland (Edevik, Sandnäset, precipitation data taken from SMHI, https://www.smhi.se/data).

Specimens examined: **Sweden.** *Jämtland*: Kall par., Svenskådalen Nature Reserve, along the trail from Långnäset towards the river Svenskån, c. 2.7 km SE of Långnäset, 64.03502°N 13.07022°E, elev. 486 m, on *Sphagnum* in a bog, 10 Aug. 2021, M. Westberg JMT486 (UPS L-1031000); Skäckerfjällen Nature Reserve, c. 1.7 km NNE of the farm Äsingen by the NW end of Lake Stortjärnen, 63.76987°N 12.44266°E, elev. 416 m, on dead *Sphagnum*, 8 Aug. 2021, M. Westberg & R. Isaksson JMT260 (UPS L-1033355); about 650 m WNW of Äsingen, 63.75670°N 12.41678°E, elev. 435 m, on dead *Sphagnum* in open mire, 10 Aug. 2021, M. Svensson 4078 (UPS L-1060013). *Ångermanland*: Anundsjö par., 10.7 km WNW of Seltjärn, S of S Gäddtjärnen, 63.62728°N 17.74494°E, on dead *Sphagnum*, 10 July 2023, R. Isaksson (UPS L-1086627). **USA.** *Alaska*: Petersburg Borough, Mitkof Island, muskeg c. 0.6 km S of Papkes Landing Road, W side of highway behind radio towers, 56.673015°N 132.916128°W, elev. 9 m, on *Sphagnum* hummocks in muskeg, 1 Sept. 2014, T. Spribille, A. Fryday & K. Dillman 40824 (UPS L-998784).

Lecania madida Reese Næsb. & Björk **Fig. 2**

in Reese Næsborg, *Mycologia* **100**: 410 (2008). – Type: Canada, British Columbia, Clearwater Valley, Wells Gray Provincial Park, on hardwood root buttress (*Populus trichocarpa*) in a swamp in Edgewood west, 27 Feb., C. Björk 12193 (UBC, holotype, not seen; UPS L-165823, isotype, seen by MS).

Figure 2. *Lecania madida*, (UPS L-1059620). Bar = 1 mm.

New to Fennoscandia and Europe. *Lecania madida* was described by Reese Næsborg (2008), based on material collected in the Pacific Northwest of North America. It is a corticolous species with a preference for humid habitats, such as swamps and riparian corridors (Reese Næsborg 2008). The Swedish find was made on a weathered old wooden post at the shore of river Ångermanälven, in an exposed but probably periodically inundated situation. The old post supported a rather unusual assemblage of species including *Amandinea punctata*, *Athallia pyracea*, *Bryostigma lapidicola* s. lat., *Catinaria atropurpurea*, *Cryptodiscus microstomus*, *Lecania sordida*, *Lecanora symmicta*, and *Myriolecis hagenii*. This includes several species usually viewed as corticolous and one normally saxicolous (*L. sordida*), which suggests that wood may be an atypical substrate for *L. madida* also in Sweden.

The Swedish specimen agrees with *L. madida* morphologically and sequences of mtSSU and ITS from it are identical or very similar to those from North American specimens that were published by Reese Næsborg (2008). They are also identical to sequences generated from a specimen collected in Austria and uploaded to GenBank under the name *Lecania cyrtellina* (GenBank IDs MZ409482 and MZ409494), indicating that *L. madida* may be widely distributed in Europe but overlooked. *L. cyrtellina* differs from *L. madida* by having narrower and usually non-septate ascospores and a preference for basic bark in dry conditions (Reese Næsborg 2008). It is also rather distant to *L. madida* genetically (Reese Næsborg 2008). Confusion is perhaps most likely with *L. prasinoides*, which shares the same ecological preference for humid habitats as *L. madida*, but *L. prasinoides* has

somewhat narrower ascospores (–4 µm versus –4.5µm in *L. madida*, see also figure 4 in Reese Næsborg 2008), apothecia with less pronounced pigment spots when wet, and paraphyses without apical thickenings (up to 5.5 µm wide in *L. madida*; Reese Næsborg 2008).

Specimen examined: **Sweden.** *Ångermanland*: Ytterlännäs par., Sandslån, Sandslåön, on the shore in the SW corner of the island, 63.00792°N, 17.79529°E, elev. 0 m, on weathered old wooden post, 21 July 2021, M. Svensson 4030a (UPS L-1059620; GenBank IDs OR773054 (mtSSU), OR773064 (ITS)).

***Lecanora horiza* (Ach.) Linds.** **Fig. 3**

Trans. Bot. Soc. Edinburgh **10**: 96 (1870). *Lecanora subfusca* var. *horiza* Ach., *Lichenogr. Univ.*: 394 (1810). – Type: [France,] Gallia, undated, L. Dufour 73 (H-ACH 1193, lectotype, designated by Brodo & Vitikainen 1984, not seen).

New to Sweden. This species is widely distributed in Europe (Edwards et al. 2009) and has been reported as far north as Denmark (Danish Mycological Society 2016). It is here reported from Skåne, Öland and Gotland. *Lecanora horiza* belongs to the *L. allophana* group, which is set apart by the small crystals in the amphithecium as opposed to the large crystals found in the *L. argentata* group. Morphologically, *Lecanora horiza* closely resembles *L. glabrata* and *L. allophana* in the brown, often glossy apothecium discs. It is distinguished by its typically darker brown apothecia, a thallus with a darker shade of grey, and a well-delimited cortex of the thalline margin, which sets it apart from both the other species. *Lecanora allophana* also differs from the other two species in the normally rather thick and flexuous thalline margin whereas *L. horiza* and *L. glabrata* have thin, even margins. Ecologically, *L. glabrata* prefers forests or sometimes forest openings, occurring mainly on *Fagus* but also on *Fraxinus* and *Carpinus*. *Lecanora horiza*, on the other hand, is more likely to be found in the same habitat as *L. allophana*, both occurring in well-lit sites, e.g., churchyards, roadside trees, and wooded meadows, where it typically inhabits *Fraxinus*, *Ulmus*, or *Populus*. However, *L. horiza* has also been observed on stems and twigs of *Juniperus* and *Dasiphora fruticosa* in alvar habitats on Öland and Gotland, where *L. allophana* does not occur. Finally, *L. horiza* may also grow on rock, particularly on walls, which can lead to confusion with *L. campestris*. *L. horiza* can be separated from this species by the thicker cortex of the thalline margin, 38–85(–150) µm at the base as opposed to the 22–40 µm in *L. campestris* (Brodo 1984). Furthermore, the apothecia in *L. horiza* are normally larger (–1.5 mm versus 0.6–0.8 mm in *L. campestris*) and are more constricted at the base, and the prothallus is often lacking or poorly developed in contrast to the normally conspicuous, fimbriate white prothallus in *L. campestris* (Cannon et al. 2022).

In the collection from Resmo church, Öland, the lichenicolous fungus *Vouaxiuella verrucosa* was present. It is new to Öland and in Sweden previously known only from Gotland.

Specimens examined: **Sweden.** *Gotland*: Gammelgarn par., 825 m S of Gammelgarn church, on twigs of *Juniperus* at the road, exposed, 57.40630°N 18.80642°E, elev. c. 25 m, 25 Sept. 2013, U. Arup L13305 (LD); Hejnum par., Hejnum hällar, 1850 m NNE of the church, on *Juniperus* in open alvar habitat, exposed, 57.69529°N 18.64449°E, elev. c. 70 m, 25 Sept. 2013, U. Arup L13267 (LD). *Skåne*: Dalby par., Dalby parish church, at base of *Fraxinus excelsior* next to the church gate S of the church, exposed, 55.66421°N 13.34412°E, elev. c. 63 m, 16 May 2014, U. Arup L14005 (LD); Eslöv par., in an avenue 1.5 km NE of Kristineberg, on *Ulmus glabra*, 31 Jan 1995, P. Frödén 28 (LD); *Öland:* Gårdby par., on bark of *Juniperus* in open area near the trail/road, exposed, 56.58512°N 16.58115°E, elev. c. 20 m, 17 June 2017, U. Arup L17156 (LD). Hulterstad par., at the parish church, N side of the churchyard, on siliceous boulder on top of the limestone wall, fairly exposed, 56.45020°N 16.56788°E, elev. 13 m, 15 June 2017, U. Arup L17137 (LD); 1.5 km NW of Gösslunda, 150 m N of the road, on twig of *Juniperus* in alvar habitat, exposed, 56.49418°N 16.51231°E, 20 Apr. 2009, U. Arup (LD); Kastlösa par., Kastlösa kyrka, *Fraxinus*, 20 May 1997, P. Frödén 335 (LD); Resmo par., Resmo churchyard, on *Fraxinus* near the rear entrance, 56.54144°N 16.44327°E, 20 Apr. 2001, U. Arup L01527,

Figure 3. *Lecanora horiz*a with glossy, dark brown apothecia and a rather narrow and smooth thalline margin (field photo from southern Öland). Bar = 1 mm.

L02001 (LD); Södra Möckleby par., c. 1 km S of the village, N of the road to the stone quarry, on *Ulmus* in avenue along the main road, 56.33972°N 16.41101°E, 4 Aug. 2009, U. Arup L09038 (LD); Albrunna, N of Alsjö, on *Ulmus* in avenue along the road, 56.33182°N 16.40959°E, 4 Aug. 2009, U. Arup L09035 (LD); Ås par., Näsby, near N end of village, on *Fraxinus* in the avenue along the road, 56.25278°N 16.47177°E, 3 Aug. 2009, U. Arup L09037 (LD); Ås, 350 m E of the church, on *Ulmus* in the avenue along the road, 56.23843°N 16.45470°E, 3 Aug. 2009, U. Arup L09039 (LD); c. 660 m E of Nygärde, just E of the parish wall N of the road, on twigs of *Potentilla fruticosa*, exposed, 56.25560°N 16.43440°E, elev. 9 m, 26 July 2015, U. Arup L15634 (LD).

***Lecanora subravida* Nyl.** **Fig. 4**

Flora **55**: 250 (1872). – Type: Switzerland, undated, Schaerer: Lich. Helv. no. 544 (M, lectotype, designated by van den Boom & Brand 2008, not seen; UPS, isolectotype, seen by MS).

New to Fennoscandia. *Lecanora subravida* was rescued from oblivion by van den Boom & Brand (2008) who, apart from the Swiss type material, cited one collection from France and two from Germany. The species is characterised by rather large apothecia with a thin, often subrugose to verrucose margin, broad ascospores (typically 5–6 µm), and an often poorly developed thallus (van den Boom & Brand 2008, Ivanovich et al. 2021). A further character distinguishing *L. subravida* from closely related and/or similar species is its secondary chemistry. According to van den Boom & Brand (2008), *L. subravida* contains usnic acid and placodiolic acid as major substances, with isousnic acid and squamatic acid occurring as minor/trace substances. Ivanovich et al. (2021) on the other hand, reported *L. subravida* as having usnic acid as a major compound, with isousnic, pseudoplacodiolic and squamatic acids as minor/trace compounds (following Ivanovich et al. 2021, page 70; isousnic acid is not mentioned for *L. subravida* in their Table 5). We analysed eight

Figure 4. *Lecanora subravida*, typical appearance with scattered apothecia with a thin margin (UPS L-1060006). Bar = 1 mm.

specimens of *L. subravida* with HPTLC, including two sequenced specimens. Of these, all contained usnic acid, six isousnic acid, and five pseudoplacodiolic acid. None of these specimens contained detectable amounts of placodiolic or squamatic acid.

In our phylogenetic analysis (Fig. 5), the Swedish specimens of *Lecanora subravida* (2, 3 and 4 in Fig. 5) were recovered in a fully supported clade together with the *L. subravida* specimens from Iran, Russia and the United States analysed by Ivanovich et al. (2021). There is evidence of genetic structuring within the species, as the Swedish specimens and the Iranian/Russian specimens form separate, fully supported sub-clades, with the single North American specimen (*L. subravida* 1 in Fig. 5) appearing as sibling to these two sub-clades. The apparent variation in secondary chemistry described above as well as variation in some morphological characters (i.e. colour of the apothecial disc, see Ivanovich et al. 2021) suggests that more than one species may be included in the current concept of *L. subravida*.

Lecanora subravida is primarily a lignicolous species, in Sweden often collected on stumps of *Picea abies* where it may cover large areas on vertical to sloping surfaces. It has also been collected on wood of *Betula*, *Salix caprea*, *Pinus sylvestris*, and *Ulmus glabra*. It is likely to be a common and widely distributed species in Fennoscandia.

Specimens examined: **Sweden.** *Dalarna*: Transtrand par., Björnbäckdalens fäbod, 28.5 km NV Transtrand k:a, på lignum av *Salix caprea* på fäbodvallen, 21 June 1987, J. Hermansson 734 (UPS L-103508; HPTLC: isousnic,

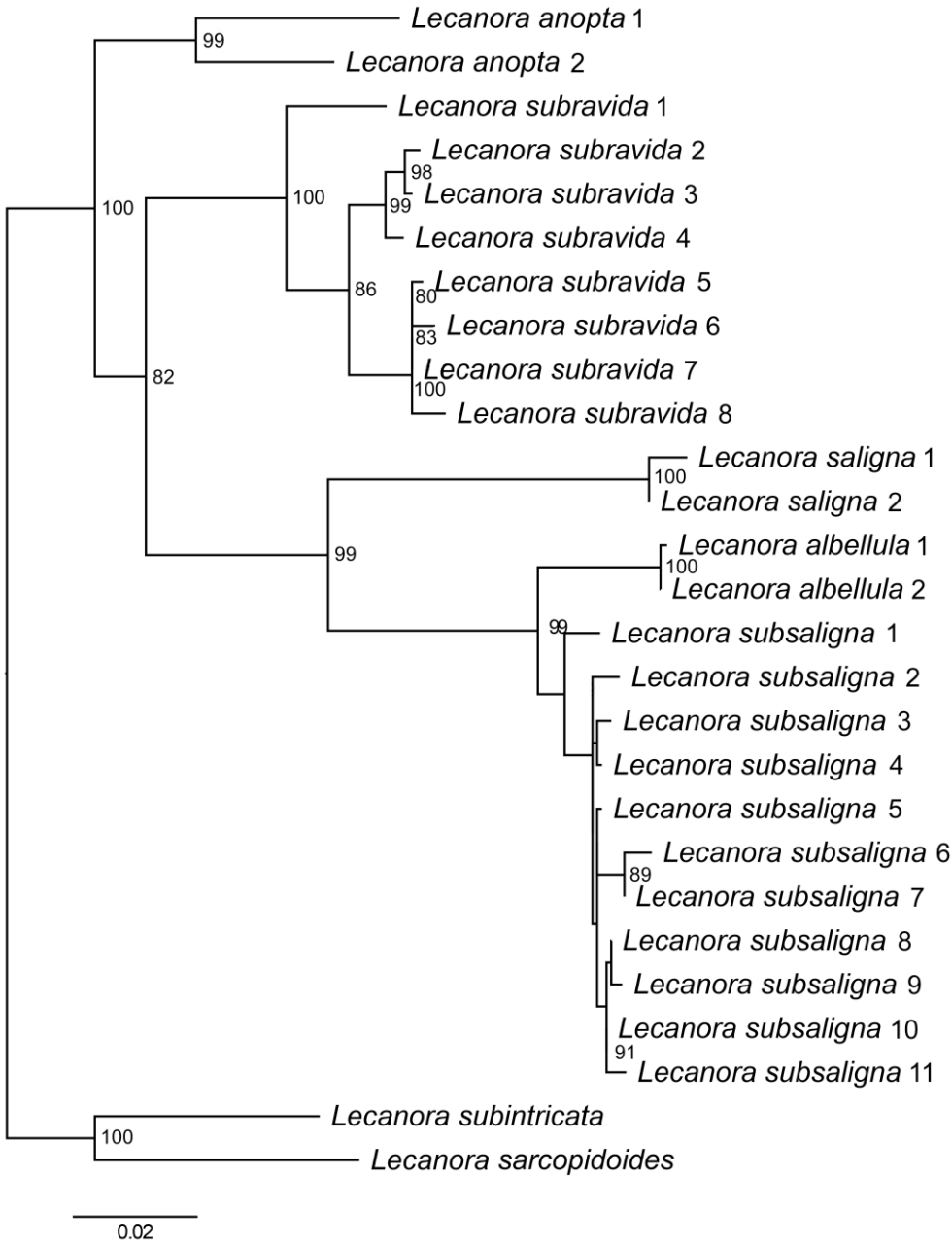

Figure 5. Maximum likelihood phylogenetic reconstruction (mtSSU + ITS) showing the phylogenetic position of Swedish specimens of *Lecanora subravida* and *L. subsaligna* among closely related species of the *L. saligna* group. Branch support is based on non-parametric bootstrap, with only support values > 75% shown.

usnic and pseudoplacodiolic acids). *Småland*: Aneboda par., vid Fiolenbäcken, stubbe [= on stump, probably of *Picea abies*], 1 July 1934, Y. Thulin (UPS L-175298; HPTLC: isousnic and usnic acids). *Uppland*: Enköping par., Enköping, July 1889, [on stump of *Picea abies*] T. Hedlund (UPS L-769822; HPTLC: isousnic and usnic acids); Frösunda par., about 1.4 km SW of Tarby, just E of the bend in the forest road, 59.65503°N 18.10494°E, elev. 25 m, on stump of *Pinus sylvestris* in clear-cut, 15 Jan. 2022, M. Svensson 4223 (UPS L-1060008; HPTLC: isousnic, usnic and pseudoplacodiolic acids; GenBank IDs OR773052 (mtSSU), OR773062 (ITS)); about 200 m NW of Örsta, 59.66515°N 18.13147°E, elev. 30 m, on stump of *Picea abies* in small clear-cut, 21 Mar. 2021, M. Svensson 3967 (UPS L-1060005; HPTLC: usnic and pseudoplacodiolic acids; GenBank IDs OR773051 (mtSSU), OR773061 (ITS)), M. Svensson 3965 (UPS L-1060007); about 200 m NW of Örsta, 59.66513° 18.13086°, elev. 27 m, on large stump of *Betula*, 11 Apr. 2011, M. Svensson 2050 (UPS L-1069055). Simtuna par., about 250 m WNW of Viktorsberg, just W of road 70, 59.79116°N, 16.82852°E, elev. 50 m, on stump of *Picea abies* in young managed coniferous forest, 4 May 2022, M. Svensson 4269 (UPS L-1060006); Övergran par., Biskops-Arnö, SE of Vasastugan, 59.66162°N 17.48747°E, elev. 6 m, on large decorticated log of *Ulmus glabra*, 24 Mar. 2022, M. Svensson 4237 (UPS L-1060004; HPTLC: usnic and pseudoplacodiolic acids; GenBank ID:s OR773053 (mtSSU), OR773063 (ITS)). *Värmland*: Karlskoga par., Silverhyttan, stubbe [= on stump, probably of *Picea abies*], 11 Sept. 1978, L.-E. Muhr 948 (UPS L-594276; HPTLC: isousnic, usnic and pseudoplacodiolic acids). *Västergötland*: Torsö par., Torsö, Kipplingsberg, July 1930, [on stump, probably of *Picea abies*,] E. P. Vrang (UPS L-769772; HPTLC: isousnic and usnic acids).

Lecanora subsaligna M. Brand & van den Boom **Fig. 6**

in van den Boom & Brand, *Lichenologist* **40:** 477 (2008). – Type: Belgium, Namur, SSW of Beauraing, WSW of Gedinne, 300 m, E of Croix Scaille, open area with many big stumps (K5.26), on *Vaccinium*, 500 m, 2 May 2000, P. & B. van den Boom 24408 (LG, holotype, not seen; isotypes, hb. van den Boom, hb. Brand, not seen).

New to Sweden. *Lecanora subsaligna* is similar to *L. saligna* although it typically has smaller thalli and apothecia, the latter measuring 0.2–0.5 mm diam. compared to 0.4–0.7 mm diam. *Lecanora subsaligna* can also be distinguished from *L. saligna* by its ellipsoid to oblong ascospores, which are narrower, 3.3–4.0 µm, versus 4.1–4.8 µm wide in *L. saligna*. According to van den Boom and Brand (2008), macropycnidia are the most commonly found pycnidial type and they contain macroconidia measuring 22–27 × 1.7–2.2 µm, which is significantly longer than those of *L. saligna* (6–8.1 × 2.0–2.4 µm,). In our material, however, leptopycnidia are by far the most common type, containing curved leptoconidia measuring 10–17.5 x 0.8–1(–2) µm, whereas leptoconidia are not reported from *L. saligna. Lecanora subsaligna* is also similar to *L. albellula,* to which it is also close phylogenetically (Fig. 5) However, the thallus of the latter species tends to be more verruculose in contrast to the rather thin and poorly developed thallus in *L. subsaligna*, the apothecia soon become strongly convex with a disappearing thalline excipulum and the disc is slightly to strongly whitish or yellowish pruinose. All but one of the specimens examined by HPTLC contain isousnic acid. The last one, LD 2276403, contained no detectable substances by HPTLC but that may have been caused by the very few and small apothecia available for analysis.

Lecanora subsaligna was described from several European countries including Belgium, the Czech Republic, Denmark, France, Germany, Italy, Luxembourg, the Netherlands, Norway, Portugal, and Spain (van den Boom & Brand 2008). One specimen from California was also reported. Despite the relatively broad distribution in Western Europe, only one specimen from Norway was previously reported and no material from Sweden was known. Here, we include one specimen from Norway, from the same district as in the original publication (Sogn og Fjordane), but from a new locality, as well as four Swedish localities from Torne Lappmark in the far north to Skåne in the south. The collections were made on bark or wood, including both processed wood and wood of standing trees in exposed situations.

Figure 6. *Lecanora subsaligna*, typical form with small, pale, plane to convex apothecia without pruina and a poorly developed thallus (LD-2278771). Bar 1 mm.

Specimens examined: **Norway**. *Sogn og Fjordane*: Sogndal, Kaupanger church, on wood of exposed *Quercus* below the church, 61.18412°N 7.23413°E, elev. c. 20 m, 14 June 2018, U. Arup, L18310 (LD 2276467; HPTLC: isousnic acid; Genbank ID: OR578380 (ITS)). **Sweden**. *Närke:* Kumla par., Hällabrottet, Hästhagsbrottet, on wooden fence S of the lake, exposed, 59.10821°N 15.23080°E, elev. c. 65 m, 21 Apr. 2017, U. Arup L17001 (LD 2276531; HPTLC: nil; Genbank ID: OR578381(ITS)). *Skåne*: Brunnby par., Kullaberg, c. 200 m E of the lighthouse, on bark of *Pinus* in exposed situation, elev. c. 65 m, 56.30105°N 12.45471°E, L. Salomon LS-K017 (LD 2276403; HPTLC: isousnic acid; Genbank ID: OR578382 (ITS)). Ramsåsa par., Kronoskogen, c. 680 m SE of Ramsåsa church, along the road, on *Betula* below S-facing slope, exposed, 55.55624°N 13.89363°E, 29 Sept. 2012, U. Arup L12041 (LD 2278771; HPTLC: isousnic acid; Genbank ID: OR578383 (ITS)). *Torne lappmark*: Jukkasjärvi par., Kurravaara, Kippiniemi, just NW of the air base, on *Salix caprea*, elev. c. 320 m, 2 Aug. 2011, U. Arup L11061 (LD 2278835; HPTLC: isousnic acid).

***Lecidea subhumida* Vain.** **Fig. 7**

Med. Soc. Fauna Fl. Fenn. **10**: 50 (1883). – Type: Finland, Lapponia Inarensis [=Inarin Lappi], Paatsjoki, supra lignum Pini, 1878, E. A. Vainio (TUR-V 23289, lectotype, designated by Printzen 1995 [ICN Art. 9.10], seen by MS; H9503555, isolectotype, not seen).

New to Sweden. *Lecidea subhumida* was described from Finland by Vainio (Wainio 1883), but not encountered again until Urbanavichus & Fadeeva (2018) reported the species as new to Russia from Murmansk. Subsequently, it was reported from one locality in Norway by Holien & Palice (2018), who also provided the first modern description of the species. It is characterised by a dark olive grey to dark brown thallus, convex, reddish brown apothecia, and one-celled, rather small ascospores (Holien & Palice 2018). In Norway, the species was found in an open old-growth, mixed *Pinus sylvestris* forest, where it occurred on a dead branch of a living *P. sylvestris* as well as on an old

Figure 7. *Lecidea subhumida* with dark reddish brown, strongly convex apothecia and a thallus of small, dark granules (UPS L-1060560). Bar = 1 mm.

stump. One of the Swedish localities (Mt. Sundsvalen) is apparently similar to the Norwegian one: an open, old-growth *P. sylvestris* forest rich in exposed, very old wood. Two of the other Swedish localities are open mires with scattered *P. sylvestris* trees and an abundance of very old snags. *L. subhumida* seems to prefer growing on very old and weathered wood. This substrate is very rare in managed forest areas and consequently, *L. subhumida* is red-listed (as Endangered, EN) in Norway (Artsdatabanken 2021). It is likely to be a species of conservation concern in Sweden too.

Specimens examined: **Sweden.** *Jämtland*: Kall par., about 200 m SE of Lillmelstjärnen, E of road 336, 63.72412°N 12.47646°E, elev. 430 m, on old weathered snag of *Pinus sylvestris* in open mire, 10 Aug. 2021, M. Svensson 4105a (UPS L-1060559); about 2.4 km SSW of Björkede, just E of the gravel road, 64.02079°N, 12.92606°E, elev. 445 m, on old weathered snag of *Pinus sylvestris* in open mire, 12 Aug. 2021, M. Svensson 4143b (UPS L-1060561); 850 m SSW of Hamborgsvallen, below the SE slope of Mt. Sundsvalen, 63.66338°N 12.80692°E, elev. 487 m, on weathered old snag of *Pinus sylvestris* in open old-growth *P. sylvestris* forest, 24 July 2022, M. Svensson 4319 (UPS L-1060560).

Lecidea toensbergii Haugan & Timdal

Graphis Scripta **30**: 55 (2018). – Type: Norway, Møre og Romsdal, Norddal, W slope of Skarfjellenden, 62.4275°N 7.6602°E, elev. 870 m, siliceous rock in late snow-bed, low alpine heath, 2010, R. Haugan 9156 (O L-165806, holotype, not seen).

New to Sweden. *Lecidea toensbergii* was described from Norway (Haugan & Timdal 2018) and is the only sorediate species in *Lecidea* sensu stricto described so far. Closely related to *L. leucothallina*, it differs primarily in the presence of soralia on the areole margins. Three sequenced specimens were recovered as a monophyletic clade within *L. leucothallina* s. lat. by Haugan & Timdal (2018). The Swedish specimen was collected in an overhang on the surface of an iron-rich boulder in an alpine locality in the westernmost part of Pite lappmark. The specimen is sterile but morphologically characteristic with marginal soralia on scattered areoles. Using HPTLC, we detected the presence of pannarin (soralia Pd+ orange), a lichen compound that is often present in both *L. leucothallina* and *L. toensbergii* (Haugan & Timdal 2018).

Specimen examined: **Sweden.** *Pite lappmark*: Arjeplog par., ridge along the NW part of the lake Ikesjávrre close to the border to Norway, 66.87628°N 16.03548°E, elev. 881 m, on iron-rich, schistose boulder, 25 Aug. 2017, M. Westberg, L. Hedenäs & G. Odelvik PL288 (UPS L-877039; HPTLC: pannarin).

Micarea coppinsii Tønsberg **Fig. 8**

Sommerfeltia **14**: 215 (1992). – Type: Norway, Sogn og Fjordane, Askvoll, W of Fure, S of Djupevika, hill 48, UTM grid ref.: 32V KP 8601 (map 1117 IV), alt. 20–48 m, on *Calluna vulgaris*, maritime, 4 Aug. 1989, T. Tønsberg 11781 (BG L-24059, holotype, not seen).

New to Sweden. The thallus of *Micarea coppinsii* consists of scattered to more contiguous convex areoles up to 0.3 mm that soon turn completely sorediate with farinose soredia 15–25 µm broad. The greenish hue of the thallus and soralia, the C+ rose reaction that quickly disappears, the small photobiont (4–7 µm diam.), as well as the presence of 5-methyl-hiascic acid, are key characteristics for identifying the species (Tønsberg 1992). While no apothecia have been observed in the Swedish specimens, they have been documented in other countries and are similar to those of *M. peliocarpa*, albeit smaller, up to 0.2 mm in diameter (Tønsberg 1992).

In all three Swedish localities, *Micarea coppinsii* was found growing directly on siliceous rocks and boulders situated close to the sea, in north-facing positions. The humidity level in all localities remains consistently high most of the year. While it has not been found on bark or wood in those sites, it may well occur on such substrates in proximity to the areas where it has been found on rocks.

Specimens examined: **Sweden**. *Skåne*: Brunnby par., Nabben Nature Reserve, c. 550 m SE of Stensnäs, on NE-facing, perpendicular siliceous rock above the beach, 56.26897°N 12.59784°E, elev. 6 m., 12 Oct. 2014 U. Arup L14086 (LD; Genbank ID: OR578384 (ITS); Östra Kullaberg, c. 415 m ESE of Laddörren, on exposed siliceous boulder in boulder field above the shore, 56.29291°N 12.51997°E, elev. c. 25 m, 10 Oct. 2021, U. Arup L21080 (LD; Genbank ID: OR581061 (mtSSU)); c. 270 m NNE of Håkull, on siliceous boulders in boulder field, N-facing slope in *Fagus* forest, 56.28955°N 12.52758°E, elev. c. 85 m., 9 Oct. 2022, U. Arup L22045 (LD).

Micarea isidioprasina van den Boom, Guzow-Krzem., Sérus. & Kukwa **Fig. 9**

in Guzow-Krzemińska et al., *MycoKeys* **57**: 18 (2019). – Type: Poland, Równina Bielska, Białowieża Primeval Forest, Białowieża National Park, forest section no 256, Pino-Quercetum, on wood of log, 21 Aug. 2015, M. Kukwa 17367a & A. Łubek (holotype UGDA, not seen).

New to Fennoscandia. *Micarea isidioprasina* is a species of the *M. prasina* group, characterised by a green olive to green thallus with granules/areoles that develop into isidia. The isidia are often abundantly branched and coralloid, forming a more or less continuous layer over the substrate when well developed (Guzow-Krzemińska et al. 2019). *M. isidioprasina* has been described as rarely forming apothecia. The Swedish specimen, which is sterile, forms scattered areoles developing into

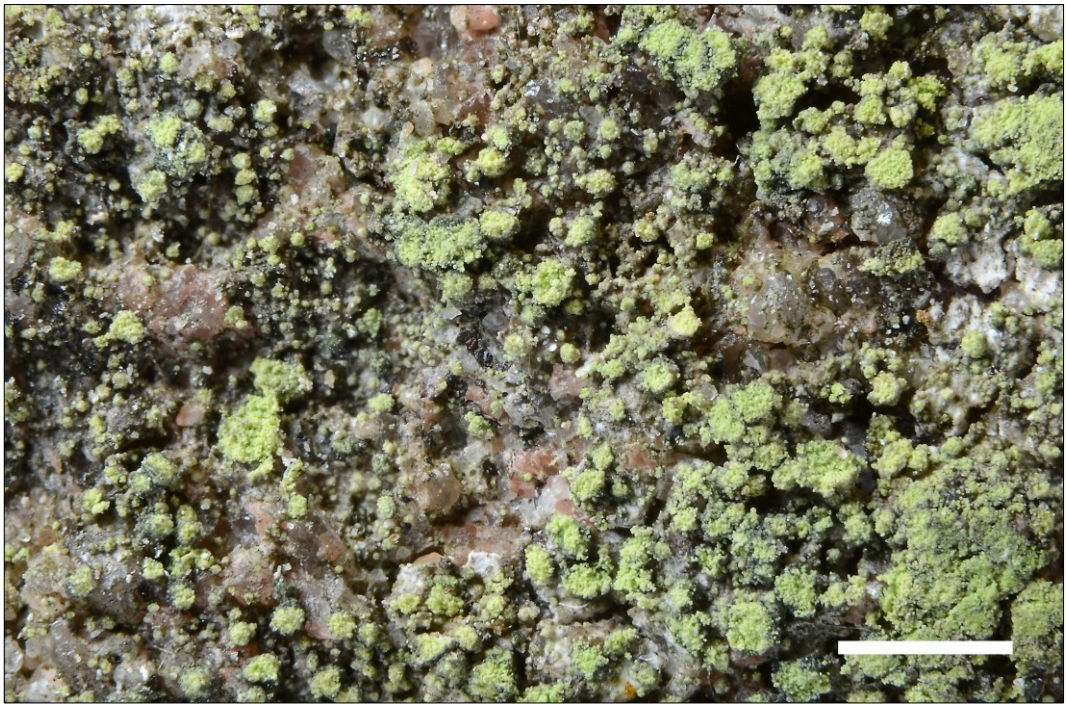

Figure 8. *Micarea coppinsii* with small greenish, scattered to contiguous soralia are typical of this species (Arup L21080, LD). Bar 1 mm.

isidia, suggesting that the specimen consists of young thalli. When fertile, the species have pale grey to grey-beige apothecia.

Three other species of the same genus form similar isidiate thalli: *M. aeruginoprasina*, *M. atroviridis* (syn. *M. nigra* sensu Guzow-Krzemińska et al. 2019) and *M. pauli*. *M. pauli* is the only one of these that seems to have an overlapping distribution with *M. isidioprasina*, but the latter is set apart by the presence of micareic acid instead of methoxymicareic acid. When fertile, *M. aeruginoprasina* and *M. atroviridis* differ from *M. isidioprasina* in the colouration of apothecia: *M. aeruginoprasina* has pale cream to pale brown or aeruginose apothecia (often all colours in the same apothecium), whereas M. *atroviridis* has dark greyish to black apothecia. The former two species are so far only known from the Azores and continental Portugal, respectively (Guzow-Krzemińska et al. 2019).

Micarea isidioprasina grows on decomposing wood and acidic bark. The Swedish specimen was collected on bark of *Quercus robur* in a mature (but not old growth) managed broad-leaved deciduous forest.

Specimen examined: **Sweden.** *Halland*: Breared par., Simlångsdalen, 500 m NW of Skällås, 56.70985°N 13.11242°E, on *Quercus robur* in shady forest, 19 Oct. 2022, O. Hammarström (UPS L-1062578; GenBank ID: OR773055 (mtSSU)).

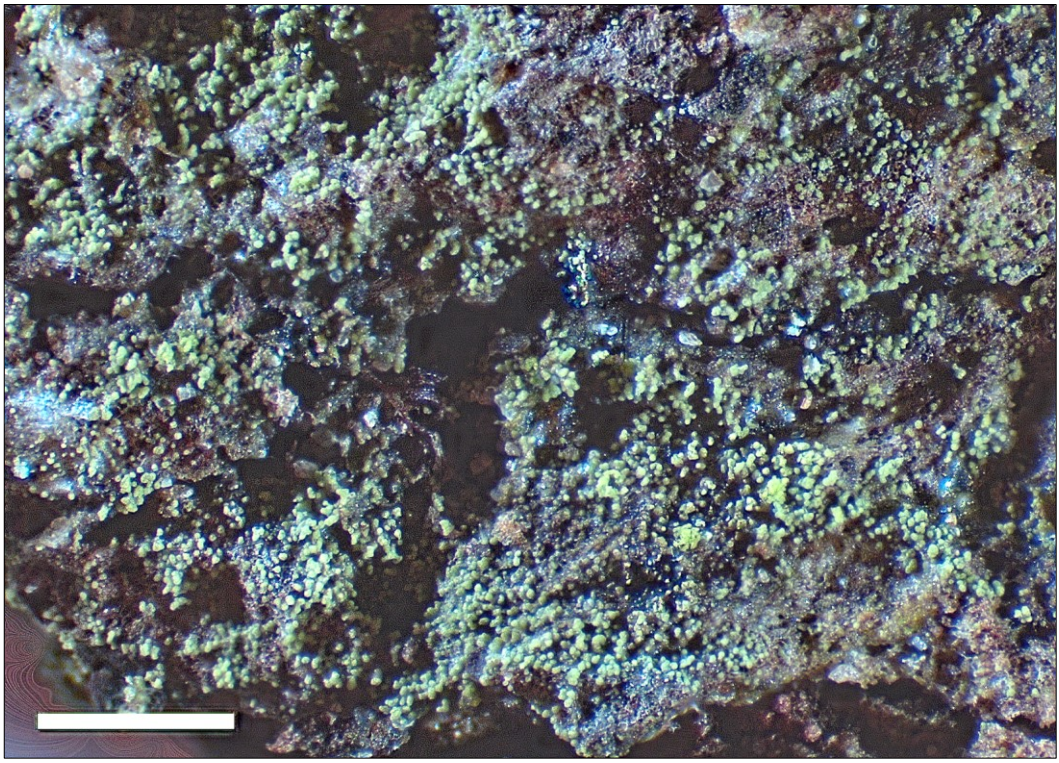

Figure 9. *Micarea isidioprasina*, sterile thallus with small, green granules developing into isidia-like structures (UPS L-1062578). Bar = 1 mm.

***Micarea microsorediata* M. Brand, van den Boom, Guzow-Krzem., Sérus. & Kukwa**

in Guzow-Krzemińska et al., *MycoKeys* **57**: 19 (2019). – Type: Poland, Wysoczyzna Żarnowiecka, Pużyckie Łęgi nature reserve, 54°38'N 17°51'E, Circaeo-Alnetum, on wood of log, 12 Aug. 2015, M. Kukwa 17053 (UGDA, holotype, not seen).

New to Fennoscandia. *Micarea microsorediata* is a species of the *M. prasina* group, characterised by a sorediate thallus with delimited or diffuse to confluent soralia with green or partially bluish soredia produced from the thallus areoles (Guzow-Krzemińska et al. 2019). It has white and immarginate apothecia when mature according to Guzow-Krzemińska et al. (2019) but is rarely found fertile (Kantelinen et al. 2022). The Swedish specimen lacks apothecia and is only sorediate.

Both Guzow-Krzemińska et al. 2019 and Kantelinen et al. (2022) noted that *M. microsorediata* mostly occurs as a corticolous lichen, in microhabitats where only few other lichen species (e.g. *Cladonia* spp. and *Lepraria* spp.) co-occur. *Micarea microsorediata* predominantely grows on acidic bark of various trees (Guzow-Krzemińska et al. 2019). Similarly, in Sweden the species was found on acidic bark of *Picea abies* in a shaded plantation where only a few lichens (*Lepraria* spp., *Cladonia* spp. and *Coenogonium pineti*) inhabit similar substrates.

Specimen examined: **Sweden**. *Skåne*: Dalby par., Skrylle, 55.68360°N, 13.36324°E, elev. 100 m, on *Picea abies* in spruce-dominated forest (old spruce plantation), 30 Dec. 2022, R. Vicente (UPS L-1076512; GenBank ID: OR773058 (mtSSU)).

Micarea pseudotsugae van den Boom, Guzow-Krzem. & Kukwa

Plant Fung. Syst. **65**: 197 (2020). – Type: The Netherlands, Gelderland Prov., Apeldoorn, NW of city, W of Palace Het Loo, small *Pseudotsuga* forest with trees up to 1.2 m in diam., along trail, 52°13.9′N 5°56.4′E, grid ref. 33.13.43, on bark of *Pseudotsuga* sp., 5 May 2019, P. & B. van den Boom 58480 (UGDA, holotype, not seen).

New to Fennoscandia. *Micarea pseudotsugae* is a species of the *M. prasina* group, characterised by a continuous thallus, adnate, darkly pigmented apothecia, and a secondary chemistry with methoxymicareic acid (van den Boom et al. 2020). Unlike other species of the group with dark apothecia, *M. pseudotsugae* does not have the K+ violet pigment Sedifolia-grey in its apothecia, but instead the K– Superba-brown (van den Boom et al. 2020). *M. pseudotsugae* was described from a few specimens collected in Belgium and the Netherlands, all of which were collected on bark or (in one case) on a stump of *Pseudotsuga*. Most of the Swedish finds were made in a rather small area within the Kullaberg nature reserve in southwesternmost Sweden. Here, the species is apparently common and inhabits wood of *Quercus petraea* or *Q. robur* and wood of *Fraxinus excelsior*, but also occurs on soil and humus on the ground. The specimens fit the description by van den Boom et al. (2020) and we confirmed the identity by obtaining mtSSU sequences from two of them.

Specimens examined: **Sweden.** *Skåne*: Brunnby par., Kullaberg, 240 m NNW of the light house, on moist soil on vertical siliceous rock above the shore, 56.3029°N 12.4500°E, elev. 5 m, 15 Oct. 2017, U. Arup L17230 (LD); 345 m ESE the lighthouse, on soil and humus in NW-facing slope, fairly exposed, 56.2984°N 12.4549°E, elev. 50 m, 10 Oct. 2018, U. Arup L18104 (LD); about 70 m WNW of the cave of Fredrik VII, 56.29987°N 12.48053°E, elev. 30 m, on wood of still living *Quercus petraea*, 12 Nov. 2022, M. Svensson 4532 (UPS L-1062069; GenBank ID: OR773056 (mtSSU)); about 100 m WNW of the cave of Fredrik VII, 56.30010°N 12.47993°E, elev. 28 m, on stump of *Quercus*, 12 Nov. 2022, M. Svensson 4535 (UPS L-1062070); Josefinelust, close to the shore NW of the stairs, 56.29981°N 12.48231°E, elev. 2 m, on wood in hollow of living *Fraxinus excelsior*, 13 Nov. 2022, M. Svensson 4547 (UPS L-1062071; GenBank-ID: OR773057 (mtSSU)); Kullaberg, 56.29122°N 12.48494°E, oak-dominated forest in S-facing slope, on base (shadowed, N-facing) *Quercus*, 24 Mar. 2023, R. Vicente (UPS L-1075775). Perstorp par., 2 km N of Perstorp, 56.15831°N 13.39317°E, on mature *Quercus robur*, 15 Oct. 2022, O. Hammarström (UPS L-1075773).

Micarea substipitata Palice & Vondrák

in Vondrák et al., *Preslia* **94**: 164 (2022). – Type: Russia, Krasnodar Territory, Sochi, Estosadok, Mt. Tabunnaya [2351], fir-beech primeval forest on WSW descending crest of 'Psekhano' along a tourist trail E of the Olympic-games ski-complex 'Pichtovaya polyana', 43.69722°N 40.35694°E, on dry decaying wood of a moribund snag of *Abies nordmanniana*, alt. 1670–1700 m, 27 June 2019, Z. Palice 27411 (PRA-ZP27411, holotype, seen by ZP; UPS L-1060140, isotype, seen by ZP and MS).

New to Fennoscandia. *Micarea substipitata* was recently described by Vondrák et al. (2022), who reported the new species from the Czech Republic, Russia, Slovakia, and Ukraine. It is characterised by small (0.15–0.3 mm diam.), pale apothecia, numerous, pale and short-stipitate pycnidia, and a spherical to ellipsoid (5–6 µm, or ca 8–9 × 5–6 µm), *Stichococcus*-like photobiont (Vondrák et al. 2022; our own measurements). *M. substipitata* is perhaps most likely to be confused with *Biatora veteranorum*, which has similar, pale pycnidia. In *B. veteranorum* however, these are pruinose, which is also detectable as K+ solvable granules in microscopical sections (Vondrák et al. 2022). In addition, *B. veteranorum* does not have an ellipsoid photobiont.

Most of the localities reported for *Micarea substipitata* by Vondrák et al. (2022) were in old-growth forests, and when occurring outside such areas, it still preferred old parklands or veteran trees left in managed forests. This is in contrast to the Swedish findings, the majority of which are

from young, secondary woodland. Three of the Swedish collections were made at the same locality, which is a rather open swamp forest at the edges of a drained, former lake. The draining was undertaken in pursuit of new arable land, but this was not successful, and the area has been left to itself for decades. Few trees are old, however. All finds of *M. substipitata* here were made at the base of stumps, close to periodically wet ground. The fourth locality is a former arable field that has slowly been overgrown by deciduous trees. The stump where *M. substipitata* was found was in a rather advanced state of decay and situated close to a poorly maintained agricultural ditch, again implying humid and periodically wet conditions. The final locality is a sparse subalpine birch forest by a lake in northernmost Sweden.

Specimens examined: **Sweden.** *Torne lappmark*: Karesuando par., c. 5 km S of Karesuando, north side of the lake Hirvasjärvi, 68.39183°N 22.51960°E, elev. 440 m, on small *Betula* stump, 29 Aug. 2019, M. Westberg, G. Odelvik, L. Hedenäs & A. Jörgensen KAR193 (UPS L-1067436). *Uppland*: Frösunda par., about 650 m SW of Finnberga, NW part of Mörtsjön, 59.64755°N 18.16523°E, elev. 12 m, at the base of standing dead *Betula pubescens* in open swamp forest, 3 Apr. 2022, M. Svensson 4250 (UPS L-1060126); about 650 m SW of Finnberga, NW part of Mörtsjön, 59.64770°N 18.16595°E, at the base of stump of *Betula pubescens* in open swamp forest, 3 Apr. 2022, M. Svensson 4252 (UPS L-1060130); about 650 m SW of Finnberga, NW part of Mörtsjön, 59.64879°N 18.16545°E, at the base of stump of *Picea abies* in swamp forest, 3 Apr. 2022, M. Svensson 4256 (UPS L-1060132); Skepptuna par., about 500 m ESE of Äspesta, just W of the main ditch ('gravdike'), 59.66844°N 18.11445°E, elev. 20 m, on old stump of *Betula pubescens* in overgrown, former agricultural field, 17 May 2022, M. Svensson 4280 (UPS L-1060134).

Miriquidica majae Tønsberg **Fig. 10**

in Tønsberg & Andersen, *Graphis Scripta* **31**: 16 (2019). – Type: Norway, Nordland, Grane, Majavatn, the NW-facing slope of Mt. Litlfjellet E of/uphill from Majavatn Railway Station, 65.16496°N 13.38216°E, elev. 425 m, on trunk of mature *Picea abies* of the petticoat type, in steep slope with old-growth spruce forest, 26 June 2017, T. Tønsberg 47166 (BG L-102205, holotype, not seen).

New to Sweden. *Miriquidica majae* was recently described from Norway, (Tønsberg & Andersen 2019) and is also known from Russia (Urbanavichus et al. 2021). The species is recognised by its mostly discrete soralia with very fine soredia (measuring 10–20 µm diam.) occurring on bark of *Picea abies.* The soralia react KC+ fleetingly violet (lobaric acid) but have negative reactions with K and C separately. *Miriquidica majae* bears some resemblance to *Caloplaca lucifuga*, although lacking the orange tinge of the soralia caused by anthraquinones (K+ purple). The latter species also typically grows on *Quercus* and has never been found on *Picea abies*. *Pycnora sorophora*, which is often found in the same habitat as *M. majae*, has larger soredia and more confluent soralia and reacts K+ orange and C+ red (alectorialic acid). The distinction from *Myochroidea porphyrospoda*, which also contains lobaric acid, is described in detail by Tønsberg & Andersen (2019). All Swedish specimens of *M. majae* lack apothecia.

In Norway, the species appears to belong to the Trøndelag phytogeographical element and is known mainly from a small area around Lake Majavatnet at the border between Nordland and Nord-Trøndelag with a few outliers to the north and south (Artskart 2023). Here, it occurs at the bases of petticoat *Picea abies* trees, mainly on coarse bark and in old-growth *Picea abies* forests (Tønsberg & Andersen 2019). Similarly, the Swedish specimens were found on bark of *Picea abies* in old-growth forests dominated by *Picea abies*. The known Swedish localities are situated close to the Norwegian border in the suboceanic areas of western Jämtland. The species is red listed (as Vulnerable, VU) in Norway (Artsdatabanken 2021) and may likewise be a species of conservation concern also in Sweden.

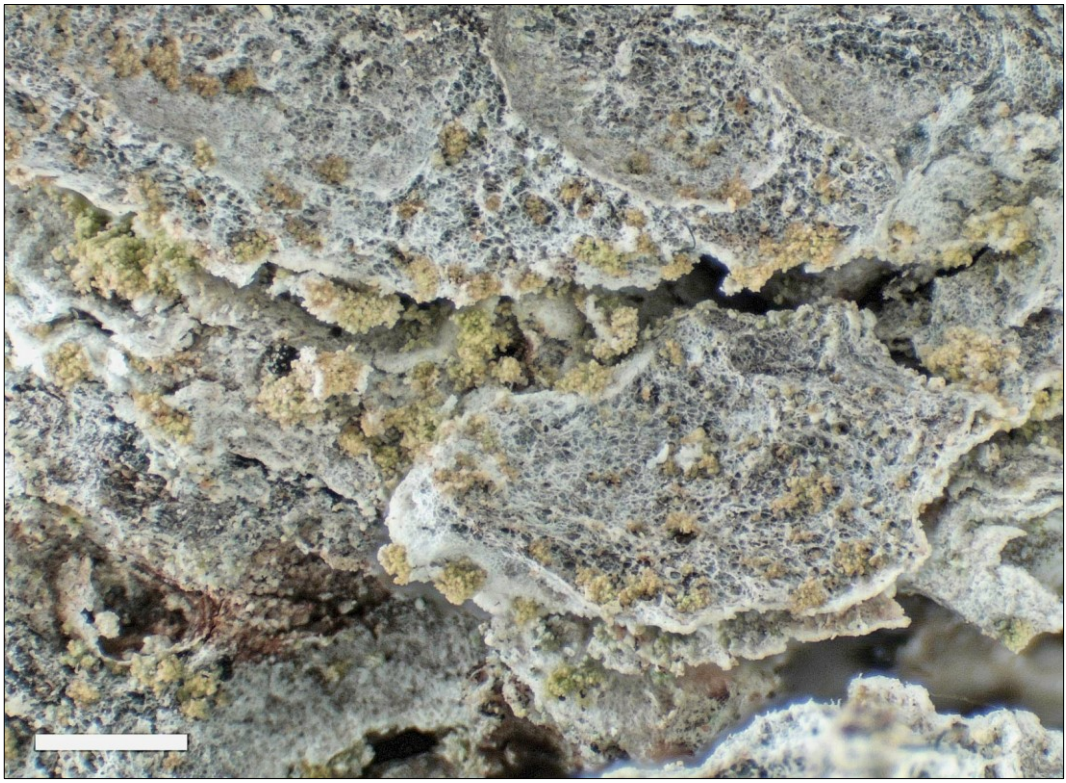

Figure 10. *Miriquidica majae*, sterile thallus with discrete soralia with fine soredia (UPS L-1051131). Bar = 1 mm.

Specimens examined: **Sweden.** *Jämtland*: Frostviken par., Jormlien, c. 850 m NNW of Storliden, the valley Lerdalen, along the river Lerdalsälven, 64.73586°N 13.93338°E, elev. 415 m, on bark of *Picea abies*, 14 Aug. 2021, M. Westberg JMT479 (UPS L-1051131; HPTLC: lobaric acid); 64.73489°N 13.43479°E, on bark of old spruce in leafrich forest close to a stream, 25 July 2023, O. Hammarström (UPS L-1093519); WSW of Jormlien, NW slope of Mt Storklumpen, 64.72374˚N 13.89338˚E, elev. 523 m, on *Picea abies*, bark near the base of the tree, 15 Aug. 2021, M. Westberg JMT491 (UPS L-1051132; HPTLC: lobaric acid); Kall par., Skäckerfjällen Nature Reserve, c. 1.5 km NW of the farm Äsingen, 100 m, SSE of the tarn Lilltjärnen, 63.76349°N 12.40633°E, elev. 421 m, on *Picea abies*, 9 Aug. 2021, M. Westberg JMT335 (UPS L-1040719).

Normandina chlorococca (Leight.) Orange **Fig. 11**

Lichenologist **54**: 374 (2022). *Verrucaria chlorococca* Leight., *Lich.-Fl. Great Brit. ed. 3*: 484 (1879). *Arthopyrenia chlorococca* (Leight.) A.L.Sm., *Monogr. Brit. Lich. vol. 2*: 329 (1911). *Thelidium chlorococcum* (Leight.) Keissl., *Rabenh. Krypt.-Fl., Aufl. 9 (1.2)*: 190 (1937). *Sphaerulina chlorococca* (Leight.) R. Sant. in Henssen, *Lichenology: Progress and problems*: 129 (1976). *Lauderlindsaya chlorococca* (Leight.) Diederich & Sérus., *Lichenologist* **25**: 99 (1993). – Type: [Great Britain, England, Buckinghamshire (VC 24) or possibly Oxfordshire (VC 23),] on ash near Stokenchurch, highest point of Chiltern Hills, Feb. 1876, C. de Bois Larbalestier (BM 001107462, lectotype, designated by David & Hawksworth 1989, not seen).

Thelidium corticola H. Magn., *Bot. Notiser* **108**: 296 (1955). – Type: Sweden, Västergötland, Kville par., the churchyard, on *Fraxinus*, 25 July 1934, A. H. Magnusson 14436 (UPS L-163532, holotype, seen by SE; UPS L-163533, isotype, seen by SE).

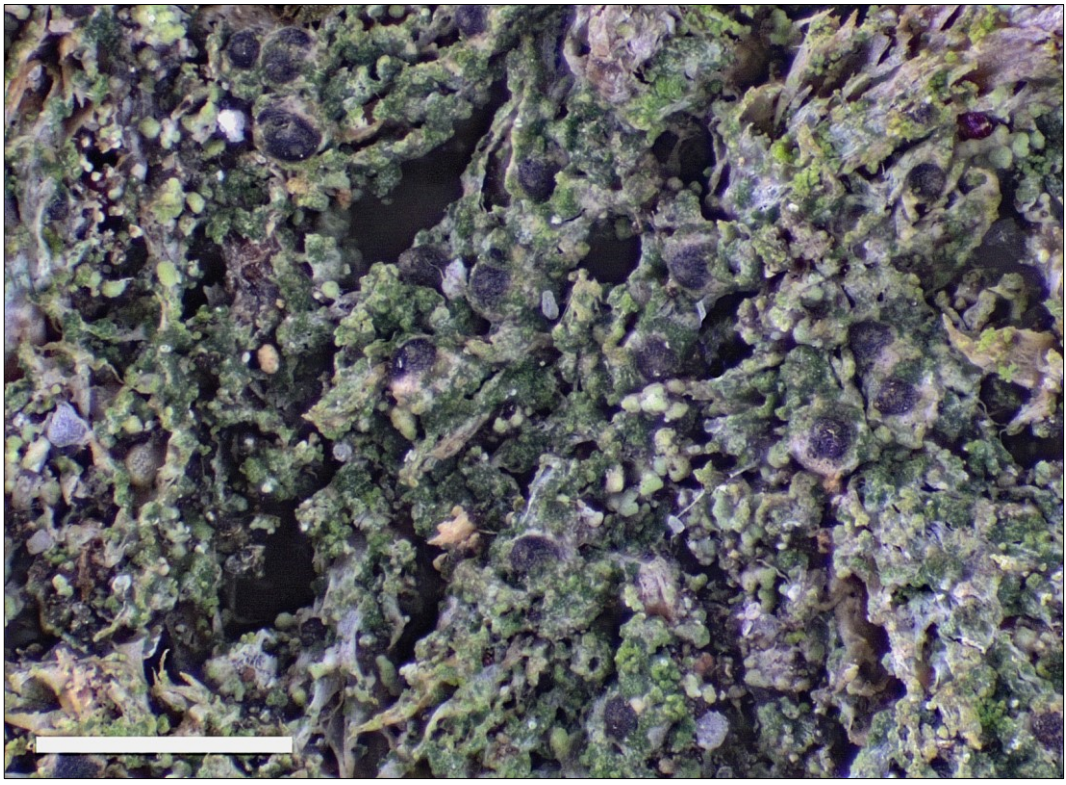

Figure 11. *Normandina chlorococca*, green thallus of convex granules and scattered black perithecia (UPS L-1047330). Bar = 1 mm.

New to Sweden. *Normandina chlorococca* was distinguished from *N. acroglypta* (Norman) Aptroot ex V. Wirth by Orange (2022) on account of a phylogeny based on ITS and mtSSU sequences, differences in secondary chemistry, and the lobation of the areoles. *Normandina acropglypta* contains two unidentified terpenoids, none of which is zeorin, whereas *N. chlorococca* contains zeorin or no lichen substances at all. Young areoles were described as 'subsquamulose' in *N. acroglypta*, whereas they supposedly form 'convex granules without any subsquamulose appearance' in *N. chlorococca*. However, we prefer to describe young areoles in *N. acroglypta* as 'effigurate' rather than 'subsquamulose', as the lower side of the areoles is generally attached to the substrate (Fig. 12**)**. The thallus in *N. chlorococca* is variable and can be anything from almost smooth to warted from the fusion of tiny granules. Effigurate areoles, like in *N. acroglypta*, are sometimes also found in young thalli of *N. chlorococca*. When young thalli are effigurate, the two species can be distinguished by the width of the terminal lobes, which are 25–60 µm wide in *N. chlorococca* but 60–250 µm wide in *N. acroglypta*. In addition to the coarser lobes in *N. acroglypta* and the secondary chemistry, we have observed that the non-sorediate thallus appears to be pale grey in *N. acroglypta* and dull grey-green in *N. chlorococca*. Although specimens of *N. chlorococca* are often sterile, there is also a difference between the species in their mature perithecia. The ostiole in perithecia of *N. acroglypta* appears in a distinct depression, whereas there is no or only a very slight depression around the ostiole in the perithecia of *N. chlorococca*. The differences in thallus colour and

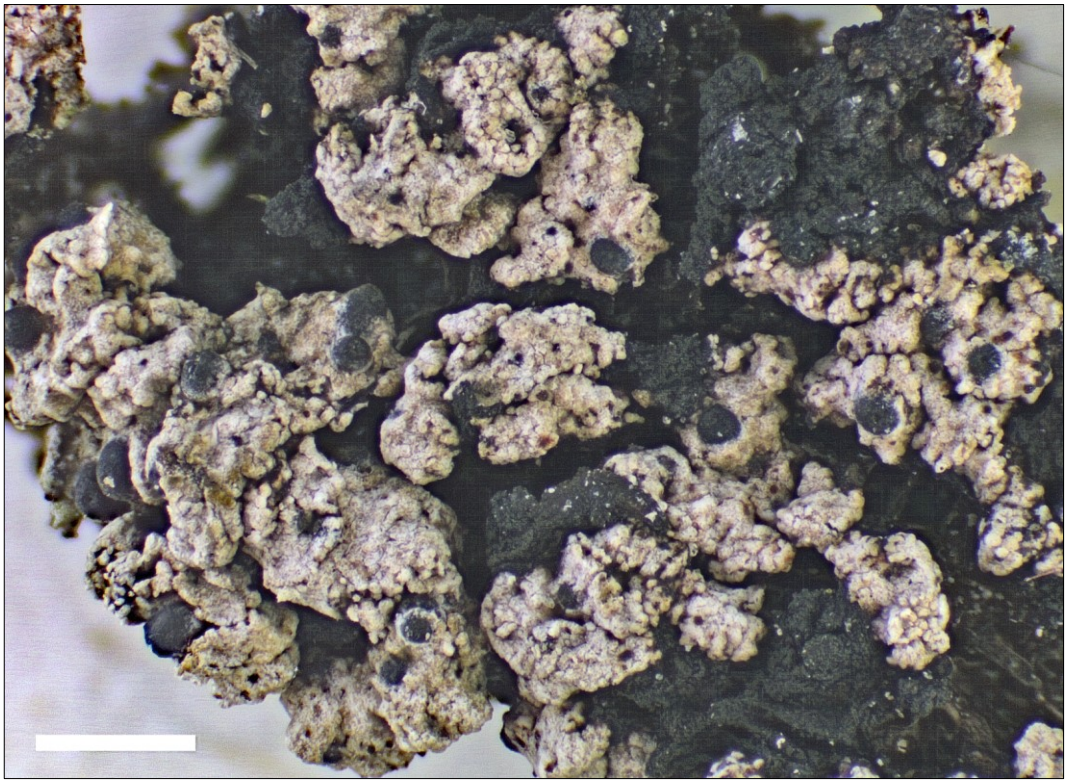

Figure 12. *Normandina acroglypta*, pale thallus with effigurate areoles and scattered black perithecia (UPS L-124838). Bar = 1 mm.

perithecium morphology were first pointed out by Magnusson (1955). He was unaware of any earlier names for *N. chlorococca* and described the taxon as *Thelidium corticola*, which he compared to *N. acroglypta* (as *Thelidium acroglyptum*). *Thelidium erichsenii* Keissl. (Keissler 1892) and *Polyblastia armericola* Walt.Watson (Watson 1939) constitute further synonyms of either *N. chlorococca* or *N. acroglypta* (David & Hawksworth 1989).

Orange (2022) described *N. acroglypta* as occurring 'over rock' and *N. chlorococca* 'over bark'. However, all three Norwegian specimens of *N. acroglypta* included in his phylogeny occurred over bark. Among the Swedish specimens of *N. chlorococca* studied here, most occur over bark, either directly on the bark, on bryophytes (often *Frullania*), in cyanobacterial mats, or on cyanolichens (often *Parmeliella triptophylla* or *Nephroma* spp.). There are two specimens inhabiting *Vahliella leucophaea* over rock. Whereas *N. chlorococca* appears to be widespread in Sweden, *N. acroglypta* is currently known only from a single site, where it occurs in cyanobacterial mats overgrowing decaying moss tufts on a N-facing, steep rock at lake Vättern, only a few metres above the waterline.

An earlier lectotypification by R. Santesson in Henssen (1976) is invalid, as the selected specimen (BM 001107500, discussed by Swinscow 1963) is not part of any gathering included in Leighton's protologue (Leighton 1879).

Selected specimens examined (*Normandina chlorococca*, Swedish specimens only, one specimen per province): **Sweden.** *Dalarna*: Leksand par., Draggberget, NE-exposed slope, 60.63°N 14.70°E, elev. 270 m, on thallus of

Parmeliella triptophylla on *Salix caprea* at small scree below rocks, 19 Oct. 1997, J. Hermansson 8223 (UPS L- 093039). *Dalsland*: Skållerud par., Östeboudden, c. 1.3 km E of Upperud, 58.80774°N 12.45940°E, on *Populus tremula*, 5 May 2022, M. Westberg & R. Isaksson (UPS L-1039569). *Gotland*: Rone par., Oggesänget wooded meadow, c. 500 m S of Jaksarve and c. 1.0–1.4 km W of Rone church, 57.20°N 18.42°E, elev. 25 m, on *Fraxinus excelsior*, 28 Aug. 1990, A. Nordin, R. Sundin & G. Thor 1175 (UPS L-161827, HPTLC: nil). *Gästrikland*: Hedesunda par., Ingevaraängen 1.5 km ENE of Gysinge, ca 50 m SE of the road, old open forest, 60.28°N 16.92°E, elev. 55 m, on a deciduous tree, 27 Mar. 1993, G. Thor 11401 (UPS L-173857). *Halland*: Falkenberg par., Asige, 56.86°N 12.84°E, elev. 160 m., på gammal bokstam ovanpå mossor (*Frullania* och *Isothecium*), 31 Mar. 1986, T. Hallingbäck (UPS L-173854). *Jämtland*: Åre par., Tännforsen, close to the waterfall, 63.48°N 12.73°E, on twigs of *Picea*, 25 July 1993, R. Santesson 33536a (UPS L-776359, HPTLC: nil). *Lycksele lappmark*: Tärna par., Lake Överuman, Strimasund, along the path towards the sami camp Gausjosjön, in subalpine *Betula*-dominated forest, 66.05°N 14.87°E, elev. 520 m, on *Fuscopannaria leucophaea* on rock, 15 June 2003, H. Döring & M. Wedin 1215 (UPS L-163778, HPTLC: zeorin). *Småland*: Visingsö par., the *Morus nigra* plantation E of the road to Näs, c. 2.5 km SW of the church Brahekyrkan, 58.02°N 14.32°E, on old *Morus nigra*, 24 Aug. 1990, G. Thor 9783 (UPS L-163586). *Uppland*: Väddö par., calcareous fen close to Skottviken, N of Nothamn, 60.03°N 18.83°E, elev. 10 m, on trunk of *Fraxinus excelsior*, 23 Sept. 1996, A. Nordin 4452 (UPS L-084817, HPTLC: zeorin). *Värmland*: Södra Finnskoga par., Hebbomägg, c. 6 km NW of Bjurberget, in old spruce forest along the north side of the brook Hånnikobäcken, 60.5778°N 12.6481°E, elev. 450 m, on *Parmeliella triptophylla* on *Salix caprea*, 22 July 2015, B. Owe-Larsson 10064b (UPS L-735724). *Västergötland*: Håcksvik par., Boderås, 57.35°N 13.12°E, elev. 150 m, over mosses on trunk of *Populus tremula*, 14 Oct. 1995, A. Nordin 4367 (UPS L-072545). *Västmanland*: Nora par., 16 km NNE of Enåker church, the peninsula Täljkniven at the river Dalälven, mixed coniferous-deciduous forest, 60.18°N 16.72°E, elev. 60 m, on *Populus tremula*, 28 Mar. 1993, G. Thor 11409 (UPS L-173858). *Öland*: Algutsrum par., Törnbotten, 1200 m Ö om byn, ca. 150 m N om markvägen, mosaikartad hasselrik utmarksskog, 56.67°N 16.57°E, på grov vildapel, 20 Apr. 1994, U. Arup, S. Ekman & T. Knutsson 94-066 (UPS L-724150). *Östergötland*: Kisa par., Visskvarn, blandlövskog invid bäck, 57.89°N 15.38°E, på *Ulota crispa* på ask, 10 May 2014, T. Knutsson 2014-120 (UPS L-689833).

Specimens examined (*Normandina acroglypta*): **Norway.** *Nordland*: Gildeskål, Indyr [= Inndyr], 28 June 1867, J. M. Norman (UPS L-085532, syntype), undated, J. M. Norman (UPS L-163530). **Sweden.** *Östergötland*: Västra Tollstad par., rocky shore at Lake Vättern below Berghem and Granviken S of Ödeshög, 58.20°N 14.60°E, elev. 100 m, on mosses on steep rock facing N c. 5 m above water level, 2 Nov. 2002, A. Nordin 5557 (UPS L-124838; HPTLC: two unidentified terpenoids).

***Protoblastenia calvella* Kainz & Rambold** **Fig. 13**

Biblioth. Lichenol. **88**: 290 (2004). – Type: Austria, Tirol, Tuxer Voralpen, Steinach am Brenner, forest track from Mauern to Bendlstein, west exposed [cited as "climbing trail from Mauern to Bendlstein, on calcareous outcrops beside forestry road, at more or less vertical western side, 47°06'N 11°25'E, 1400 m.a.s.l." by Kainz & Rambold (2004)], 10 Oct. 2002, C. Kainz 967 (M 0066802, holotype, seen by SE and LEE).

New to Sweden. *Protoblastenia calvella* was described by Kainz & Rambold (2004), who provided ITS sequences from four specimens and characterised the species morphologically by "a thin but distinct episubstratic thallus, medium-sized... and mostly strongly convex, often brown coloured apothecia". The epithet was chosen because 'the apothecia... look like tiny variants of those by *P. calva*…'. Wirth et al. (2013) interpreted the species as a 'kryptische [Art], ohne molekulargenetische Untersuchung nicht sicher bestimmbar', whereas Nimis et al. (2018) briefly characterised it as 'a species resembling *P. calva*, but with a distinctly epilithic thallus and smaller apothecia (less than 1 mm in diam.)'. According to our own studies of the Swedish material as well as the German and Austrian material reported by Kainz & Rambold (2004), *P calvella* can be recognised by the continuous epilithic thallus, starting as a thin film without cracks but becoming cracked or even areolate with age, by the apothecia that start out as orange to brown-orange and flat or moderately

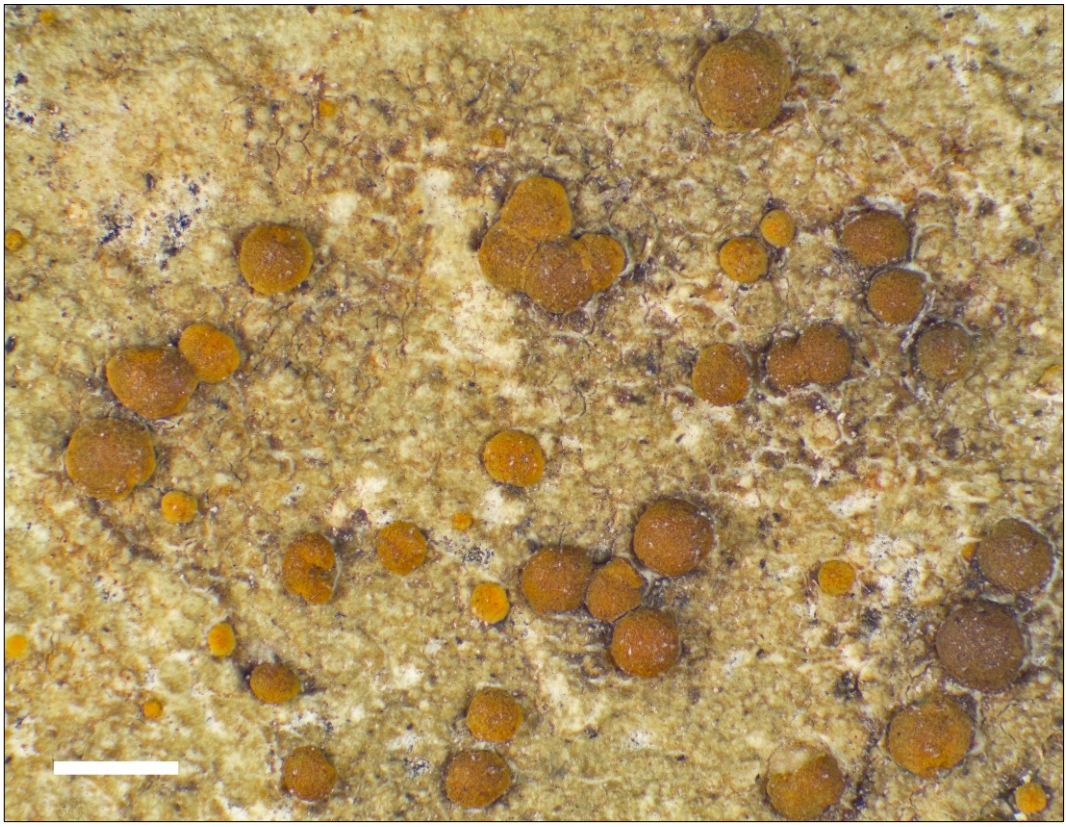

Figure 11. *Protoblastenia calvella*, with a thin, continuous epilithic thallus and small apothecia (M 0066803). Bar = 1 mm.

convex but soon become more or less strongly convex and brown-orange to dark red-brown, and a pale hypothecium that occasionally contains small amounts of a pink or brownish pigment. The species is morphologically very similar to *P. rupestris*, although that species tends to have a consistently and finely areolate thallus, less convex apothecia that may assume a dirty greenish hue with age but do not become dark red-brown. Morphological differences are subtle, however, and complicated by the presence of a third, probably undescribed species widespread in the mainland of southern Sweden. Furthermore, the species informally recognised as '*P. pseudoincrustans*' by Kainz & Rambold (2004) is also morphologically very similar to *P. rupestris* and *P. calvella* but has so far not been encountered in northern Europe.

Protoblastenia calvella has been formally reported from Austria, Germany, and Finland (Kainz & Rambold 2004, Nimis et al. 2018, Pykälä 2023). In addition, the species has been indirectly reported from Croatia, based on ITS sequence HQ650618 (Schmull et al. 2011, Gaya et al. 2012), and from western Norway (BOLD, https://v3.boldsystems.org, and the Norwegian Lichen Database 2, https://nhm2.uio.no/lav/nld2/, both accessed on 29 Sept. 2023). The species appears to primarily inhabit shaded limestone (Kainz & Rambold 2004, Nimis et al. 2018) from "the lowlands and up to 1800 m altitude" (Kainz & Rambold 2004). At the Swedish locality, *P. calvella* inhabited a vertical, weathered surface of concrete of a ruin, a few decimetres above the ground, at the bottom of a former

Figure 12. *Protoblastenia szaferi*, with vividly orange apothecia surrounded by a distinct crack (UPS L-784109). Bar = 1 mm.

kaolin quarry. The surface is NE-facing, partly shaded by vegetation, and impregnated with particles from the ground, which consists of wet, calcareous clay. Neighbouring, more sun-exposed surfaces of the same ruin are inhabited by *P. rupestris*.

Additional specimens examined: **Sweden**. *Skåne*: Ivö par., Ivö, Blaksudden, the kaolin quarry, 56.14074°N 14.40402°E, on vertical, NE-facing cement surface of old ruin, 30 Oct. 2019, S. Ekman & L. Eide Ekman 5821 (UPS L-1088774; GenBank ID: OR773065 (ITS)). **Germany**. *Bayern*: Unterfranken, Landkreis, Weißenburg-Gunzenhausen, Solnhofen, S river Altmühl, on calciferous stones called "Solnhofener Plattenkalk", north-west oriented, shady, 11°00'N 48°55'E, 19 Nov. 2000, C. Kainz 805 (M 0066803). Landkreis Ostallgäu, Kienberg, climbing trail from Fallmühle (3 km SW Pfronten) to Himmelreich, on outcrop of calciferous rocks, at vertical northern side in a mixed forest with *Fagus sylvatica* & *Picea abies*, north-west oriented, shady, 10°32'N 47°35'E, 17 Oct. 2000, C. Kainz 764 (M 0066800), 765 (M 0066801).

***Protoblastenia szaferi* J. Nowak** **Fig. 14**

Fragm. Flor. Geobot. **20**: 529 (1974). – Type: Poland, 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 July 1955, J. Nowak (KRAM L-5756, holotype, not seen).

New to Fennoscandia. *Protoblastenia szaferi* is reported here based on a single specimen collected on Ordovician limestone on Kinnekulle in the province Västergötland, SW Sweden, in 1940 by A.

H. Magnusson. The locality is situated at low elevation, between 75 and 150 m above sea level. The specific circumstances around the find are unknown. Other limestone lichens collected by Magnusson at the same site on the same day include *Caeruleum heppii*, *Circinaria contorta*, *Diplotomma venustum*, *Enchylium tenax*, *Lempholemma polyanthes*, *Myriolecis albescens*, *Rinodina bischoffii*, *Verrucaria muralis*, and *V. viridula*.

Hafellner (2006) studied the type material and provided a detailed morphological description and images of *P. szaferi*. The species is easily recognised by its endolithic or partially thinly epilithic thallus and persistently more or less flat, vividly orange apothecia surrounded by a distinct, deep crack and leaving distinct pits in the limestone when they die.

Originally described from the Tatra Mountains of Poland by Nowak (1974), *P. szaferi* was later reported from Austria, Germany (Hafellner 2006, 2012), and Italy (Nascimbene et al. 2021). Here, it seems to prefer shaded, often more or less N-facing, steep rock faces (Nimis et al. 2018) in an elevational range from 1520 to 2330 m above sea level, i.e. much higher than the Swedish find. *Protoblastenia szaferi* may have been overlooked in the Scandinavian mountains. Other species known from the Kinnekulle area that primarily inhabit the Alps as well as high latitudes and/or the Scandinavian Mountains include the lichens *Solorina spongiosa* and *Fuscopannaria praetermissa* as well as the bryophytes *Clevea hyalina* and *Drepanocladus turgescens*.

Specimens examined: **Sweden**. *Västergötland*: Medelplana par., NE of Trolmen, on limestone, 28 June 1940, A. H. Magnusson 17231 (UPS L-784109). **Austria**. *Steiermark*: Nordalpen (Nördliche Kalkalpen), Ennstaler Alpen, Gesäuseberge E of Admont, 'Großer Buchstein', northern anticline between the summit and 'Admonter Frauenmauer', 47°36'50"N 14°35'55"E, elev. 2065 m, on W-exposed steep rock faces, 19 June 2005, J. Hafellner 64388 (UPS L-169110); Nördliche Kalkalpen, Ennstaler Alpen, Lugauer, SW of Hieflau, near the cross of the western summit, 47°33'12"N 14°43'20"E, elev. 2210, on NW-exposed steep faces of low cliffs, 3 July 2005, J. Hafellner 65408 in Obermayer: Lichenotheca Graecensis no. 314 (UPS L-169162).

***Ptychographa xylographoides* Nyl.** **Fig. 15**

Flora **57**: 315 (1874). – Type: [Great Britain,] apud Craig Calliach in Killin Scotia, super lignum *Sorbi aucupariae* decorticatum, 1873, J. M. Crombie (H-NYL 4718 = H9507487, syntype, not seen); ad truncos decorticatos *Pyri aucupariae* apud Craig Calliach in Scotiae Perthshire, undated, J. M. Crombie in Crombie: Lich. Brit. exs. no. 192 (UPS L-725192, possible syntype, seen by MS).

New to Sweden. *Ptychographa xylographoides* was originally described from Scotland (Crombie 1874, Nylander 1874) and is characterised by black, lirellate apothecia, reminiscent of, e.g., *Elixia flexella* or a species of the non-lichenised genus *Hysterium*. The asci have a K/I– apical dome (*Trapelia*-type) and contains eight ellipsoid, colourless, one-celled spores (Cannon et al. 2021). It was for a long time only known from Great Britain but has now been encountered in Oregon and Washington in the northwestern United States, northwest Spain, United Kingdom (southwest England, Scotland, Wales), Norway and western Caucasus in Russia (Artskart 2023, Barreno & Pérez-Ortega 2005, Cannon et al. 2021, McCune 1997, Nordén et al. 2019, Urbanavichus et al. 2020). The known distribution indicates a distinct preference for an oceanic and temperate rainforest climate. The Swedish find was made on a fallen, decorticated trunk of *Pinus sylvestris* in an open pine woodland below a north-facing mountain slope in western Jämtland. The area has a humid climate, and the lichen flora includes many suboceanic species, e.g., *Bactrospora brodoi*, *Hypogymnia hultenii*, *Peltigera britannica* and *Platismatia norvegica*.

Specimen examined: **Sweden.** *Jämtland*: Kall par., 4.5 km S of Rutsvallen, below the N slope of Mt. Sundsvalen, 63.66405°N 12.77738°E, elev. 490 m, on wood of up-ended *Pinus sylvestris* at the edge of open mire, 27 July 2022, M. Svensson 4347 (UPS L-1060272).

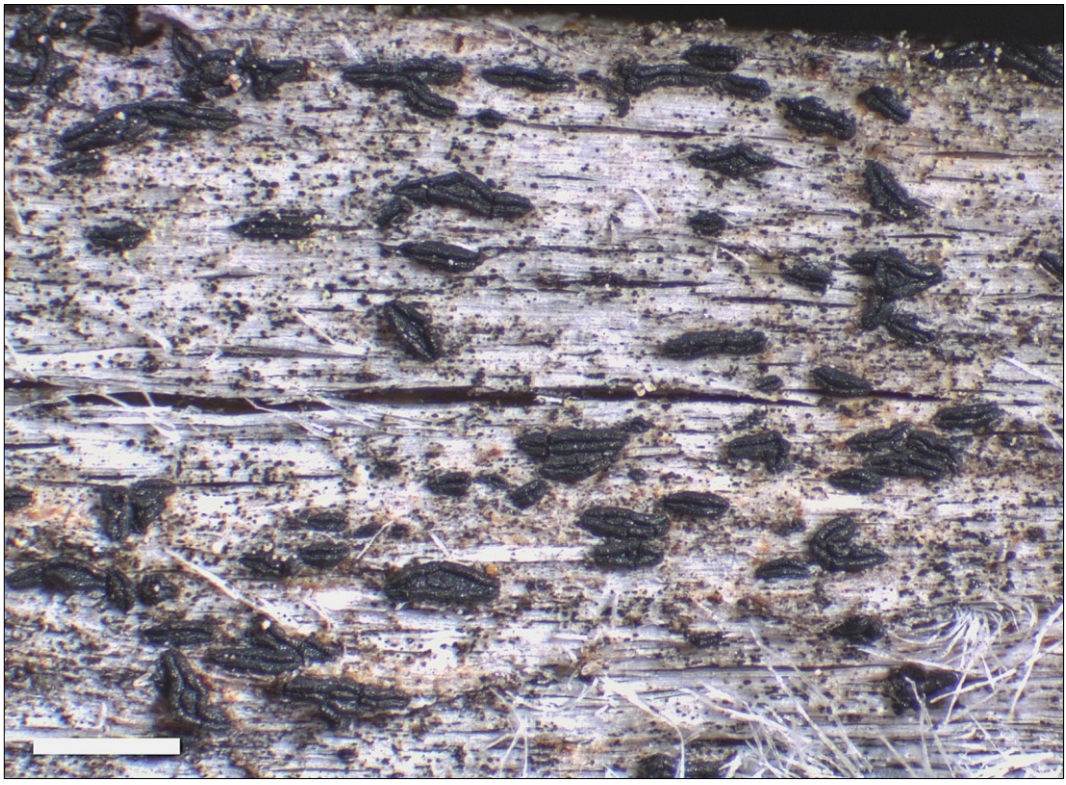

Figure 13. *Ptychographa xylographoides*, with lirellate, black apothecia (UPS L-1060272). Bar = 1 mm.

***Ramboldia subcinnabarina* (Tønsberg) Kalb, Lumbsch & Elix** **Fig. 16**

in Kalb et al., *Nova Hedwigia* **86(1–2)**: 38 (2008). *Lecidea subcinnabarina* Tønsberg, *Sommerfeltia* **14**: 181 (1992). – Type: Norway, Sør-Trøndelag, Åfjord, S of the river N of hill Tørresenåsen, alt. 140-180 m, UTM 32W NS 7205 (map 1623 III), 24 Sept. 1983, T. Tønsberg 8238 (BG L-21991, holotype, not seen).

New to Sweden. *Ramboldia subcinnabarina* was described from central Norway and later reported from western North America and the Canary Islands (Tønsberg 1992, 1993, Holien & Tønsberg 2012, van den Boom & Clerc 2017). It shares with *R. cinnabarina* the vermilion apothecia on a sorediate thallus. The two species can be distinguished chemically by the presence of two fatty acids in *R. subcinnabarina*, whereas *R. cinnabarina* contains atranorin and fumarprotocetraric acid (Tønsberg 1992, Holien & Tønsberg 2012). Morpologically, the soralia of *R. subcinnabarina* usually have a brownish tint, unlike the white soralia in *R. cinnabarina*.

Ramboldia subcinnabarina has been found at three localities in western Jämtland. On the first locality, it was found on *Sorbus aucuparia* in the vicinity of a waterfall and on the other two it was inhabiting *Alnus incana* in two closely situated river valleys. All localities are species-rich and characterised by a humid climate. *Ramboldia subcinnabarina* belongs to the Trøndelag phytogeographic element (Holien & Tønsberg 1996) and is strongly associated with deciduous boreal rainforests along rivers and streams (Haugan et al. 2021).

Figure 14. *Ramboldia subcinnabarina*, cinnabar-red apothecia, note inconspicuous, pale soralia with brownish margins (UPS L-1051556). Bar = 1 mm.

Specimen examined: **Sweden.** *Jämtland*: Frostviken par., about 2 km E of Jormlien, 480 m NNW of Jormskolan, W side of river Vallån, 64.73727°N 14.01638°E, elev. 349 m, old-growth alluvial, mixed deciduous forest, on *Alnus incana*, 28 July 2017, M. Westberg ULR275 (UPS L-880253); 1 km NNW of Storliden, E slope of Säterklumpen, W side of the river Lerdalsälven, 64.73630°N 13.92971°E, elev. 443 m, alluvial, mixed deciduous forest, on *Alnus incana*, 29 July 2022, M. Westberg JMT628 (UPS L-1051556); Åre par., Handölsfallen, V om fallen, 63.24873°N 12.44038°E, elev. 618 m, på bark på stam av levande rönn (10 cm dbh), i granskog av frisk lågörttyp med inslag av glasbjörk, 60 m från Handölan, 5 Aug. 2005, F. Jonsson FU6678 (UPS L-1051552).

Sphaeronaema truncatum Fr.:Fr **Fig. 17**

K. Svenska Vetensk-Akad. Handl., ser. 3, **39**: 358 (1818); *Syst. mycol.* **2(2)**: 539 (1823). – Type: Sweden, E. Fries in Fries: Scleromyc. Suec. no. 105 (UPS F-117549, syntype, seen by MS and MW).

Originally described from Sweden 200 years ago by Fries (1818, 1823), *Sphaeronaema truncatum* has been long forgotten but was recently shown to be the correct name for a common lignicolous fungus known also from Central Europe (Vondrák et al. 2023). It is an anamorphic, weakly lichenised fungus characterised by black, up to 0.5 mm high, stipitate pycnidia with conspicuous blobs of protruding conidia at their top. The conidia measure 5–7 × 2.5–3 µm and have slightly pointed ends. Although no well-differentiated thallus is formed, the species is apparently associated

Figure 15. *Sphaeronaema truncatum*, stipitate pycnidia with blobs of protruding conidia (UPS F-924639). Bar = 1 mm.

with algae, which occur in cushions at the base of the pycnidia. *Sphaeronaema truncatum* could be mistaken for a *Micarea* species with stalked pycnidia but is clearly different from all those species by having much larger pycnidia (often easily spotted even without a hand-lens), differently shaped conidia and by associating with different, *Stichococcus*-like algae. Sequence data published by Vondrák et al. (2023) indicate that *S. truncatum* belongs to the Ostropomycetidae but both its correct generic placement as well as sexual fruitbodies are unknown.

Sphaeronaema truncatum is a common pioneer species on lignum of newly dead trees, in Sweden perhaps most common on wood of *Picea abies*, but it has also been found on wood of *Betula* sp., *Pinus sylvestris* and *Populus tremula*. The Swedish records range from Blekinge in the south to Norrbotten in the north, which suggest that the species is widely distributed throughout Fennoscandia.

Specimens examined: **Finland.** *Tavastia australis*: Tammela par., Mustiala, in ligno pini, 22 Aug. 1873, P. Karsten (UPS F-645331). **Sweden.** *Blekinge*: Hjortsberga par., Värmansnäs Nature Reserve, 56.29140°N 15.37886°E, 24 Apr. 2022, M. Westberg (UPS F-1037801). *Dalsland*: Skållerud par., c. 450 m NE of the sluice in Upperud, just E of the small hill "Annikas knatte", 58.81729°N 12.44144°E, 24 June 2016, M. Westberg (UPS F-852035). *Lule Lappmark*: Jokkmokk par., 7.5 km SE of Ålloluokta Chapel, about 450 m WSW of Barivierra, by the stream Barijåhkå, 67.06847°N 19.59121°E, elev. 380 m, on large stump of *Picea abies* in old-growth coniferous forest, 3 Aug. 2019, M. Svensson 3662 (in collection of *Xylographa parallela*, UPS L-1095431). *Medelpad*: Liden par., on the NE slope of Mt. Vättaberget, 62.6953°N 16.7770°E, elev. 90 m, on

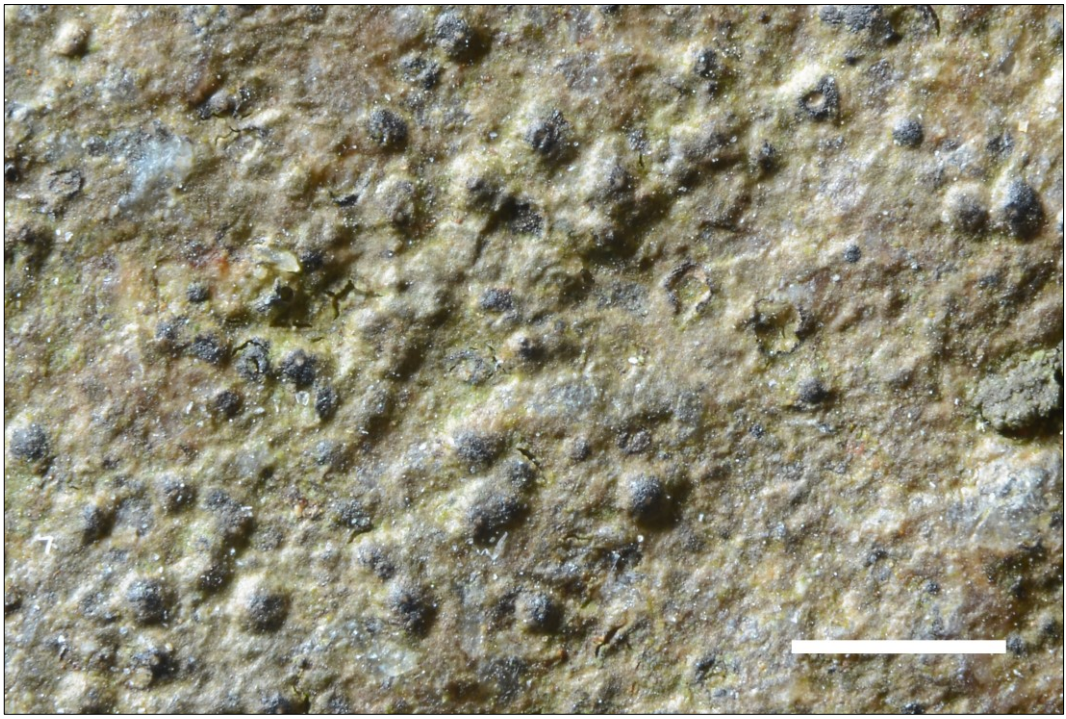

Figure 16. *Verrucaria hydrophila* with a continuous, thin, sparsely cracked thallus with a greyish green to mid-brown colour and perithecia initially covered by the thallus but later exposing the black apex (Arup L2118, LD). Bar 1 mm.

log of *Picea abies* in coniferous forest, 13 Sept. 2011, M. Svensson 2369 (UPS F-1062013). *Norrbotten*: Edefors par., SW of Övre Svartlå, N portion of Stormyran, 65.99025°N 20.99758°E, elev. 170 m, 24 July 2021, M. Westberg SCNB165 (UPS F-1034921). *Småland*: Östra Ed par., about 400 m E of Skärkullen, just S of Mörkkärr, 58.06853°N 16.61572°E, elev. 20 m, on log of *Betula* on the ground, 3 Jan. 2022, M. Svensson 4221 (UPS F-1062014). *Uppland*: Frösunda par., at the N edge of the forest S of Svampdalen, 59.6630°N 18.1190°E, elev. 30 m, on log of *Picea abies*, 15 Jan. 2022, M. Svensson 4229 (UPS F-1062015). Länna par., Ängsö National Park, E of Norrviken, 59.62765°N, 18.76265°E, elev. 5 m, on log of *Picea abies*, 4 May 2019, M. Svensson 3458 (F-1062017). Uppsala par., Uppsala kungspark, på en granstubbe, 16 Oct. 1825, G. Wahlenberg (UPS F-645332); Uppsala, undated, E. P. Fries (UPS F-645333). Vittinge par., 2.4 km W of Morbolandet, the top of Mt. Uvberget, 59.9737°N 17.0748°E, elev. 100 m, on log of *Picea abies*, 8 Apr. 2020, M. Svensson 3730 (UPS F-1062016). Vänge par., Fiby Nature Reserve, 59.88889°N 17.3525°E, on wood, 5 Sept. 2017, M. Westberg (UPS F-924639). Älvkarleby par., WNW of Marma by, Storön, S of Ol-Persmyren, 60.47765°N 17.36132°E, elev. 40 m, on log of *Populus tremula* in old-growth coniferous forest, 9 Aug. 2023, M. Svensson 4799 (UPS F-1092935). *Värmland*: Norra Råda par., about 450 m SE of Sjögeränden, W slope of Mt. Stjärnberget, just N of small power line, 60.03593°N 13.60413°E, elev. 170 m, on log of *Picea abies* in managed coniferous forest, 6 Oct. 2020, M. Svensson 3859 (UPS F-1066555). *Östergötland*: Regna par., 1 km W of Gäddö, W part of Gällsnäset, 58,85308°N, 15.80103°E, elev. 70 m, on log of rather recently dead *Pinus sylvestris* in *Pinus sylvestris* plantation (stand age 37 years), 5 Oct. 2009, M. Svensson 1647 (UPS F-1094597).

Verrucaria hydrophila Orange **Fig. 18**

Lichenologist **45**: 309 (2013). – Type: Great Britain, Wales, Denbighshire (V.C. 50), Bontuchel, Coed y Fron-wyllt, Nant Melin-dŵr, 53°10'N 03°37'W, national grid reference 33/0825.5713, on shaded stone by stream in woodland, 26 Apr. 2007, A. Orange 16776 (NMW C.2007.001.11, holotype, not seen).

New to Sweden. *Verrucaria hydrophila* was described from the British Isles by Orange (2013). It belongs to the group of aquatic species growing mainly on siliceous rock in fresh-water habitats. The only Swedish find was made in northwestern Skåne, on the Kullaberg peninsula. Here, it occurs on siliceous rock in a small brook running through a *Fagus* forest on the north side of the peninsula. This habitat appears to be similar to the British sites. In Fennoscandia, the species is known also from Akershus in Norway (Westberg et al. 2021), where it seems to inhabit metal scrap in more or less shaded habitats (Norwegian Lichen Database 2, 2023).

Verrucaria hydrophila is characterised by the continuous, thin, sparsely cracked thallus with a greyish green to mid-brown colour. The perithecia are 0.25–0.4 mm in diameter, initially covered by the thallus but later the black apex is exposed. According to Orange (2013), the ascospores are (15–)19.5–23(–26) × (6.5–)8–9.5(–11) µm, which agrees well with the Swedish material (ascospores 17–21 × 9–10 µm).

Specimens examined: **Sweden.** *Skåne*: Brunnby par., Östra Kullaberg, 100 m SW of Valdemarsgrottan, on siliceous stone in small creek on steep N-facing slope above the sea, 56.29088°N 12.52323°E, elev. c. 75 m, 23 Oct. 2021, U. Arup L21108 (LD; Genbank-ID: OR578385 (ITS)).

Verrucaria prominula Nyl. ex Mudd **Fig. 19**

Manual Brit. Lich.: 291 (1861). – Type: [Ireland, Co. Kerry,] on maritime rocks, Kerry, undated, T. Taylor (H-NYL 2796 = H9505825, syntype, not seen).

New to Sweden. In northern Europe, *Verrucaria prominula* has been found in Norway, where it was collected on Hanøy NW of Bergen in 1978 by E. Klinkenberg (Westberg et al. 2021, Norwegian Lichen Database 2, 2023). In Sweden, all records are concentrated to the Kullaberg peninsula in northwestern Skåne. Here, *V. prominula* occurs in a variety of sites on both the shady and humid north side of the peninsula as well as the drier south side, both sides nevertheless featuring an abundance of shady crevices close to the sea. The species is typically found from just above sea level and 2 metres further up, only exceptionally higher up. It is often associated with *Bacidia scopulicola*, which like *V. prominula* seems to prefer dry and sheltered sites with minimal competition from other lichens.

The genus *Verrucaria* is notoriously difficult but *V. prominula* is usually distinguishable by the relatively prominent perithecia, which may reach 0.8 mm diam. In addition, they have a conical or irregular shape and a rather blunt apex (Orange et al. 2009). The thallus is consistently poorly developed and not prominent in any of the Swedish specimens. Ascospores measure 11.5–14 × 5–8 µm and are characteristically elongate with more or less parallel sides and with broadly rounded to almost square ends.

Specimens examined: **Sweden.** *Skåne*: Brunnby par., Kullaberg Nature Reserve, Diamantklipporna between Solviken and Ransvik, on siliceous rocks near shoreline, in crevise, 56.29035°N 12.47956°E, elev. 3 m., 12 Aug. 2016, U. Arup L16066 (LD); c. 315 m N of Kullagården, on siliceous seashore rock, semi-shaded between rocks, 56.30177°N 12.46839°E, elev. c. 2 m, 2 Nov. 2017, U. Arup L17250 (LD; Genbank ID: OR578386 (ITS)); at the large rock outcrop Björnen, on siliceous seashore rock in deep crevise, shady, 56.29581°N 12.45700°E, elev. 2 m., 16 Aug. 2018, U. Arup L18082 (LD); c. 100 m E of Ablahamn, on siliceous seashore rock, in crevice, 56.30115°N 12.47195°E, elev. 1 m., 8 Sept . 2019, U. Arup L19057 (LD); half way to

Figure 17. *Verrucaria prominula* with an inconspicuous thallus and typical prominent perithecia that often have a conical or irregular shape and a rather blunt apex (Arup L21070, LD). Bar 1 mm.

Käringmalen from Josefinelust, on perpendicular siliceous seashore rock, 56.30043°N 12.48047°E, elev. 1.5 m, 15 Oct. 2019, U. Arup L19103 (LD); N-facing slope 185 m E of Söftingsgrottan, on siliceous seashore rock, 56.29524°N 12.50879°E, elev. c. 2 m, 26 Sept. 2021, U. Arup L21046 (LD); c. 150 m ESE of Laddörren, on seashore greenstone rock, 56.29402°N 12.51617°E, elev. 2 m., 10 Oct. 2021, U. Arup L21070 (LD); c. 825 m E of Håkull, on underside of siliceous seashore boulder, 56.28778°N 12.53936°E, elev. 2 m, 9 Oct. 2022, U. Arup L22066 (LD).

Verrucaria rosula Orange **Fig. 20**

Lichenologist **45**: 317 (2013). – Type: Great Britain, Wales, Breconshire (V.C. 42), Brecon Beacons, Cwm Dringarth, Nant y Gwair, 51°87N, 3°52W, national grid ref. 22/9539.2042, alt. 470 m, on unshaded rock in flush, 4 Apr. 2007, A. Orange 16753 (NMW C.2007.001.4, holotype, not seen).

New to Fennoscandia. *Verrucaria rosula* was described by Orange (2013), who portrayed the thallus as consisting of numerous small rosette-like units that gradually merge and overlap, forming a larger thallus over time. On a smaller scale, these rosettes consist of 30–80 µm large units that make the thallus surface uneven. Typically, older brown thallus parts can be found at the bottom, often overgrown by younger segments. However, the thallus of the specimen reported here appears to be mature, lacking the rosette-like structures and instead featuring an extensive contiguous thallus with scattered cracks mixed with smoother areas. The surface is partly even and partly slightly rugulose, just as described by Orange (2013), and the lower part of the thalli often appears brown and dead. The perithecia, measuring 0.25–0.4 mm diam., are largely immersed in the thallus with only the

Figure 18. *Verrucaria rosula*, an atypical form without rosettes, but with a slightly rugulose to even surface and perithecia with just the ostioles visible (Arup L21106, LD). Bar 1 mm.

ostiole visible. The ascospores in the single Swedish collection measure 20–22 × 9–11 µm, which is in the lower range of the size reported by Orange (2013), (20.5–)22.5–27.0 µm. Interestingly, Orange (2013) mentioned that both *V. hydrophila* and *V. margacea* are often associated with *V. rosula*, which is also the case at the Kullaberg site.

Verrucaria rosula is a species of freshwater habitats, according to Orange (2013) occurring "on damp siliceous rocks and stones in or near streams, or on flushed ground." At the site at Kullaberg, the species inhabited siliceous stone in a small creek in a steep, north-facing slope.

Specimens examined: **Sweden.** *Skåne*: Brunnby par., Östra Kullaberg, 100 m SW of Valdemarsgrottan, on siliceous stone in small creek in steep N-facing slope above the sea, 56.29088°N 12.52323°E, elev. c. 75 m., 23 Oct. 2021, U. Arup L21106 (LD; Genbank ID: OR578387 (ITS)).

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