

Varicellaria lactea new to the U.S.A. from Alaska

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ABSTRACT. – *Varicellaria lactea* is reported new to the U.S.A. from Katmai National Park and Preserve and Lake Clark National Park, both in Alaska. It was found on slightly overhanging rock walls on lake shores. The specimens agree well morphologically and chemically with material from Scandinavia (Norway) used for comparison.

KEYWORDS. – Crustose lichens, soralia, range extension, *Lepra*.

INTRODUCTION

Based on molecular methods the old genus *Varicellaria* Nyl. was recently given a new circumscription (Schmitt et al. 2012). Seven species previously regarded as belonging to *Pertusaria* DC., e.g. by Dibben (1980) in his monograph for North America, were transferred to *Varicellaria* (Schmitt et al. 2012). Species of *Varicellaria* have disciform apothecia, non-amyloid hymenial gel, amyloid asci containing 1–2, simple or 1-septate spores with unzoned walls and a thallus containing lecanoric acid (Schmitt et al. 2012). Three species of *Varicellaria*, *V. lactea* (L.) Schmitt & Lumbsch, *V. rhodocarpa* (Körb.) Th. Fr. and *V. velata* (Turner) Schmitt & Lumbsch have been reported from North America (Esslinger 2016, Lendemer & Harris 2017, McMullin et al. 2017, Schmitt et al. 2012).

Fieldwork in Katmai National Park and Preserve and Lake Clark National Park, both in Alaska, in 2013 and 2014, yielded two specimens of *Varicellaria lactea*. As the species has previously been reported in North America only from Canada (McMullin et al. 2017), these finds are reported and illustrated here.

MATERIALS AND METHODS

Herbarium specimens

This study is based on the author's fieldwork in Alaska in the U.S.A., in addition to herbarium material in BG and UPS. The author's collections from North America will be deposited in BG; duplicates, as far as the material permits, will be deposited in ALA and OSC.

Morphological and chemical studies

The morphological characterization of the species was based on the material deposited in BG (about 30 specimens from Norway), if not otherwise stated. Soralia were sectioned in search of hymenia. Thin-layer chromatography (TLC) was carried out according to Culberson and Kristinsson (1970), Culberson (1972), and Menlove (1974). All the three solvents recommended by these authors were used, with aluminium plates in solvents A and B' and, to allow for the detection of fatty acids, glass plates in solvent C.

RESULTS AND DISCUSSION

Varicellaria lactea (L.) Schmitt & Lumbsch, Mycokeys 4: 31. 2012. ≡ *Lichen lacteus* L., Mant. Pl. 1: 132. 1767. **TYPE: SWEDEN, VÄSTERGÖTLAND:** Mularp, 6.viii.1922, leg. E. Vrang s.n. (UPS!, neotype [designated by Jørgensen et al. 1994]).

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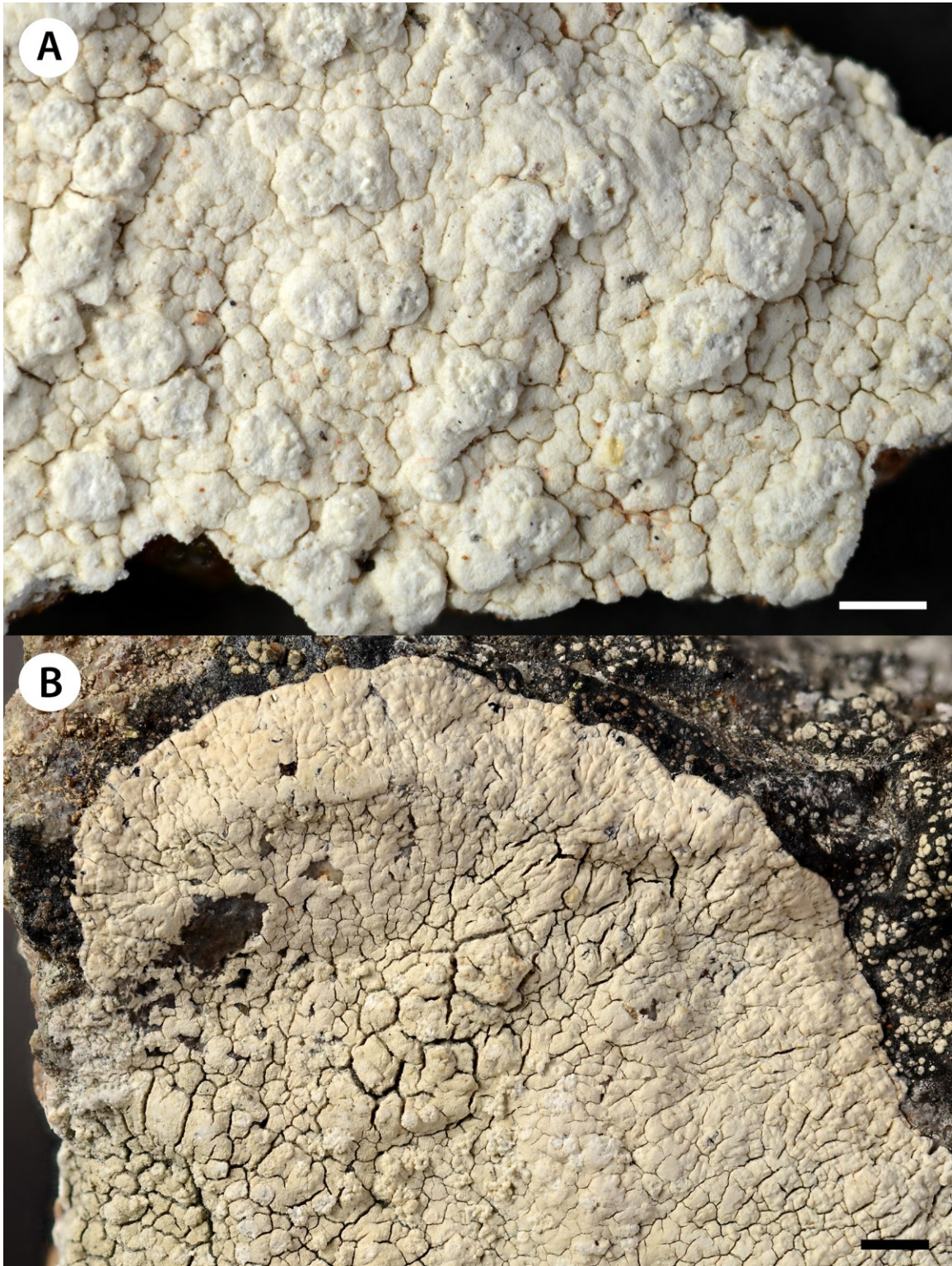


Figure 1. *Varicellaria lactea* from Alaska. A, part of Tønsberg 42724b (BG). B, part of Tønsberg 43909 (BG). Scales = 1 mm in A; 2 mm in B. Photos by E. Timdal 2017.

Characterization of material from Scandinavia. – Thallus usually grayish to creamy white, matt or sometimes, along the margin, glossy, rather smooth to minutely warty, especially towards thallus center (distinctly warty in e.g. *Tønsberg* 9250), rimose-cracked; margin sometimes indistinctly zoned; areoles flat to slightly convex, more or less angular to rounded, mostly up to 1 mm wide, when larger usually in the process of forming cracks. Soralia irregularly shaped, diffuse and often efflorescent and up to 3 mm wide, or circular and surrounded laterally by an esorediate, thalline collar and up to 1.3 mm wide; the first diaspores often smooth, club-shaped to globose and resembling isidia, up to 0.4(–1.0) mm tall and 0.3(–0.9) mm wide, subsequent diaspores mostly irregularly rounded consoredia to 400 µm in diameter or more. (This type of soralia development where diaspores resembling isidia are produced first, and then soredia and/or consoredia, is described by Chambers et al. (2009) for *Lepra excludens* (Nyl.) Hafellner (as *Pertusaria excludens* Nyl.) and for *P. lactescens* Mudd.) Apothecia very rare, resembling soralia (Chambers et al. 2009), not seen. Medulla distinct, white. Photobiont layer distinct, just beneath the thallus surface. Prothallus white and of projecting bundles of hyphae at the thallus edge, or not evident. Photobiont green, coccoid, to 13 µm diameter.

In the literature consulted (e.g., Chambers et al. 2009, Erichsen 1936, Foucard 2001, Poelt 1969, Wirth et al. 2013), there is no information about the size of the thallus of *Varicellaria lactea*. In material of the species in BG there are specimens up to 14 cm in diameter (*Tønsberg* 7094 comprising only a part of the original specimen since the thallus margin is lacking) and up to 2 mm thick when measured through soralia (*Tønsberg* 36930). Although accurate field measurements of the diameter of whole thalli may be lacking, observations of the species in the field in Norway indicate that *V. lactea* may reach several decimeters in diameter (*Tønsberg*, pers. observ.).

Chemistry. – The chemical constituents are lecanoric and variolaric acids; the latter substance sometimes apparently absent (at least not detected by TLC). Esorediate parts of the upper surface C+ yellow (variolaric acid), medulla and the soralia C+ blood red (lecanoric acid). When C is applied to the thallus surface, a reticulate pattern of blood-red lines sometimes appeared reflecting the positive reaction with C of the upper medulla/photobiont layer evident through the rimose-cracks.

Characterization of the material from Alaska. – The specimens from Alaska agree with the material from Scandinavia characterized above. The specimen from Lake Clark is six centimeters in diameter, has parts of the thallus margin intact (Fig. 1B) and the surface is minutely warty, whereas in the specimen from Katmai (Fig. 1A) the thallus margin is not evident and the surface is not warty. The specimens are both sterile and their chemical constituents are lecanoric and variolaric acids.

In the genus *Varicellaria*, the creamy white thallus surface, the presence of soredia, the production of lecanoric and variolaric acids, and the saxicolous habit make *V. lactea* a distinctive species (Schmitt et al. 2012). The specimen from Katmai (*Tønsberg* 42724b) was closely associated (occurred side by side on the same rock wall) with a morphologically similar lichen (*Tønsberg* 42724a) which was identified as *Lepra excludens* based on morphology and its chemical constituents norstictic and connorstictic acids; the latter substance in trace amounts. Interestingly these two thalli (see Figs 1A and 2, respectively) could hardly be distinguished based on morphology only.

Distribution and ecology. – In Alaska *Varicellaria lactea* was found on rock walls on lakeshores at altitudes of 10–15 m (Katmai) and 450 m (Lake Clark). The species was recently (McMullin et al. 2017) reported as new to North America from British Columbia and Québec in Canada. The species is here reported as new to the U.S.A. from Alaska. Outside North America *V. lactea* occurs in Asia and Europe (Chambers et al. 2009, as *Pertusaria lactea* (L.) Arnold).

Specimens examined. – **U.S.A. ALASKA. LAKE AND PENINSULA BOROUGH:** Katmai National Park and Preserve, Naknek Lake, NNE of Brooks Camp, 58.56320°N 155.75915°W, alt. 10–15 m, saxicolous in shallow cavity in lakeshore cliff, 26.vii.2013, *T. Tønsberg* 42724b (ALA, BG); Lake Clark National Park, Portage Lake, bay on SW side, 60.5015°N 153.8776°W, alt. 450 m, saxicolous on overhanging rock wall on lake shore with cliffs and *Picea* forest, 12.vii.2014, *T. Tønsberg* 43909 (ALA, BG, OSC).



Figure 2. *Lepra excludens*, part of *T. Tønsberg* 42724a (BG). Scale = 1 mm. Photo E. Timdal 2017.

Selected comparative material examined (all BG). – **NORWAY. ROGALAND.** UTSIRA: SSW of Utsira fyr [light-house], 59.30549°N 4.87021°E, alt. 57 m, saxicolous on upper face of low boulder in coastal heath, 4.x.2017, *T. Tønsberg* 47534. SAUDA: ESE of Gjuvastøl, S of Storelva, along path to old zinc mines, 59°39.2'N 6°28.2'E [59.33333°N 6.47000°E], alt. 175 m, on N-facing rock wall in gorge, 1.viii.1999, *T. Tønsberg* 27358. **SØR-TRØNDELAG.** MELHUS: Lundadalen, 3–4 km E of brook Skarvbekken, alt. 170 m, 09.vii.1982, *T. Tønsberg* 7094. **NORDLAND.** LEIRFJORD: Leinesstranda, alt. 30 m, on shaded, N-facing rock, 23.vii.1985, *T. Tønsberg* 9250. MELØY: S of Glomfjorden, along Reindalselva, W side, 66°47.95'N 13°45.80'E [66.79916°N 13.763333°E], alt. 160 m, saxicolous on N-facing rock wall on riverbank, exposed to spray from waterfall, 19.vii.2006, *T. Tønsberg* 36930. NESNA: Tomma, N of Husby, between Tomsvika and Kvernán, 66.24843°N 12.73897°E, alt. 29 m, saxicolous on boulder in coastal heath, 20.vi.2016, *T. Tønsberg* 46501.

Specimen of Lepra excludens examined. – **U.S.A. Alaska. Lake and Peninsula Borough:** Katmai National Park and Preserve, Naknek Lake, NNE of Brooks Camp, 58.56320°N 155.75915°W, alt. 10–15 m, saxicolous in shallow cavity in lakeshore cliff, 26.vii.2013, *T. Tønsberg* 42724a (ALA, BG).

ACKNOWLEDGEMENTS

Thanks are due to Bruce McCune, Oregon State University, for the invitation to do lichenological field work in Katmai and Lake Clark National Parks and Preserves in 2013 and 2014, and for comments on the manuscript; the National Park Service (NPS), Southwest Alaska Network, Anchorage, for funding; Amy Miller and James Walton (both NPS) for project coordination and for organizing and executing field logistics; the curator of UPS for loan of type material; Einar Timdal, University of Oslo, for the photos; Beate Helle, University of Bergen, for technical help; and James Lendemer, New York Botanical Garden, and Troy McMullin, Canadian Museum of Nature, for pointing out to me recently published papers, e.g. on *Varicellaria lactea* in North America and for valuable comments on the manuscript.

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