

Lecidella varangrica sp. nov. from the Varanger Peninsula, northernmost Norway

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The new species *Lecidella varangrica* Haugan & Tønsberg is described from the northern shores of the Varanger Peninsula, Finnmark, Norway. It probably belongs to the saxicolous *L. asema* group by having a pigmented hypothecium and by producing chloroxanthones. *Lecidella varangrica* is distinguishable from other species in this group by a set of characters: the presence of soralia, the small apothecia with rather small ascospores, and the production of aotearone as the major chemical constituent. *Lecidella varangrica* is a species of vertical to overhanging weather-protected rock faces with strong marine influence along the harsh shores of the Barents Sea.

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Introduction

In Fennoscandia the genus *Lecidella* Körb. (Lecanoraceae; type species *L. viridans* (Flot.) Körb.) has been given little attention in recent decades when judged by the rather small number of papers that is based on material from this region. Tønsberg (1992) studied the sorediate, corticolous species in Norway and described *L. subviridis* Tønsberg as new. Elvebakk & Bjerke (2006) reported several species new to Troms Co., Norway, based on fieldwork in Skibotn, and Pykälä (2013) reported *L. pataвина* (A. massal.) Knoph & Leuckert new to Finland from Kittilän Lappi. The (chemo-) taxonomical studies on the genus by Knoph (1990), Knoph et al. (1995) and Knoph & Leuckert (2000) are pertinent also for Fennoscandia. Foucard's (2001) crustose lichen flora for Sweden treats 21 species. Currently the genus comprises 23 species in Fennoscandia (Nordin et al. 2018).

During an international field workshop in Varanger in June 2014, we collected a rich material of a sorediate, saxicolous *Lecidella* species. Some specimens collected in the same area (Båtsfjord and Vardø municipalities) in 1993 and 2011 proved to represent the same species. As this species, to the best of our judgement, didn't match any previously described *Lecidella*, it is formally described here.

Material and Methods

This study is based on the authors' fieldwork in Finnmark, Varanger, in July 2014, as well as on herbarium specimens in O. The authors' collections will be deposited in BG and O, and with

duplicates in GZU, MSCS, and NY. Elevational data given for the collection localities are derived from Kartverket (2018), based on field GPS data (datum WGS84).

Thin-layer chromatography (TLC) was routinely carried out in solvent systems A, B' and C according to Culberson and Kristinsson (1970), Culberson (1972), and Menlove (1974). For the identification of xanthenes solvent system J (Hanko 1983) was used. The plates were developed with sulphuric acid and heat after a thorough check under the UV-lamp, or not developed at all (during development the xanthenes lose their characteristic UV-fluorescence needed for identification). Aluminium plates were used in most cases because of the better UV-fluorescence of the xanthenes compared to glass-plates. To check for presence of hydrophobic substances, samples were additionally run on glass plates.

For DNA-analysis, apothecia from the type material were extracted.

The Species

Lecidella varangrica Haugan & Tønberg, sp. nov.

Mycobank: MB825186

Diagnosis: Similar to *Lecidella effugiens* (Nilson) Knoph & Hertel and *L. asema* (Nyl.) Knoph & Hertel, but differs in the significantly smaller spores, by being sorediate, and from the latter species, in the production of aotearone as a major compound.

Type: **Norway.** *Finnmark:* Vardø, Persfjorden, between Næringsodden and Hestmannes, cove Nordvestkeila, between the road and the sea, 70.4386°N 30.8416°E (GPS), 12 m alt., saxicolous on dry, slightly overhanging cliff face, 2014-07-01, T. Tønberg 43564 (BG-L-97803, holotype; GZU, NY, O, isotypes). Fig. 1.

Description: Thallus crustose, episubstratal, areolate, mostly indeterminate, to several dm² in diameter; prothallus not evident; areoles tiny, white to dirty yellowish white, glossy, scattered or a few becoming contiguous, fastened by the central parts of the underside, and with free, entire or, at least in older areoles, with incised margins, when well-developed sometimes weakly cerebriform, with a tendency to become subsquamulose and/or coralloid, convex, irregularly rounded, sometimes elongate, to 0.9 mm wide and, when subsquamulose, to 1.3 mm tall, esorediate or sorediate; soralia laminal or more rarely marginal on the areoles, concave to convex, greyish to blackish or bluish in young areoles, dirty white in soralia where the external soredia have been shed, punctiform at first, later becoming larger and sometimes covering major parts of the areoles, in extreme cases becoming capitate and to 0.6 mm diam.; soredia to 30 µm diam.; consoredia to 60 µm diam., outer part of external soredia brown, K⁻. Medulla K⁻, distinct, with 3–5 µm wide hyphae. Photobiont green, forming a distinct layer 60–145 µm tall in well-developed areoles; individual cells usually globose, thin- to thick-walled, to 15 (–20) µm wide.

Apothecia common, often restricted to esorediate areoles, lecidineae, sessile to constricted below, 1 per areole, 0.1–0.4 (–0.5) mm diameter; disc flat to convex, black, glossy and somewhat scabrid; margin distinct in young apothecia, later becoming indistinct, black, glossy and smooth; excipulum with dark olive green, K⁺ intensifying cortical zone, yellowish brown in interior part, without refracting crystals in polarized light; hymenium colourless, not interspersed, with scattered refracting crystals that are indissoluble in K (polarized light), 50–75 µm tall; epihymenium dark olivaceous green to blackish, without refracting crystals; hypothecium brown to yellowish brown, with refracting crystals that dissolve in K; paraphyses weakly branched, easily separated, 1.2–1.5



Figure 1. *Lecidella varangrica*, holotype. Scale 1 mm. Photo: Einar Timdal.

μm wide, top cell not swollen; asci clavate, $30\text{--}40 \times 13\text{--}20 \mu\text{m}$, with 8 spores; ascospores broadly ellipsoid, $9\text{--}11 \times 5.5\text{--}7.5 \mu\text{m}$.

Conidiomata (observed in TT 43566 only) pycnidia, one or a few per areole, black, laminal, to 0.14 mm wide; wall brown, K–; conidia-producing layer green, K–; conidia filiform, mostly strongly curved, to 30 μm long.

Chemistry: Aotearone (major substance), capistratone (= 2,5,7-trichloro-3-O-methylnorliche-xanthone), thiophanic acid, isoarthothelin, and trace of atranorin occur in all parts of thallus.

Ecology: *Lecidella varangrica* is a species of vertical to overhanging rock faces along shores with strong marine influence. Near the sea it grows in niches protected from direct sea spray. Further inland it may occur more exposed being found on small rocky ridges in open heath, but in all known localities there is some marine influence by wind-transported sea spray. The rock is hard and composed of somewhat calciferous sandstone and clayey slate. Associate species included *Amandinea punctata* (Hoffm.) Coppins & Scheid., *Anaphychia ciliaris* (L.) Körb., *Flavoplaca marina* (Wedd.) Arup et al., *Lecanora contractula* Nyl., *L. polytropa* (Ehrh. Ex Hoffm.) Rabenh. s. lat., *Lecidea lapicida* (Ach.) Ach., *L. praenubila* Nyl., *Lecidella carpathica* Körb., *Ochrolechia* sp., *Parmelia saxatilis* (L.) Ach., *Phaeophyscia sciastra* (Ach.) Moberg, *Physcia caesia* (Hoffm.) Fűrnr., *Rhizocarpon geminatum* Körb., *R. richardii* (Lamy ex Nyl.) Zahlbr.,

Scoliosporum umbrinum (Ach.) Arnold, *Tephromela atra* (Huds.) Hafellner, *Tremolecia atrata* (Ach.) Hertel, *Umbilicaria torrefacta* (Lightf.) Schrad., and *Verrucaria* sp.

Distribution: The species is presently known only from the northern coast areas (along the Barents Sea) of the Varanger Peninsula, i.e. Vardø and Båtsfjord municipalities in Finnmark county, northern Norway.

Etymology: *Lecidella varangrica* is named after the Varanger Peninsula from where it is described.

Discussion

Lecidella varangrica most probably belongs to the saxicolous *L. asema* group (sensu Leuckert et al. 1992), which in northern Europe includes the saxicolous species *L. asema*, *L. effugiens* and *L. meiococca* (Nyl.) Leuckert & Hertel. The group is characterized by chlorinated xanthones occurring in different chemosyndromes (see e.g. Knoph 1990, Knoph & Leuckert 1994, Knoph & Leuckert 2004). With aotearone as a major substance, *Lecidella varangrica* is chemically similar to *L. effugiens*, and chemically distinct from *L. asema*. In the North European chemotype of *L. asema* (syn. *L. subincongrua* (Nyl.) Leuckert & Hertel), thiophanic acid is a major xanthone and aotearone is minor or lacking. *Lecidella meiococca* is a saxicolous, atlantic and oceanic species that should not be confused with *L. varangrica* as it is blastidiate and chemically identical to *L. asema*.

Lecidella varangrica is the only sorediate member of the *Lecidella asema* group in Europe. Knoph & Leuckert (1994, 2004) mention occasional sorediate specimens of *L. effugiens* and *L. asema* from North America, without any reference to specific specimens. The affinities of those specimens to *L. varangrica* have thus not been studied. Apart from the presence of soralia, *L. varangrica* may in thalline characters resemble *L. asema* and *L. effugiens* as those species sometimes also develop subsquamulose to coralloid areoles. In *L. asema* such specimens usually have thicker and larger areoles than *L. varangrica*. *Lecidella varangrica* resembles *L. effugiens* in having rather small apothecia (those of *L. asema* are larger, up to ca 1.5 mm in diam.). Furthermore, the spores of *L. varangrica* are significantly smaller than in the other species of the *L. asema* group. *Lecidella effugiens*, which seems to be the most similar species, has spores that are 10–16 × 6–9 µm. The more widely distributed *L. scabra* (Taylor) Hertel & Leuckert has a more adnate, areolate-rimose thallus and soralia that may resemble those of *L. varangrica*, but which often become confluent forming irregular patches. It is further distinct by the production of atranorin and arthothelin (both major) and thuringione (accessory) in Norwegian specimens (Tønberg 1992, Knoph et al. 1997). The corticolous and lignicolous *L. elaeochroma* (Ach.) M.Choisy s. lat. is usually esorediate, with exception of “forma *soralifera*” which is a southern, strictly oceanic strain growing on deciduous trees (Tønberg 1992). It contains lichexanthone in the soralia as the diagnostic compound. Forms of *L. elaeochroma* s. lat. with a chemistry similar to that of *L. varangrica* (with high concentration of aotearone, and regular presence of atranorin) occurs, but are not known to be sorediate. There is a need for further studies of the corticolous species in the *Lecidella elaeochroma* group and their affinities to the *L. asema* group.

Recently, molecular phylogenies were provided for the genus by Zhao et al. (2015, 2016). In the latter phylogeny, two main clades were recognized, one comprising species with hyaline hypothecia and the lack of chlorinated xanthones, the other with pigmented hypothecia and the presence of chlorinated xanthones in most species. One species, *L. enteroleucella* (Nyl.) Hertel, has an intermediate position between the clades. Unfortunately the type species of *Lecidella*, *L.*

viridans (Flot.) Koerb. (see e.g. Hertel & Leuckert 1969), was not included in these phylogenies. That species doesn't fit well with any of the two clades having a hyaline hypothecium and producing chlorinated xanthenes (Fletcher et al. 2009). Based on the anatomy and the chemistry, *Lecidella varangrica* probably belongs to the clade comprising species with a pigmented hypothecium and the production of chlorinated xanthenes. Unfortunately we were not able to get sequences from the samples subjected to DNA-analysis.

Additional specimens examined: Norway. Finnmark: Båtsfjord, ca 1 km E of Sandfjord, 70.5°N 30.6°E, alt. 5–20 m, on vertical rock in maritime situation, 1993-08-03, R. Haugan 3480 (O L-199754); Vardø, Persfjorden, W of Bukkemoltangen, 70.429°N, 30.728°E (GPS), alt. 6 m, on rocks close to the sea, 2011-08-19, H. Bratli 8063 (O L-175951); Persfjorden, Bukkemoltangen, Fanthaugen, 70.426°N 30.759°E (GPS), alt. 25 m, vertical rock face, rock outcrop near the sea, 2014-07-01, R. Haugan 141537c (O L-198923); Persfjorden, between Næringsodden and Hestmannes, cove Nordvestkeila, uphill from road, 70.4378°N 30.8420°E (GPS), alt. 17 m, saxicolous on sheltered rock face, 2014-07-01, T. Tønsberg 43566 (BG L-97804, MSCS); same locality and date, between the road and the sea, 70.4395°N 30.8418°E (GPS), alt. 8 m, vertical rock face, rock outcrop near the sea, R. Haugan 141523 (O L-198624); same locality and date, 70.4392°N 30.8408°E (GPS), alt. 6 m, R. Haugan 141527 (O L-198625); same locality and date, 70.439°N 30.841°E (GPS), alt. 12 m, R. Haugan 141531 (O L-198628).

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