

Notes on some rare *Verrucaria* species (lichenised *Ascomycotina*, *Verrucariales*)

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Abstract: *Verrucaria cincta* and *V. putnae* are reported for the first time from Fennoscandia; *V. dalslandensis* is new to Finland and Austria. *Verrucaria scabridula* is synonymized with *V. subfuscata*, and *Verrucaria olivacella* with *V. inaspecta*. *Verrucaria inaspecta* and *V. scabridula* are lectotypified. The type material of *V. gotlandica* includes four *Verrucaria* species.

Zusammenfassung: *Verrucaria cincta* und *V. putnae* werden erstmals aus Fenno-Skandinavien gemeldet; *V. dalslandensis* ist neu für Finnland und Österreich. *Verrucaria scabridula* wird mit *V. subfuscata* und *Verrucaria olivacella* mit *V. inaspecta* synonymisiert. *Verrucaria inaspecta* und *V. scabridula* werden lectotypifiziert. Das Typusmaterial von *V. gotlandica* enthält vier *Verrucaria*-Arten.

Calcareous rocks are very rich in *Verrucaria* species in Fennoscandia. Numerous species new to Fennoscandia have been previously reported (PYKÄLÄ 2007, 2008, 2010 a, b, c; PYKÄLÄ & BREUSS 2008, 2009). However, the *Verrucaria* flora of calcareous rocks is still somewhat poorly known, and many unidentified species occur. In the present paper we report three globally rarely collected species as new to Fennoscandia or Finland. Furthermore, the identity of three species originally described from Sweden (MAGNUSSON 1952, SERVÍT 1952) and later mostly neglected, is clarified.

The study is based on type specimens loaned from the herbaria PRM, S and UPS as well as on specimens collected by the first author and stored in the herbarium H. Collection number is given after the collection date. The specimens have been investigated using standard microscopical techniques. Microscopical measurements refer to material examined in water or treated in KOH. The size of the perithecia is given in surface view.

Results

Verrucaria cincta HEPP

Thallus inconspicuous or thin, mainly developed around the perithecia, grey, often with slight brown pigmentation; perithecia 0.2-0.3 mm, $\frac{1}{2}$ - $\frac{3}{4}$ -immersed; involucrellum extending to the base of the exciple, 70-100 μm thick, often slightly diverging from the exciple; exciple 0.20-0.25 mm, dark; spores 15-22(-25) \times 7-8(-9) μm .

New to Fennoscandia. *Verrucaria cincta* is close to *V. amylacea* HEPP, which has a thinner involucrellum (40-70 μm thick).

Specimens examined: **Finland:** Varsinais-Suomi (Ab), Lohja, Torhola, 300 m NNE of Kallioranta, young pine plantation, S-slope, small wall of calcareous rock, 60° 15' N 23° 52' E, 22. 7. 2004, 25276; det. O. BREUSS 2009; Varsinais-Suomi (Ab), Karjalohja, Saarenpää, W of Rauhala, backyard of a new house, 1 m high NW-facing wall of a calcareous rock, 60°13'N 23°49'E, 8. 6. 2006, 28727, det. O. BREUSS 2009.

Verrucaria dalslandensis SERVÍT

Thallus continuous or broken up, rimose, 0.10-0.25 mm thick, grey, often patchily with pale brown or medium brown pigmentation, sometimes variable coloured within areole and darker pigmented around the perithecia, areoles 0.2-0.5 mm; perithecia 0.20-0.25(-0.3) mm, ($\frac{1}{2}$ -) $\frac{3}{4}$ -immersed, numerous; involucrellum extending down to the middle or more often to the base-level of exciple, 40-60 μm thick; exciple pale or (mostly) dark, 0.20-0.25 mm wide; spores 15-20(-23) \times 6-8(-9) μm .

In appearance, *Verrucaria dalslandensis* closely resembles *V. amylacea*, but the latter species occurs on calcareous rocks. Pale forms of *V. anceps* KREMP. and *V. pinguicula* A. MASSAL. have thicker and more determinate thalli and occur on calcareous rocks (BREUSS & BERGER 2010). *Verrucaria anceps* has not been recorded from northern Europe. Spore size of *Verrucaria dalslandensis* is intermediate between *V. anceps* and *V. pinguicula*. According to SERVÍT (1952) spore size of *V. dalslandensis* is 16-20 \times 8-9 μm ; spore sizes found in the type specimen were 17-19 \times 7-8 μm . There is a superficial similarity with *Verrucaria muralis* ACH., but in the latter the involucrellum rarely reaches more than halfway down the exciple. *Verrucaria gudbrandsdalensis* ZSCHACKE ex H. MAGN. (ZSCHACKE 1933-1934) has larger perithecia (0.3-0.4 mm) and spores (20-25 \times 9-12 μm) than *V. dalslandensis*.

Verrucaria dalslandensis has been known only from the type locality in Sweden [Dalsland, Dalskog, Idala, 26. 6. 1938, A. H. MAGNUSSON, PRM – holotype], where it was growing on schistose rock (SERVÍT 1952). SANTESSON & al. (2004) considered *V. dalslandensis* as a dubious species, which was not accepted in the Fennoscandian check list. We believe that *V. dalslandensis* merits retention as a distinct species. Recently, *V. dalslandensis* has been found in Austria [Osttirol, Weg von Matrei über den Thiemeweg zum Wirtshaus Strumerhof, 1200-1230 m s. m., auf Glimmerschiefer, 27. 10. 2000, leg. R. TÜRK no. 36443, SZU] and is herewith reported for the first time from Central Europe.

Specimens examined: **Finland:** Varsinais-Suomi (Ab), Lohja, Hermala, Kalkkimäki, *Pinus sylvestris*-dominated forest, by a small lime quarry, on siliceous stone, 60° 13' N 23° 52' E, 19. 7. 2004, H 25135, det O. BREUSS 2009; Varsinais-Suomi (Ab), Karkkila, Haavisto, Koirakallio, nature reserve, pyroxene gneiss rock, cliff, on SW-slope, 60° 29' N, 24° 20' E, 5. 10. 2008, H 33988.

Verrucaria gotlandica SERVÍT

The packet containing the type material of *Verrucaria gotlandica* contains three fragments of rock glued to a card. Besides *Verrucaria gotlandica*, three other *Verrucaria* species as well as one *Thelidium* and one *Placopyrenium* species were found. The fragment on the left shows *Verrucaria gotlandica* with *Placopyrenium fuscillum* (TURNER) GUEIDAN & ROUX sparsely on it and *Thelidium auruntii* (A. MASSAL.) KREMP. The fragment in the middle shows *Verrucaria* cf. *subviridula* NYL., and the piece on the right shows *V. aspicilioides* VAIN. and *Verrucaria* spec. The four species are briefly described:

1. *Verrucaria gotlandica*: Thallus areolate, medium brown, 0.15-0.3 mm thick, dark basal layer covering most of the thallus or weakly developed or lacking, areoles 0.2-1.2 mm, some areoles secondarily subdivided into smaller units; perithecia immersed; involucrellum extending to the exciple-base level, ca. 40 μ m thick; exciple 0.15-0.25 mm, dark; spores ca. 17-24 \times 8-12 μ m (only few well developed spores seen). The description of *Verrucaria gotlandica* by SERVÍT (1952) is clearly based on this species and does not include elements of other species. According to SERVÍT (1952) there is type material also in his herbarium (but not found in PRM); as the UPS material is rather small, we did not select it as lectotype.

2. *Verrucaria* cf. *subviridula*: Thallus medium brown, areolate, ca. 0.2-0.3 mm thick; perithecia 0.15 mm, $\frac{3}{4}$ - to fully immersed; involucrellum enveloping the exciple or at least extending to the exciple-base level; exciple 0.15-0.20 mm, dark; spores ca. 17-21 \times 9-10 μ m. This species may be conspecific with *V. subviridula* NYL., a species described from Russian Karelia. VAINIO (1921) reported the spore size to be 17-25 \times 9-13 μ m in *V. subviridula*.

3. *Verrucaria aspicilioides*: Thallus grey, areolate, 0.2-0.3 mm thick; perithecia $\frac{3}{4}$ - to fully immersed; involucrellum apical; exciple 0.3-0.4 mm, dark, bottle-shaped or roundish; periphyses ca. 50 \times 1-2 μ m; spores 25-32 \times 14-17 μ m. *Verrucaria aspicilioides* was described by VAINIO (1921) and may be conspecific with *V. viridula* (SCHRAD.) ACH. However, molecular studies are needed to confirm if *V. viridula* is as variable as presently considered. The type material of *Verrucaria aspicilioides* is from the same locality as the type of *V. gotlandica* and was collected by MALME during the same day as the type of *V. gotlandica* by MAGNUSSON.

4. *Verrucaria* spec.: Thallus areolate, medium brown, 0.2-0.4 mm thick; perithecia in poor condition, involucrellum not discernible with certainty; exciple 0.15-0.20 mm; two spores seen (17 \times 10 μ m).

Because the type material of *Verrucaria gotlandica* includes several *Verrucaria* species some confusion has raised in the literature on the identity of *V. gotlandica*. SANTESSON & al. (2004) synonymize *V. gotlandica* with *V. aspicilioides*. However, SERVÍT's (1952) description is clearly based on one species, which does not include elements from *V. aspicilioides*. *Verrucaria gotlandica* seems to belong to the *V. nigrescens* complex. *Placopyrenium fuscillum* occurs on the thallus of the cited specimen.

Specimen examined: Sweden: Gotland, Öja par., Burgsvik, sandstone in stone fence, 5. 7. 1918, A. H. MAGNUSSON 1460 (UPS, syntype).

***Verrucaria inaspecta* SERVIT (= *V. olivacella* SERVIT)**

Thallus ca. 0.05-0.10 mm thick, continuous or rimose, pale green, pale greenish brown or medium brown; perithecia 0.15-0.20(-0.25) mm, 1/2-3/4-immersed; ostiole pale; involucrellum thin (ca. 30-40 µm), extending down to the exciple-base level, slightly diverging from the exciple near base; exciple 0.15 mm, pale to rarely darkening; periphyses ca. 15-20 × 2 µm; spores (15-)17-22(-24) × 7-8(-9) µm.

The characters of *Verrucaria inaspecta* agree well with those of *V. olivacella*. Spore size is slightly larger than given by BREUSS (2007), but is within the range of the spore sizes reported by SERVIT (1953) and PYKÄLÄ & BREUSS (2008). *Verrucaria inaspecta* is older (SERVIT 1952) than *V. olivacella* (SERVIT 1953). Thus, *V. olivacella* is a synonym of *V. inaspecta*.

Verrucaria inaspecta is a widely distributed but rarely collected species occurring on both calcareous and siliceous rocks. It has been reported to occur in Europe as far south as Italy (as *V. olivacella*, SERVIT 1953) and in North America (as *V. olivacella*, BREUSS 2007). It is very similar to *Verrucaria dolosa* HEPP from which it differs by larger spores.

Specimen examined: Sweden: Västergötland, Österplana par., E of church, on limestone, 31. 7. 1937, A. H. MAGNUSSON 15830 (UPS, lectotype, selected here).

***Verrucaria putnae* SERVIT**

Thallus rimose or areolate, pale brown, 0.2-0.4 mm thick, areoles 0.3-1 mm; perithecia 0.2-0.4 mm, 3/4- to fully immersed; involucrellum reaching down to the base-level of the exciple, broadening up to 130-200 µm thick at the base, in some perithecia black medullary tissue around their bases and thus involucrellum appearing to envelope the exciple; exciple pale, (0.20-)0.25-0.30 mm; periphyses 25-35 µm long, simple; spores 18-26 × 10-13(-14) µm.

Verrucaria putnae is close to *V. turgida* SERVIT, and both taxa have been tentatively united by BREUSS (2007). *Verrucaria turgida* has a thinner involucrellum (barely more than 100 µm at the base), slightly larger spores (24-29 × 13-15 µm), and wider exciples (0.3-0.5 mm). The Finnish specimens agree very well with type material of *V. putnae* in PRM [Romania, Putna, Sovejana, 1935, leg. CRETZOIU]. *Verrucaria putnae* may also be confused with species of the *V. macrostoma* complex in which, however, the involucrellum either hardly reaches the middle of the perithecium or is less broadening at base. *Verrucaria apatela* (A. MASSAL.) TREVIS., a member of this species complex, with a similar development of the involucrellum as in *V. putnae* has a slightly thicker (0.3-0.5 mm), medium to dark brown thallus, and strikingly long (50-70 µm) periphyses (BREUSS 2008). *Verrucaria endocarpoides* SERVIT has a slightly thinner thallus (0.2-0.3 mm thick), which is usually medium brown, a thinner involucrellum (50-80 µm) and narrower spores (20-26 × 8-11 µm) than *V. putnae* (BREUSS & BERGER 2010).

Verrucaria putnae was formerly only known from the type specimen from Romania (SERVIT 1952).

Specimens examined: Finland: Varsinais-Suomi (Ab), Lohja, Lohja, Pitkäniemi industrial area, 8 m from shore of lake Lohjanjärvi, deciduous forest, 5 m from building, calcareous rock, on NW-facing rock wall, 60° 15' N 24° 02' E, 23. 8. 2005, 27743; det. O. BREUSS 2009; Varsinais-Suomi (Ab), Karjalohja, Pellonkylä, 300 m NW of Suomela, calcareous rock, on SW-slope, 60° 13' N 23° 44' E, 17. 6. 2006, 28863, det. O. BREUSS 2009.

***Verrucaria scabridula* H. MAGN. (= *Verrucaria subfuscata* H. MAGN.)**

The type packet of *Verrucaria scabridula* contains three pieces of rock glued to a card. The piece on the left includes *Verrucaria subfuscata* H. MAGN., *Staurothele areolata* (ACH.) LETTAU and an unidentified pyrenocarpous lichen with only five perithecia (size 0.25-0.40 mm, not studied). This piece was annotated on the card by MAGNUSSON's handwriting as "*Verrucaria subfuscata*?". The piece in the middle, annotated by MAGNUSSON as "*Polyblastia intermedia*", includes *Verrucaria subfuscata*, *V. cf. subconjunctiva* NYL. and *Polyblastia albida* s. l. The piece on the right shows *Verrucaria subfuscata*, *V. tornensis* H. MAGN., and *V. spec.* There is the letter "a" written on the card next to *Verrucaria subfuscata* and another "a" next to *V. tornensis* and *V. spec.* The packet includes a separate annotation label with MAGNUSSON's description of *Verrucaria scabridula* and with an "a" apparently referring to the "a" on the card. Altogether there are four *Verrucaria* species in the packet; the original description of *V. scabridula* by MAGNUSSON (1952) includes elements from three of them (species nos. 1, 2, and 3, those marked with "a"). The locations of these species on the right fragment of rock are annotated in a figure enclosed in the packet by the first author.

Species no. 1 (*Verrucaria subfuscata*): Thallus rimose or areolate, medium brown, ca. 0.2 mm thick, areoles 0.2-0.3 mm; perithecia 0.2 mm, $\frac{3}{4}$ -immersed; involucrellum reaching down to the exciple-base level, ca. 50 μ m thick; exciple 0.15-0.20 mm, pale or brown; spores 12-15 \times 6-7 μ m. This species was described in the same publication as was *V. scabridula* (MAGNUSSON 1952). The size of the spores of *V. subfuscata* has been reported to be slightly smaller than in the *V. scabridula* specimen: 10-13 \times 6-7 μ m according to MAGNUSSON (1952), 9-14(-15) \times 5-7 μ m according to PYKÄLÄ (2010b). This is the most abundant *Verrucaria* species in the type packet.

Species no. 2 (*V. spec.*): Thallus rimose or areolate, medium brown, ca. 0.2 mm thick (and thus very similar to the previous species); perithecia 0.20(-0.25) mm, $\frac{1}{2}$ - $\frac{3}{4}$ -immersed; involucrellum enveloping the exciple, ca. 30-40 μ m thick, thinning to base; exciple 0.18-0.20 mm, pale; spores 17-23 \times 9-11 μ m. The specimen is very small. The identity of this species is uncertain; it should be compared to *Verrucaria molaris* SERVÍT (SERVÍT 1952).

Species no. 3 (*V. tornensis*): Thallus, thin, 0.1-0.2 mm thick, pale ochraceous; perithecia 0.20-0.25 mm, $\frac{1}{2}$ - $\frac{3}{4}$ -immersed; involucrellum apical, thin (30-50 μ m thick); exciple 0.15-0.20 mm, black; spores 20-25 \times 10-11 μ m. This specimen fits well with the type of *V. tornensis*, which is from the same locality and was collected during the same day as *V. scabridula*. The altitude of the collection site was given as 450 m on the label (400 m in the protologue) for *V. scabridula*, and as ca. 400 m for *V. tornensis*. In the type collection of *V. tornensis* [Torne Lappmark, Jukkasjärvi, Abiskojojk, marmorbrott, c. 400 m, 29. 7. 1921 A. H. MAGNUSSON 6020b (S)] a little *V. subfuscata* is also present.

Species no. 4: Thallus inconspicuous; perithecia 0.2-0.4 mm, $\frac{1}{2}$ -immersed; involucrellum apical (?); exciple dark; spores 25-30 \times 12-13 μ m. The species is very scarce and only one perithecium was sectioned. The specimen may belong to *V. subconjunctiva* NYL. (see PYKÄLÄ 2010 b).

In the original description of *V. scabridula*, the description of the thallus is based on species no. 3, the perithecium characters are taken from species no. 2, and the size of the spores from species no. 1. Thus *V. scabridula* is an ambiguous taxon the

description of which includes elements from three different species. This unfortunate situation can be solved by selecting species no. 1 as the lectotype of *V. scabridula* because in this species the spore size is in accordance with the original description and the protologue in MAGNUSSON (1952): the measurements given in the description ("13-15 × 7 µm") and the term "Sporae minutae" in the diagnosis as well as noticing "...much smaller spores" in comparison to *V. deversa* VAIN. clearly shows that MAGNUSSON had the small-spored species in mind when establishing the new species. This solution is also supported by the fact that the small-spored species is the most abundant *Verrucaria* species in the type collection. By this typification *V. scabridula* becomes conspecific with *V. subfuscata*. Both taxa were described in the same paper (MAGNUSSON 1952, p. 62 *V. scabridula*, p. 62-63 *V. subfuscata*). According to the ICBN (Art. 11. 5) simultaneously published names have equal priority and in case of uniting two species one of the competing names may be adopted. We choose *Verrucaria subfuscata* because this name was used before (SANTESSON & al. 2004, PYKÄLÄ 2010 b) and its type material is not a mixture of several species.

Specimen examined: Sweden: Torne Lappmark, Jukkasjärvi par., Abisko district, Marmorbrotet, alt. 450 m, on dolomite, 29. 7. 1921 A. H. MAGNUSSON 6033c, on right piece (UPS, lectotype).

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