

# Notes on the Lichen Genus *Lepraria* in Great Smoky Mountains National Park, southeastern North America: *Lepraria lanata* and *L. salazinica* spp. nov.

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**ABSTRACT.** – *Lepraria lanata* Tønsberg and *L. salazinica* Tønsberg are described as new from the Great Smoky Mountains National Park, North Carolina and Tennessee, U.S.A. *Lepraria lanata* has exceptionally large consoredia, produces protocetraric and angardianic/roccellic acids and occurs on rock walls. It is easily recognized even in the field. *Lepraria salazinica* forms a thin, grayish white cover of soredia and consoredia on overhanging rock surfaces and produces atranorin, salazinic acid, and angardianic/roccellic acid.

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## INTRODUCTION

The Great Smoky Mountains National Park on the border between North Carolina and Tennessee in southeastern U.S.A., is very rich in lichens including sorediate crusts. Based mainly on material collected by the author, several sorediate, crustose species have recently been described as new to science, including *Bacidia lobarica* Printzen & Tønsberg (Printzen & Tønsberg 2007), *Biatora appalachensis* Printzen & Tønsberg (Printzen & Tønsberg 2004), *B. printzenii* Tønsberg (Tønsberg 2002), all with type material collected in the Park. Three further crustose species, the sorediate *B. pontica* Printzen & Tønsberg (Printzen & Tønsberg 2003) and *Vainionora americana* Kalb, Tønsberg & Elix (Kalb 2004), as well as the esorediate *Biatora pycnidiata* Printzen & Tønsberg (Printzen & Tønsberg 2004) were described with material from the Park. These species are mainly corticolous although some also occur on wood and rock. In the present note two saxicolous species of *Lepraria* are described as new.

## MATERIALS AND METHODS

This study is based on material from the Great Smoky Mountains National Park (GSMNP) collected by the author and deposited in BG in addition to three specimens (including one from outside the park) from NY and one from UPS. Thin-layer chromatography was carried out according to the methods of Culberson & Kristinsson (1970) and Culberson (1972) with later modifications. Fatty acids with R<sub>f</sub>-values similar to those of angardianic acid and roccellic acid, which can not be separated by thin-layer chromatography (Leuckert et al. 1995), are referred to as angardianic/roccellic acid.

## RESULTS

### *Lepraria lanata* Tønsberg sp. nov.

Thallus leprosus, plerumque non stratosus, constans ex consorediis conspicuis ad 1 mm diam. Paginis arachnoideis, albidis vel caesio-/fusco-griseis; acide protocetraricum et angardianicum/roccellicum continens.

**TYPE:** USA. TENNESSEE. SEVIER CO.: Great Smoky Mountains National Park, along the Boulevard Trail, 35° 39.11' N, 83° 25.76' W, 1870 m, saxicolous on shaded, overhanging, schistose rock wall, 8.ix.2005, *T. Tønsberg* 36347 (BG, holotype; ASU, DUKE, NMW, NY, isotypes).

**DESCRIPTION.** – Thallus leprose, unstratified, effuse, irregularly spreading to 1 dm or more in diam., whitish throughout, or with a ±brownish to bluish gray surface, composed of consoredia (see Tønsberg 1992).

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Consoredia rounded, large and conspicuous, to 1 mm diam., of loose, arachnoid tissue (Fig. 1); hyphae (3–)4–8(–9)  $\mu\text{m}$  wide, branched and anastomosed, colourless or, in external parts, often forming a network of brown hyphae giving the thallus a  $\pm$ brownish or bluish gray colour; tips not projecting. Hypothallus not evident. Photobiont trebouxoid, to 10(–13)  $\mu\text{m}$  wide.

**ETYMOLOGY** – The specific epithet (*lanatus* = woolly) refers to the consoredia which resemble balls of wool.

**CHEMISTRY**. – Protocetraric acid, angardianic/roccellic acid. Thallus PD+ orange, K–, C–, KC–.

**ECOLOGY AND DISTRIBUTION**. – *Lepraria lanata* was saxicolous (most specimens), terricolous or muscicolous on shallow, dry to rather wet overhangs and rock walls. Closely associated lichens included *Cladonia* sp(p). (primary squamules), *Lepraria* spp., and *Leprocaulon arbuscula* (Nyl.) Nyl. At one site, *Cetradonia linearis* (Evans) J.-C. Wei & Ahti (syn. *Gymnoderma lineare* (Evans) Yoshim. & Sharp) grew in the vicinity, albeit in a more rain-exposed niche. The vertical distribution of *L. lanata* ranged from 1120 to 1990 m, but most specimens were from above 1500 m elevation.

**DISCUSSION**. – *Lepraria lanata* is a very characteristic species which can be readily recognized in the field by the particularly large, arachnoid consoredia and the network of pigmented, external hyphae giving the thallus a partly brownish or more often, a bluish grey tinge. *Lepraria lanata* is chemically similar to chemotypes of *L. nivalis* Laundon (see Laundon 1992) and *L. normandinoides* Lendemer & R.C. Harris (see Lendemer & Harris 2007). The two latter species have well-delimited thalli with marginal lobes and the granules are smaller (to 0.4 mm and 30–60  $\mu\text{m}$  in diameter, respectively); these species should therefore not be confused with *L. lanata*. Based on the material examined, *L. lanata* seems to be endemic to the southern Appalachians – a distribution which it shares with lichens such as, e.g., *Bacidia lobarica* (see map in Printzen & Tønsberg 2007), *Biatora appalachensis* (see map in Printzen & Tønsberg 2004), *Cetradonia linearis* (see map in Wei & Ahti 2002) and *Leioderma cherokeense* P. M. Jørg. & Tønsberg (see map in Jørgensen & Tønsberg 2005).

**SELECTED SPECIMENS EXAMINED**. **USA. NORTH CAROLINA. AVERY Co.:** Grandfather Mountain, vi.1936, *G. P. Anderson s.n.* (NY). **SWAIN Co.:** GSMNP, along Clingmans Dome Rd, close to the parking lot loop at end of road, 1915 m, saxicolous on dry and shaded rock wall under overhang, 17.vi.2002, *T. Tønsberg 30847, 30848* (BG). **TENNESSEE. SEVIER Co.:** GSMNP, along Alum Cave Trail, between Arch Rock and Alum Cave, 1350 m, saxicolous in wet overhang, 24.ix.2003, *T. Tønsberg 33718, 33719* (BG); along Alum Cave Trail, just SE of Alum Cave, 1500 m, saxicolous/muscicolous/terricolous, 24.ix.2003, *T. Tønsberg 33744, 33745, 33747, 33748, 33752, 33753, 33754* (ALL BG); Great Smoky Mountains [National Park], below Alum Cave, on overhanging rocks, about 1515 m, 13.ix.1939, *G. Degelius s.n.* (UPS); Mount Le Conte, below Myrtle Point, on cliff, 6000 ft, xi.1935, *A. J. Sharp 59* (NY); Mount Le Conte, beneath Cliff Top, 1930 m,  $\pm$ muscicolous/saxicolous under overhanging rock, 29.vi.2004, *T. Tønsberg 34117* (BG); off Roaring Fork Motor Nature Trail, at Grotto Falls, 1120 m, saxicolous under shaded overhang near waterfall, 3.vi.2005, *T. Tønsberg 35219* (BG); W of Clingmans Dome, along Appalachian Trail, 1990 m, saxicolous under N-facing overhang below exposed crest, 4.vi.2005, *T. Tønsberg 35253* (BG); along the Boulevard Trail, 1840 m, muscicolous/over plant debris on shaded rock overhang, 8.ix.2005, *T. Tønsberg 36346* (BG); Ramsey Cascades, plant growing on shaded bluff face to the right of the falls, ca. 6–7 feet below the rim, 4400 ft, 6.v.1973, *P. R. Fantz 1* (NY).

### ***Lepraria salazinica* Tønsberg sp. nov.**

Thallus ubique leprosus, griseo-albidus, tenuis, non stratosus, effusus. Soredia farinosa aut cum consorediis ad 50  $\mu\text{m}$  diam. Acidum atranoricum, salazinicum et angardianicum/roccellicum continens.

**TYPE: USA. NORTH CAROLINA. SWAIN Co.:** Great Smoky Mountains National Park, Balsam Mountain, along Balsam Mountain Rd, 4 miles (along the road) from the gate (near the end of Heintooga Rd), 35° 36.2' N, 083° 11.5' W, 1420–1450 m, saxicolous under overhang, 20.vi.2002, *T. Tønsberg 30941* (BG, holotype; DUKE, isotype).

**DESCRIPTION**. – Thallus leprose, unstratified, not lobed, effuse, thin, grayish-white, forming small patches to a few mm in diameter soon becoming confluent and  $\pm$ contiguous; soredia to 30  $\mu\text{m}$  in diam., or in consoredia to 50  $\mu\text{m}$  in diam., with a  $\pm$ complete wall of colourless hyphae; hyphae not projecting; photobiont trebouxoid; cells to 13  $\mu\text{m}$  in diam.

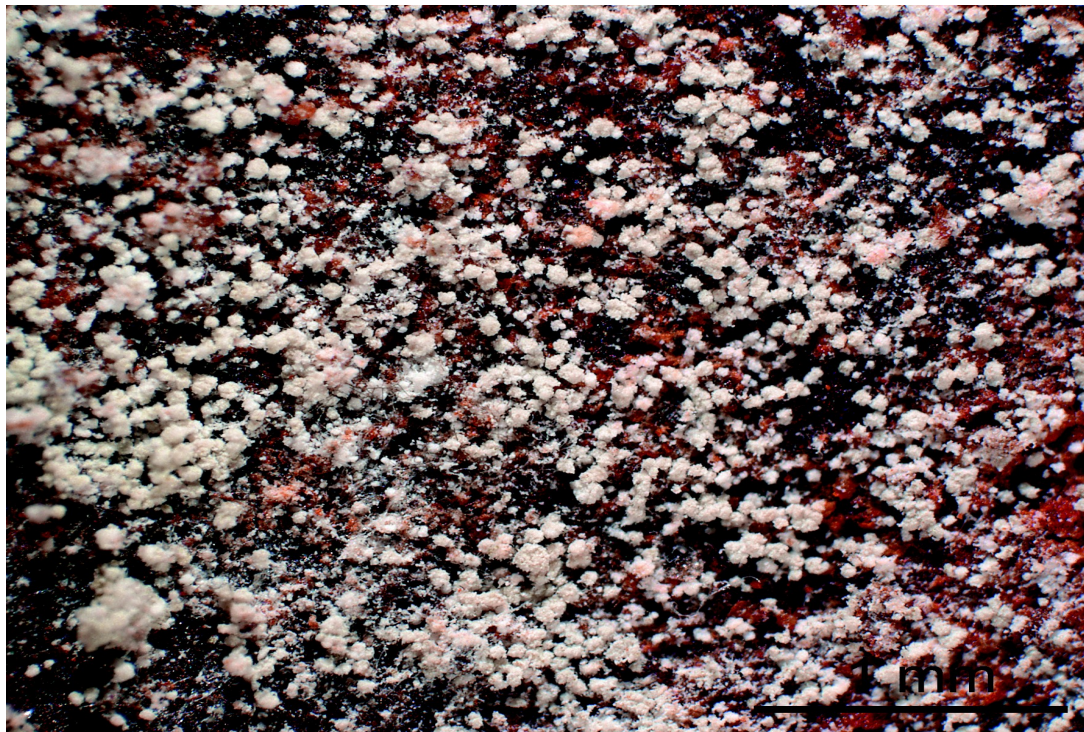


Figure 1 (top). *Lepraria lanata*, holotype. Figure 2 (bottom). *Lepraria salazinica*, holotype.



**ETYMOLOGY** – The specific epithet (*salazinica*) refers to the presence of salazinic acid.

**CHEMISTRY.** – Atranorin, salazinic acid, and angardianic/roccellic acid. Thallus: PD+ orange, K+ yellow becoming red, C–, KC–.

**ECOLOGY AND DISTRIBUTION.** – Based on the two specimens available *L. salazinica* appears to be saxicolous on overhanging rock. Closely associated lichen species on the small pieces of rock in the herbarium packets included only fragments of a *Chrysothrix*. Its vertical distribution ranged from 570 to 1420–1450 m.

**DISCUSSION.** – Salazinic acid is a rare substance in *Lepraria*, previously known only as a trace substance in *L. multiacida* Aptroot (Elix & Tønsberg 2004). *Lepraria salazinica* appears to be the first species of *Lepraria* known to produce salazinic acid as a major diagnostic substance. The thin, whitish thallus composed of rather small soredia and consoredia, and the presence of major quantities of salazinic acid are particularly diagnostic characters for *L. salazinica* and readily distinguish it from *L. multiacida*. The latter species is thick, with a ±black hypothallus and produces a range of substances including atranorin, zeorin, stictic acid and satellite compounds, strepsilin and related compounds in addition to salazinic acid (Aptroot 2002, Elix & Tønsberg 2004). At present the distribution of *L. salazinica* is not well known.

**ADDITIONAL SPECIMENS EXAMINED. USA. TENNESSEE. SEVIER Co.:** GSMNP, along Little River Rd/Little River, along tributary creek, 570 m, saxicolous under shaded overhang in creek ravine, 16.vi.2002, T. Tønsberg 30789 (BG, NMW, NY).

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