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PHYLOGENY AND TAXONOMY OF *POLYOZOSIA*, *SEDELNIKOVAEA* AND *VERSEGHYA* OF THE LECANORACEAE (LECANORALES, LICHEN-FORMING ASCOMYCOTA)

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From the combined phylogenetic analysis of multi-locus sequence data of the Lecanoraceae including two nuclear protein-coding markers (RPB2 and RPB1), the internal transcribed spacer and a fragment of the mitochondrial small subunit, found that the originally monotypic eastern Asian genus *Verseghya* is positioned within the *Verseghya-Lecidella-Pyrrhospora* clade of the Lecanoraceae and includes one more taxon *Verseghya thysanophora* widely distributed in Northern Hemisphere.

The genus *Lecidella* forming the *Lecidella-Glaucomaria* subclade within the same *Verseghya-Lecidella-Pyrrhospora* clade of the Lecanoraceae found to have tendency to be polyphyletic after including the recently described eastern Asian taxon *Lecidella mandshurica* into phylogenetic analysis of the Lecanoraceae. It is shown that *Lecidella mandshurica* was previously recorded from China sub *Lecidella* aff. *elaeochroma*.

The originally monotypic eastern Asian genus *Sedelnikovaea* forming a monophyletic branch within the *Sedelnikovaea-Lecanoropsis* subclade and being in out-position to the *Rhizoplaca-Protoparmeliopsis* s. str. clade of the Lecanoraceae found to include three more taxa, i.e. *Sedelnikovaea marginalis*, *S. pseudogyrophorica*, and *S. subdiscrepans*.

The Eurasian *Protoparmeliopsis bolcana*, and the eastern Asian *P. kopachevskae,* are illustrated for the first time as being positioned within the *Protopameliopsis* branch of the Lecanoraceae, while the South Korean '*Protoparmeliopsis*' *chejuensis* found to be positioned in separate monophyletic branch from all other branches of the *Rhizoplaca-Protoparmeliopsis* s. l. clade of the Lecanoraceae.

The genus *Polyozosia* A. Massal. as earlier name for the former *Myriolecis* branch of the Lecanoraceae is accepted as far the type species of the latter genus, i.e. *P. poliophaea*, found to be positioned within this branch. The *Polyozosia* robust monophyletic branch is positioned in the outermost position in the *Rhizoplaca-Protoparmeliopsis* s. str. clade of the Lecanoraceae.

Position and species content of the accepted genera *Glaucomaria*, *Lecanoropsis*, *Omphalodina*, *Polyozosia*, and *Straminella* are discussed in separate nrITS and mtSSU, and combined phylogeny based on concatenated sequences of nrITS, mtSSU, RPB2 and RPB1 genes.

Fourty new combinations are proposed: *Glaucomaria bicincta*, *G. carpinea*, *G. leptyrodes*, *G. lojkaeana*, *G. subcarpinea*, *G. sulphurea*, *G. swartzii*, *G. swartzii* subsp. *caulescens*, *G. swartzii* subsp. *nylanderi*, *Lecanoropsis anopta*, *L. macleanii*, *Omphalodina chrysoleuca*, *O. huashanensis*,

O. opiniconensis, *O. phaedrophthalma*, *O. pseudistera*, *Palicella anakeestiicola*, *Polyozosia albescens*, *P. andrewii*, *P. contractula*, *P. crenulata*, *P. dispersa*, *P. hagenii*, *P. perpruinosa*, *P. populicola*, *P. pruinosa*, *P. reuteri*, *P. sambuci*, *P. semipallida*, *P. straminea*, *P. thuleana*, *Sedelnikovaea marginalis*, *S. pseudogyrophorica*, *S. subdiscrepans*, *Straminella bullata*, *S. burgaziae*, *S. conizaeoides*, *S. densa*, *S. maheui*, *S. varia*, and *Verseghya thysanophora*. Validation of one name as *Polyozosia perpruinosa* Fröberg ex S. Y. Kondr., L. Lőkös et Farkas is also proposed.

Key words: China, *Glaucomaria*, *Lecanoropsis*, *Myriolecis*, phylogeny, *Omphalodina*, *Palicella*, *Polyozosia*, *Sedelnikovaea*, *Straminella*, taxonomy, *Verseghya*

INTRODUCTION

Many efforts to adjust the placement of genera and species within Lecanoraceae Körb. based on large dataset phylogenies and several gene markers have been done in the past decades (e.g. Ekman and Wedin 2000, Papong *et al.* 2013, Miadłikowska *et al*. 2014, Zhao *et al.* 2016). However, further research is still necessary to elucidate relationships and species boundaries among most of lecanoroid and lecideoid species.

The genus *Verseghya* S. Y. Kondr., L. Lőkös et J.-S. Hur was recently described as monotypic eastern Asian genus with one species *V. klarae* S. Y. Kondr., L. Lőkös et J.-S. Hur on the basis of morphological and anatomical characters and preliminary it was placed in the intermediate position between the Lecanoraceae and the Pertusariaceae after peculiarities of ascus (Kondratyuk *et al.* 2016*a*). During the last years molecular data on *Verseghya klarae* obtained within this study have allowed confirming the position of the genus *Verseghya* within the Lecanoraceae as well as to clarify its position within the *Verseghya-Tylothallia* subclade of the *Verseghya-Lecidella-Pyrrhospora* clade of the Lecanoraceae.

Molecular data on the originally monotypic Asian genus *Sedelnikovaea* S. Y. Kondr., M. H. Jeong et J.-S. Hur were provided in original publication (Kondratyuk *et al.* 2014*a*), but they were not included into consideration by Zhao *et al.* (2016). Several more members of the *Sedelnikovaea* monophyletic branch of the Lecanoraceae are found within this study.

During revision of the South Korean lichen flora (see Hur *et al.* 2016, Kondratyuk *et al.* 2013, 2015*a*, *b*, 2016*a*, *b*, 2017, 2018*c*) a number of new representatives of the Lecanoraceae, mainly genera *Lecanora* and *Protoparmeliopsis* (i.e. *Lecanora ussuriensis* S. Y. Kondr., L. Lőkös et J.-S. Hur, *P. chejuensis* S. Y. Kondr. et J.-S. Hur, *P. kopachevskae* S. Y. Kondr., L. Lőkös et J.-S. Hur, *P. pseudogyrophoricum* S. Y. Kondr., S.-O. Oh et J.-S. Hur, *P. zerovii* S. Y. Kondr., etc., as well as *Lecidella mandshurica* S. Y. Kondr., L. Lőkös et J.-S. Hur) were recently described (Kondratyuk *et al.* 2013, 2014*b*, 2015*a*, 2016*a*, 2017, 2018*c*). Molecular data on members of the Lecanoraceae were especially accumulated within this study with aim to check the status of the species mentioned as well as the status of the newly described genera *Verseghya* and *Ivanpisutia* (Kondratyuk *et al.* 2015*a*, 2016*a*).

Originally the main aim of this paper was to provide molecular data on members of the genera *Verseghya*, *Sedelnikovaea*, as well as on some members of the genera *Lecanora* and *Protoparmeliopsis*, and to illustrate their position in the phylogenetic tree of the Lecanoraceae, while within the phylogenetic analysis of this family additional novelties for the genera *Lecanoropsis* M. Choisy, *Palicella* Rodriguez Flakus et Printzen, *Polyozosia* A. Massal., and *Straminella* M. Choisy were found and proposed below.

METHODS

Numerous specimens of the Lecanoraceae from eastern Asian collections treated within the latest years (see Kondratyuk *et al.* 2013, 2015*a*, *b*, 2016*a*, *b*, 2017, 2018*c*), as well as separate taxa from Europe were included in comparative molecular study.

Methods of extractions of DNA, data on primers and phylogenetic analysis are provided in our previous papers (Kondratyuk *et al.* 2018*a*, *b*, *d*).

Data on specimens of species included in the combined phylogenetic analysis are provided in the Appendix.

RESULTS

Molecular data on the number of eastern Asian and European lecanoroid taxa (i.e. *Lecanora layana* Lendemer, *L. ussuriensis*, *Lecidella mandshurica*, *Protoparmeliopsis chejuensis*, *P. kopachevskae*, *P. pseudogyrophorica*, and *Verseghya klarae*, as well as *Protoparmeliopsis bolcana* (Pollin.) S. Y. Kondr., etc.) are for the first time provided to the GenBank within this study.

A combined phylogenetic analysis of the Lecanoraceae based on molecular sequence data including four loci, i.e. two nuclear protein-coding markers (RPB2 and RPB1), the internal transcribed spacer and a fragment of the mitochondrial small subunit was carried out. Unfortunately data on another molecular markers (beta-tubulin, elongation factor 1 alpha, 28S-18S rRNA intergenic spacer, replacing licensing factor MCM7, putative non-reducing polyketide synthase (PKS) gene, small subunit ribosomal RNA gene, group I intron hypothetical protein gene, and ribosomal biogenesis protein (TSR1) gene) are still scarce and they are not available for the representatives of all groups of the Lecanoraceae discussed below.

In result of combined phylogenetic analysis of multi-locus sequence data of the Lecanoraceae the phylogenetic tree of the Lecanoraceae include several clades additionally to the *Lecanora* s. str. clade, which itself includes the genera *Lecanora* Ach. s. str. and *Japewia* Tønsberg (the Ramalinaceae) (Fig. 1: clade 1). It should be mentioned that both branches, i.e. the *Lecanora* s. str.

and the *Japewia* branches have the highest level of the bootstrap support. After separate nrITS phylogeny the *Lecanora* s. str. branch includes the recently described eastern Asian *Lecanora ussuriensis* S. Y. Kondr., L. Lőkös et J.-S. Hur (Kondratyuk *et al.* 2014*b*) molecular data for which are provided for the first time here. After separate mtSSU phylogeny the *Lecanora* s. str. clade includes also the genus *Psorinia* (in the outermost position).

The following clades: *Verseghya-Lecidella-Pyrrhospora* clade (Fig. 1: clade 2), *Adelolecia-Miriquidica* clade (Fig. 1: clade 3), *Rhizoplaca-Protoparmeliopsis* s. l. clade and *Lecanora layana* group clade (Fig. 1: clade 4) are present also in the Lecanoraceae tree.

The *Verseghya-Lecidella-Pyrrhospora* clade of the Lecanoraceae

The *Verseghya-Tylothallia* subclade

From the combined phylogenetic analysis of the Lecanoraceae based on concatenated sequences of nrITS, mtSSU, RPB2 and RPB1 genes found that the genus *Verseghya* is positioned within the *Verseghya-Tylothallia* subclade of the *Verseghya-Lecidella-Pyrrhospora* clade of the phylogenetic tree of the Lecanoraceae (Fig. 1: clade 2). Level of support of the *Verseghya-Tylothallia* subclade is very low, while the *Verseghya* monophyletic branch has the highest level of support. Unfortunately there are molecular data only for one voucher specimen of *Tylothallia biformigera* (Leight.) P. James et H. Kilias, and the level of its support is still not clear. From our data the genus *Tylothallia* is positioned in separate position from the other genera of the *Ramalina*-group (sensu Kistenich *et al.* 2018) of the Ramalinaceae. Furthermore, the originally monotypic eastern Asian genus *Verseghya* found to include additionally to the type species *V. klarae* one more widely distributed in the Northern Hemisphere taxon *Verseghya thysanophora* (R. C. Harris) S. Y. Kondr., L. Lőkös, Farkas et J.-S. Hur as well as probably one more taxon, known so far from the Russian Caucasus as *Verseghya* sp. (mentioned as '*Lecanora* sp. isolate JM 10608' after Guzow-Krzeminska *et al.* 2017) (Appendix).

It should be stressed that originally more than 5 specimens of *V. klarae* were selected for molecular study. However, readable sequences were obtained only for 5 specimens investigated. Furthermore, within the phylogenetic analysis it was found that an additional taxon (preliminary identified as member of the *Lecanora albella* group) was present among the Korean material originally identified as *Verseghya klarae*, and originally it was not recognised as different from the latter taxon after morphological characters. However, in this paper only results on *V. klarae* are presented. Molecular data on Korean material of the *Lecanora albella* group will be analysed elsewhere.

It should be mentioned that the genus *Verseghya* is positioned in sister position to the genera *Palicella* Rodriguez Flakus et Printzen and *Adelolecia* Hertel et Hafellner (the Ramalinaceae) after both separate nrITS and mtSSU phylogenies as well as after combined phylogenetic analysis based on nrITS and 12S mtSSU sequences.*

So after separate nrITS phylogeny the genus *Verseghya* is positioned within the clade with members of the genera *Palicella*, *Frutidella* and single taxon *Lecanora formosa* (Bagl. et Carestia) Khoph et Leuckert. After the mtSSU phylogeny the *Verseghya* well-supported branch is positioned in out-position to rather complex clade including the members of the genera *Frutidella*, *Miriquidica*, *Palicella*, *Pyrrhospora*, *Ramboldia*, as well as the *Lecanora layana* and the *Lecanora symmicta* groups. However, after combined phylogeny based on concatenated nrITS, mtSSU, RPB2 and RPB1 sequences the genera *Palicella* and *Adelolecia* found to be positioned in the separate subclades of the separate *Adelolecia-Miriquidica* clade, which is positioned in intermediate position between the *Verseghya-Lecidella-Pyrrhospora* and the *Rhizoplaca-Protoparmeliopsis* s. l. clades of the Lecanoraceae.

The *Lecidella-Glaucomaria* subclade

The genus *Lecidella* Körber of the *Lecidella-Glaucomaria* clade includes the recently described eastern Asian taxon *Lecidella mandshurica* S. Y. Kondr., L. Lőkös et J.-S. Hur after combined phylogenetic analysis of the Lecanoraceae (Fig. 1: clade 2). *Lecidella mandshurica*, originally described from South Korea and Russian Far East (Kondratyuk *et al*. 2015*a*), here is for the first time shown that it is identical with material, which was previously recorded from China sub *Lecidella* aff *elaeochroma* (Zhao *et al.* 2016). So, after nrITS and mtSSU phylogeny *Lecidella mandshurica* S. Y. Kondr., L. Lőkös et J.-S. Hur from South Korea (from our data provided for the first time here) is identical with Chinese specimens, which were previously recorded as *Lecidella* aff. *elaeochroma* (Zhao *et al.* 2016). This taxon found to be positioned within the *Lecidella elaeochroma* subclade of the genus *Lecidella* as after separate ITS, mtSSU analysis as well as

* Unfortunately there is a number of taxa of the genus *Lecanora* Ach. for which only nrITS or only mtSSU sequences are still available. It should be especially emphasised that we have included in the combined phylogenetic analysis only the taxa with complete molecular data available on both gene sequences. Nevertheless, there are data on very short sequence (up to 450 bp) of 12S mtSSU sequence of various species of the genus *Lecanora*. These 'short sequence' data were also not included in our phylogenetic analysis because they cause very unstable, sometimes contradicting positions of taxa of the same groups. From this point of view data on taxa of the genus *Ramboldia* Kantvilas et Elix for which very incomplete data on nrITS1 portion were present are included into combined phylogenetic analysis with some hesitation.

after combined phylogeny based on nrITS, mtSSU, RPB2 and RPB1 genes. So generic position of *Lecidella mandshurica* is confirmed with molecular data for the first time.

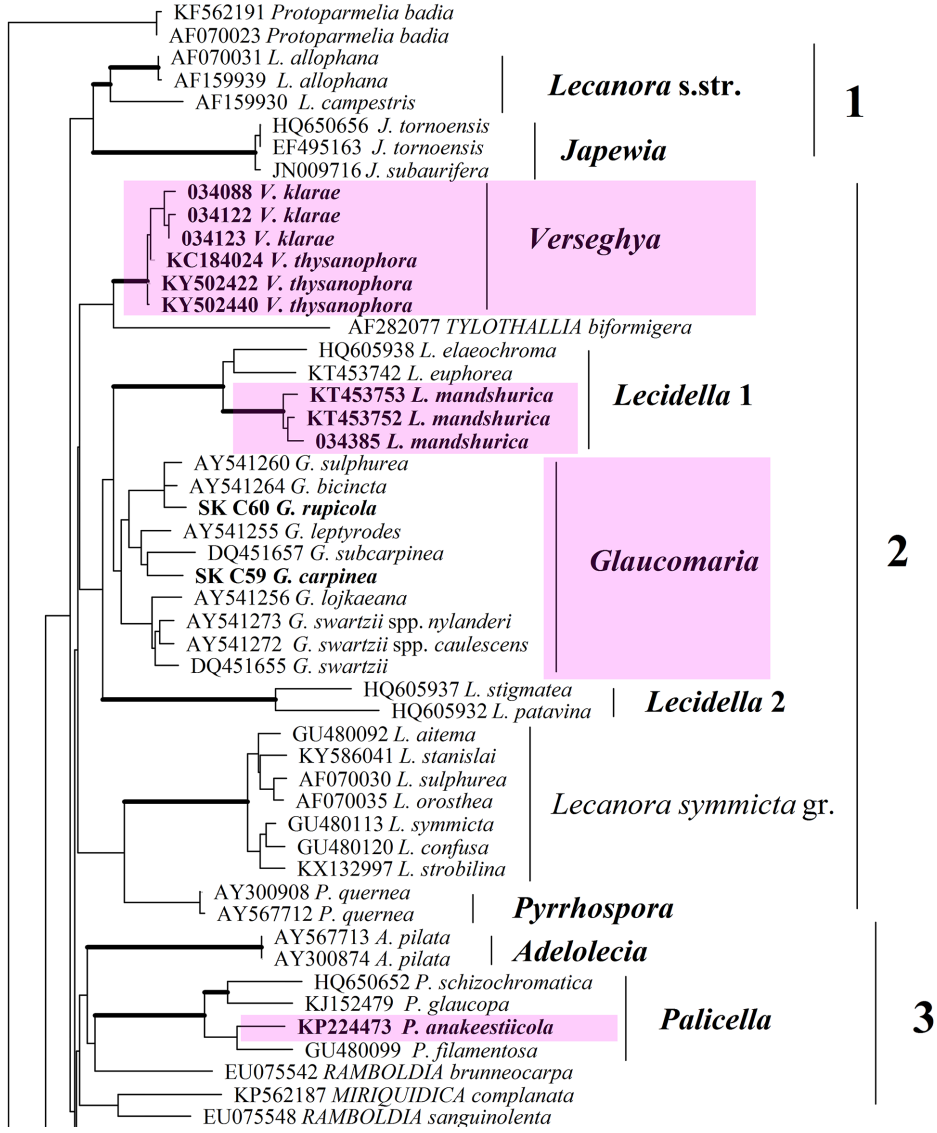

Fig. 1. Position of the genera *Polyozosia*, *Sedelnikovaea* and *Verseghya* in phylogenetic tree of the Lecanoraceae, based on combined multi-loci sequence data set. Branches with the highest level of the bootstrap support are in bold

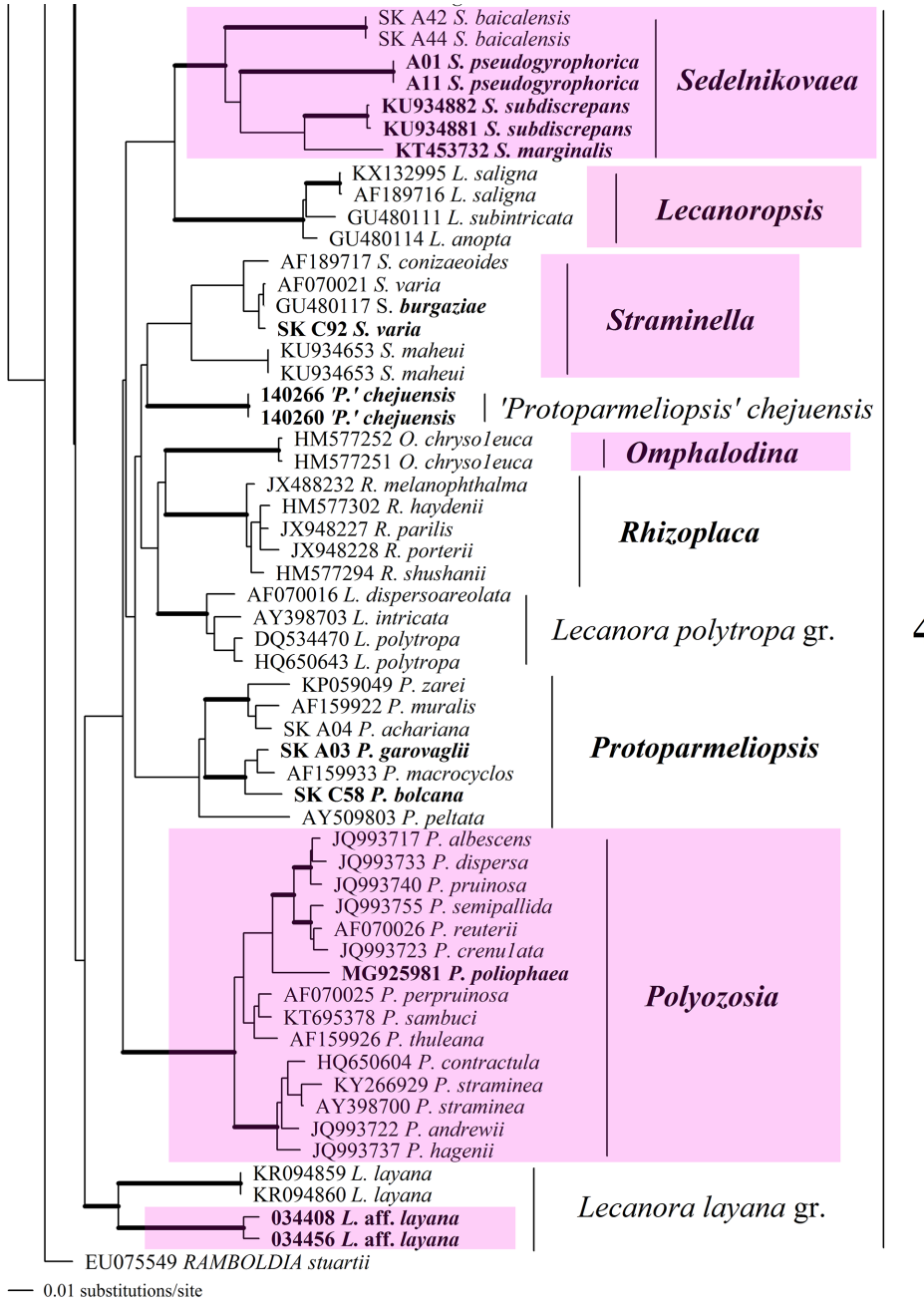

Fig. 1 (continued)

Furthermore, *Lecidella mandshurica* is for the first time recorded for China on the basis of phylogenetic identification of specimens previously submitted to the GenBank as *Lecidella* aff. *elaeochroma*. Thus, data on the nrITS, mtSSU and RPB2 and RPB1 sequences deposited sub *Lecidella* aff. *elaeochroma* in fact belong to *Lecidella mandshurica.* And the latter taxon, i.e. *L. mandshurica* is for the first time recorded for China here.

The genus *Lecidella* Körber of the *Lecidella-Glaucomaria* clade after combined phylogenetic analysis of the Lecanoraceae found to have tendency to be polyphyletic. Several species including *Lecidella elaeochroma*, *L. euphorea*, and *L. mandshurica* form a robust monophyletic branch (Fig. 1: clade 2). At the same time another separate robust monophyletic branch is formed by *Lecidella stigmatea* and *L. patavina*. It should be mentioned that the same two monophyletic branches of the *Lecidella* species found to be present in separate RPB2 and the RPB1 phylogeny. So it is no wonder that the genus *Lecidella* shows tendency to be polyphyletic after combined phylogeny. However, status of these two branches of the *Lecidella* species (mentioned as '*Lecidella*' and '*Lecidella* 2' in Figure 1) will be clarified when molecular data on type species, i.e. *Lecidella viridans* (Flot.) Körber will be available.

The genus *Glaucomaria* M. Choisy in fact resurrected by Hafellner (1984) for the *Lecanora rupicola* group has the highest level of bootstrap support as in separate ITS, mtSSU, as well as in the combined phylogenetic analysis based on the nrITS, mtSSU, RPB2 and RPB1 sequences (Fig. 1). Nine new combinations of ten taxa known hitherto in the genus *Glaucomaria* are proposed below, while molecular data on *G. cinerella* (Flörke) M. Choisy ex Werner and *G. leptoplaca* (Nyl.) M. Choisy, mentioned together with *G. rupicola* (L.) M. Choisy (Choisy 1929) are still missing.

It should be mentioned that after combined phylogenetic analysis the *Lecanora symmicta* group together with the members of the genus *Pyrrhospora* Körber are forming the separate subclade of the *Verseghya-Lecidella-Pyrrhospora* clade of the Lecanoraceae. After combined phylogeny the *Lecanora symmicta* group and the genus *Pyrrhospora* Körber are positioning in separate clade in somewhat out-position to the *Lecidella-Glaucomaria* and to the *Verseghya-Tylothallia* subclades. After nrITS phylogeny the *Lecanora symmicta* group is positioned together with the *Lecanora intumescens* group in the sister position to the *Verseghya-Palicella* subclade, while after the mtSSU phylogeny the *Lecanora symmicta* group together with the *Pyrrhospora* branch are positioned in sister position to the *Lecanora layana* group-*Sedelnikovaea-Japewia* subclade being sister to the *Palicella-Ramboldia* subclade.

The *Adelolecia-Miriquidica* clade of the Lecanoraceae

The *Palicella-Adelolecia* subclade

By the combined phylogenetic analysis of the Lecanoraceae based on concatenated sequences of nrITS, mtSSU, RPB2 and RPB1 genes the genus *Palicella* Rodriguez Flakus et Printzen is positioned within the *Palicella-Adelolecia* subclade of the *Adelolecia-Miriquidica* clade of the phylogenetic tree of the Lecanoraceae (Fig. 1: clade 3). The genus *Adelolecia* (the Ramalinaceae) has the highest level of bootstrap support if several sequences/specimens are included in the phylogenetic analysis.

The recently introduced lichen-forming fungal genus *Palicella* Rodr. Flakus et Printzen (Rodriguez Flakus and Printzen 2014) forming a monophyletic lineage nested inside the Lecanoraceae Körber (Zhao *et al.* 2016, Printzen *et al.* 2017) hitherto contained four species occurring in Europe, North and South America. Within our study one more *Palicella* species is found. It should be especially stressed that it is for the first time found that *Lecanora anakeestiicola* Lendemer et E. Tripp positioned within the *Palicella* clade as after separate nrITS, mtSSU as well as combined phylogeny. It is why new combination *Palicella anakeestiicola* (Lendemer et E. Tripp) S. Y. Kondr., L. Lőkös, et Farkas is proposed (see below). The new member of the genus, *P. anakeestiicola* shows closer relations to the type species of the genus, i.e. *P. glaucopa* (Hook. f. et Taylor) Rodr. Flakus et Printzen after combined phylogeny. However, the level of support of the *Palicella* branch is rather low, and may be in the future the genus *Palicella* will be polyphyletic.

It should be mentioned that the *Miriquidica* branch includes additionally to the species of the genus *Miriquidica* Hertel et Rambold some species of the genus *Ramboldia* Kantvilas et Elix, while type species of the genus *Ramboldia*, i.e. *R. stuartii* (Hampe) Kantvilas et Elix is positioned in out-position to all lecanoroid taxa included in the combined analysis (Fig. 1). Thus after molecular data available hitherto the genus *Ramboldia* shows tendency to polyphyly after combined phylogenetic analysis.

The *Rhizoplaca-Protoparmeliopsis* s. l. clade of the Lecanoraceae

The *Rhizoplaca-Protoparmeliopsis* s. l. clade includes three subclades: the *Sedelnikovaea-Lecanoropsis*, the *Straminella-Rhizoplaca-Protoparmeliopsis*, and the *Polyozosia*, where the latter includes only separate genus.

The *Sedelnikovaea-Lecanoropsis* subclade

The originally monotypic eastern Asian genus *Sedelnikovaea* forming a monophyletic branch within the *Sedelnikovaea-Lecanoropsis* subclade and being in out-position to the *Rhizoplaca-Protoparmeliopsis* s. str. clade of the Lecanoraceae is found to include three more taxa. So, the recently described eastern Asian taxon, *Protoparmeliopsis pseudogyrophorica* S. Y. Kondr., S.-O. Oh et J.-S. Hur (Kondratyuk *et al.* 2013) is found to be positioned in the *Sedelnikovaea* robust monophyletic branch of the *Rhizoplaca-Protoparmeliopsis* subclade of the Lecanoraceae together with two more taxa, i.e. *Sedelnikovaea marginalis* (Hasse) S. Y. Kondr., L. Lőkös et Farkas, and *S. subdiscrepans* (Nyl.) S. Y. Kondr., L. Lőkös et Farkas (Fig. 1: clade 4). So new combinations *Sedelnikovaea marginalis*, *S. pseudogyrophorica* (S. Y. Kondr., S.-O. Oh et J.-S. Hur) S. Y. Kondr., L. Lőkös et Farkas, and *S. subdiscrepans* are consequently proposed (see below).

It should be mentioned that type species of the genus *Sedelnikovaea*, i.e. *S. baicalensis* is in urgent need of verification of the mtSSU sequences from additional voucher specimens. In our study results on mtSSU sequences of this species were obtained after several unsuccessful attempts. After mtSSU phylogeny *S. baicalensis* is positioned in somewhat isolated position from the other member of the *Sedelnikovaea* branch of the combined phylogeny tree (not shown in Figure 1). After mtSSU data so far presented for this species *S. baicalensis* shows similarity to the *Pycnora* clade of the *Pycnora xanthococca* and other species of this genus (family Pycnoraceae), if they are included in the tree. So if the further data on *S. baicalensis* will confirm that they are the same, probably the *Sedelnikovaea* will be member of the Pycnoraceae, while another name will be necessary to propose for the other species of the *Sedelnikovaea* branch (*Sedelnikovaea marginalis*, *S. pseudogyrophorica*, and *S. subdiscrepans*) as it is accepted here. Thus, taxa of this branch are especially in need of the further revision and confirmation with data on additional loci and on additional voucher specimens.

The *Lecanoropsis* robust monophyletic branch being in the sister position to the *Sedelnikovaea* branch has the highest level of the bootstrap support after combined phylogeny (Fig. 1: clade 4). Of four species of the genus *Lecanoropsis* M. Choisy accepted by M. Choisy (1949) position of two species, i.e. *L. saligna* (Schrad.) M. Choisy and *L. subintricata* (Nyl.) M. Choisy is confirmed by molecular data of our combined phylogenetic analysis (Fig. 1: clade 4), while *L. sarcopis* (Wahlenb. ex Ach.) M. Choisy considered being synonym to *L. saligna*, and molecular data on *L. sarcopidoides* (A. Massal.) M. Choisy are still missing. *Lecanoropsis anopta* (Nyl.) S. Y. Kondr., L. Lőkös et Farkas and *L. macleanii* (C. W. Dodge) S. Y. Kondr., L. Lőkös et Farkas as new members of the *Lecanoropsis* branch were added within this study.

The *Straminella-Rhizoplaca-Protoparmeliopsis* subclade

The *Straminella* monophyletic branch is positioned in somewhat intermediate position between the *Rhizoplaca-Lecanora polytropa* group subclade and the *Protoparmeliopsis* branch after combined phylogeny. Its position is similar after separate nrITS and mtSSU phylogeny. Six new combinations for the members of the genus *Straminella* M. Choisy are proposed below, while molecular data for *Straminella conizelloides* Werner et M. Choisy and *S. oraefrigidae* (R. Sant.) Miyaw. are still missing. Unfortunately only data on mtSSU are available hitherto for *Straminella bullata* (Follmann et A. Crespo) S. Y. Kondr., L. Lőkös et Farkas. After mtSSU phylogeny this taxon is a member of the *Straminella* branch, while its position in the *Straminella* branch should be also confirmed by further data on other genes.

Our results confirm data of previous authors (Zhao *et al.* 2016) that the '*Rhizoplaca*' *chrysoleuca* group forms separate well-supported branch, which is positioned in sister position to the *Rhizoplaca* s. str. branch. However, the level of support of the *Rhizoplaca* s. l. (sensu Zhao *et al.* 2016) is much lower than the levels of support of both the *Rhizoplaca melanophthalma* and the '*Rhizoplaca*' *chrysoleuca* branches (Zhao *et al.* 2016 and see also Fig. 1: clade 4 in this paper). Thus we do not share opinion of the previous authors (Zhao *et al.* 2016) that the '*Rhizoplaca*' *chrysoleuca* group should be included in the genus *Rhizoplaca*. It is why we accept the genus *Omphalodina* M. Choisy, and consequent new combination is proposed for *O. chrysoleuca* (Sm.) S. Y. Kondr., L. Lőkös et Farkas below. Unfortunately molecular data on all members of the *Rhizoplaca* s. l. clade sensu Zhao *et al.* 2016 (or the *Rhizoplaca-Protoparmeliopsis* s. l. subclade in our combined tree, Fig. 1) are still very limited (and they are not the same complete for all taxa of this clade regarding to 6-gene phylogeny, see Zhao *et al.* 2016). One more taxon, i.e. *Omphalodina pseudistera* (Nyl.) S. Y. Kondr., L. Lőkös et Farkas for which molecular data are for the first time provided within this study is included to the genus on the basis of mtSSU phylogeny. Unfortunately data on nrITS, RPB2 and RPB1 sequences of this species are still missing. So, final conclusion about species content of the *Omphalodina* monophyletic branch will wait till the accumulation of complete set of data.

The Eurasian species *Protoparmeliopsis bolcana* (Pollin.) S. Y. Kondr. (combination published in Oxner 2010 vs. *P. bolcana* (Pollin.) Lumbsch in Gasparyan *et al.* 2016), as well as the eastern Asian species *Protoparmeliopsis kopachevskae* S. Y. Kondr., L. Lőkös et J.-S. Hur (see Kondratyuk *et al.* 2017) are for the first time illustrated to be positioned within the *Protoparmeliopsis* branch of the Lecanoraceae. It should be emphasised that the oldest combination for *Protoparmeliopsis garovaglii* (Körb.) S. Y. Kondr. was published in 2010 year (Kondratyuk 2010) (vs. *P. garovaglii* (Körb.) Zhao *et al.* 2016). Thus position of

eight species (i.e. *P. achariana* (A. L. Sm.) Moberg et R. Sant., *P. bolcana*, *P. garovaglii*, *P. kopachevskae*, *P. macrocyclos*, *P. muralis* (Schreb.) M. Choisy, *P. peltata* (Ramond) Arup, Zhao Xin et Lumbsch and *P. zarei* S. Y. Kondr.) are hitherto confirmed within the *Protoparmeliopsis* branch by molecular data.

It should be mentioned that molecular data (i.e. nrITS sequences) on *Protoparmeliopsis kopachevskae* were obtained for six specimens (they are included in Table 1). All these specimens form separate monophyletic branch with 100% level of bootstrap support, i.e. they belong to the same taxon. However, only three of these specimens are included into the final version of tree (Fig. 2).

Furthermore, the recently described eastern Asian species '*Protoparmeliopsis*' *chejuensis* S. Y. Kondr. et J.-S. Hur (Kondratyuk *et al.* 2013) is found to be positioned as a separate monophyletic branch in the sister position to all other branches of the *Rhizoplaca-Protoparmeliopsis* s. str. subclade of the Lecanoraceae (i.e.: the *Omphalodina*, the *Protoparmeliopsis*, the *Rhizoplaca* and the *Lecanora polytropa* branches). However, it is not a member of the *Protoparmeliopsis* branch, this species is positioned in a separate monophyletic branch after nrITS analysis, mtSSU analysis, as well as after combined phylogenetic analysis. The position of '*Protoparmeliopsis*' *chejuensis* should be checked with the data on sequences of additional genes, recently used for phylogeny of the Lecanoraceae (Zhao *et al.* 2016), as well as with additional voucher specimens.

Thus, new combinations for *Sedelnikovaea marginalis*, *S. pseudogyrophorica* and *S. subdiscrepans* are proposed below because the *Sedelnikovaea* branch has the highest level of support, while position of the '*Protoparmeliopsis*' *chejuensis*, as well as the *Omphalodina* branch is still waiting for data on new genes for final conclusions.

From the combined phylogenetic analysis of the Lecanoraceae based on concatenated sequences of nrITS, mtSSU, RPB2 and RPB1 genes the *Straminella-Rhizoplaca-Protoparmeliopsis* clade includes also the *Omphalodina* and the *Lecanora polytropa* group branches having the highest level of bootstrap support.

The *Polyozosia* subclade

The *Polyozosia* clade consisting of only one, the *Polyozosia* branch of the highest level of bootstrap support is positioned in out-position to both the *Straminella-Rhizoplaca-Protoparmeliopsis* and the *Sedelnikovaea-Lecanoropsis* clades.

Lecanora poliophaea (Wahlenb. ex Ach.) Ach., type species of the genus *Polyozosia* A. Massal., designated by Hafellner (1984: 292) is found to be positioned within the former *Myriolecis* monophyletic branch of the Lecanoraceae after separate nrITS, mtSSU, RPB2 and RPB1 phylogeny, as well as after combined phylogeny based on concatenated sequences of nrITS, mtSSU, RPB2 and RPB1 genes. Thus, the generic name *Polyozosia* A. Massal. (Massalongo 1855) found to be earlier name for the *Myriolecis* Clements branch. Conse-

quently, the genus *Myriolecis* hitherto one of the richest in species diversity in the Lecanoraceae is proposed to be a later synonym of the genus *Polyozosia* A. Massal., and consequent taxonomic changes are proposed below. Fourteen new combinations are proposed below for the members of the *Polyozosia* branch, for which molecular data are hitherto available.

The genus ***Polyozosia*** A. Massal., Framm. Lich.: 18 (1855)

Type species: *Polyozosia poliophaea* (Wahlenb. ex Ach.) A. Massal.
Syn.: *Myriolecis* Clements, Gen. Fungi: 79, 175 (1909) – Type species: *Myriolecis sambuci* (Pers.) Clem.

Regarding species diversity the genus *Polyozosia* is found to be the second hitherto after the genus *Lecanora* in the Lecanoraceae. There are more than 40 species names within the former genus *Myriolecis* recently proposed. However, it should be mentioned that the *Lecanora* s. str. branch includes so far not too many species. So the genus *Polyozosia* will be the richest genus of the Lecanoraceae in future after its species diversity.

However, there are molecular data only on smaller portion of taxa of the *Polyozosia* branch. So new combinations are proposed only for 14 taxa for which we have hitherto confirmation on their position in the *Polyozosia* (= the former *Myriolecis*) branch after molecular data.

Unfortunately in general data on mtSSU of the members of the genus *Polyozosia* are extremely pure. There are hitherto only data on mtSSU of *P. contractula* (Nyl.) S. Y. Kondr., L. Lőkös et Farkas, *P. perpruinosa* (Fröberg ex Śliwa *et al.*) S. Y. Kondr., L. Lőkös et Farkas, and *P. poliophaea*, as well as data on RPB2 and RPB1 only for *P. poliophaea* (Appendix).

After mtSSU phylogeny *Carbonea supersparsa* is positioned within the *Protoparmeliopsis-Rhizoplaca* clade (in out-position to the *Lecanora polytropa* group). However, only mtSSU data are hitherto available for this taxon.

The *Lecanora layana* group branch of the Lecanoraceae

Lecanora layana is positioned in sister position to the whole *Rhizoplaca-Protoparmeliopsis* s. l. clade after the combined phylogenetic analysis of the Lecanoraceae based on concatenated sequences of nrITS, mtSSU, RPB2 and RPB1 genes. The *Lecanora layana* branch including the North American taxon *L. layana* Lendemer itself, as well as the eastern Asian material previously recorded as *Lecanora layana* (Kondratyuk *et al.* 2016*b*, 2017) (but shown here to be probably a different taxon). *Lecanora nothocaesiella* Lendemer et R. C. Harris is found for the first time to be positioned in a separate clade, while after the ITS and mtSSU phylogeny it is positioned in the *Ramboldia* / *Pyrrhospora* clade.

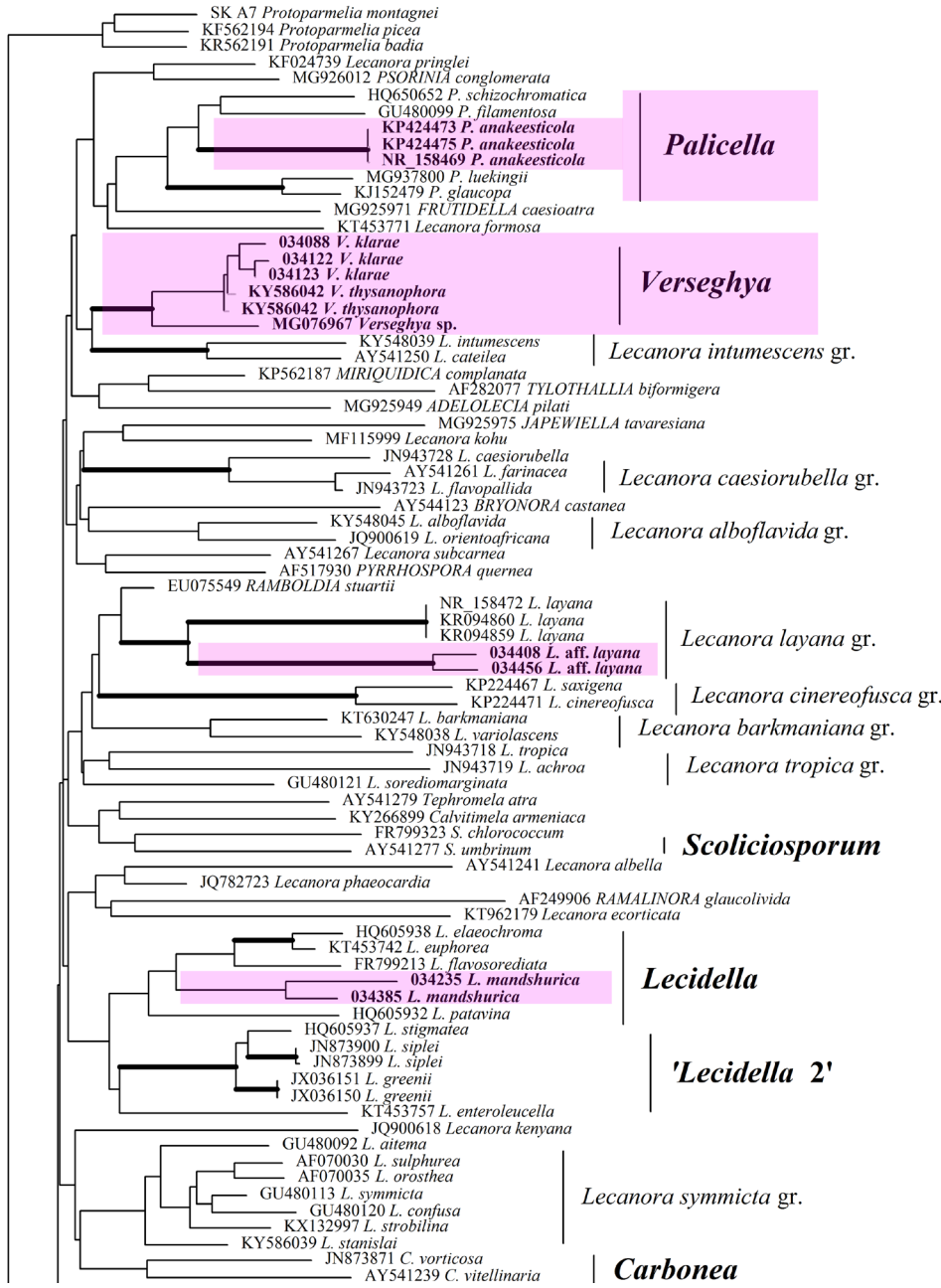

Fig. 2. Position of the genera *Polyozosia*, *Sedelnikovaea* and *Verseghya* in the phylogenetic tree of the Lecanoraceae, based on nrITS sequence data set. Branches with the highest level of the bootstrap support are in bold

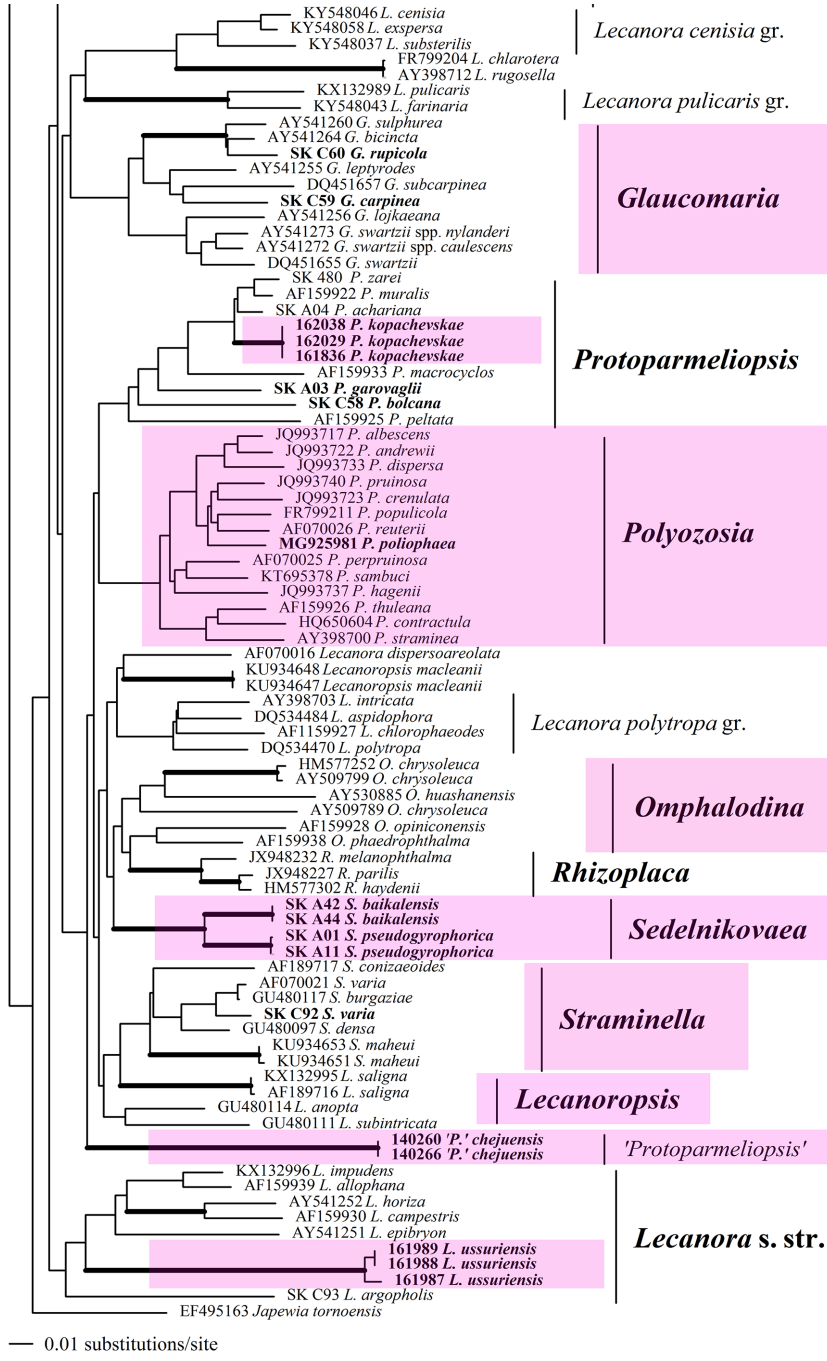

Fig. 2 (continued).

Consequently, the *Lecanora layana* record previously reported from South Korea may refer to another, may be still undescribed species as it is pointed out from data obtained within this study (after separate nrITS and mtSSU phylogeny, see Fig. 2 and the latter not shown).

We have tried to include molecular data of *Lecanora cinereofusca* H. Magn. and *L. saxigena* Lendemer et R. C. Harris, all of which are positioned in sister position to the genus *Verseghya* and to the *Lecanora layana* group, including North American and South Korean specimens, as well as *Lecanora nothocaesiella*, after mtSSU phylogeny into combined phylogenetic analysis, too. However, after the combined phylogenetic analysis they are positioned in separate branches or data on some sequences of species mentioned are still missing.

Lecanora nothocaesiella is closely related to the Korean material of *Lecanora layana* (data after mtSSU phylogeny). However, it was not included into the combined phylogeny, because data on nrITS, and RPB2 and RPB1 sequences of *Lecanora nothocaesiella* are still missing.

Lecanora cinereofusca and *L. saxigena* formed a separate branch with rather low level of support after combined analysis, while they are positioned in sister position to the *Lecanora layana* branch sometimes together with the *Lecanora barkmaniana* group after separate nrITS and mtSSU phylogeny. However, data on RPB2 and RPB1 genes are still missing for these species groups.

Other subclades and branches of the Lecanoraceae

As a result of the combined analysis the following conclusions were outlined on the other *Lecanora* species groups.

Lecanora kohu Printzen, Blanchou, Fryday et de Lange being in sister position to *Pyrrhospora quernea* after mtSSU is found to be in a separate monophyletic branch in the combined phylogenetic analysis.

The situation is similar in the *Lecanora symmicta* group (i.e. *L. stanislai* Guzow-Krzem., Lubek, Malicek et Kukwa, *L. strobilina* Ach., *L. symmicta* (Ach.) Ach., and *L. sulphurea* (Hoffm.) Ach., as well as *L. phryganitis* Tuck. and *L. alboflavida* Taylor). They are positioned in the same clade with *Lecanora layana* after mtSSU, while in combined phylogenetic analysis they form separate monophyletic branches.

It is also shown that the genera *Lecanora*, *Protoparmelia*, and *Ramboldia* are polyphyletic after data hitherto available in the GenBank.

Our results confirm data of previous authors that morphologically well distinguished and established genera, such as *Adelolecia* Hertel et Hafellner, *Bryonora*, *Carbonea*, *Frutidella* Kalb, *Japewia* Tønsberg, *Lecidella* Körber, *Miriquidica*, *Palicella*, *Pyrrospora* Körber, *Ramboldia,* and *Scoliciosporum* A. Massal. are nested within *Lecanora* s. l. (Kondratyuk *et al.* 2014*a*, Miadłikowska *et*

al. 2014, Rodriquez Flakus and Printzen 2014, Schmull *et al.* 2011; Zhao *et al.* 2016, Printzen *et al.* 2017).

The genus *Ramalinora* Lumbsch, Rambold et Elix for which only mtSSU data are hitherto available is positioned in the outermost position to all branches/clades of the Lecanoraceae.

NEW COMBINATIONS

The genera *Glaucomaria* (for the '*Lecanora*' *rupicola* group), *Lecanoropsis* (for the '*Lecanora*' *saligna* group), *Omphalodina* (for the '*Rhizoplaca*' *chrysoplaca* group), as well as *Straminella* (for the '*Lecanora*' *varia* group) in fact have already been resurrected by Hafellner (1984). However, they were not used by lichenologists since that time with a few exceptions. Furthermore, the species groups mentioned above have got confirmation as separate monophyletic branches from molecular phylogeny of the Lecanoraceae during the last decades (Grube *et al.* 2004, 2007, Kondratyuk *et al.* 2014*a*, Zhao *et al.* 2016, and this paper). So these genera are accepted here. However, we would like to emphasise that after data of various authors these groups include rather different taxa. We are discussing here only those taxa of the genera *Glaucomaria*, *Lecanoropsis*, *Omphalodina* and *Straminella*, for which complete data on nrITS and mtSSU are hitherto available and which are positioned in the monophyletic branches, which have got the highest level of support in our analysis. The further data on species content of these genera will be provided within next species revisions as well as with the usage of multi-locus phylogeny.

Seven species of the genus *Glaucomaria* and two more taxa of the subspecies level are confirmed from nrITS, mtSSU and combined phylogeny. Totally nine new combinations for the taxa of the genus *Glaucomaria* are provided below.

The genus *Omphalodina* is found to have confirmation for five species so far, combinations for which are provided below in this paper.

The genus *Straminella* is found hitherto to include six species, combinations for which are provided in this paper.

Comments on new representatives of the genera *Lecanoropsis*, *Palicella*, *Sedelnikovaea*, and *Polyozosia* are provided above.

Glaucomaria bicincta (Ramond) S. Y. Kondr., L. Lőkös et Farkas, *comb. nova* – MycoBank no.: MB 829771 – Basionym: *Lecanora bicincta* Ramond, Annls Sci. Nat., sér. 1, 6: 132 (1827).

Glaucomaria carpinea (L.) S. Y. Kondr., L. Lőkös et Farkas, *comb. nova* – MycoBank no.: MB 829773 – Basionym: *Lichen carpineus* L., Sp. pl. 2: 1141 (1753). – Syn.: *Lecanora carpinea* (L.) Vain., Meddn Soc. Fauna Flora fenn. 14: 23 (1888).

Glaucomaria leptyrodes (G. B. F. Nilsson) S. Y. Kondr., L. Lőkös et Farkas, *comb. nova* – MycoBank no.: MB 829774 – Basionym: *Lecanora leptyrodes* G. B. F. Nilsson, Ark. Bot. 24A (no. 3): 82 (1931).

Glaucomaria lojkaeana (**Szatala**) S. Y. Kondr., L. Lőkös et Farkas, *comb. nova* – MycoBank no.: MB 829775 – Basionym: *Lecanora lojkaeana* Szatala, Annls hist.-nat. Mus. natn. hung., n.s. **5**: 135 (1954).

Glaucomaria subcarpinea (Szatala) S. Y. Kondr., L. Lőkös et Farkas, *comb. nova* – MycoBank no.: MB 829776 – Basionym: *Lecanora subcarpinea* Szatala, Annls hist.-nat. Mus. natn. hung., n.s. 5: 136 (1954).

Glaucomaria sulphurea (Hoffm.) S. Y. Kondr., L. Lőkös et Farkas, *comb. nova* – MycoBank no.: MB 829777 – Basionym: *Verrucaria sulphurea* Hoffm., Descr. Adumb. Plant. Lich. 1(2): 56 (1789) [1790]. Replaced synonym for *Lichen sulphureus* Hoffm., Enum. Crit. Lich. Europ. (Bern): p. 32 (1784), nom. illegit., Art. 53.1 [non *Lichen sulphereus* Retz., K. svenska Vetenck-Akad. Handl., ser. 1, 30: 249 (1769) (current name *Chaenotheca brachypoda* (Ach.) Tibell)]. – Syn.: *Lecanora sulphurea* (Hoffm.) Ach., Lich. Univ.: p. 339 (1810).

Glaucomaria swartzii (Ach.) S. Y. Kondr., L. Lőkös et Farkas, *comb. nova* – MycoBank no.: MB 829778 – Basionym: *Lichen swartzii* Ach., K. Vetensk-Acad. Nya Handl. 15: 185 (1794). – Syn.: *Lecanora swartzii* (Ach.) Ach., Lich. Univ.: p. 363 (1810).

Glaucomaria swartzii subsp. ***caulescens*** (J. Steiner) S. Y. Kondr., L. Lőkös et Farkas, *comb. nova* – MycoBank no.: MB 829779 – Basionym: *Lecanora subradiosa* var. *caulescens* J. Steiner, Annln K. K. naturh. Hofmus. Wien 20: 377 (1907) [1905]. – Syn.: *Lecanora swartzii* subsp. *caulescens* (J. Steiner) Leuckert et Poelt, Nova Hedwigia 49(1–2): 164 (1989).

Glaucomaria swartzii subsp. ***nylanderi*** (Räsänen) S. Y. Kondr., L. Lőkös et Farkas, *comb. nova* – MycoBank no.: MB 829780 – Basionym: *Lecanora subradiosa* var. *nylanderi* Räsänen, Ann. Bot. Soc. Zool.-Bot. Fenn. Vanamo, 12(1): 70 (1939). – Syn.: *Lecanora swartzii* subsp. *nylanderi* (Räsänen) Leuckert et Poelt, Nova Hedwigia 49(1–2): 162 (1989). Nom. inval., Art. 41.4 (Melbourne) [full reference to basionym omitted].

Lecanoropsis anopta (Nyl.) S. Y. Kondr., L. Lőkös et Farkas, *comb. nova* – MycoBank no.: MB 829781 – Basionym: *Lecanora anopta* Nyl., Flora, Regensburg 56 (19): 292 (1873). – Syn.: *Lecidora anopta* (Nyl.) Motyka, Porosty (Lichenes) 2. Rodzina Lecanoraceae. Pinacisca, Lecidorina, Urceolaria, Semilecanora, Paraplacodium, Koerberiella, Lecidora, Pseudoplacodium, Tephromela. (Lublin): p. 550 (1996).

Lecanoropsis macleanii (C. W. Dodge) S. Y. Kondr., L. Lőkös et Farkas, *comb. nova* – MycoBank no.: MB 829782 – Basionym: *Lecanora macleanii* C. W. Dodge, [as McLeani], B. A. N. Z. Antarct. Res. Exped. Rep., Ser. B 7: 173 (1948). – Syn.: *Rhizoplaca macleanii* (C. W. Dodge) Castello, Lichenologist 42(4): 430 (2010).

Omphalodina chrysoleuca (Sm.) S.Y. Kondr., L. Lőkös et Farkas, *comb. nova* – MycoBank no.: MB 829783 – Basionym: *Lichen chrysoleucus* Sm., Trans.

Linn. Soc. London 1: 82 (1791). – Syn.: *Rhizoplaca chrysoleuca* (Sm.) Zopf, Justus Liebigs Annln Chem. 340: 291 (1905).

Omphalodina huashanensis (J. C. Wei) S. Y. Kondr., L. Lőkös et Farkas, *comb. nova* – MycoBank no.: MB 829838 – Basionym: *Rhizoplaca huashanensis* J. C. Wei, Acta Mycol. Sin. 3(4): 2008 (1984).

Omphalodina opiniconensis (Brodo) S. Y. Kondr., L. Lőkös et Farkas, *comb. nova* – MycoBank no.: MB 829784 – Basionym: *Lecanora opiniconensis* Brodo, Mycotaxon 26: 309 (1986).

Omphalodina phaedrophthalma (Poelt) S. Y. Kondr., L. Lőkös et Farkas, *comb. nova* – MycoBank no.: MB 829785 – Basionym: *Lecanora phaedrophthalma* Poelt, Mitt. Bot. StSamml., München 19–20: 483 (1958).

Omphalodina pseudistera (Nyl.) S. Y. Kondr., L. Lőkös et Farkas, *comb. nova* – MycoBank no.: MB 829786 – Basionym: *Lecanora pseudistera* Nyl., Flora, Regensburg 55: 354 (1872).

Palicella anakeestiicola (Lendemer et E. Tripp) S. Y. Kondr., L. Lőkös et Farkas, *comb. nova* – MycoBank no.: MB 829787 – Basionym: *Lecanora anakeestiicola* Lendemer et E. Tripp, Bryologist 118: 3 (2015).

Polyozosia albescens (Hoffm.) S. Y. Kondr., L. Lőkös et Farkas, *comb. nova* – MycoBank no.: MB 829788 – Basionym: *Psora albescens* Hoffm., Deutschl. Fl., Zweiter Theil (Erlangen): p. 165 (1796) [1795]. – Syn.: *Myriolecis albescens* (Hoffm.) Śliwa, Zhao Xin et Lumbsch, in Zhao, Leavitt, Zhao, Zhang, Arup, Grube, Pérez-Ortega, Printzen, Śliwa, Kraichak, Divakar, Crespo and Lumbsch, Fungal Diversity 78(1): 301 (2015). ≡ *Lecanora albescens* (Hoffm.) Flörke, Flora, Regensburg 11(2): 633 (1828).

Polyozosia andrewii (B. de Lesd.) S. Y. Kondr., L. Lőkös et Farkas, *comb. nova* – MycoBank no.: MB 829789 – Basionym: *Lecanora andrewii* B. de Lesd., Trans. & Proc. Bot. Soc. Edinb. 26(2): 184 (1913). – Syn.: *Myriolecis andrewii* (B. de Lesd.) Śliwa, Zhao Xin et Lumbsch, in Zhao, Leavitt, Zhao, Zhang, Arup, Grube, Pérez-Ortega, Printzen, Śliwa, Kraichak, Divakar, Crespo and Lumbsch, Fungal Diversity 78(1): 301 (2015).

Polyozosia contractula (Nyl.) S. Y. Kondr., L. Lőkös et Farkas, *comb. nova* – MycoBank no.: MB 829790 – Basionym: *Lecanora contractula* Nyl., Not. Sällsk. Fauna et Fl. Fenn. Förh., Ny Ser. 8: 126 (1866). – Syn.: *Myriolecis contractula* (Nyl.) Śliwa, Zhao Xin et Lumbsch, in Zhao, Leavitt, Zhao, Zhang, Arup, Grube, Pérez-Ortega, Printzen, Śliwa, Kraichak, Divakar, Crespo and Lumbsch, Fungal Diversity 78(1): 301 (2015).

Polyozosia crenulata (Ach.) S. Y. Kondr., L. Lőkös et Farkas, *comb. nova* – MycoBank no.: MB 829791 – Basionym: *Lecanora hagenii* var. *crenulata* Ach., Syn. meth. lich. (Lund): p. 168 (1814). – Syn.: *Myriolecis crenulata* (Ach.) Śliwa, Zhao Xin et Lumbsch, in Zhao, Leavitt, Zhao, Zhang, Arup, Grube, Pérez-Ortega, Printzen, Śliwa, Kraichak, Divakar, Crespo and Lumbsch, Fungal Di-

versity 78(1): 301 (2015)). ≡ *Lecanora crenulata* (Ach.) Hook., in Smith, Engl. Fl. (London) **5**: 190 (1844).

Polyozosia dispersa (Pers.) S. Y. Kondr., L. Lőkös et Farkas, *comb. nova* – MycoBank no.: MB 829792 – Basionym: *Lichen dispersus* Pers., Ann. Bot. (Usteri) 1: 27 (1794). – Syn.: *Myriolecis dispersa* (Pers.) Śliwa, Zhao Xin et Lumbsch, in Zhao, Leavitt, Zhao, Zhang, Arup, Grube, Pérez-Ortega, Printzen, Śliwa, Kraichak, Divakar, Crespo and Lumbsch, Fungal Diversity 78(1): 301 (2015)). ≡ *Lecanora dispersa* (Pers.) Röhl., Deutschl. Fl. (Frankfurt) **3**(2): 96 (1813).

Polyozosia hagenii (Ach.) S. Y. Kondr., L. Lőkös et Farkas, *comb. nova* – MycoBank no.: MB 829793 – Basionym: *Lichen hagenii* Ach., Lich. suec. prodr. (Linköping): p. 57 (1799) [1798]. – Syn.: *Myriolecis hagenii* (Ach.) Śliwa, Zhao Xin et Lumbsch, in Zhao, Leavitt, Zhao, Zhang, Arup, Grube, Pérez-Ortega, Printzen, Śliwa, Kraichak, Divakar, Crespo and Lumbsch, Fungal Diversity 78(1): 301 (2015). ≡ *Lecanora hagenii* (Ach.) Ach., Lich. univ.: p. 367 (1810).

Polyozosia perpruinosa Fröberg ex S. Y. Kondr., L. Lőkös et Farkas, *spec. nova* – MycoBank no.: MB 829794 – Syn.: *Lecanora perpruinosa* Fröberg, The Calcicolous Lichens on the Great Alvar of Öland, Sweden (Lund): p. 50 (1989), nom. inval., Art. 36.1(a) (Melbourne). – Type: [Sweden] 'Öland: Resmo par., 2.9 km ESE of Resmo church, on the south side of the Resmo-Stenåsa road. On limestone. 56° 31' N 16° 29' E. RUBIN 4G312219. Alt. 0–50 m, 1984-07-26, Lars Fröberg L319' (LD – holotype). – Syn.: *Myriolecis perpruinosa* Fröberg ex Śliwa, Zhao Xin et Lumbsch, in Zhao, Leavitt, Zhao, Zhang, Arup, Grube, Pérez-Ortega, Printzen, Śliwa, Kraichak, Divakar, Crespo and Lumbsch, Fungal Diversity 78(1): 301 (2015).

Polyozosia populicola (DC.) S. Y. Kondr., L. Lőkös et Farkas, *comb. nova* – MycoBank no.: MB 829795 – Basionym: *Patellaria populicola* DC., in Lamarck and De Candolle, Fl. Franc., Edn 3 (Paris) 2: 363 (1805). – Syn.: *Lecanora populicola* (DC.) Duby, Bot. Gall. Edn 2 (Paris) 2: 664 (1830).

Polyozosia pruinosa (Chaub.) S. Y. Kondr., L. Lőkös et Farkas, *comb. nova* – MycoBank no.: MB 829796 – Basionym: *Lecanora pruinosa* Chaub., in Saint-Amans, Fl. agen.: p. 495 (1821). – Syn.: *Myriolecis pruinosa* (Chaub.) Śliwa, Zhao Xin et Lumbsch, in Zhao, Leavitt, Zhao, Zhang, Arup, Grube, Pérez-Ortega, Printzen, Śliwa, Kraichak, Divakar, Crespo and Lumbsch, Fungal Diversity 78(1): 301 (2015).

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Polyozosia straminea (Ach.) S. Y. Kondr., L. Lőkös et Farkas, *comb. nova* – MycoBank no.: MB 829800 – Basionym: *Lecanora straminea* Ach., Lich. univ.: p. 432 (1810). – Syn.: *Myriolecis straminea* (Ach.) Śliwa, Zhao Xin et Lumbsch, in Zhao, Leavitt, Zhao, Zhang, Arup, Grube, Pérez-Ortega, Printzen, Śliwa, Kraichak, Divakar, Crespo and Lumbsch, Fungal Diversity 78(1): 301 (2015).

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Straminella varia (Hoffm.) S. Y. Kondr., L. Lőkös et Farkas, *comb. nova* – MycoBank no.: MB 829810 – Basionym: *Patellaria varia* Hoffm., Descr. Adumb. Plant. Lich. 1(4): 102 (1790). – Syn.: *Lecanora varia* (Hoffm.) Ach., Lich. Univ.: p. 377 (1810).

Verseghya thysanophora (R. C. Harris) S. Y. Kondr., L. Lőkös, Farkas et J.-S. Hur, *comb. nova* – MycoBank no.: MB 829811 – Basionym: *Lecanora thysanophora* R. C. Harris, in Harris, Brodo and Tønsberg, Bryologist 103(4): 790 (2000).

CONCLUSIONS

Thus, from results of combined phylogenetic analysis of the members of the Lecanoraceae based on concatenated data on nrITS, mtSSU, RPB2 and RPB1 gene sequences it is found that the originally monotypic genus *Verseghya* is positioned within the *Verseghya-Lecidella-Pyrrhospora* clade of the Lecanoraceae and includes one more species, *Verseghya thysanophora*, widely distributed in the Northern Hemisphere.

Members of some sublades of the *Rhizoplaca-Protoparmeliopsis* s. l. subclade of the Lecanoraceae (i.e. the *Sedelnikovaea*, '*Protoparmeliopsis*' *chejuensis*, and *Omphalodina* subclades) are still in urgent need of further studies. Their status should be checked with molecular data including additional loci as well as additional voucher specimens.

The monophyly of the genus *Lecidella* of the *Lecidella-Glaucomaria* subclade of the Lecanoraceae after inclusion of the eastern Asian taxon *Lecidella mandshurica* should be checked with additional data on various molecular loci too.

The further data on species content of the genera *Glaucomaria*, *Lecanoropsis*, *Omphalodina* as well as *Straminella* will be provided within next species revisions, as well as with the usage of multi-locus phylogeny.

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Appendix

GenBank accession numbers and voucher information for newly generated sequences from this study (bold) included to the phylogenetic analysis.

Taxon	Voucher/reference	ITS1/2	mtSSU	RPB2	RPB1
Adelolecia pilati	Kistenich *et al.* 2018	MG925949			MG926227
Adelolecia pilati	Andersen and Ekman 2005		AY567713		
Adelolecia pilati	Lumbsch *et al.* 2004		AY300874		
Bryonora castanea	Grube *et al.* 2004	AY544123			
Calvitimela armeniaca	Timdal 2017 (unpubl.)	KY266899			
Calvitimela talayana	Bendiksby *et al.* 2015	KR303664			
Carbonea supersparsa	Andersen and Ekman 2005		AY567773		
Carbonea vitellinaria	Grube *et al.* 2004	AY541239			
Carbonea vorticosa	Ruprecht *et al.* 2012	JN873871			
Frutidella caesioatra	Kistenich *et al.* 2018	MG925971	MG925872		
Frutidella caesioatra	Andersen and Ekman 2005		AY567765		
Frutidella caesioatra	Ekman *et al.* 2008				AY756383
Glaucomaria bicincta	Grube *et al.* 2004	AY541264			
Glaucomaria carpinea	Grube and Blaha 2003	AY398710			
Glaucomaria carpinea	Arup *et al.* 2007		DQ787364		
Glaucomaria carpinea	Grube *et al.* 2004	AY541247			
Glaucomaria carpinea	SK C59, Ukraine, Kiev oblast, Bila Tserkva, Olexandria park, 2013 Kondratyuk S. 21337 (KW-L)	SK C59			
Glaucomaria leptyrodes	Grube *et al.* 2004	AY541255			
Glaucomaria lojkaeana	Grube *et al.* 2004	AY541256			
Glaucomaria rupicola	Blaha and Grube 2007	DQ451670			
Glaucomaria rupicola	SK C60, Ukraine, Mykolaiv oblast, Granitno-Stepove Pobuzhzhia park, 2003 Kondratyuk S. 20384 (KW-L)	SK C60			

Taxon	Voucher/reference	ITS1/2	mtSSU	RPB2	RPB1
Glaucomaria subcarpinea	Blaha and Grube 2007	DQ451657			
Glaucomaria sulphurata	Grube *et al.* 2004 (sub *Lecanora rupicola* subsp. *sulphurata*)	AY541260			
Glaucomaria swartzii	Blaha and Grube 2007	DQ451655			
Glaucomaria swartzii subsp. *nylanderi*	Grube *et al.* 2004	AY541273			
Glaucomaria swartzii subsp. *caulescens*	Grube *et al.* 2004	AY541272			
Japewia subaurifera	Spribille *et al.* 2011	JN009716		KR0017534	KR0017471
Japewia tornoensis	Schmull *et al.* 2011	HQ650656	HQ660559		
Japewia tornoensis	Kistenich *et al.* 2018	MG925974	MG925874		
Japewia tornoensis	Arup *et al.* 2007		DQ899301		
Japewia tornoensis	Spribille and Printzen 2007	EF495163			
Japewiella tavaresiana	Kistenich *et al.* 2018	MG925975			
Japewiella tavaresiana	Kistenich *et al.* 2018	MG925976			
Lecanora achroa	Schoch *et al.* 2012	JN943719	JQ782663		JN987930
Lecanora achroa	Schoch *et al.* 2012	JN943715			JN987929
Lecanora achroa	Schoch *et al.* 2012	JN943714			JN987926
Lecanora achroa	Zhao *et al.* 2016			KT453937	
Lecanora aitema	Pérez-Ortega *et al.* 2010	GU480092			
Lecanora albella	Malíček *et al.* 2017	KY548048, KY548049	KY502423		
Lecanora albella	Grube *et al.* 2004	AY541241			
Lecanora albella f. *sorediata*	Malíček *et al.* 2017	KY548044	KY502430		
Lecanora alboflavida	Malíček *et al.* 2017	KY548045, KY548055	KY502427, KY502428, KY502429, KY502455		
Lecanora allophana	Arup and Grube 2000	AF159939	n/a		
Lecanora allophana	Grube and Arup, (unpubl.)	AF070031			
Lecanora allophana	Malíček *et al.* 2017	KY548051	KY502416		

Taxon	Voucher/reference	ITS1/2	mtSSU	RPB2	RPB1
Lecanora allophana	Malíček *et al.* 2017	KY548050, KY548055, KT630248	KY502418, KY502421, KY502456, KT630256		
Lecanora aspidophora	Kim *et al*. 2006	DQ534484			
Lecanora argentata	Malíček *et al.* 2017	KT630245	KT630264		
Lecanora argopholis	SK C93, Ukraine, Krym, Novy Svit, 2013 Kondratyuk S. 21324 (KW-L)	SK C93	SK C93		
Lecanora argopholis	Arup *et al.* 2007		DQ787358		
Lecanora barkmaniana	Malíček *et al.* 2017		KY502432, KY502438, KY502439, KT630259		
Lecanora barkmaniana	Malíček *et al.* 2017	KT630246, KT630247	KT630257, KT630258		
Lecanora bicincta	Grube *et al.* 2004	AY541245, AY541263			
Lecanora caesiorubella	Schoch *et al.* 2012	JN943722, JN943727, JN943728			JN987920, JN987931, JN987934
Lecanora caesiorubella	Miadłikowska *et al.* 2014		KJ766415		KJ766861
Lecanora caesiorubella	Kirika *et al.* 2012		JQ782666, JQ782667		
Lecanora californica	Kirika *et al.* 2012		JQ782668		
Lecanora campestris	Arup and Grube 2000	AF159930			
Lecanora caperatica	Asher and Lendemer 2018		MH700563, MH700564, MH700565, MH700566		
Lecanora cateilea	Grube *et al.* 2004	AY541250			
Lecanora cenisia	Malíček *et al.* 2017	KY548047	KY502424, KY502425		
Lecanora cenisia	Malíček *et al.* 2017	KY548046	KY502426, KY502437		
Lecanora cenisia	Malíček *et al.* 2017	KY548041	KY502435		
Lecanora chlarotera	Kelly *et al.* 2011	FR799204			
Lecanora chlarotera	Malíček *et al.* 2017		KY502422		
Lecanora chlarotera	Malíček *et al.* 2017		KT630263		
Lecanora chlarotera	Kelly *et al.* 2011	FR799206			

Taxon	Voucher/reference	ITS1/2	mtSSU	RPB2	RPB1
Lecanora chlorophaeodes	Arup and Grube 2000	AF159927			
Lecanora chlorophaeodes	Grube and Arup 1999 (unpubl.)	AF070029			
Lecanora chlorophaeodes	Grube and Blaha 2003	AY398704			
Lecanora cinereofusca	Lendemer and Harris 2014	KP224470, KP224471	KP224465		
Lecanora concolor	Reeb *et al.* 2004			AY641049	
Lecanora concolor	Grube and Arup 1999 (unpubl.)	AF070037			
Lecanora concolor	Schmull *et al.* 2011	HQ650678			
Lecanora confusa	Pérez-Ortega *et al.* 2010	GU480120			
Lecanora dispersoareolata	Grube and Arup 1999 (unpubl.)	AF070016	AF070041		
Lecanora ecorticata	Orange 2016 (unpubl.)	KT962179			
Lecanora elatinoides	Kirika *et al.* 2012		JQ782669		
Lecanora epibryon	Grube *et al.* 2004	AY541251			
Lecanora expallens	Guzow-Krzeminska *et al.* 2017	MG076968, MG076969, MG076970			
Lecanora expallens	Kelly *et al.* 2011	FR799207, FR799208			
Lecanora exspersa	Malíček *et al.* 2017	KT630244	KT630255		
Lecanora exspersa	Malíček *et al.* 2017	KY548035, KY548036, KY548053, KY548054, KY548056, KY548057, KY548058	KY502415, KY502417, KY502419, KY502420, KY502450, KY502452		
Lecanora farinacea	Grube *et al.* 2004	AY541261			
Lecanora farinacea	Grube *et al.* 2004	AY541262			
Lecanora farinacea	Kirika *et al.* 2012	JQ782710	JQ782671, JQ782672		
Lecanora farinacea	Schoch *et al.* 2012	JN943725			JN987923, JN987924
Lecanora farinaria	Malíček *et al.* 2017		KT630261		
Lecanora farinaria	Malíček *et al.* 2017	KY548042			
Lecanora farinaria	Malíček *et al.* 2017	KY548043	KY502433		

Taxon	Voucher/reference	ITS1/2	mtSSU	RPB2	RPB1
Lecanora flavopallida	Schoch *et al.* 2012	JN943723, JN943724			JN987925
Lecanora flavopallida	Kirika *et al.* 2012		JQ782674		
Lecanora flavopallida	Zhao *et al.* 2016			KT453938	
Lecanora formosa	Zhao *et al.* 2016	KT453769, KT453770, KT453771		KT453978, KT453979	
Lecanora gangaleoides	Kirika *et al.* 2012		JQ782676		
Lecanora glabrata	Arup *et al.* 2007		DQ787360		
Lecanora helva	Kirika *et al.* 2012	JQ782713, JQ782714, JQ782715, JQ782716	JQ782677, JQ782678, JQ782680		
Lecanora horiza	Grube *et al.* 2004	AY541252			
Lecanora horiza	Zhao *et al.* 2016		KT453876		KT453903
Lecanora hybocarpa	Crespo *et al.* 2007	EF105412			
Lecanora hybocarpa	Miadłikowska *et al.* 2006		DQ912273		
Lecanora hybocarpa	James *et al.* 2006			DQ782871	
Lecanora impudens	Mark *et al.* 2016	KX132996			
Lecanora impudens	Malíček *et al.* 2017		KY502453, KY502454, KY502457, KY502458, KY502460		
Lecanora intricata	Grube and Blaha 2003	AY398703			
Lecanora intricata	Grube and Arup 1999 (unpubl.)	AF070022			
Lecanora intumescens	Grube *et al.* 2004	AY541254			
Lecanora intumescens	Malíček *et al.* 2017	KY548040	KY502441		
Lecanora intumescens	Lumbsch *et al.* 2004		AY300892		
Lecanora intumescens	Ekman *et al.* 2008				AY756386
Lecanora intumescens	Malíček *et al.* 2017	KY548039	KY502443		
Lecanora kenyana	Kirika *et al.* 2012	JQ900618	JQ900616		
Lecanora kohu	Printzen *et al.* 2017	MF115999			
Lecanora layana	Lendemer 2015	KR094859, KR094860, NR_158472	KR094857, KR094858		

Taxon	Voucher/reference	ITS1/2	mtSSU	RPB2	RPB1
Lecanora* aff. *layana	South Korea, Gangwon-do, Jeongseong-gun, 10.07.2015 Lőkös, L., Kondratyuk S., 151175 KoLRI 034408	34408			
Lecanora* aff. *layana	South Korea, Gangwon-do, Jeongseong-gun, 10.07.2015 Kondratyuk S. (SK-97), Lőkös, L. 151223 KoLRI 034456	34456			
Lecanora leproplaca	Kirika *et al.* 2012		JQ782683, JQ782684		
Lecanora leprosa	Kirika *et al.* 2012		JQ782682		
Lecanora orientoafricana	Kirika *et al.* 2012	JQ900617			
Lecanora orientoafricana	Kirika *et al.* 2012		JQ900617		
Lecanora orosthea	Grube and Arup 1999 (unpubl.)	070035			
Lecanora pacifica	Kirika *et al.* 2012		JQ782686		
Lecanora paramerae	Malíček *et al.* 2017	EF105413			
Lecanora phaeocardia	Lumbsch *et al.* 2012	JQ782724, JQ782723	JQ782688, JQ782687		
Lecanora polytropa	Kim *et al.* 2006	DQ534470			
Lecanora polytropa	Schmull *et al.* 2011	HQ650643			
Lecanora polytropa	Miadłikowska *et al.* 2006			DQ992418	
Lecanora pringlei	Stone and Sutton 2013 (unpubl.)	KF024739			
Lecanora pulicaris	Mark *et al.* 2016	KX132989			
Lecanora pulicaris	Malíček *et al.* 2017	KY548052			
Lecanora pulicaris	Malíček *et al.* 2017		KT630262, KY502434		
Lecanora rugosella	Grube and Blaha 2003	AY398712			
Lecanora saxigena	Lendemer and Harris 2014	KP224466, KP224467, KP224468	KP224459, KP224460, KP224461		

Taxon	Voucher/reference	ITS1/2	mtSSU	RPB2	RPB1
Lecanora sorediomarginata	Azevedo *et al.* 2010 (unpubl.)	GU480121, GU480122			
Lecanora stanislai	Guzow-Krzeminska *et al.* 2017	KY586039			
Lecanora strobilina	Mark *et al.* 2016	KX132997			
Lecanora strobilina	Parnmen *et al.* 2016 (unpubl.)	MG642084			
Lecanora strobilina	Miadłikowska *et al.* 2014		KJ766420	KJ766934	KJ766914
Lecanora subcarnea	Malíček *et al.* 2017	AY541267			
Lecanora subimmergens	Kirika *et al.* 2012		JQ782695		
Lecanora substerilis	Malíček *et al.* 2017	KT630243	KT630252, KT630254		
Lecanora substerilis	Malíček *et al.* 2017	KY548037	KY502447, KY502448, KY502449, KT630253		
Lecanora sulphurea	Grube and Arup 1999 (unpubl.)	AF070030			
Lecanora sulphurea	Crespo *et al.* 2007				EF105432
Lecanora sulphurea	Lumbsch *et al.* 2004				DQ870951
Lecanora symmicta	Pérez-Ortega *et al.* 2010	GU480113			
Lecanora symmicta	Telfer *et al.* 2015	KT695370			
Lecanora symmicta	Grube and Arup 1999 (unpubl.)	AF070024			
Lecanora symmicta	Miadłikowska *et al.* 2014			KJ766977	KJ766827
Lecanora symmicta	Rodrigues Flakus and Printzen 2014		KJ152466	KJ152487	KJ152452
Lecanora toroyensis	Kirika *et al.* 2012	JQ782734	JQ782698		
Lecanora tropica	Kirika *et al.* 2012		JQ782699		
Lecanora tropica	Schoch *et al.* 2012	JQ943718			JN987927, JN987928, JN987936
Lecanora ussuriensis	South Korea, Ulleung-do, 10.07.2016 Kondratyuk S., Lőkös, L., 161989 KoLRI 040227	161989			

Taxon	Voucher/reference	ITS1/2	mtSSU	RPB2	RPB1
Lecanora ussuriensis	South Korea, Ulleung-do, 10.07.2016 Kondratyuk S., Lőkös, L., 161988 KoLRI 040226	161988			
Lecanora ussuriensis	South Korea, Ulleung-do, 10.07.2016 Kondratyuk S., Lőkös, L., 161987 KoLRI 040225	161987			
Lecanora vainioi	Kirika *et al.* 2012	JQ782711, JQ782716	JQ782701, JQ782702		
Lecanora variolascens	Malíček *et al.* 2017	KY548038	KY502445, KY502446, KT630260		
Lecanoropsis anopta	Pérez-Ortega *et al.* 2010	GU480114, GU480115, GU480116			
Lecanoropsis macleanii	Leavitt *et al.* 2016 (as *Rhizoplaca macleanii*)	KU934643, KU934645, KU934647, KU934648			
Lecanoropsis subintricata	Pérez-Ortega *et al.* 2010	GU480111, GU480112			
Lecanoropsis saligna	Leavitt *et al.* 2016	KU934539		KU935036	KU935293
Lecanoropsis saligna	Arup and Grube 2000	AF189716			
Lecanoropsis saligna	Mark *et al.* 2016	KX132995			
Lecanoropsis saligna	Pérez-Ortega *et al.* 2010	GU480108			
Lecidella carpathica	Zhao *et al.* 2016	KT453741	KT453830	KT453942, KT453943, KT453944	KT453905
Lecidella effugiens	Zhao *et al.* 2016		KT453833	KT453941, KT453957, KT453958	
Lecidella elaeochroma	Schmull *et al.* 2011	HQ605938			
Lecidella elaeochroma	Zhao *et al.* 2016			KT453956	
Lecidella elaeochroma	Miadłikowska *et al.* 2006			DQ992429	DQ986818
Lecidella elaeochromoides	Zhao *et al.* 2016		KT453836	KT453953	
Lecidella enteroleucella	Zhao *et al.* 2016		KT453838		

Taxon	Voucher/reference	ITS1/2	mtSSU	RPB2	RPB1
Lecidella euphorea	Zhao *et al.* 2016	KT453742	KT453844	KT453947, KT453954	KT453908, KT453909
Lecidella euphorea	Miadłikowska *et al.* 2006			DQ992479	DQ986857
Lecidella flavosorediata	Kelly *et al.* 2011	FR799213			
Lecidella greenii	Pérez-Ortega *et al.* 2012	JX036133, JX036141, JX036151			
Lecidella mandshurica	South Korea, Gangwon-do, Jeongseong-gun, 10.07.2015 Kondratyuk S. (SK-92), Lőkös, L. 151002 KoLRI 034235	034235			
Lecidella mandshurica	South Korea, Gangwon-do, Jeongseong-gun, 10.07.2015 Kondratyuk S. (SK-96), Lőkös, L. 151152 KoLRI 034385	034385			
Lecidella mandshurica	Zhao *et al.* 2016 (sub *Lecidella* aff. *elaeochroma* ZX20141284)	KT453751	KT453827	KT453963	
Lecidella mandshurica	Zhao *et al.* 2016 (sub *Lecidella* aff. *elaeochroma* ZX20141264-2)	KT453752	KT453826	KT453962	
Lecidella mandshurica	Zhao *et al.* 2016 (sub *Lecidella* aff. *elaeochroma* ZX20141244-2)	KT453753	KT453825	KT453961	
Lecidella meiococca	Ekman and Tønsberg 2002	AF517929			
Lecidella meiococca	Lumbsch *et al.* 2004		AY300893		
Lecidella meiococca	Andersen and Ekman 2005		AY567714		
Lecidella patavina	Başaran *et al.* 2015	HQ605932			
Lecidella patavina	Zhao *et al.* 2016	KT453767	KT453846	KT453967, KT453968	KT453910, KT453911
Lecidella siplei	Ruprecht *et al.* 2012	JN873897, JN873899, JN873900			

Taxon	Voucher/reference	ITS1/2	mtSSU	RPB2	RPB1
Lecidella stigmatea	Zhao *et al.* 2016	KT453439		KT453972, KT453973, KT453977	KT453915, KT453917, KT453918
Lecidella subviridis	Vondrák *et al.* 2018		MG773683, MG773684		
Lecidella tumidula	Zhao *et al.* 2016	KT453936, KT453937	KT453853	KT453945, KT453946	KT453906, KT453907
Lecidella wulfenii	Ruprecht *et al.* 2012	JN873903			
Miriquidica complanata	Singh *et al.* 2013	KP562187, KF562188			KF601233
Miriquidica garovaglii	Kalb *et al.* 2008	EU075538			
Miriquidica garovaglii	Ekman *et al.* 2008				AY756420
Miriquidica instrata	Bendiksby *et al.* 2015		KR303703		
Miriquidica leucophaea	Divakar *et al.* 2015		KR995351		
Omphalodina chrysoleuca	Leavitt *et al.* 2011	HM577251, HM577252			
Omphalodina chrysoleuca	Arup *et al.* 2007		DQ787354		
Omphalodina chrysoleuca	Zhao *et al.* 2016		KT453856		KT453898, KT453899
Omphalodina chrysoleuca	Leavitt *et al.* 2016			KU935093, KU935095, KU935097, KU935099	KU935337, KU935342, KU935347, KU935348, KU935349, KU935350
Omphalodina chrysoleuca	Zhou *et al.* 2004 (unpubl.)	AY509789, AY509799			
Omphalodina huashanensis	Zhou *et al.* 2006	AY530885			
Omphalodina opiniconensis	Arup and Grube 2000	AF159928			
Omphalodina phaedrophthalma	Arup and Grube 2000	AF159938			
Omphalodina pseudistera	SK A16, China, Liaoning province, 26.07.2012 Oh S.-O., Hur J.-S. CH120045 KoLRI 016655		SK A16		
Palicella anakeestiicola	Lendemer and Tripp 2015	KP224473, KP224475	KP224472		
Palicella filamentosa	Pérez-Ortega *et al.* 2010	GU480099, GU480100			

Taxon	Voucher/reference	ITS1/2	mtSSU	RPB2	RPB1
Palicella filamentosa	Schmull *et al.* 2011	HQ650663			
Palicella filamentosa	Rodriguez Flakus and Printzen 2014		KJ152468		
Palicella glaucopa	Rodriguez Flakus and Printzen 2014	KJ152479	KJ152470, KJ152472, KJ152473	KJ152497, KJ152498, KJ152499	
Palicella lueckingii	Rodriguez Flakus 2018	MG937800			
Palicella schizochromatica	Schmull *et al.* 2011	HQ650652			
Palicella schizochromatica	Pérez-Ortega *et al.* 2010 (sub *Lecanora schizochromatica*)	GU480109, GU480110			
Palicella schizochromatica	Rodriguez Flakus and Printzen 2014		KJ152465, KJ152467, KJ152468	KJ152488, KJ152489	
Polyozosia albescens	Sliwa *et al.* 2012	JQ993717			
Polyozosia albescens	Śliwa *et al.* 2012	JQ993717			
Polyozosia andrewii	Śliwa *et al.* 2012	JQ993722			
Polyozosia contractula	Grube and Arup 1999 (unpubl.)	AF070032			
Polyozosia contractula	Schmull *et al.* 2011	HQ650604			
Polyozosia contractula	Miadłikowska *et al.* 2006		DQ986898	DQ992428	DQ986817
Polyozosia crenulata	Śliwa *et al.* 2012	JQ993723			
Polyozosia dispersa	Śliwa *et al.* 2012	JQ993733			
Polyozosia dispersa	Zhao *et al.* 2016			KT453921, KT453922	KT453888
Polyozosia hagenii	Śliwa *et al.* 2012	JQ993737			
Polyozosia perpruinosa	Arup and Grube 2000	AF070025			
Polyozosia perpruinosa	Arup *et al.* 2007		DQ787344		
Polyozosia poliophaea	Kistenich *et al.* 2018	MG925981	MG925879	MG926254	MG926178
Polyozosia populicola	Kelly *et al.* 2011	FR799211, FR799210, FR799209			
Polyozosia pruinosa	Śliwa *et al.* 2012	JQ993740			
Polyozosia reuterii	Arup and Grube 2000	AF070026			
Polyozosia sambuci	Telfer *et al.* 2015	KT695378			
Polyozosia semipallida	Śliwa *et al.* 2012	JQ993755			

Taxon	Voucher/reference	ITS1/2	mtSSU	RPB2	RPB1
Polyozosia straminea	Timdal 2016 (unpubl.)	KY266929			
Polyozosia straminea	Grube and Blaha 2003	AY398700			
Polyozosia thuleana	Arup and Grube 2000 (as *Arctopeltis thuleana*)	AF159926			
Protoparmelia badia	Singh *et al.* 2013	KF562191			
Protoparmelia badia	Grube and Arup 1999 (unpubl.)	AF070023			
Protoparmelia badia	Crespo *et al.* 2007		EF105420		
Protoparmelia badia	Malíček *et al.* 2017	JN00972			
Protoparmelia badia	Sing *et al*. 2016		KY012810, KY012809, KY012808		KY012843, KY012842, KY012841
Protoparmelia montagnei	SK A07, Ukraine, Donetsk oblast, 'Kamyani Mogyly' zapovidnyk, 12.05. 2011 Nadeina O.V. et al. (KW-L 68284)	SK A7			
Protoparmelia ochrococca	Singh *et al.* 2015	KP822293	KP822489		
Protoparmeliopsis achariana	Grube and Arup 1999 (unpubl.)	AF070019			
Protoparmeliopsis achariana	Miadłikowska *et al.* 2014		KJ766465		
Protoparmeliopsis achariana	Miadłikowska *et al.* 2006			DQ973088	DQ973051
Protoparmeliopsis bolcana	SK C58, Ukraine, Mykolaiv oblast, Granitno-Stepove Pobuzhzhia park, 2003 Kondratyuk S. 20309 (KW-L)	SK C58	SK C58		
'Protoparmeliopsis' chejuensis	140266-2 KoLRI, South Korea, Jeju-do, 18.06.2014 Kondratyuk S. 140266-2 KoLRI 022622	140266	140266		
'Protoparmeliopsis' chejuensis	140260-3 KoLRI, South Korea, Jeju-do, 18.06.2014 Kondratyuk S. 140260-3 KoLRI 022618	140260	140260		

Taxon	Voucher/reference	ITS1/2	mtSSU	RPB2	RPB1
Protoparmeliopsis garovaglii	SK A03, Iran, Northern Khorasan, 03.05.2013 M. Haji Moniri (KW-L)	SK A03	SK A03		
Protoparmeliopsis garovaglii	Leavitt *et al.* 2016			KU935041, KU935043, KU935044	KU935297, KU935300, KU935301, KU935302
Protoparmeliopsis garovaglii	Arup and Grube 2000	AF189718, AF189719			
Protoparmeliopsis garovaglii	Zhao *et al.* 2016		KT453818	KT453923, KT453924, KT453925	
Protoparmeliopsis kopachevskae	South Korea, Ulleung-do, 10.07.2016 Kondratyuk S., Lőkös, L., 161831 KoLRI 040056	161831			
Protoparmeliopsis kopachevskae	South Korea, Ulleung-do, 10.07.2016 Kondratyuk S., Lőkös, L., 161839 KoLRI 040064	161839			
Protoparmeliopsis kopachevskae	South Korea, Ulleung-do, 10.07.2016 Kondratyuk S., Lőkös, L., 161836 KoLRI 040061	161836			
Protoparmeliopsis kopachevskiae	South Korea, Ulleung-do, 11.07.2016 Kondratyuk S., Lőkös, L., 161986 KoLRI 040224	161986			
Protoparmeliopsis kopachevskae	South Korea, Ulleung-do, 11.07.2016 Kondratyuk S., Lőkös, L., 162029 KoLRI 040267	162029			
Protoparmeliopsis kopachevskae	South Korea, Ulleung-do, 11.07.2016 Kondratyuk S., Lőkös, L., 162038 KoLRI 040276	162038			
Protoparmeliopsis macrocyclos	Arup and Grube 2000	AF159933			
Protoparmeliopsis muralis	Arup and Grube 2000	AF159922			

Taxon	Voucher/reference	ITS1/2	mtSSU	RPB2	RPB1
Protoparmeliopsis muralis	Crespo *et al*. 2004		AH013686		
Protoparmeliopsis muralis	SK 765, Kondratyuk *et al*. 2015		KP059054		
Protoparmeliopsis muralis	Miadłikowska *et al.* 2014		KJ766466	KJ766943	
Protoparmeliopsis muralis	Leavitt *et al.* 2016	KU935052		KU935051, KU935052	KU935305, KU935306, KU935307
Protoparmeliopsis muralis	Schmull *et al*. 2011			HQ660523	
Protoparmeliopsis peltata	Barak *et al.* 2016	KX550109			
Protoparmeliopsis peltata	Arup and Grube 2000	AF159925			
Protoparmeliopsis peltata	Zhou *et al*. 2004 (unpubl.)	AY509803			
Protoparmeliopsis peltata	Zhou *et al.* 2006	AY530887			
Protoparmeliopsis peltata	Leavitt *et al.* 2016			KU935155, KU935157, KU935158	KU935397, KU935405, KU935409, KU935410
Protoparmeliopsis peltata	Zhao *et al*. 2016		KT453860	KT453925, KT453926, KT453927	
Protoparmeliopsis zarei	SK 480, SK 481, Kondratyuk *et al*. 2015	KP059048, KP059049	KP059055, KP059056		
Psorinia conglomerata	Kistenich *et al.* 2018	MG926012	MG926914		
Pycnora praestabilis	Miadłikowska *et al.* 2014		KJ766478		KJ766886
Pycnora sorophora	Voglmayr *et al*. 2018	MH468790		MH468793	MH468797
Pycnora sorophora	Bendiksby and Timdal 2013	KF360404, KF360406	KF360438, KF360441, KF360442		
Pycnora sorophora	Mark *et al.* 2016	KX132977			
Pycnora sorophora	Wedin *et al.* 2005		AY853338		
Pycnora xanthococca	Bendiksby and Timdal 2013	KF360412			
Pycnora xanthococca	Wedin *et al.* 2005		AY853339		
Pyrrhospora quernea	Ekman and Tønsberg 2002	AF517930			

Taxon	Voucher/reference	ITS1/2	mtSSU	RPB2	RPB1
Pyrrhospora quernea	Lumbsch *et al.* 2004		AY300908		
Pyrrhospora quernea	Andersen and Ekman 2005		AY567712		
Ramalinora glaucolivida	LaGreca and Lumbsch 2001	AF249906			
Ramalinora glaucolivida	Lumbsch *et al.* 2004		HM441297		
Ramboldia brunneocarpa	Kalb *et al.* 2008	EU075542	EU075528		
Ramboldia petraeoides	Kalb *et al.* 2008	EU075545	EU075531		
Ramboldia petraeoides	Resl *et al.* 2015	KR017140			
Ramboldia russula	Singh *et al.* 2015	KP822307	KP822522		
Ramboldia russula	Singh *et al.* 2015	KP822308			
Ramboldia sanguinolenta	Kalb *et al.* 2008	EU075548	EU075534		
Ramboldia sanguinolenta	Zhao *et al.* 2016				KT453920
Ramboldia stuartii	Kalb *et al.* 2008	EU075549	EU075535		
Ramboldia stuartii	Singh *et al.* 2015	KP822309	KP822523		
Rhizoplaca haydenii	Leavitt *et al.* 2011	HM577302			
Rhizoplaca haydenii	Zhao *et al.* 2016		KT453857		
Rhizoplaca haydenii	Leavitt *et al.* 2016			KU935113, KU935114, KU935115	KU935352, KU935353
Rhizoplaca idahoensis	Leavitt *et al.* 2013				JX948310
Rhizoplaca idahoensis	Leavitt *et al.* 2016				KU935367
Rhizoplaca melanophthalma	Leavitt *et al.* 2013	JX948232			
Rhizoplaca melanophthalma	Arup *et al.* 2007		DQ787352		
Rhizoplaca melanophthalma	Leavitt *et al.* 2013			JX948361, JX948363, JX948365	
Rhizoplaca novomexicana	Leavitt *et al.* 2011	HM577357			
Rhizoplaca novomexicana	Leavitt *et al.* 2016	KU934693, KU934697		KU935134, KU935135, KU935137	
Rhizoplaca novomexicana	Leavitt *et al.* 2013			JX948345, JX948346, JX948347	

Taxon	Voucher/reference	ITS1/2	mtSSU	RPB2	RPB1
Rhizoplaca novomexicana	Zhao *et al.* 2016		KT453824		
Rhizoplaca parilis	Leavitt *et al.* 2013	JX948227		JX948351, JX948352, JX948353	JX948311, JX948312
Rhizoplaca parilis	Leavitt *et al.* 2016				KU935393
Rhizoplaca parilis	Zhao *et al.* 2016		KT453859		
Rhizoplaca polymorpha	Leavitt *et al.* 2011	HM577325			
Rhizoplaca polymorpha	Leavitt *et al.* 2013			JX948367, JX948368, JX948369	
Rhizoplaca polymorpha	Leavitt *et al.* 2016			KU935159	
Rhizoplaca porteri	Leavitt *et al.* 2011	HM577381			
Rhizoplaca porteri	Leavitt *et al.* 2013	JX948228		JX948375, JX948377, JX948379	JX948412
Rhizoplaca porteri	Zhao *et al.* 2016		KT453860		
Rhizoplaca shushanii	Leavitt *et al.* 2011	HM577293, HM577294			
Rhizoplaca shushanii	Zhao *et al.* 2016		KT453862		
Rhizoplaca shushanii	Leavitt *et al.* 2013			JX948372, JX948373, JX948374	
Scoliciosporum chlorococcum	Kelly *et al.* 2011	FR799323			
Scoliciosporum intrusum	Ekman *et al.* 2008				AY576391
Scoliciosporum intrusum	Andersen 2004 (unpubl.)				AY756397
Scoliciosporum schadeanum	Miadłikowska *et al.* 2014		KJ766492		
Scoliciosporum umbrinum	Grube *et al.* 2004	AY541277			
Sedelnikovaea baicalensis	SK A13, Kondratyuk *et al.* 2014*a*	KP059050	KP059057		
Sedelnikovaea baicalensis	SK 776, Kondratyuk *et al.* 2014*a*	KP059051	KP059058		
Sedelnikovaea baicalensis	SK A18, Kondratyuk *et al.* 2014*a*		KP059059		

Taxon	Voucher/reference	ITS1/2	mtSSU	RPB2	RPB1
Sedelnikovaea baicalensis	SK A42, China, Inner Mongolia, Xilin county, Mountain, 43°36.272′ N, 116°43.242′E, 1260 m alt., on rock, 10.viii.2009 J.-S. Hur & X.Y. Wang CH090352 (KoLRI 010966)	SK A42	SK A42		
Sedelnikovaea baicalensis	SK A44, China, Inner Mongolia, Xilin county, Mountain, 43 36′272′′ N, 116 43′242′′E, 1260 m alt., on rock, 10.viii.2009 J.-S. Hur & X.Y. Wang CH090347 (KoLRI 010961)	SK A44	SK A44		
Sedelnikovaea marginalis	Leavitt *et al*. 2016	KU934655, KU934654		KU935123, KU935122	KU935370, KU935369
Sedelnikovaea marginalis	Zhao *et al.* 2016	KT453732			KT453901
Sedelnikovaea pseudogyrophorica	SK A01, China, Liaoning province, 26.07.2012 Oh S.-O., Hur J.-S., CH120041 (KoLRI 016651)	SK A01	SK A01		
Sedelnikovaea pseudogyrophorica	SK A11, China, Liaoning province, 26.07.2012 Oh S.-O., Hur J.-S., CH120041 (KoLRI 016651)	SK A11	SK A11		
Sedelnikovaea subdiscrepans	Zhou *et al.* 2004 (unpubl.)	AY509789			
Sedelnikovaea subdiscrepans	Cao *et al*. 2015	KP226212			
Sedelnikovaea subdiscrepans	Leavitt *et al*. 2011	HM577232			
Sedelnikovaea subdiscrepans	Zhou *et al.* 2004 (unpubl.)	KU934905			
Sedelnikovaea subdiscrepans	Leavitt *et al*. 2016	KU934881, KU934882, KU934899		KU935177, KU935183, KU935185, KU935187, KU935189	KU935437, KU935435, KU935433, KU935431, KU935418

Taxon	Voucher/reference	ITS1/2	mtSSU	RPB2	RPB1
Sedelnikovaea subdiscrepans	Zhao *et al*. 2016			KT453933	KT453900
Straminella bullata	Crespo *et al*. 2004 (sub *Rhizoplaca bullata*)		AY464070		
Straminella burgaziae	Pérez-Ortega *et al*. 2010	GU480117, GU480118			
Straminella conizaeoides	Arup and Grube 2000	AF189717			
Straminella conizaeoides	Miadłikowska *et al*. 2014			KJ766955, KJ766956	KJ766862
Straminella conizaeoides	Shaheen 2017 (unpubl.)	MG554661			
Straminella maheui	Leavitt *et al*. 2016	KU934649, KU934651, KU934653		KU935117, KU935119, KU935121	KU935368
Straminella varia	Grube and Arup 1999 (unpubl.)	AF070021			
Straminella varia	Grube and Arup 1999 (unpubl.)	AF070027			
Straminella varia	Grube and Arup 1999 (unpubl.)	AF070028			
Straminella varia	Mark *et al*. 2016	KX133000			
Straminella varia	SK C92, Ukraine, Krym, Novy Svit, 2013 Kondratyuk S. 21325 (KW-L)	SK C92	SK C92		
Tephromela atra	Grube *et al*. 2004	AY541279			
Tephromela atra	Miadłikowska *et al*. 2006			DQ992450, DQ992451, DQ992452	DQ986834, DQ986835
Tephromela atra	Ekman *et al*. 2008				AY756428
Tylothallia biformigera	Ekman 2001	AF282077			
Tylothallia biformigera	Kistenich *et al*. 2018		MG925946	MG926304	MG926226
Verseghya klarae	South Korea, Gangwon-do, Jeongseong-gun, 10.07.2015 Kondratyuk S. (SK-90), Lőkös, L. 150855 KoLRI 034088	034088	034088		

Taxon		ITS1/2	mtSSU	RPB2	RPB1
Verseghya klarae	South Korea, Gangwon-do, Jeongseong-gun, 10.07.2015 Lőkös, L., Kondratyuk, S., 150889 KoLRI 034122	034122	034122		
Verseghya klarae	South Korea, Gangwon-do, Jeongseong-gun, 10.07.2015 Lőkös, L., Kondratyuk, S., 150890 KoLRI 034123	034123	034123		
Verseghya sp.	Isolate JM 10608, Guzow-Krzeminska *et al*. 2017	MG076967			
Verseghya thysanophora	Guzow-Krzeminska *et al*. 2017	KY586042			
Verseghya thysanophora	Malíček *et al*. 2017		KY502440, KY502442, KY502444		
Verseghya thysanophora	Lendemer and Hodkinson 2013		KC184000, KC184024		
Verseghya thysanophora	Miadłikowska *et al*. 2014		KJ766422		