

Six rare *Verrucaria* species new to Finland

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Abstract: Six *Verrucaria* species are reported as new to Finland. Four of these have previously been known only from the type specimens: *Verrucaria carbonella*, *V. invenusta*, *V. lignicola*, and *V. magnussoniana*. *Verrucaria banatica*, *V. fraudulosa*, and *V. lignicola* are new to Fennoscandia. Descriptions of each species are given based on Finnish specimens, and notes on the ecology of the species are provided.

Zusammenfassung: Sechs *Verrucaria*-Arten werden erstmals aus Finnland gemeldet. Vier davon, *Verrucaria carbonella*, *V. invenusta*, *V. lignicola* und *V. magnussoniana*, waren vordem nur von der Typusaufsammlung bekannt. *Verrucaria banatica*, *V. fraudulosa* und *V. lignicola* sind Neufunde für ganz Skandinavien. Kurze Beschreibungen der Arten, basierend auf den finnischen Proben, werden durch Anmerkungen zu ihrer Ökologie ergänzt.

Verrucaria SCHRAD. in its traditional sense is probably the species-richest lichen genus in Finland. Recent studies have shown that *Verrucaria* is a highly polyphyletic assemblage of species pending for taxonomic revision (GUEIDAN & al. 2009). Prior to the generic splitting detailed studies at species level should be undertaken that will considerably increase our knowledge with regard to both species delimitation and floristics. *Verrucaria* has been badly overlooked in Finland until recently. During the recent years the *Verrucaria* flora has been intensively studied and numerous species new to the country have been reported (PYKÄLÄ 2006, 2007, 2008, unpubl.; PYKÄLÄ & BREUSS 2008).

In the present paper we report six species new to Finland. Two of them are known only from very few records world-wide, and four species have previously been known only from the type specimen. Descriptions of each species are given based on the Finnish specimens, and differences to previous descriptions of the species are annotated. Short notes on the ecology of the species are provided.

Material and methods

All specimens have been collected by the first author during recent years. Collection number is reported after the date of the collection. Biological provinces are printed *s p a c e d*. All specimens are deposited in H.

Microscopical examinations were carried out in water or after pretreatment with KOH. The size of the perithecia is given in surface view.

Species list

Verrucaria banatica SERVÍT

It is new to Fennoscandia. Perithecia are 0.25-0.4 mm wide, $\frac{1}{4}$ - $\frac{1}{2}$ -immersed. The thin involucrellum covers more than half of the exciple or extends to the base of the exciple. The exciple (0.25-0.3 mm) is initially pale, but soon becomes brown in some specimens while remaining pale in other specimens. The thallus is endolithic or usually thinly epilithic, white, grey, pale brown or pale green. The spores measure $18-25 \times 9-12 \mu\text{m}$. The periphyses are $30-40 \times 2 \mu\text{m}$. The specimens with endolithic or inconspicuous thallus have almost superficial perithecia, whereas the specimens with epilithic thallus have half-immersed perithecia.

The Finnish specimens have smaller spores than previously reported for the species: $23-26 \times 10-13 \mu\text{m}$ in the type description (SERVÍT 1948), and $23-27 \times 12-13 \mu\text{m}$ in BREUSS (2004). A specimen in M from Tyrol, Austria, has spores $22-24 \times 9-11 \mu\text{m}$ and fits well within the size range and comes close to the spore measurements of *Verrucaria subdolosus* SERVÍT (BREUSS 2008 b) that differs only in somewhat smaller perithecia and shorter periphyses, and therefore may be synonymous. *Verrucaria gudbrandsdalensis* ZSCH. ex H. MAGN. agrees with *V. banatica* externally and in spore size, but differs in having black exciples and in occurring on siliceous or weakly calciferous rocks. In *V. muralis* the involucrellum covers less than half of the exciple.

Verrucaria banatica grows on calcareous rocks, lime quarries, concrete and bricks on sun-exposed and half-shady habitats. The species is uncommon, but probably overlooked.

Specimens examined: Varsinais-Suomi: Lohja, Lohja, Pitkänieni industrial area, flat calcareous rock on shore of lake Lohjanjärvi, $60^{\circ}15'N$, $24^{\circ}02'E$, 19. 7. 2005, 27558, det. O. BREUSS 2007; - Lohja, Vappula, 100 m S of Montessori play school, house ruins, on bricks, $60^{\circ}13'N$, $23^{\circ}59'E$, 20. 5. 2006, 28570, det. O. BREUSS 2008; - Karjalohja, Saarenpää, W of Rauhala, calcareous rock, on stones, $60^{\circ}13'N$, $23^{\circ}49'E$, 8. 6. 2006, 28719; - Turku, Raunistula, Juhannuskukkula, on concrete foundation, $60^{\circ}27'N$, $22^{\circ}15'E$, 29. 6. 2008, 32772; - Västan-fjärd, Norrslammala, Prästgårdsgruvorna, herb-rich heath forest, heap of lime quarry waste stones, on stones, $60^{\circ}03'N$, $22^{\circ}42'E$, 24. 7. 2008, 33331; - Nummi-Pusula, Pusula, by the community centre, abandoned lime quarry, on SW-slope, $60^{\circ}28'N$, $23^{\circ}59'E$, 27. 8. 2008, 33478; - Karjalohja, Saarenpää, Saarenpäänniemi, calcareous rock on shore of lake Lohjanjärvi, on SW-slope, $60^{\circ}13'N$, $23^{\circ}46'E$, 7. 10. 2008, 34066; - Uusimaa: Helsinki, Haltia, Haltiavuori, abandoned lime quarry, on SE-facing wall, $60^{\circ}15'N$, $24^{\circ}54'E$, 28. 12. 2007, 32264.

Verrucaria carbonella NYL. ex HULTING

The perithecia are 0.15(-0.2) mm wide, $\frac{1}{2}$ -immersed. The thin involucrellum extends to the exciple base level. The exciple is pale. The very thin thallus is pale brown to medium brown (predominantly pale brown). The spores measure $13-17 \times 6-7 \mu\text{m}$.

The type specimen of *V. carbonella* in H-Nyl (Sweden, Dalslandia, Tisselskog, Liden, 1870, J. HULTING) is in poor condition. Its perithecia are small: 0.15-0.2 mm, and $\frac{1}{4}$ - $\frac{1}{2}$ (- $\frac{3}{4}$)-immersed. The thallus is very thin and pale brown to medium brown. Unfortunately,

the structure of the perithecia could not be clarified, because they are too old. According to the figure made by NYLANDER in the *V. carbonella* foulder the species has a pale exciple and an involucrellum that reaches to the exciple base level. Spore size given by NYLANDER is $12-15 \times 6-7 \mu\text{m}$. The type has also been collected from burnt wood. Under the dissecting microscope the Finnish specimen looks very similar to the type specimen. Thus, the Finnish specimen seems to be conspecific with *V. carbonella*. Possibly, this species belongs to lichens restricted to burnt wood. No other specimens of *Verrucaria carbonella* have previously been known. In *V. corticola* SERV., another small-fruited species with small spores ($14-18 \times 5-7 \mu\text{m}$), the perithecia are usually thinly covered by thallus tissue, and this latter species grows on bark.

The Finnish specimen reported below was erroneously reported as *V. hegetschweileri* KÖRB. by PYKÄLÄ (2008).

Specimen examined: Varsinais-Suomi: Lohja, Virkkala, Metelimäentie road, house ruins, semi-open deciduous forest, on burnt log, $60^{\circ}11'N$, $23^{\circ}59'E$, 13. 5. 2006, 28522.

Verrucaria fraudulosa NYL.

It is new to Fennoscandia. The perithecia are 0.2 mm wide, $\frac{1}{2}$ -immersed, and mostly situated at the margins of the areolae. The involucrellum is completely enveloping the exciple or at least incurved beneath it. The exciple is pale. The thallus consists of small, medium brown or greenish brown, convex areoles. The spores measure $14-18 \times 6-8 \mu\text{m}$. No other Fennoscandian *Verrucaria* species has marginal perithecia.

Verrucaria fraudulosa usually grows on siliceous rocks (BREUSS 2008 a), but the Finnish specimens were collected from calcareous or calciferous substrata. The sites are sun-exposed. The species is easily overlooked due to its small size.

Specimens examined: Varsinais-Suomi: Lohja, Lohja, Pitkäniemi industrial area, lime quarry, on SW-edge, $60^{\circ}15'N$, $24^{\circ}02'E$, 23. 8. 2005, 27663b, det. O. BREUSS 2008; - Lohja, Lohja, 200 m NE of Kiviniemi lime quarry, open quarry waste land, on calciferous pebbles, $60^{\circ}15'N$, $24^{\circ}03'E$, 26. 10. 2006, 29915, det. O. BREUSS 2008.

Verrucaria invenusta H. MAGN.

The perithecia are 0.2-0.25(-0.3) mm wide and $(\frac{1}{4}-)\frac{1}{2}$ -immersed. The thin involucrellum reaches to the base of the perithecia. The exciple is pale to dark. The spores measure $17-25 \times 7-9 \mu\text{m}$. The spores are in suboptimal state and possibly narrower than in normally developed specimens. Periphyses are $20-25 \times 2 \mu\text{m}$. The thinly epilithic thallus is medium brown and fleck-like.

In most aspects, the specimen matches well the type specimen of *V. invenusta* from schistose rock in northern Sweden (Jukkasjärvi, Abisko, 4. 7. 1919, A. H. MAGNUSSON, S). However, the perithecia of the type are larger (0.25-0.35 mm) than in the Finnish specimens, and most perithecia are almost superficial. According to MAGNUSSON (1952) the spore size is $20-25 \times 10-12 \mu\text{m}$. The colour of the thallus is reported as ash-grey in the original description, but varies from medium brown to ash-grey in the type specimen. *Verrucaria invenusta* has been previously known only from the type collection.

Specimen examined: Varsinais-Suomi: Lohja, Suittila, Laukkamäki, pyroxene gneiss rock outcrop, on high E-NE-facing wall, scarce, $60^{\circ}19'N$, $24^{\circ}05'E$, 25. 5. 1996, 16619, det. O. BREUSS 2008.

Verrucaria lignicola ZSCHACKE

It is new to Fennoscandia. The perithecia are (0.15-)0.2-0.25 mm wide, $\frac{1}{2}$ - $\frac{3}{4}$ -immersed, often thalline covered. The thin involucrellum extends down to the base level of the exciple, it is appressed to the exciple but often slightly diverging at the base. The exciple is pale. The thin thallus is greenish to brownish grey. The spores measure (13-)15-20(-22) \times 7-9 μ m.

Verrucaria lignicola is rather similar to *V. trabicola* ARNOLD ex SERV., which has larger spores (PYKÄLÄ, unpubl.). The species occurs on lake and brook shores on bases and exposed roots of trees. In the same habitat several other *Verrucaria* species have been found (PYKÄLÄ 2008, unpubl.). *Verrucaria lignicola* was previously known only from Belgium, where it was collected from inundated roots of elder (BREUSS 1998). According to THÜS & SCHULTZ (2009) it is only a corticolous form of *Verrucaria sublobulata* EITNER ex SERV., another poorly known species that would also be new to Finland. We prefer to regard them as distinct species pending further studies on additional samples.

Specimens examined: Varsinais-Suomi: Lohja, Outamo, E of Vähä-Tiirö, stony shore of lake Lohjanjärvi, on base of *Alnus glutinosa*, 60°17'N, 23°54'E, 30. 7. 2005, 27448, det. O. BREUSS 2008; - Karjalohja, Maila, Kaitsaari, shore of lake Lohjanjärvi, on exposed root of *A. glutinosa*, 60°14'N, 23°49'E, 15. 3. 2007, 30293; - Lohja, Ojamo, Lahokallio, stony shore of lake Lohjanjärvi, on exposed roots of *A. glutinosa*, 60°14'N, 24°00'E, 23. 3. 2007, 30495, 30500b; - Karjalohja, Karkali, Karkali strict nature reserve, stony shore of lake Lohjanjärvi, on exposed thick root of *A. glutinosa*, 60°14'N, 23°47'E, 5. 10. 2007, 32067, 32104, 32143; - Uusimaa: Lohja, Lieviö, 300 m SW of Pariisi, stony brook, on exposed roots of *Picea abies*, 60°17'N, 24°16'E, 12. 5. 2007, 30875.

Verrucaria magnussoniana SERVÍT

The perithecia are 0.2-0.35 mm wide and ($\frac{1}{2}$ -) $\frac{3}{4}$ -immersed. The small exciple (0.15-0.2 mm) is pale to dark. The involucrellum covers the upper third to half of the exciple and is appressed or slightly diverging. The spores measure (15-)18-25 \times 9-12(-13) μ m. The periphyses are 20-25 \times 2 μ m. The thallus is thinly epilithic (0.05-0.2 mm thick), continuous to areolate, and somewhat multi-coloured with a mixture of pale (white, grey or pale brown) and medium brown pigmentation. Brown pigments may be granular or fleck-like (the latter similar to the type specimen) on a predominantly pale thallus, or more often the thallus is predominantly brown.

The species has been previously known only from the type specimen from Norway: Akershus, Aker, Nesön, calcareous rock in forest, 17. 7. 1947, A. H. MAGNUSSON 20833a (UPS). The type specimen has dark exciples as annotated by MAGNUSSON in the specimen folder. However, according to the species description by SERVÍT (1952) the exciple is pale. This suggests that the exciple of the species is initially pale and turns dark in some specimens while remaining pale in others even in overmature perithecia. The type specimen has a thinner thallus than the Finnish samples.

Recently JØRGENSEN & NORDIN (2009) considered *Verrucaria magnussoniana* as a synonym of *V. osloënsis* H. MAGN. based on the assumption that the two type specimens have been collected from the same site (and during the same day, which was not emphasized by the authors). However, the collection site is not necessarily the same. The type specimen of *V. magnussoniana* was collected from "Nesön" and the type of *V. osloënsis* from "S of Nesön". JØRGENSEN & NORDIN (2009) further synonymised *V. osloënsis* with *V. macrostoma* DUF. ex DC. The type of *V. osloënsis* has not been studied

by us, but based on the original descriptions (MAGNUSSON 1948, SERVÍT 1952) *V. magnussoniana* and *V. osloënsis* are different. Furthermore, the type of *V. magnussoniana* differs in most respects from *V. macrostoma* (for a description of the latter species see BREUSS 2008 a). *Verrucaria magnussoniana* may be closely related to *V. illinoisensis* SERVÍT. *Verrucaria illinoisensis*, recently reported from Finland (PYKÄLÄ & BREUSS 2008), has a paler thallus and wider exciples (0.20-0.30 mm in diameter) with thicker involucrella.

Verrucaria magnussoniana seems to prefer sun-exposed sites.

Specimens examined: Varsinais-Suomi: Lohja, Hiittinen, on road cutting of calcareous rock outcrop, 60°16'N, 24°03'E, 21. 7. 2005, 27392; - Lohja, Lohja, Hiidensalmi S, on concrete, 60°15'N, 24°03'E, 28. 3. 2007, 30591; - Lohja, Laakspohja, 150 m NE of Munkkaa, Suintantie road, road bank, on concrete culvert, 60°14'N, 24°09'E, 21. 4. 2008, 32477; - Särkisalo, Vähämaankaula, abandoned lime quarry, on SE-facing wall, 60°05'N, 22°52'E, 23. 7. 2008, 33044; - Uusimaa: Helsinki, Herttoniemi, 400 m S-SW of Herttoniemi manor, on calciferous vulcanite rock, 60°11'N, 25°02'E, 12. 4. 2007, 30592.

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