The typification of *Variolaria discoidea* Pers.

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Abstract. The type species of the lichen genus *Variolaria* is *V. discoidea*. The name is solely based on a Hoffmann (1784) illustration. To stabilize the nomenclature, we have designated a lectotype and an epitype from Germany, for which we generated molecular data. The species was formerly placed in the genus *Pertusaria* as *P. albescens*, and is presently correctly named *Lepra albescens*.

Key words: lichens, nomenclature, *Pertusariales*, taxonomy

Introduction

When the taxonomy of the crustose genus *Pertusaria* DC. was revised with molecular methods (Lumbsch & Schmitt 2001), it proved to be polyphyletic as generally adopted at that time, and it needed to be divided into several genera, which had to be named. One of them had informally been called the *Variolaria*-group (see Erichsen 1936), but because of the older, different *Variolaria* Bull., it could not be used and unfortunately no one thought of conserving this long-adopted name for the group. Instead other alternatives were used of which *Lepra* Scop. was the oldest, but had previously been adapted for some species in the genus *Lepraria* Ach. (Jørgensen 2018). Therefore, a proposal was finally made to conserve the name *Variolaria* Pers. for the genus (Jørgensen 2018), but this has yet not been treated by the nomenclatural committee (MacNeill pers.comm.). It has been pointed out that it is unfortunate that the type species, *V. discoidea* Pers., is based on an old illustration (Persoon 1794), Tab. 7, Fig. 5 (Fig. 1A) in Hoffmann's Enumeratio (1784), of which no herbarium specimen has survived. This illustration accordingly needs an epitype to be precisely characterized. Since there are two specimens shown, we base our interpretation on the larger specimen on the left (shown in fig. 5a) which then is a lectotype (*hic designatus*, MBT 10015333). Since no specimen from the German region was included in a recent phylogenetic study (Wei & al. 2017), we have aimed at designating a typical specimen (Fig. 1B–C) of this species from the

region of its description. We generated molecular data for two protein-coding loci (*RPB1*, *MCM7*) to infer the placement of the taxon within the pertusarian lichens, and of ITS rDNA and mtSSU rDNA to confirm the placement within the genus *Lepra*.

Material and methods

We generated molecular data for the following two specimens:

1. Germany, Baden-Würtemberg, Schwarzwald-Randplatten, Pforzheim, Südwest-Stadt, Davosweg, near tennis courts by Nagold river, elevation 270 m (48.879722°, 08.697784°), Dec. 2017, leg. A.P. Dornes 21712.004, on *Acer pseudoplatanus* (FR-0264873, epitypus, see below).

2. Germany, Baden-Würtemberg, Schwarzwald-Randplatten, Pforzheim, Südwest-Stadt, gardens between Postwiesenweg and Werner-Siemens-Str., elevation 310 m (48.884444°, 08.677222°), 4. Dec. 2017, leg. A.P. Dornes 21712.001, on *Malus domestica* (FR-0264874).

Photographs were taken with a KEYENCE VHX-1000 using the depth composition function.

Molecular methods and phylogenetic analysis

We sequenced parts of the protein-coding genes *RPB1* and *MCM7*, as well as the ribosomal DNAs ITS and mtSSU (12S) of two specimens of *Lepra albescens*. Molecular methods were the same as in Wei et al. (2017). We created three alignments: 1) a concatenated alignment of *RPB1* and *MCM7* sequences (25 sequences), 2) an ITS rDNA alignment (14 sequences), and 3) a mtSSU alignment (14 sequences). For alignment 1), we used closely

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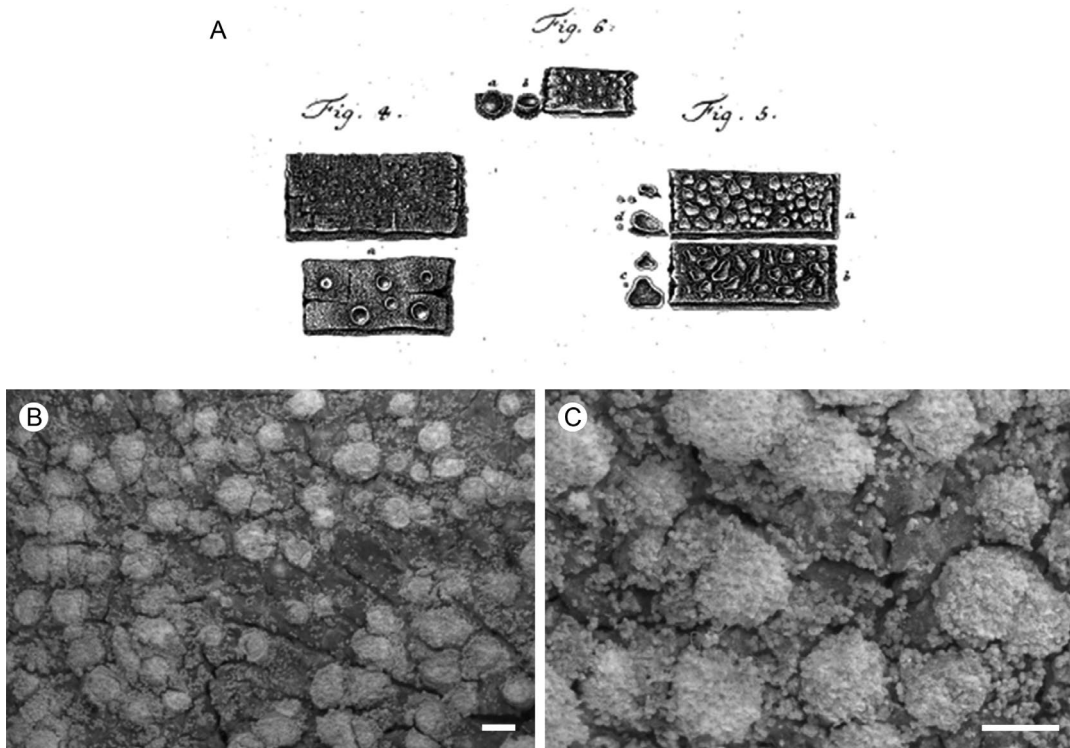* Corresponding author e-mail: pmjorg@broadpark.no

Figure 1. Morphology of *Lepra albescens*. A – Hoffmann's (1784) illustration, Table 7, Fig. 5 – the only original material left of *Variolaria discoidea* Pers.; B–C – the designated epitype of *Variolaria discoidea* (=*Lepra albescens*). Scales = 1 mm.
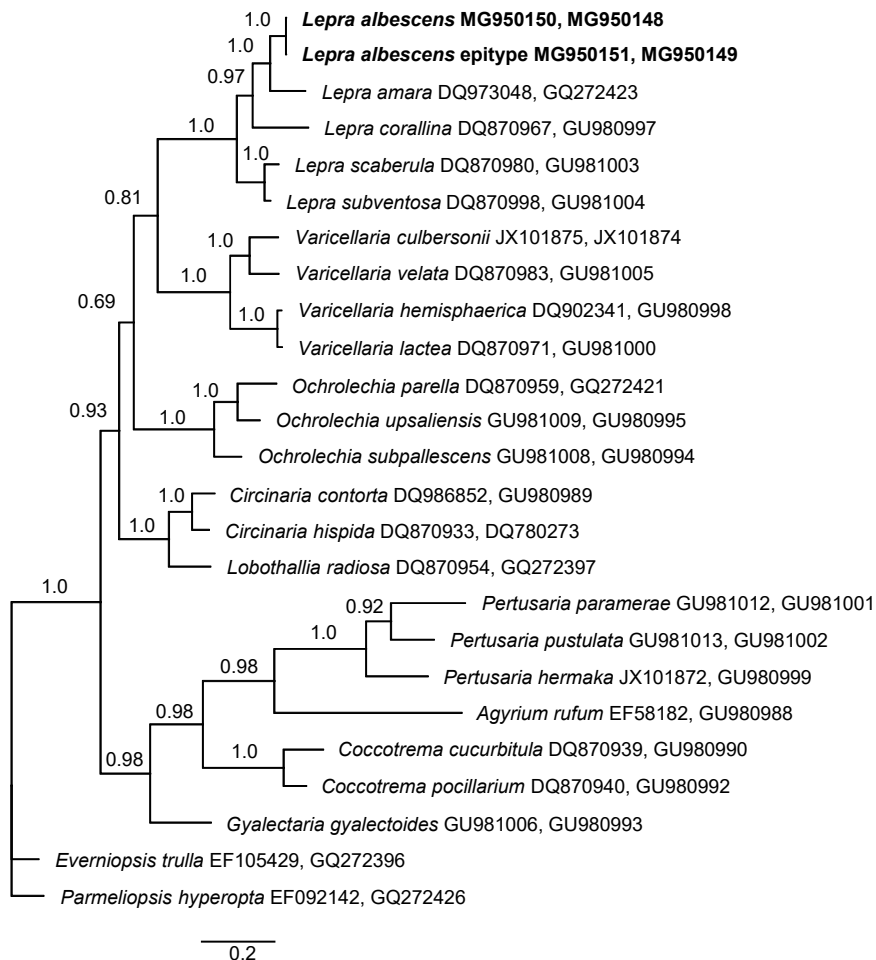

Figure 2. Phylogeny of pertusarialean fungi indicating the placement of the epitype of *Lepra albescens* (in bold). This is a Bayesian inference based on concatenated *RPB1* and *MCM7* sequences. GenBank accession numbers are given behind the names (*RPB1*, *MCM7*). Posterior probabilities are indicated at the branches.
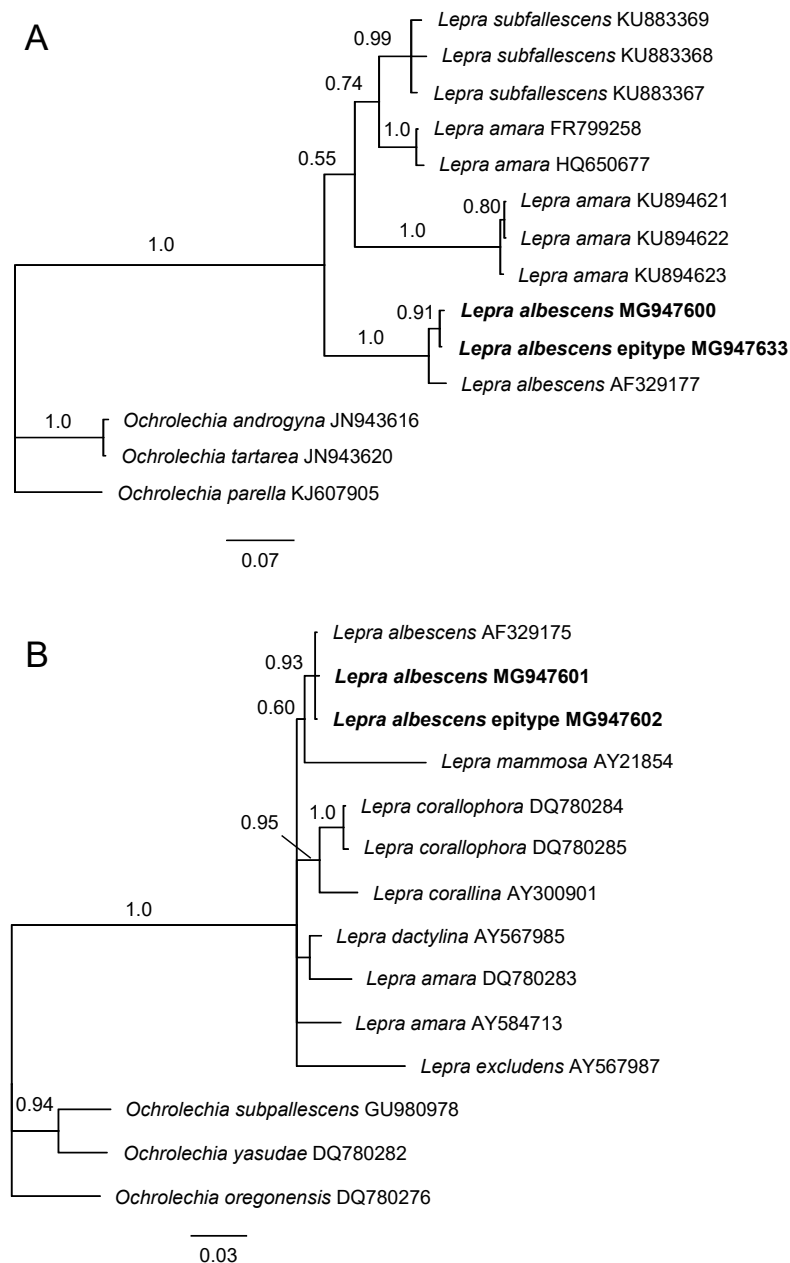
Figure 3. Phylogenetic placement of the epitype of *Lepra albescens* within the genus *Lepra*. These are Bayesian inferences based on ITS (A) and mtSSU (B) rDNA. GenBank accession numbers are given behind the names. Posterior probabilities are indicated at the branches.

related pertusarialean taxa, for which both, *RPB1* and *MCM7* sequences were available (Schmitt et al. 2012). For alignments 2) and 3), we used the most similar sequences from GenBank retrieved via BLAST searches. Since the taxon overlap between ITS and mtSSU sequences was poor, we opted for single-locus analyses. All alignments were analyzed with MrBayes (Huelsenbeck & Ronquist 2001) using the following settings: GTR +I, 1 million generations, sample frequency 100, print frequency 1000, 8 chains, branch lengths included, burnin 2500. Phylogenies were visualized in Genious, version 5.6.7.

Results

The newly generated sequences are deposited in Gen-Bank under accession numbers MG947633, MG947602, MG950151, MG950149, MG947600, MG947601,

MG950150, and MG950148. The consensus tree based on the concatenated *RPB1* (612 bp) and *MCM7* (573 bp) alignments shows that the newly generated sequences group with the genus *Lepra* (Fig. 2). The single locus phylogenies (ITS alignment = 572 bp, mtSSU alignment = 813 bp) indicate that the newly sequenced epitype groups with other specimens of *Lepra albescens* (Fig. 3). The mtSSU phylogeny provided little resolution and support (Fig. 3B).

Conclusions

The specimen from Germany studied molecularly here falls within the species presently known as *Lepra albescens* (Hudson) Hafellner, and is also morphologically, as well as chemically, typical of this species as described by Tønsberg (1992). We therefore designate

this as epitype of *Variolaria discodea* Pers. (Fig. 1B–C): Germany, Baden-Würtemberg, Schwarzwald-Randplatten, Pforzheim, Südwest-Stadt, Davosweg (48.884444°, 08.677222°), 4. Dec. 2017, A.P. Dornes 21712.004, on *Acer pseudoplatanus* (FR-0264873, *epitypus hic designates*, MBT 10015334) [GenBank accession numbers: ITS rDNA MG947633, mtSSU MG947602, *RPB1* MG950151, *MCM7* MG950149]. This species is the generitype of *Variolaria* Pers., as well as *Lepra* Scop. (Jørgensen 2018).

Acknowledgements

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