

Squamarina poeltii, a new lichen species from Novaya Zemlya

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Squamarina (sect. *Petroplaca*) *poeltii* Vänskä, sp. nova (lichen-forming fungi, Lecanorales) is described from Novaya Zemlya, U.S.S.R. Usnic acid and traces of unidentified fatty acids are reported as its chemical constituents.

Key words: *Squamarina*, *Petroplaca*, Lecanorales, lichen, taxonomy, usnic acid, U.S.S.R.

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During a revision of *Lecanora frustulosa* (Dickson) Ach., s. ampl., a collection from Novaya Zemlya made by B. Lyngé in 1921 under the name '*Lecanora frustulosa*' proved to represent an undescribed lichen taxon. This collection was published by Zahlbruckner (1928) as '*L. frustulosa* var. *ludwigii* (Sprengel) Th. Fr.'. In contrast, another collection made by Lyngé on the same expedition, in Guba Mashigina ('Mashigin fjord'), and also published by Zahlbruckner (1928) as *L. frustulosa* var. *ludwigii*, proved in fact to be what has generally been understood by that epithet in continental Europe until now. (The nomenclatural problems of *L. frustulosa*, s. ampl., are discussed in Vänskä 1984.)

Squamarina poeltii Vänskä, sp. nova, Figs. 1 and 2

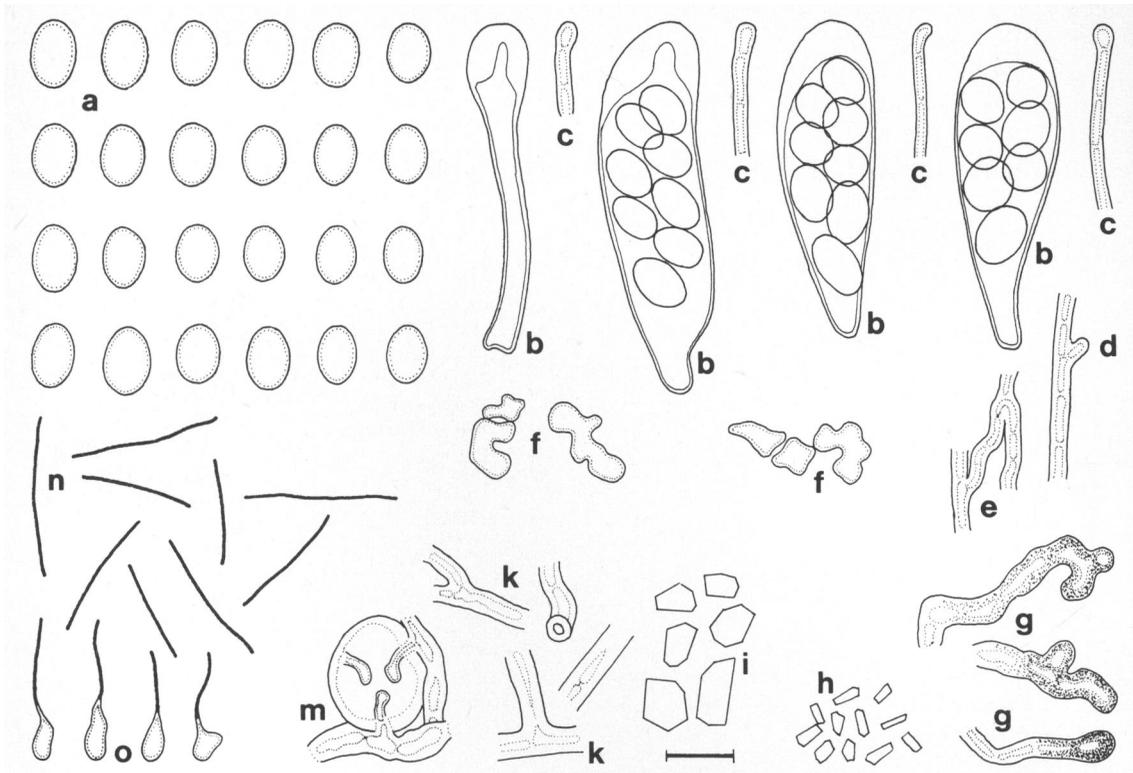
Etymology: Dedicated to Professor Dr. J. Poelt (Graz, Austria), an authority on *Squamarina*, on the occasion of his 60th birthday, on 17 October 1984.

Thallus squamulis parvis et apotheciis numerosis; *squamulae* crassae, eburneae vel albae, epruinosae, marginibus partim atrotinctis; *cortex* crassus, optime limitatus, granulis ± hyalinis inspersus, ex hyphis ± intricatis compositus; *stratum algaceum* optime limitatum, vix interruptum; *algae* typi *Trebouxiae*; *medulla* crassa copia granorum

hyalinorum impleta; *apothecia* dispersa vel aggregata, late sessilia, discis planis, atrofuscis vel fuliginosis, epruinosis, marginibus crassis, albidis vel eburneis; *hymenium* 60–65 µm altum; *asci* clavati, 47–54 µm longi, 14–15.5 µm crassi; *spores* 8:nae, unicellulares, hyalinae, late ellipsoideae, (8.1–) 9.5 (–11.4) µm longae, (5.7–) 6.5 (–8.1) µm crassae; *conidiomata* immersa, late ovata vel subglobosa, hyalina; *conidia* filiformia, recta vel leviter curvata, (15–) 19.4 (–24.5) µm longa, 0.5 µm crassa. Differt e *S. degelii* Poelt et *S. magnussonii* Frey & Poelt thallo epruinoso et discis distincte atrofuscis vel fuliginosis.

Typus: U.S.S.R. Russian Federation, Archangel Region: Novaya Zemlya, Matochkin Shar, at the foot of Mt. Sernaya ('Under Syernaia fjell, Matotchkin Shar', 73° 20' N, 55° 50' E), 15.VII.1921 B. Lyngé (O, holotypus; C, FH, H, O, S, W, isotypi; sub *Lecanora frustulosa*).

Vegetative thallus poorly developed, squamulose, relatively thick, penetrating up to (0.5–) 0.7 (–0.9) mm into the substrate (fine-grained sand layer on rocks), squamules small, (0.5–) 1–2 mm in diam, larger ones with small lobes, not pruinose, pale cream-yellow to yellow-white (ISCC nos. 89, 92; Kelly 1965), the edges (and their undersides when free from substrate) partly bluish black to purplish black (ISCC nos. 193, 235), (0.1–) 0.2 (–0.3) mm thick; *cortex* (30–) 40–60 µm thick, with ± hyaline crystals (3–5 × 1–3 µm) which do not dissolve in KOH, HCl or



Figs. 1a–o. Anatomical details of *Squamarina poeltii* Vänskä, sp. nova (U.S.S.R. Novaya Zemlya, Matochkin Shar, 1921 B. Lyngé, holotype; O). — a: spores, b: asci, c: distal parts of the paraphyses, d: an initial of a branch in a paraphysis, e: anastomosing hyphae at the limit of the hymenium and the parathecium, f: irregular hyphal cells in the upper part of the subhymenium, g: partly dark-walled hyphae in the edges and undersides of the squamules, h: crystals in the cortex, i: crystals in the medulla, k: medullary hyphae, m: algal cell of *Trebouxia* type with the haustoria of the hyphae, n: conidia, o: terminal conidiogenous cells with young conidia; a in water, b–o in lactic blue. Scale (black bar) 10 μ m.

HNO₃; hyphae 4–5 μ m thick, branching, loosely intricate; cell walls 1–1.5 μ m thick, lumina 1 μ m in diam; algal layer 50–95 μ m thick, continuous; algae of *Trebouxia* type (10–16 \times 10–15 μ m); haustoria intracellular, finger-like structures, c. 4–5 \times 1 μ m, with slightly expanded (1.5 μ m in diam) tips; up to 6 haustoria seen in dead algal cells; medulla very thick (c. 0.5–0.9 mm), pure white, containing abundant hyaline granular crystals (4–11 \times 3–7 μ m), which do not dissolve in KOH, HCl or HNO₃; medullary hyphae hyaline, branching, anastomosing, cells 5–11.5 \times (3.5–) 4 (–4.5) μ m; cell walls 1–1.5 μ m thick; lumina (0.5–) 1–1.5 (–2) μ m in diam; outermost surface hyphae (with pigment evidently in hyphal wall) in edges and undersides of squamules dark greyish blue to bluish black (ISCC nos. 187, 188) in water, lactic blue, KOH, HCl and HNO₃ in microscopical preparations.

Apothecia frequent, dispersed or aggregated, (0.5–) 0.7–0.9 (–1.0) mm in diam, broadly sessile; discs brown-black to dark olive-brown (ISCC nos. 65, 96), flat; thalline margins entire, robust, (110–) 140–170 (–220) μ m broad, yellow-white to very pale cream-yellow (ISCC nos. 92, 89), hardly elevated at all from the disc surfaces, outsides (150–) 230–260 (–300) μ m high, (lower parts) partly bluish black to purplish black (ISCC nos. 193, 235); epihymenium dark grey-brown to dark olive-brown (ISCC nos. 62, 81, 96) in water, in HCl first dark greyish olive (ISCC no. 111), then colourless, in HNO₃ dark grey-brown to dark olive-brown (ISCC nos. 62, 96), c. 15–20 μ m high, coarsely granular at the surface, the granules (3–4 μ m in diam) only partly soluble in KOH, HCl and HNO₃; hymenium hyaline, 60–65 μ m high, distinctly delimited at the base; asci clavate, 47–54 \times 14–

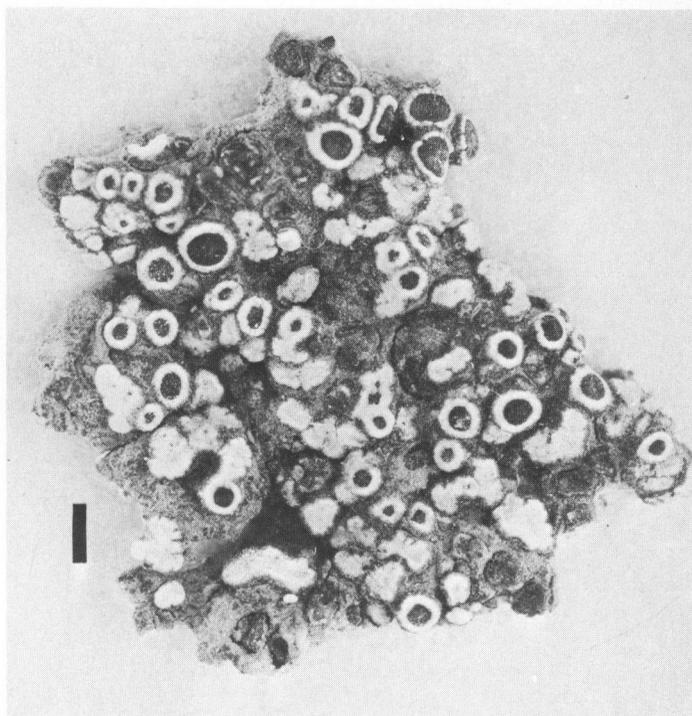


Fig. 2. *Squamarina poeltii* Vänskä, sp. nova, part of the holotype (O) photographed by Mr. Mauri Korhonen. Scale (black bar) 1 mm.

15.5 μm ; spores broadly ellipsoid (8.1–) 9.5 (–11.4) \times (5.7–) 6.5 (–8.1) μm (80 measurements), walls 0.5 μm thick; paraphyses 2 μm thick, hyaline, somewhat branching near the tips, anastomoses not frequent, tips slightly expanded (4–5 \times 3 μm), cells short (5–7 μm), inconspicuously septate, thin-walled (0.5 μm thick); parathecium 25–40 μm thick, hyphae 2–3 μm thick, frequently branching and anastomosing; subhymenium colourless, containing two parts; upper part (with ascogenous hyphae) 20–50 μm thick, staining as strongly as the hymenium with lactic blue, cells thin-walled (0.5 μm thick), large and irregular, 5–15 \times 4–8 μm ; lower part 30–35 μm thick, staining only weakly with lactic blue, hyphae thick-walled (1–1.5 μm thick), frequently branching and anastomosing, cell lumina 5–6 μm long, 0.5–1 μm in diam; lower part of the subhymenium forming a low cup-like structure with the parathecium; algal layer under subhymenium 45–75 μm thick, otherwise continuous, but under middle of subhymenium leaving alga-free space, 80–100 μm in diam; structure of cortex of thalline margin (25–30 μm thick) similar to that elsewhere in cortex of vegetative thallus.

Conidiomata rare, totally sunken into thallus, broadly ovoid to subglobose, c. 90 \times 80 (–85) μm , walls hyaline; conidiogenous cells terminal, obclavate, hyaline, 5–8.5 \times 3–3.5 μm ; conidia filiform, straight or slightly curved, hyaline, (15–) 19.4 (–24.5) \times 0.5 μm .

Chemical products: usnic acid and traces of unknown fatty acids [thin-layer chromatographic (TLC) method according to Culbertson 1972]. Hymenium IKI+ blue; cortex K–, C–, KC+ pale yellow, CK+ pale yellow, PD–, IKI–; medulla K–, C–, KC–, CK–, PD–, IKI–; acetone extract of thallus fragments on filter paper FeCl_3 + violet.

Ecology and distribution: on thin, fine-grained sand layer on siliceous rocks in the Arctic; as yet known only from the type locality in Novaya Zemlya.

Squamarina poeltii can be placed in sect. *Petroplaca* (Poelt 1958, 1969) because its characters include a very small but thick vegetative thallus with distinct lobes, a thick cortex, a continuous and well-differentiated algal layer, and a very thick medulla containing abundant granular crystals. It resembles *S. degelii* and *S. magnussonii*, which have lobes not

exceeding 1–1.5 mm in length and similar chemical products. The holotype (M) of *S. degelii* contains usnic acid and traces of unidentified fatty acids and the isotype (BERN) of *S. magnussonii* contains the same substances in similar concentrations and also two unknown substances, MAG-1 in high and MAG-2 in low concentrations (TLC tests made by the present author).

Characteristics of MAG-1: R_f classes 3 (A), 2–3 (B), 2 (C) in three solvent systems (A, B, C) of the standard lichen TLC method; $R_f \times 100$ values 30/51,88 (A), 20/37,76 (B), 13/34,70 (C) (for method and data presentation see Culberson 1972); deep brown (ISCC no. 56) in daylight after spray and heat, dark red-brown (ISCC no. 44) in UV light (366 nm). Characteristics of MAG-2: R_f classes 2 (A), 2 (B), 2 (C); $R_f \times 100$ values 13/51,88 (A), 13/37,76 (B), 7/34,70 (C); brown-pink (ISCC no. 33) in daylight and dark bluish grey (ISCC no. 192) in UV light (366 nm). Besides usnic acid, Timdal (1983) reports 'Unknown B' and 'Unknown C' as the chemical constituents of the isotype (fragment in M) and the non-type material (O) of *S. magnussonii*. According to the R_f classes and colour designations given by Timdal (1983), 'Unknown B' is equivalent to MAG-2 and 'Unknown C' to MAG-1. As regards the non-type material of *S. degelii*, Timdal (1982) reports only usnic acid, but no traces of unidentified fatty acids.

Both species differ from *S. poeltii* in having distinctly paler discs (brilliant-yellow, strong-yellow to dark yellow; ISCC nos. 83, 84, 88), often somewhat crenulate thalline margins and a \pm pruinose thallus surface, and in growing directly on rock surfaces (\pm calcareous), not on a sand layer. *S. magnussonii* differs from both *S. poeltii* and *S. degelii* in having a more compact cortex, in the K+ yellow reaction and in containing the unknown substances MAG-1 and MAG-2. *S. pachylepidea* (Hellbom) Poelt differs from *S. poeltii* in having longer lobes (2–3 mm long), larger apothecia (up to 2.5 mm in diam), and paler discs (light yellowish brown to dark greyish yellow; ISCC nos. 76, 85, 88, 91), and in the PD+ orange reaction of the cortex. *S. cal-*

lichroa (Zahlbr.) Poelt differs from *S. poeltii* in having somewhat pruinose margins in the squamules, larger apothecia (1–1.3 mm in diam), pale to brownish red and somewhat pruinose discs, and thinner thalline margins. *S. serpentini* Poelt differs from *S. poeltii* in having stalked peltate squamules in the older portions of the thallus and pruinose discs, in the K+ yellow and PD+ red reaction of the cortex and in growing on serpentine rocks (Poelt 1975).

S. magnussonii is known from several localities in the eastern and western Alps (Poelt 1958, Poelt & Krüger 1970), and from one locality in Norway (Oppland fylke; Timdal 1983). *S. degelii* is known from 20 localities in southern Norway (Poelt 1958, Poelt & Buschart 1978, Timdal 1982, 1983) and *S. pachylepidea* is known with certainty only from the type locality in southern Sweden (a single collection; biogeographical province of Närke; Poelt 1958) and from one locality in southern Norway (Oppland fylke; Timdal 1982, 1983). It is, however, possible that *S. degelii* also occurs in the Harz Mts. in Germany and *S. pachylepidea* in the eastern Alps (Poelt 1969, Poelt & Krüger 1970). The other species of sect. *Petroplaca* are more rare. *S. serpentini* and *S. callichroa* are known only from their type localities, in Yugoslavia (south-west Serbia) and southern China (Province of Yunnan), respectively (Poelt 1958, 1975).

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