Acta Botanica Hungarica 62(1–2), pp. 109–136, 2020
DOI: 10.1556/034.62.2020.1-2.7

THREE NEW GENERA OF THE TELOSCHISTACEAE PROVED BY THREE GENE PHYLOGENY

S. Y. Kondratyuk[1], L. Lőkös[2], E. Farkas[3], I. Kärnefelt[4]
A. Thell[4], Y. Yamamoto[5] and J.-S. Hur[6]

[1]*M. H. Kholodny Institute of Botany, Tereshchenkivska str. 2, 01004 Kiev, Ukraine*
E-mail: ksya_net@ukr.net, corresponding author
[2]*Department of Botany, Hungarian Natural History Museum*
H-1431 Budapest, Pf. 137, Hungary
[3]*Institute of Ecology and Botany, MTA Centre for Ecological Research*
H-2163 Vácrátót, Alkotmány u. 2–4, Hungary
[4]*Botanical Collections, Biological Museum, Lund University*
Box 117, SE-221 00 Lund, Sweden; E-mail: arne.thell@biol.lu.se
[5]*Osaka Museum of Natural History*
24-1-402, Ikeda-Kitamachi, Neyagawa, Osaka, 572-0073, Japan
[6]*Korean Lichen Research Institute, Sunchon National University, Suncheon 57922, Korea*

(Received: 14 August 2019; Accepted 10 January 2020)

Three new for science genera, i.e.: *Erichansenia* S. Y. Kondr., Kärnefelt et A. Thell for the '*Caloplaca*' *epithallina* group of the subfamily Xanthorioideae, as well as *Lendemeriella* S. Y. Kondr. for the *Caloplaca reptans* group, and *Pisutiella* S. Y. Kondr., L. Lőkös et E. Farkas for the *Caloplaca conversa* group of the subfamily Caloplacoideae of the Teloschistaceae, are described on the basis of results of the three gene phylogeny of the Teloschistaceae based on nrITS, nrLSU and mtSSU sequences.

Twenty-seven new combinations, i.e.: *Erichansenia epithallina* (for *Caloplaca epithallina* Lynge), *Erichansenia cryodesertorum* (for *Shackletonia cryodesertorum* Garrido-Ben., Søchting et Pérez-Ort.), *Erichansenia sauronii* (for *Caloplaca sauronii* Søchting et Øvstedal), *Fauriea mandshuriaensis* (for *Caloplaca mandshuriaensis* S. Y. Kondr., L. Lőkös et J.-S. Hur), *Fauriea trassii* (for *Caloplaca trassii* Galanina et S. Y. Kondr.), *Lendemeriella borealis* (for *Lecanora pyracea* f. *borealis* Vain.), *Lendemeriella dakotensis* (for *Caloplaca dakotensis* Wetmore), *Lendemeriella exsecuta* (for *Lecanora exsecuta* Nyl.), *Lendemeriella lucifuga* (for *Caloplaca lucifuga* G. Thor), *Lendemeriella nivalis* (for *Zeora nivalis* Körb.), *Lendemeriella reptans* (for *Caloplaca reptans* Lendemer et B. P. Hodk.), *Lendemeriella sorocarpa* (for *Placodium sorocarpum* Vain.), *Lendemeriella tornoensis* (for *Caloplaca tornoensis* H. Magn.), *Pisutiella congrediens* (for *Lecanora congrediens* Nyl.), *Pisutiella conversa* (for *Callopisma conversum* Kremp.), *Pisutiella furax* (for *Caloplaca furax* Egea et Llimona), *Pisutiella grimmiae* (for *Lecanora grimmiae* Nyl.), *Pisutiella ivanpisutii* (for *Caloplaca ivanpisutii* S. Y. Kondr., L. Lőkös et Hur), *Pisutiella phaeothamnos* (for *Caloplaca phaeothamnos* K. Kalb et J. Poelt), *Pyrenodesmia aetnensis* (for *Caloplaca aetnensis* B. de Lesd.), *Pyrenodesmia albolutescens* (for *Lecanora albolutescens* Nyl.), *Pyrenodesmia aractina* (for *Parmelia aractina* Fr.), *Pyrenodesmia atroflava* (for *Lecidea atroflava* Turner), *Pyrenodesmia bicolor* (for *Caloplaca bicolor* H. Magn.), *Pyrenodesmia molariformis* (for *Caloplaca molariformis* Frolov, Vondrák, Nadyeina et Khodos.), *Pyrenodesmia neotaurica* (for *Caloplaca neotaurica* Vondrák, Khodos., Arup et Søchting), *Pyrenodesmia peliophylla* (for *Placodium peliophyllum* Tuck.) are

proposed based on results from a combined phylogenetic analysis using nrITS, nrLSU and mtSSU gene sequences.

Key words: *Caloplaca*, Caloplacoideae, *Erichansenia*, *Lendemeriella*, *Pisutiella*, *Shackletonia*, Xanthorioideae

INTRODUCTION

Publishing the 'Checklist of the members of the Teloschistaceae confirmed by molecular phylogeny' (Kondratyuk *et al.*, in prep.) was delayed since 2018, because there is a number of species groups for which molecular data are accumulated, but recent status of which after molecular data is still not clarified / not published.

A rather abundant addition to the taxonomy of the Teloschistaceae, i.e. 17 monophyletic branches of the phylogenetic tree of the Teloschistaceae, was published in 2017 (Kondratyuk *et al.* 2017). After this publication only a few genera were recently described, i.e.: *Hosseusiella* S. Y. Kondr., L. Lőkös, Kärnefelt et A. Thell and *Rehmanniella* S. Y. Kondr. et J.-S. Hur of the Teloschistoideae (Kondratyuk *et al.* 2018*b*), *Coppinsiella* S. Y. Kondr. et L. Lőkös and *Seawardiella* S. Y. Kondr., I. Kärnefelt et A. Thell of the Xanthorioideae (Kondratyuk *et al.* 2018*d*), as well as *Loekoeslaszloa* S. Y. Kondr. et J.-S. Hur of the Ikaeriodeae (Kondratyuk *et al.* 2019). Thus, the total number of monophyletic branches of the Teloschistaceae corresponding genera is currently 105 (Table 1).

The main aim of this paper was to clarify the status of several species groups of the Caloplacoideae, i.e.: the '*Caloplaca*' *conversa*, '*Caloplaca*' *reptans*, '*Caloplaca*' *teicholyta* or '*Caloplaca*' *xerica* groups, as well as species of the '*Shackletonia' cryodesertorum* group of the *Shackletonia* subclade of the Xanthorioideae after combined phylogenetic analysis based on hitherto available nrITS, nrLSU and mtSSU sequences.

The status of some other lichen species groups, as well as some single species of the Teloschistaceae for which so far only data on nrITS sequences are available will be especially discussed in the forthcoming paper 'Checklist of the members of the Teloschistaceae confirmed by molecular phylogeny'.

MATERIAL AND METHODS

The consensus sequence was aligned with sequences from all related species retrieved from the GenBank database (Appendix). Phylogenetic analysis was performed using the ITS region, 28S nrLSU gene and 12S mtSSU sequences retrieved from the GenBank database.

Sequence alignment was conducted in BioEdit and a phylogenetic tree was generated by the maximum parsimony (MP), minimum evolution (ME),

Table 1

Genera of the four subfamilies of the Telochistaceae in the world scale proposed on the bases of three gene phylogeny based on ITS nrDNA, nrLSU and mtSSU sequences. NSMD = number of species for which molecular data were obtained

Subfamily (number of genera)	Genera (described on the basis of molecular phylogeny in Bold, confirmed with asterisk (*))	NSMD	References
Xanthorioideae (41 genus)	***Amundsenia***, ***Athallia***, ***Austroplaca***, ***Calogaya***, ***Cerothallia***, ***Charcotiana***, ***Coppinsiella***, *Dufourea**, ***Flavoplaca***, ***Gallowayella***, ***Golubkovaea***, ***Gondwania***, ***Honeggeria***, ***Huriella***, ***Jackelixia***, ***Jesmurrayia***, ***Igneoplaca***, ***Langeottia***, ***Martinjahnsia***, ***Massjukiella***, ***Orientophila***, ***Ovealmbornia***, *Oxneria**, ***Pachypeltis***, ***Parvoplaca***, *Polycauliona**, *Rusavskia**, ***Scythioria***, ***Seawardiella***, ***Shackletonia***, ***Solitaria***, ***Squamulea***, ***Teuvoahtiana***, ***Tomnashia***, ***Verrucoplaca***, *Xanthocarpia**, *Xanthomendoza**, ***Xanthokarrooa***, *Xanthopeltis**, *Xanthoria**, ***Zeroviella***	206	Ahti *et al.* 2015, Arup *et al.* 2013, Fedorenko *et al.* 2009, 2012, Kondratyuk *et al.* 2014b, 2015*e*, 2017, 2018*c*, *d*, Søchting *et al.* 2014*b*
Caloplacoideae (30 genera)	*Blastenia**, ***Bryoplaca***, *Caloplaca**, ***Eilifdahlia***, ***Elenkiniana***, ***Fauriea***, ***Franwilsia***, ***Gintarasiella***, *Gyalolechia**, ***Hanstrassia***, ***Huneckia***, ***Jasonhuria***, *Ioplaca**, ***Klauderuiella***, ***Laundonia***, *Leproplaca**, ***Loekoesia***, ***Loekoeslaszloa****, ***Mikhtomia***, ***Olegblumia***, ***Opeltia***, ***Oxneriopsis***, *Pyrenodesmia**, ***Rufoplaca***, *Seirophora**, ***Usnochroma***, ***Variospora***, ***Upretia***, ***Xanthaptychia***, ***Yoshimuria***	130	Arup *et al.* 2013, Fedorenko *et al.* 2009, Kondratyuk *et al.* 2014*a*, 2015*b*, *c*, 2016, 2017, 2018*a*, *c*, 2019
Teloschistoideae (24 genera)	***Catenarina***, ***Elixjohnia***, ***Filsoniana***, *Follmannia**, ***Fulgogasparrea***, ***Gintarasiella***, ***Haloplaca***, ***Harusavskia***, ***Hosseusiella***, *Josefpoeltia**, ***Ikaeria***, ***Kaernefia***, ***Lazarenkoiopsis***, ***Neobrownliella***, ***Nevilleiella***, *Niorma**, ***Rehmanniella***, ***Scutaria***, ***Stellarangia***, ***Tassiloa***, ***Teloschistes****, ***Teloschistopsis***, ***Villophora***, ***Wetmoreana***	64	Arup *et al.* 2013, Fedorenko *et al.* 2009, Kondratyuk *et al.* 2013, 2015*a*, *d*, 2017, 2018*b*, Søchting *et al.* 2014*a*
Brownlielloideae (10 genera)	***Brownliella***, ***Dijigiella***, ***Fominiella***, ***Lazarenkoella***, ***Marchantiana***, ***Raesaeneniana***, ***Streimanniella***, ***Tarasginia***, ***Tayloriellina***, ***Thelliana***	17	Kondratyuk *et al.* 2013, 2015*d*, 2017
Total number of genera **105**		**412**	

** = The genus *Loekoeslaszloa* was described as the member of the Ikaerioideae ad int. (Kondratyuk *et al.* 2019)

and maximum likelihood (ML) analysis methods. Analyses were conducted using PAUP 4.0b10 on a Macintosh platform (Swofford 2003), and in Mega 5.0 (Tamura *et al.* 2011) with the number of bootstrap trials set to 1,000.

The taxon sampling consists of 139 voucher specimens representing 124 species of the Teloschistoideae (Fig. 1) with *Brigantiaea ferruginea* as outgroup (Appendix). More than 210 nrDNA and mtDNA sequences submitted to GenBank within our study were included in phylogenetic tree mentioned.

RESULTS

A phylogenetic tree of the subfamily Teloschistoideae is presented in Figure 1. The newly described genera *Erichansenia*, *Lendemeriella* and *Pisutiella*, as well as the former '*Caloplaca*' *teicholyta* or '*Caloplaca*' *xerica* group are represented by the type species, as well as by specimens of other species molecular data for which are hitherto available. The genera *Erichansenia*, *Lendemeriella* and *Pisutiella*, found to show the highest level of support in the phylogenetic tree of the Teloschistaceae while the '*Caloplaca*' *teicholyta* or '*Caloplaca*' *xerica* group is positioned within the *Pyrenodesmia* branch.

New genera

Erichansenia S. Y. Kondr., Kärnefelt et A. Thell, *gen. nov.*

MycoBank no.: MB 834210.

Similar to Shackletonia*, but differs in having better developed epilithic thallus, in having mostly completely black apothecia with a dark greenish blue outer exciple, in having* Lecidea *green pigment in the cortex of thallus and exciple, as well as in distribution in both northern and southern hemispheres.*

Type species: *Erichansenia epithallina* (Lynge) S. Y. Kondr., Kärnefelt et A. Thell

Thallus crustose, epilithic or lichenicolous on epilithic lichens, rather continuous, reduced to tiny fragments surrounding apothecia. Surface completely rugose, minute to deeply cracked or rimose, grey to dirty greyish, often blackish within the cracks, in some areas pale brownish tinged, epruinose. Cortex paraplectenchymatous. Epicortex hyaline or sometimes brownish, composed of necrotic fungal tissue. Vegetative diaspores are absent.

Apothecia lecideine, completely black (but dark reddish orange discs in young apothecia in *Erichansenia sauronii*), epruinose, with a dark greenish blue prosoplectenchymatous outer exciple. Hymenium hyaline to faintly blue. Epithecium dark greenish blue to blackish with dispersed deep-orange

anthraquinone granules. Hypothecium hyaline to brownish. Paraphyses simple to sparingly branched at the top, slightly or hardly widening towards the apices, with blue-tinged cell walls. Asci clavate, *Teloschistes* type, with eight spores. Ascospores polardiblastic, ellipsoid. Conidiomata not known.

Chemistry: Cortical layer of thallus K–, C–, KC–, I/KI+ violet to deep blue, 10% N–, cN+ strongly pinkish (*Lecidea* green, sensu Wetmore 1994, 1996). Epicortex I+ violet. Medulla I+ violet or I–; outer part of the exciple I/KI+ violet, cN+ strongly pinkish (*Lecidea* green). Epithecium K+ faintly violet, C–, cN+ strongly pinkish (*Lecidea* green).

Ecology: Growing on siliceous rocks (large granite rocks, especially in cracks and small crevices); or lichenicolous on various crusts (rarely on foliose lichens): *Dimelaena oreina* (Ach.) Norman, *Pleopsidium oxytonum* (Ach.) Rabenh., *Protoparmeliopsis muralis* (Schreb.) M. Choisy, *P. peltata* (Ramond) Arup, Zhao Xin et Lumbsch and *Sedelnikovaea subdiscrepans* (Nyl.) S. Y. Kondr., L. Lőkös et Farkas, as well as *Aspicilia* sp., *Buellia* sp., *Montanelia* sp., *Protoparmelia* sp., *Rhizocarpon* sp.; at altitudes of 300–2,900 m a.s.l. in all ecological categories.

Etymology: The genus is named to honour the distinguished Danish lichenologist Eric Steen Hansen (C, Denmark) to recognise his contribution on particularly the lichen diversity of Greenland, and to lichenology in general.

Distribution: *Erichansenia* species occur worldwide, *E. cryodesertorum* and *E. sauronii* are known from scattered localities of continental Antarctica, while *E. epithallina* from the northern hemisphere.

Taxonomic notes: In original paper where the genus *Shackletonia* Søchting, Frödén et Arup was described (Arup *et al.* 2013) '*Shackletonia*' *sauronii* (Søchting et Øvstedal) Søchting, Frödén et Arup and the type species *Shackletonia hertelii* (Søchting, Øvstedal et Sancho) Søchting, Frödén et Arup were positioned in different branches without further discussion on the polyphyletic habit of the genus *Shakletonia*.

Garrido-Benavent with colleagues (Garrido-Benavent *et al.* 2016) have stressed that "addition of the next *Shackletonia* species, i.e. '*Shackletonia*' *cryodesertorum* illustrated the bigger differences of *Shackletonia* s. str. branch and the '*Shackletonia*' *sauronii* branch, including this species and '*Shakletonia*' *cryodesertorum*". However, no taxonomic conclusions were made.

Vondrák *et al.* (2019) showed a close position of *Shackeltonia* and '*Caloplaca*' *epithallina* using nrITS phylogeny only. According to them '*Caloplaca*' *epithallina* was positioned within the '*Shackletonia*' s. lat. subclade, but in the outermost position to all species of the genus *Shackletonia.* '*Caloplaca*' *epithallina* was also mentioned as '*Shackletonia*' *epithallina*. However, no new combination was proposed.

A combined phylogeny of the Teloschistaceae provided within this study shows that the three taxa, i.e. *Erichansenia cryodesertorum*, *E. epithallina* and *E.*

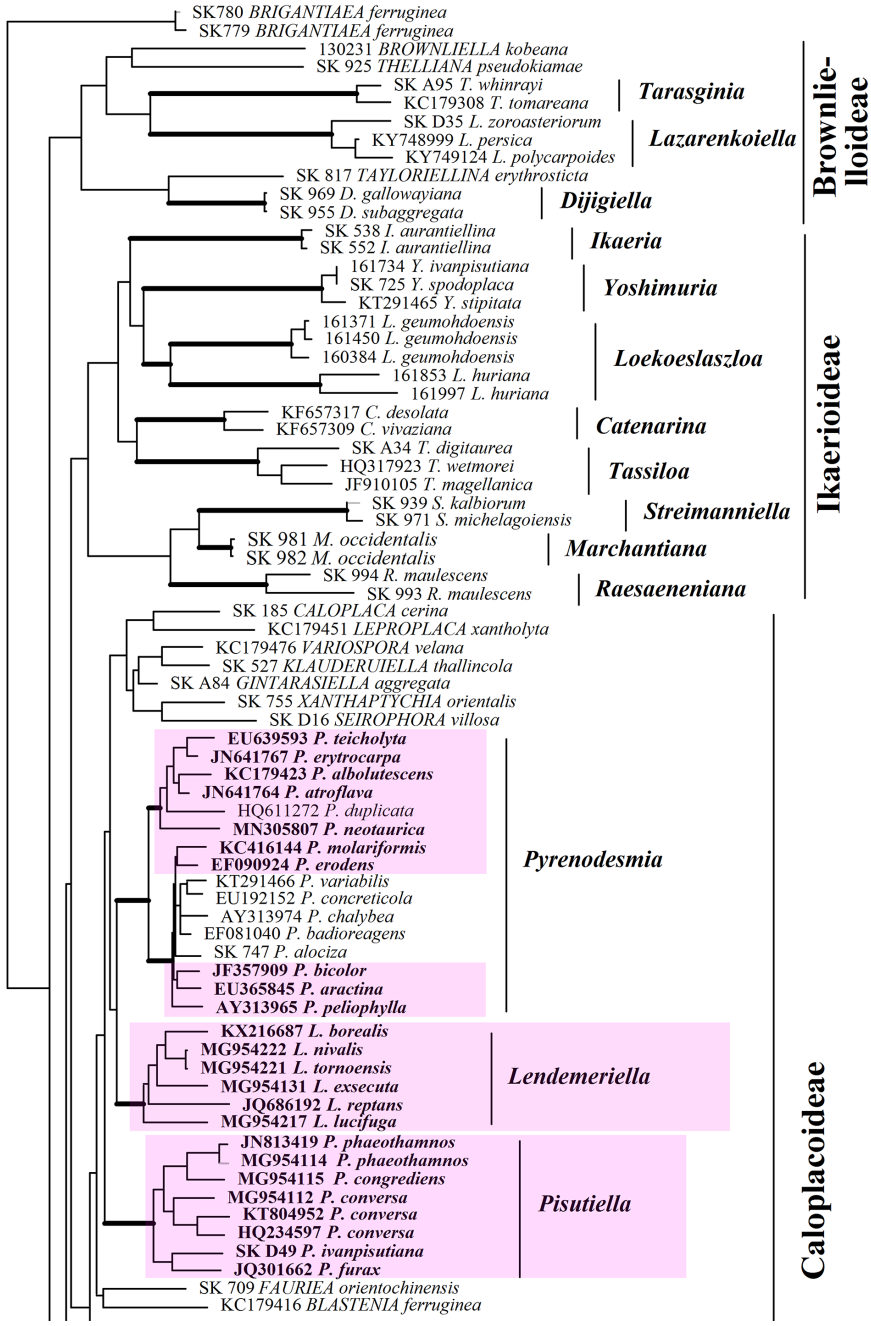

Fig. 1. Position of the genera *Erichansenia*, *Lendemeriella* and *Pisutiella*, as well as the '*Caloplaca*' *teicholyta* or '*Caloplaca*' *xerica* group in the combined phylogenetic tree of the Teloschistaceae based on nrITS, nrLSU and mtSSU sequences

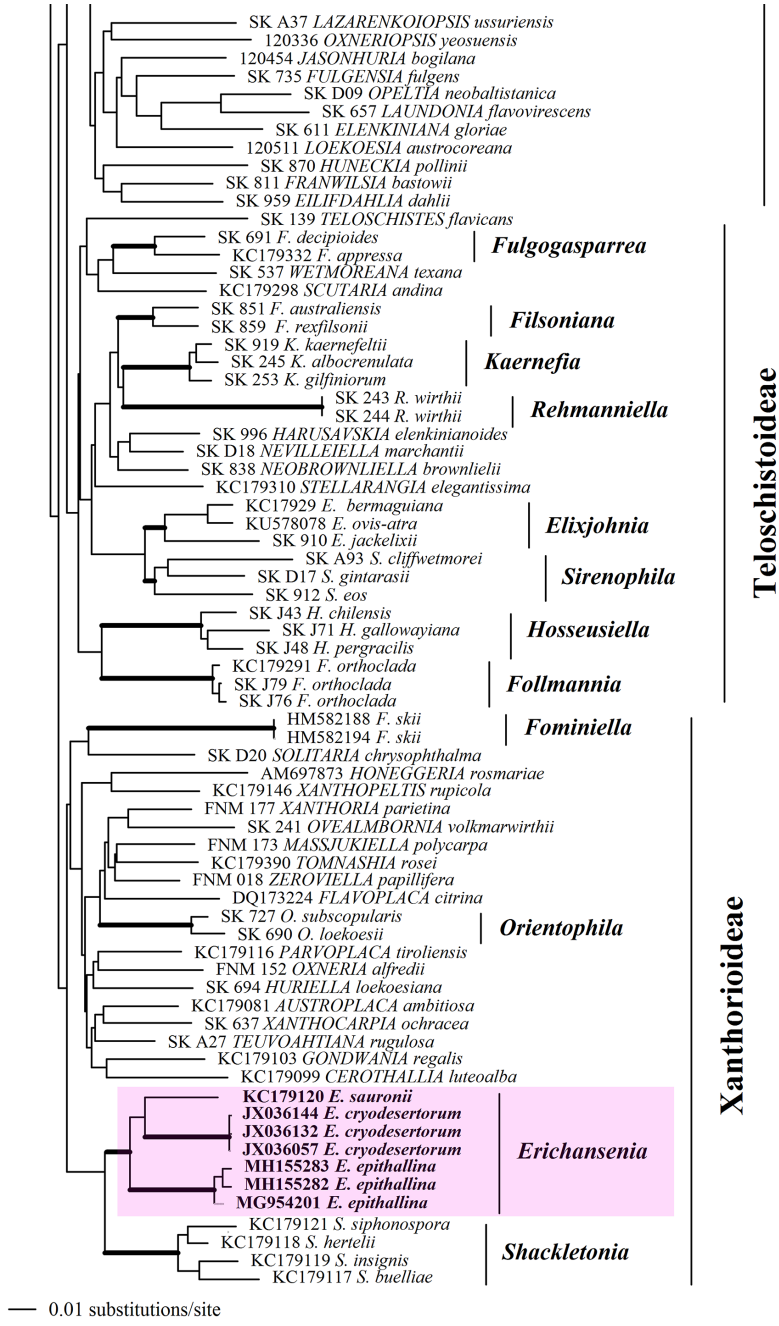

Fig. 1. (continued)

sauronii, constitute a separate monophyletic branch in sister position to the *Shackletonia* s. str. branch (i.e. the *Shackletonia hertelii* branch), while the former branch is segregated as separate genus *Erichansenia*.

According to our phylogenetic analysis the genera *Erichansenia* and *Shackletonia* are positioned in the outermost position to the other genera of the Xanthorioideae, similarly as in phylogenetic trees published by Arup *et al.* (2013), Søchting *et al.* (2014*b*), and Garrido-Benavent *et al.* (2016). The genus *Shackletonia*, a genus comprising lichen-forming, lichenicolous, and muscicolous species, is known from Antarctica and southern Patagonia (Arup *et al.* 2013). *Shackletonia* is distinguished from other Xanthorioideae groups by its unique chemistry, producing 5- and 7-chloroemodin and their derivatives.

In the key to *Shackletonia* (s. lat.) species Garrido-Benavent *et al.* (2016) included also one additional species '*Caloplaca*' *psoromatis* Olech et Søchting. It could be a member of the genus *Shackletonia*, however molecular data are still missing.

The genus *Erichansenia* is similar to *Shackletonia*, but differs in having better developed epilithic thallus (it grows on naked granitic rocks vs. lichenicolous and muscicolous), in having mostly completely black apothecia, with a dark greenish blue outer exciple (vs. the initial dark orange colour of the apothecial disc), in having *Lecidea* green pigment in the cortex of thallus and exciple, as well as in distribution in both northern and southern hemispheres.

Species of the genera *Huea* C. W. Dodge et G. E. Baker and *Pyrenodesmia* A. Massal. also show blackish or black apothecia. *Huea* species differ from *Erichansenia* by showing different chemical reactions and epithecium lacking anthraquinones, whereas *Pyrenodesmia* species have a different thallus morphology, pigmentation, chemosyndrome type, and microhabitat preferences.

The genus *Erichansenia* is similar to *Blastenia* A. Massal. of the subfamily Caloplacoideae in having dark brown to rusty brown or rusty reddish own margin or/and disk of apothecia, but differs in having mostly indistinct or badly developed thallus, in having mostly wider variation of ascospores and ascospore septum measurements and in having *Lecidea* green pigment in the cortex of thallus and exciple as well as in positioning in the subfamily Xanthorioideae of the Teloschistaceae.

Lendemeriella S. Y. Kondr., *gen. nov.*

MycoBank no.: MB 834211.

Similar to Olegblumia, *but differs in having crustose or subsquamulose to mostly indistinct (not lobate) thallus, in having different chemosyndrome type, as well as in having different ecology and distribution.*

Type species: *Lendemeriella reptans* (Lendemer et B. P. Hodk.) S. Y. Kondr.

Thallus crustose, thin and areolate or subsquamulose (in *C. dakotensis*), whitish to dark grey near apothecia, often with bluish tinge, or grey-brown, to mostly indistinct. Vegetative diaspore rarely present (only in *L. sorocarpa* and *L. reptans*). Soralia if present discrete, laminal becoming excavate as evacuated by soredia. Hypothallus dark, rarely present.

Apothecia biatorine with egg-yellow, yellow-orange, yellow-olive, reddish yellow to reddish brown, rusty red or blackish brown, grey-olive disc and own margin concolorous or somewhat lighter of disc, often with brownish, greyish brown or blackish brown outermost portion, or lecanorine, with thalline margin concolorous with thallus. Epihymenium dark, brown, olive green to reddish brown. Paraphyses simple to sparingly branched at the top, with one or two capitate uppermost cells. Asci clavate, *Teloschistes* type, with eight spores. Ascospores polardiblastic, ellipsoid, sometimes very long. Ascospore septum sometimes only initial or rather thin. Conidiomata recorded only for a few species. Conidia bacilliform.

Chemistry: Thallus K–, N– or N+ violet; disc of apothecia K+ red, C+ reddish brown. Anthraquinones are absent in thallus; apothecia (disc or both disc and margin) contain parietin (major), emodin (minor) and traces of emodinal, emodic acid, parietinic acid and fallacinal, rarely 7-chloroemodin, while some species are characterised by presence of large amount of *sedifolia* grey in all parts of the thallus and in apothecial margin. It should be mentioned that *L. exsecuta* is characterised by presence of *Lecidea* green pigment in the cortex of thallus and exciple similarly to species of the genus *Erichansenia* (see above).

Ecology: Growing on twigs of shrubs, wood and bryophytes and on siliceous rock in subalpine belt, on bark of deciduous trees and *Abies sibirica;* on base rich siliceous or calcareous rocks (limestone, schist, gneiss), usually on xerothermic outcrops in forest-steppe zone or in Mediterranean region of the northern hemisphere.

Etymology: It is named after the skilled lichenologist James C. Lendemer, New York Botanical Garden (NY), who provided first molecular data for members of this species group (e.g. for *L. reptans*), to recognise his important contribution to lichenology.

Distribution and species diversity: Arctic-alpine and boreal-montane, as well as Mediterranean distribution in the northern hemisphere. The genus is hitherto including 7 species (*Lendemeriella borealis*, *L. dakotensis**, *L exsecuta*, *L. nivalis*, *L. reptans*, *L. sorocarpa*, and *L. tornoensis*).

* *L. dakotensis* is included to this genus after mtSSU phylogeny, while data on nrITS and nrLSU sequences are still missing for this taxon. The position of *L. dakotensis* in the genus should be further studied using additional genes.

Taxonomic notes and phylogenetic affiliations: In numerous phylogenetic trees of the Teloschistaceae with varying number of vouchers and species included the genus *Lendemeriella* is positioned in the separate robust branch in sister position to the branches of the genera *Olegblumia*, *Rufoplaca* and *Usnochroma* of the *Pyrenodesmia* s. l. subclade of the Caloplacoideae.

The genus *Lendemeriella* is similar to *Olegblumia* S. Y. Kondr., L. Lőkös et J.-S. Hur, but differs in having crustose or subsquamulose to mostly indistinct (not lobate) thallus, being mostly fertile (vs. apothecia not known), in having parietin chemosyndrome and *sedifolia* grey or *Lecidea* green pigment in the cortex of thallus and exciple (vs. vicanicin and caloplacoicin), as well as in having different ecology and distribution.

The genus *Lendemeriella* is similar to *Bryoplaca* Søchting, Frödén et Arup in having similar substrate (i.e. bryophytes, wood, etc.) and distribution for some species, but differs in having crustose or subsquamulose to mostly indistinct thallus, and in having different chemosyndrome type.

The genus *Lendemeriella* is similar to *Blastenia* A. Massal. in having dark brown to rusty brown or rusty reddish own margin or/and disk of apothecia, but differs in having mostly indistinct or badly developed thallus, in having mostly wider variation of ascospores and ascospore septum measurements and in chemistry.

Based on morphological and previous molecular data *Lendemeriella* species were previously considered as members of the '*Caloplaca*' *conversa*/*conglomerata* group and '*Caloplaca*' *exsecuta* group (after Vondrák *et al.* 2019). Four species of this genus, i.e.: *Lendemeriella exsecuta*, *L. nivalis*, *L sorocarpa*, and *L. tornoensis*, mentioned as members of the '*Caloplaca*' *exsecuta* group by Vondrák and colleagues (Vondrák *et al.* 2019).

The position of '*Caloplaca*' *conglomerata* (Bagl.) Jatta mentioned as the second species of the '*Caloplaca*' *conversa* / *conglomerata* group (sensu Vondrák *et al.* 2019) is unclear pending for molecular data.

Some contradictive molecular data are submitted to GenBank for, for example, *Lendemeriella conversa*, and *L. reptans*. Clarifying position of these and other possible *Lendemeriella* species have to wait until additional molecular data are available.

Pisutiella S. Y. Kondr., L. Lőkös et E. Farkas, *gen. nov.*

MycoBank no.: MB 834212.

Similar to Usnochroma, *but differs in having mostly badly developed or lichenicolous thallus, as well as in the lack of usnic acid.*

Type species: *Pisutiella conversa* (Kremp.) S. Y. Kondr., L. Lőkös et E. Farkas.

Thallus crustose, from well developed, areolated, grey to light grey or brownish grey or blackish grey on rock surface or well distinct as orbicular portions on host lichen thalli, to consisting of a few brown to deep brownish grey areoles, or entirely reduced; mostly lichenicolous. Thallus if well developed (*P. furax*) is thick with well developed cortical layer. Vegetative diaspores are absent.

Apothecia lecanorine or zeorine, with thalline margin concolorous with thallus (sometimes disappearing with time), and dull brownish, brownish yellow or dull brownish-reddish to blackish-brownish, and ochre-brown, dull or bright reddish brown or rusty brown to blackish brown disc, or biatorine with yellow-orange rather thick own margin, immersed or semi-immersed in the thallus. Epihymenium dull yellowish. Asci clavate, *Teloschistes* type, with eight spores. Ascospores polardiblastic, ellipsoid, sometimes distinctly swollen at the septum and rather short. Conidiomata of *Xanthoria* type, conidia widely fusiform or slightly pyriform.

Chemistry: Thallus K– or rarely cortical layer K+ lightly pink, C–; disc of apothecia K+ red; epihymenium K+ purple. Anthraquinone content in apothecial disc often was not investigated, while parietin, emodin and fallacinal was previously recorded for some species.

Ecology: Growing on isolated boulders of base rich or lime-containing siliceous rocks, more rarely on compact limestone and dolomite, on bryophytes or lichenicolous (on thalli and apothecia of *Aspicilia epiglypta* (Norrl. ex Nyl.) Hue or other *Aspicilia* spp. and *Candelariella vitellina* (Hoffm.) Müll. Arg., *C. coralliza* (Nyl.) H. Magn. and other crustose lichens); at altitudes 600–2,200 m in all ecological classes, except for humid non-alpine habitats.

Etymology: It is named after the well-known Slovak lichenologist Ivan Pišút (1935–2017) to acknowledge his great contribution to our knowledge on lichens of the Carpathians and in recognition of his general contribution to lichenology.

Distribution and species diversity: Distributed in various plant communities and ecosystems of all continents of the northern hemisphere. The genus is hitherto including 6 species (*Pisutiella congrediens*, *P. conversa*, *P. furax*, *P. grimmiae*, *P. ivanpisutii*, and *P. phaeothamnos*).

Taxonomic notes and phylogenetic affiliations: The genus *Pisutiella* is similar to *Usnochroma* Søchting, Arup et Frödén, but differs in having mostly badly developed or a lichenicolous thallus, as well as in the lack of usnic acid.

The genus *Pisutiella* is similar to *Blastenia* in having somewhat ochraceous brown apothecia, but differs in having a different ecology and distribution, as well as positioning in separate branch of the phylogenetic tree of the Teloschistaceae.

The genus *Pisutiella* is similar to *Pyrenodesmia* in having ochraceous brown apothecia, but differs in having another ecology and distribution, as well as positioning in separate branch of the phylogenetic tree of the Teloschistaceae.

In numerous phylogenetic trees of the Teloschistaceae with varying number of vouchers and species included the genus *Pisutiella* is positioned as a strong branch between *Rufoplaca* and *Usnochroma* of the *Pyrenodesmia* s. l. subclade of the Caloplacoideae.

Three species of this genus, i.e. *Pisutiella congrediens*, *P. grimmiae*, and *P. phaeothamnos* were included in the Sect. *Coccinodiscus* of the genus *Caloplaca* by Poelt et Kalb (1985).

During one period *Pisutiella furax* was included in '*Caloplaca*' *conglomerata* (Nimis 1993: 162), but now accepted as a separate species differing in parasitic habit (see Nimis 2016).

The position of *Pisutiella grimmiae* within this genus is still waiting for confirmation by molecular data. However, Vondrák and colleagues (Vondrák *et al.* 2019) emphasised the close relation of the three species (i.e.: '*Caloplaca*' *congrediens*, '*Caloplaca*' *grimmiae*, and '*Caloplaca*' *phaeothamnos*) supported by nrITS sequence data, while molecular data on *Pisutiella grimmiae* are so far missing in the GenBank.

The '*Caloplaca*' *teicholyta* or '*Caloplaca*' *xerica* group

A status of the '*Caloplaca*' *teicholyta* or '*Caloplaca*' *xerica* group in the phylogenetic tree of the Teloschistaceae was clarified, while analysis of the species diversity of this group, as well as other groups of the *Pyrenodemia* subclade were not the object for our present study.

As emphasised above, the new genera *Erichansenia*, *Lendemeriella* and *Pisutiella*, were strongly supported in the phylogenetic tree of the Teloschistaceae, whereas the '*Caloplaca*' *teicholyta* or '*Caloplaca*' *xerica* group is positioned within the *Pyrenodesmia* branch (Fig. 1). The branch including *Pyrenodesmia* species, included in our study, is also strongly supported why we conclude that the former '*Caloplaca*' *teicholyta* or '*Caloplaca*' *xerica* group have to be included in the genus *Pyrenodesmia*. Of the sixteen species belonging to the *Pyrenodesmia* branch (Fig. 1), eight still needed new combinations, which are proposed below.

New combinations

Erichansenia epithallina (Lynge) S. Y. Kondr., Kärnefelt et A. Thell, *comb. nova* – MycoBank no.: MB 834213. – Basionym: *Caloplaca epithallina* Lynge, Skr. Svalbard Ishavet (Oslo) 81: 113 (1940).

Erichansenia cryodesertorum (Garrido-Ben., Søchting et Pérez-Ort.) S. Y. Kondr., Kärnefelt et A. Thell, *comb. nova* – MycoBank no.: MB 834214. – Basionym: *Shackletonia cryodesertorum* Garrido-Ben., Søchting et Pérez-Ort., in Garrido-Benavent et al., Mycol. Progr. 15: 7 (2016).

Erichansenia sauronii (Søchting et Øvstedal) S. Y. Kondr., Kärnefelt et A. Thell, *comb. nova* – MycoBank no.: MB 834215. – Basionym: *Caloplaca sauronii* Søchting et Øvstedal, in Søchting et al., Bibl. Lichenol. 88: 626 (2004). ≡ *Shackletonia sauronii* (Søchting et Øvstedal) Søchting, Frödén et Arup, in Arup et al., Nordic J. Bot. 31(1): 55 (2013).

Fauriea mandshuriaensis (S. Y. Kondr., Lőkös et J.-S. Hur) S. Y. Kondr. et Yoshik. Yamam., *comb. nova* – MycoBank no.: MB 834217. – Basionym: *Caloplaca mandshuriaensis* S. Y. Kondr., Lőkös et Hur, in Kondratyuk et al., Acta bot. hung. 57(1–2): 93 (2015).

Fauriea trassii (Galanina et S. Y. Kondr.) S. Y. Kondr. et Yoshik. Yamam., *comb. nova* – MycoBank no.: MB 834216. – Basionym: *Caloplaca trassii* Galanina et S. Y. Kondr., in Kondryatuk et al., Folia cryptog. Estonica 48: 20 (2011).

Lendemeriella borealis (Vain.) S. Y. Kondr., *comb. nova* – MycoBank no.: MB 834218. – Basionym: *Lecanora pyracea* f. *borealis* Vain., Meddn Soc. Fauna Flora fenn. 6: 146 (1881). ≡ *Caloplaca borealis* (Vain.) Poelt, Best. europ. Flecht. (Vaduz), p. 172 (1969).

Lendemeriella dakotensis (Wetmore) S. Y. Kondr., *comb. nova* – MycoBank no.: MB 834219. – Basionym: *Caloplaca dakotensis* Wetmore, Mycologia 86(6): 823 (1995) [1994].

Lendemeriella exsecuta (Nyl.) S. Y. Kondr., *comb. nova* – MycoBank no.: MB 834220. – Basionym: *Lecanora exsecuta* Nyl., Flora, Regensburg 63: 388 (1880). ≡ *Caloplaca exsecuta* (Nyl.) Dalla Torre et Sarnth., Fl. Tirol, Vorarlberg, Leichtenstein, III, Pilze, p. 191 (1902).

Lendemeriella lucifuga (G. Thor) S. Y. Kondr., *comb. nova* – MycoBank no.: MB 834221. – Basionym: *Caloplaca lucifuga* G. Thor, Lichenologist 20(2): 175 (1988).

Lendemeriella nivalis (Körb.) S. Y. Kondr., *comb. nova* – MycoBank no.: MB 834392. – Basionym: *Zeora nivalis* Körb., Denkschr. Feier fünfz. Best. her. Schles. Gesellsch. Vaterl. Kultur, p. 231 (1853). ≡ *Caloplaca nivalis* (Körb.) Th. Fr., Lich. Scand. (Upsaliae) (1), p. 191 (1871).

Lendemeriella reptans (Lendemer et B. P. Hodk.) S. Y. Kondr., *comb. nova* – MycoBank no.: MB 834222. – Basionym: *Caloplaca reptans* Lendemer et B. P. Hodk., Syst. Bot. 37(4): 841 (2012).

Lendemeriella sorocarpa (Vain.) S. Y. Kondr., *comb. nova* – MycoBank no.: MB 834223. – Basionym: *Placodium sorocarpum* Vain., Ann. bot. Soc. Zool.-Bot. fenn. Vanamo 6: 320 (1929). ≡ *Caloplaca sorocarpa* (Vain.) Zahlbr., Cat. Lich. Univers. 8: 589 (1932).

Lendemeriella tornoensis (H. Magn.) S. Y. Kondr., *comb. nova* – MycoBank no.: MB 834224. – Basionym: *Caloplaca tornoensis* H. Magn. (as '*tornoënsis*'), Göteborgs Kungl. Vetensk. Samhälles Handl., Ser. B, Math. Naturvensk. Skr. 3(1): 17 (1944).

Pisutiella congrediens (Nyl.) S. Y. Kondr., L. Lőkös et E. Farkas, *comb. nova* – MycoBank no.: MB 834225. – Basionym: *Lecanora congrediens* Nyl., Flora, Regensburg 66: 100 (1883). ≡ *Caloplaca congrediens* (Nyl.) Zahlbr., Cat. Lich. Univers. 7: 110 (1930) [1931].

Pisutiella conversa (Kremp.) S. Y. Kondr., L. Lőkös et E. Farkas, *comb. nova* – MycoBank no.: MB 834226. – Basionym: *Callopisma conversum* Kremp., Denkschr. Kgl. Bayer. Bot. Ges., Abt. 2, 4: 132 (1861). ≡ *Caloplaca conversa* (Kremp.) Jatta, Syll. Lich. Ital., p. 254 (1900).

Pisutiella furax (Egea et Llimona) S. Y. Kondr., L. Lőkös et E. Farkas, *comb. nova* – MycoBank no.: MB 834227. – Basionym: *Caloplaca furax* Egea et Llimona, Collnea bot., Barcinone Bot. Instit. 14: 266 (1983).

Pisutiella grimmiae (Nyl.) S. Y. Kondr., L. Lőkös et E. Farkas, *comb. nova* – MycoBank no.: MB 834228. – Basionym: *Lecanora grimmiae* Nyl., Flora, Regensburg 69: 97 (1886). ≡ *Caloplaca grimmiae* (Nyl.) H. Olivier, Mém. Soc. natn. Sci. nat. Cherbourg 37: 119 (1909).

Pisutiella ivanpisutii (S. Y. Kondr., L. Lőkös et J.-S. Hur) S. Y. Kondr., L. Lőkös et E. Farkas, *comb. nova* – MycoBank no.: MB 834229. – Basionym: *Caloplaca ivanpisutii* S. Y. Kondr., L. Lőkös et Hur, in Kondratyuk et al., *Acta Bot. Hung.* **60**(1–2): 131 (2018).

Pisutiella phaeothamnos (Kalb et Poelt) S. Y. Kondr., L. Lőkös et E. Farkas, *comb. nova* – MycoBank no.: MB 834382. – Basionym: *Caloplaca phaeothamnos* Kalb et Poelt, Flora 176: 137 (1985).

Pyrenodesmia aetnensis (B. de Lesd.) S. Y. Kondr., *comb. nova* – MycoBank no.: MB 834230. – Basionym: *Caloplaca aetnensis* B. de Lesd., Bull. Soc. Bot. France 82: 317 (1935).

Pyrenodesmia albolutescens (Nyl.) S. Y. Kondr., *comb. nova* – MycoBank no.: MB 834231. – Basionym: *Lecanora albolutescens* Nyl., Flora, Regensburg 64: 177 (1881). ≡ *Caloplaca albolutescens* (Nyl.) H. Olivier, Mém. Soc. natn. Sci. nat. Cherbourg 37: 127 (1909).

Pyrenodesmia aractina (Fr.) S. Y. Kondr., *comb. nova* – MycoBank no.: MB 834232. – Basionym: *Parmelia aractina* Fr., Syst. orb. veg. (Lundae) 1: 284 (1825). ≡ *Caloplaca aractina* (Fr.) Häyrén, Landveg. Flor. Meeresfels. Tvärminne, p. 152 (1914).

Pyrenodesmia atroflava (Turner) S. Y. Kondr., *comb. nova* – MycoBank no.: MB 834233. – Basionym: *Lecidea atroflava* Turner, Trans. Linn. Soc. London 9: 142 (1808). ≡ *Caloplaca atroflava* (Turner) Mong., Bull. Acad. Intern. Géogr. Bot. 23: 192 (1914).

Pyrenodesmia bicolor (H. Magn.) S. Y. Kondr., *comb. nova* – MycoBank no.: MB 834234. – Basionym: *Caloplaca bicolor* H. Magn., Lich. from Central Asia, p. 132 (1940).

Pyrenodesmia molariformis (Frolov, Vondrák, Nadyeina et Khodos.) S. Y. Kondr., *comb. nova* – MycoBank no.: MB 834235. – Basionym: *Caloplaca molariformis* Frolov, Vondrák, Nadyeina et Khodos., in Vondrák et al., Lichenologist 45(6): 712 (2013).

Pyrenodesmia neotaurica (Vondrák, Khodos., Arup et Søchting) S. Y. Kondr., *comb. nova* – MycoBank no.: MB 834236. – Basionym: *Caloplaca neotaurica* Vondrák, Khodos., Arup et Søchting, in Vondrák et al., Lichenologist 44(3): 414 (2012).

Pyrenodesmia peliophylla (Tuck.) S. Y. Kondr., *comb. nova* – MycoBank no.: MB 834237. – Basionym: *Placodium peliophyllum* Tuck., Gen. lich. (Amherst), p. 108 (1872). ≡ *Caloplaca peliophylla* (Tuck.) Zahlbr., Cat. Lich. Univers. 7: 262 (1931).

CONCLUSIONS

As mentioned above the status of some species groups of the Teloschistaceae, for which so far only nrITS data are available, will be discussed in the forthcoming 'Checklist of the members of the Teloschistaceae confirmed by molecular phylogeny'.

*

Acknowledgements – We are grateful to Dr Konstanze Bensch (MycoBank, UK) for valuable comments on nomenclature. This work was supported by the Korean National Research Resource Centre Program (NRF-2017M3A9B8069471) and the Korean Forest Service Program through the Korea National Arboretum (KNA1-1-22, 17-2), (for FE, LL) partly by the National Research, Development and Innovation Fund (NKFI K124341), and (for SK) in parts by The Ministry of Education and Science of Ukraine (M/172-2017 and M/53-2019).

REFERENCES

Ahti, T., Kondratyuk, S. Y., Kärnefelt, I. and Thell, A. (2015): Nomenclatural corrections and notes on some taxa in the Teloschistaceae (lichenized Ascomycetes). – *Graphis Scripta* **27**(1–2): 37–41.

Arup, U. (2006): A new taxonomy of the Caloplaca citrina group in the Nordic countries, except Iceland. – *Lichenologist* **38**(1): 1–20. https://doi.org/10.1017/s0024282905005402

Arup, U. and Grube, M. (1999): Where does Lecanora demissa (Ascomycota, Lecanorales) belong? – *Lichenologist* **31**(5): 419–430. https://doi.org/10.1017/s0024282999000584

Arup, U., Søchting, U. and Frödén, P. (2013): A new taxonomy of the family Teloschistaceae. – *Nordic J. Bot.* **31**(1): 16–83. https://doi.org/10.1111/j.1756-1051.2013.00062.x

Fedorenko, N. M., Stenroos, S., Thell, A., Kärnefelt, I. and Kondratyuk, S. Y. (2009): A phylogenetic analysis of xanthorioid lichens (Teloschistaceae, Ascomycota) based on ITS and mtSSU sequences. – *Bibl. Lichenol.* **100**: 49–84.

Fedorenko, N. M., Stenroos, S., Thell, A., Kärnefelt, I., Elix, J. A., Hur, J. S. and Kondratyuk, S. Y. (2012): Molecular phylogeny of xanthorioid lichens (Teloschistaceae, Ascomycota), with notes on their morphology. – *Bibl. Lichenol.* **108**: 45–64.

Frolov, I. and Konoreva, L. (2016): New records of crustose Teloschistaceae (lichens, Ascomycota) from the Murmansk region of Russia. – *Pol. Polar. Res.* **37**(3): 421–434. https://doi.org/10.1515/popore-2016-0022

Garrido-Benavent, I., Søchting, U., de los Ríos Murillo, A. and Pérez-Ortega, S. (2016): Shackletonia cryodesertorum (Teloschistaceae, Ascomycota), a new species from the McMurdo dry Valleys (Antarctica) with notes on the biogeography of the genus Shackletonia. – *Mycol. Progress* **15**: 743–754. https://doi.org/10.1007/s11557-016-1204-x

Gaya, E., Navarro-Rosinés, P., Llimona, X., Hladun, N. and Lutzoni, F. (2008): Phylogenetic reassessment of the Teloschistaceae (lichen-forming Ascomycota, Lecanoromycetes). – *Mycol. Res.* **112**: 528–546. https://doi.org/10.1016/j.mycres.2007.11.005

Gaya, E., Högnabba, F., Holguin, Á., Molnár, K., Fernández-Brime, S., Stenroos, S., Arup, U., Søchting, U., van den Boom, P., Lücking, R., Sipman, H. J. M. and Lutzoni, F. (2012): Implementing a cumulative supermatrix approach for a comprehensive phylogenetic study of the Teloschistales (Pezizomycotina, Ascomycota). – *Mol. Phyl. Evol.* **63**: 374–387. https://doi.org/10.1016/j.ympev.2012.01.012

Gaya, E., Fernández-Brime, S., Vargas, R., Lachlan, R. F., Gueidan, C., Ramírez-Mejía, M. and Lutzoni, F. (2015): The adaptive radiation of lichen-forming Teloschistaceae is associated with sunscreening pigments and a bark-to-rock substrate shift. – *Proc. Nat. Acad. Sci. USA* **112**(37): 11600–11605. https://doi.org/10.1073/pnas.1507072112

Hodkinson, B. P. and Lendemer, J. C. (2012): Phylogeny and taxonomy of an enigmatic sterile lichen. – *Syst. Bot.* **37**(4): 835–844. https://doi.org/10.1600/036364412x656536

Kondratyuk, S., Jeong, M. H., Yu, N. H., Kärnefelt, I., Thell, A., Elix, J. A., Kim, J., Kondratyuk, A. S. and Hur, J.-S. (2013): Four new genera of teloschistoid lichens (Teloschistaceae, Ascomycota) based on molecular phylogeny. – *Acta Bot. Hung.* **55**: 251–274. https://doi.org/10.1556/ABot.55.2013.3-4.8

Kondratyuk, S. Y., Jeong, M. H., Yu, N. N., Kärnefelt, I., Thell, A., Elix, J. A., Kim, J., Kondratiuk, A. S. and Hur, J.-S. (2014*a*): A revised taxonomy for the subfamily Caloplacoideae (Teloschistaceae, Ascomycota) based on molecular phylogeny. – *Acta Bot. Hung.* **56**: 93–123. https://doi.org/10.1556/ABot.56.2014.1-2.10

Kondratyuk, S. Y., Kärnefelt, I., Thell, A., Elix, J. A., Kim, J., Jeong, M. H., Yu, N. H., Kondratiuk, A. S. and Hur, J.-S. (2014*b*): A revised taxonomy of the subfamily Xanthorioideae (Teloschistaceae, Ascomycota) based on molecular phylogeny. – *Acta Bot. Hung.* **56**: 141–178. https://doi.org/10.1556/ABot.56.2014.1-2.12

Kondratyuk, S. Y., Kärnefelt, I., Thell, A., Elix, J. A., Kim, J., Kondratiuk, A. S. and Hur, J.-S. (2015*a*): Tassiloa, a new genus in the Teloschistaceae (lichenized Ascomycetes). – *Graphis Scripta* **27**: 22–26.

Kondratyuk, S. Y., Lőkös, L., Farkas, E., Oh, S.-O. and Hur, J.-S. (2015*b*): New and noteworthy lichen-forming and lichenicolous fungi, 2. – *Acta Bot. Hung.* **57**(1–2): 77–141. https://doi.org/10.1556/ABot.57.2015.1-2.10

Kondratyuk, S. Y., Lőkös, L., Kim, J. A., Kondratiuk, A. S., Jeong, M. H., Jang, S. H., Oh, S.-O. and Hur, J.-S. (2015*c*): Three new monotypic genera of the caloplacoid lichens

(Teloschistaceae, lichen-forming Ascomycetes). – *Mycobiology* **43**: 195–202. https://doi.org/10.5941/myco.2015.43.3.195

Kondratyuk, S. Y., Kärnefelt, I., Thell, A., Elix, J. A., Kim, J., Kondratiuk, A. S. and Hur, J.-S. (2015*d*): Brownlielloideae, a new subfamily in the Teloschistaceae (Lecanoromycetes, Ascomycota). – *Acta Bot. Hung.* **57**: 321–341. https://doi.org/10.1556/034.57.2015.3-4.6

Kondratyuk, S. Y., Kim, J. A., Yu, N.-H., Jeong, M.-H., Jang, S. H., Kondratiuk, A. S., Zarei-Darki, B. and Hur, J.-S. (2015*e*): Zeroviella, a new genus of xanthorioid lichens (Teloschistaceae, Ascomycota) proved by three gene phylogeny. – *Ukr. Bot. J.* **72**(6): 574–584. https://doi.org/10.15407/ukrbotj72.06.574

Kondratyuk, S. Y., Kärnefelt, I., Thell, A., Elix, J. A., Kim, J. A., Kondratiuk, A. S. and Hur, J.-S. (2015*f*). Ovealmbornia reginae (Teloschistaceae, Ascomycetes), a new xanthorioid lichen from South Africa. – *Herzogia* **28**: 465–472.

Kondratyuk, S. Y., Lőkös, L., Kim, J. A., Kondratiuk, A. S., Jeong, M.-H., Jang, S. H., Oh, S.-O., Wang, X. Y. and Hur, J.-S. (2016): Fauriea, a new genus of the lecanoroid caloplacoid lichens (Teloschistaceae, lichen-forming Ascomycetes). – *Acta Bot. Hung.* **58**(3–4): 303–318. https://doi.org/10.1556/ABot.58.2016.3-4.6

Kondratyuk, S. Y., Lőkös, L., Upreti, D. K., Nayaka, S., Mishra, G. K., Ravera, S., Jeong, M.-H., Jang, S.-H., Park, J. S. and Hur, J.-S. (2017): New monophyletic branches of the Teloschistaceae (lichen-forming Ascomycota) proved by three gene phylogeny. – *Acta Bot. Hung.* **59**(1–2): 71–136. https://doi.org/10.1556/034.59.2017.1-2.6

Kondratyuk, S. Y., Persson, P.-E., Hansson, M., Mishra, G. K., Nayaka, S., Liu, D., Hur J.-S. and Thell A. (2018*a*): Upretia, a new caloplacoid lichen genus (Teloschistaceae, lichen-forming Ascomycota) from India. – *Cryptog. Biodiv. Assessm. Spec. Vol.*, e-ISSN: 2456-0251, 22–31.

Kondratyuk, S. Y., Persson, P.-E., Hansson, M., Lőkös, L., Liu, D., Hur, J.-S., Kärnefelt, I. and Thell, A. (2018*b*): Hosseusiella and Rehmanniella, two new genera in the Teloschistaceae. – *Acta Bot. Hung.* **60**(1–2): 89–113. https://doi.org/10.1556/034.60.2018.1-2.7

Kondratyuk, S. Y., Lőkös, L., Halda, J. P., Farkas, E., Upreti, D. K., Thell, A., Woo, J.-J., Oh, S.-O. and Hur, J.-S. (2018*c*): New and noteworthy lichen-forming and lichenicolous fungi 7. – *Acta Bot. Hung.* **60**(1–2): 115–184. https://doi.org/10.1556/034.60.2018.1-2.8

Kondratyuk, S. Y., Kärnefelt, I., Lőkös, L., Hur, J.-S. and Thell, A. (2018*d*): Coppinsiella and Seawardiella, two new genera of the Xanthorioideae (Teloschistaceae, lichen-forming Ascomycota). – *Acta Bot. Hung.* **60**(3–4): 369–386. https://doi.org/10.1556/034.60.2018.3-4.8

Kondratyuk, S. Y., Lőkös, L., Farkas, E., Jang, S.-H., Liu, D., Halda, J., Persson, P.-E., Hansson, M., Kärnefelt, I., Thell, A., Fačkovcová, Z., Yamamoto, Y. and Hur, J.-S. (2019): New and noteworthy lichen-forming and lichenicolous fungi 9. – *Acta Bot. Hung.* **61**(3–4): 325–367. https://doi.org/10.1556/034.61.2019.3-4.6

Liu, Y. J. and Hall, B. D. (2004): Body plan evolution of ascomycetes, as inferred from an RNA polymerase II phylogeny. – *Proc. Natl. Acad. Sci. USA* **101** (13): 4507–4512. https://doi.org/10.1073/pnas.0400938101

Lumbsch, H. T., Ahti, T., Altermann, S., Amo de Paz, G., Aptroot, A., Arup, U., Bárcenas Peña, A., Bawingan, P. A., Benatti, M. N., Betancourt, L., Björk, C. R., Boonpragob, K., Brand., M., Bungartz, F., Cáceres, M. E. S., Candan, M., Chaves, J. L., Clerc, P., Common, R., Coppins, B. J., Crespo, A., Dal-Forno, M., Divakar, P. K., Duya, M. V., Elix, J. A., Elvebakk, A., Fankhauser, J. D., Farkas, E., Itati-Ferraro, L., Fischer, E., Galloway, D. J., Gaya, E., Giralt, M., Goward, T., Grube, M., Hafellner, J., Hernández, J. E., Herrera Campos, M. A., Kalb, K., Kärnefelt, I., Kantvilas, G., Killmann, D., Kirika, P., Knudsen, K., Komposch, H., Kondratyuk, S., Lawrey, J. D., Mangold, A.,

Marcelli, M. P., McCune, B., Messuti, M. I., Michlig, A., González, R. M., Moncada, B., Naikatini, A., Nelsen, M. P., Øvstedal, D. O., Palice, Z., Papong, K., Parnmen, S., Pérez-Ortega, S., Printzen, C., Rico, V. J., Rivas Plata, E., Robayo, J., Rosabal, D., Ruprecht, U., Salazar Allen, N., Sancho, L., Santos de Jesus, L., Santos Vieira, T., Schultz, M., Seaward, M. R. D., Sèrusiaux, E., Schmitt, I., Sipman, H. J. M., Sohrabi, M., Søchting, U., Søgaard, M. Z., Sparrius, L. B., Spielmann, A., Spribille, T., Sutjaritturakan, J., Thammathaworn, A., Thell, A., Thor, G., Thüs, H., Timdal, E., Truong, C., Türk, R., Umaña Tenorio, L., Upreti, D. K., van den Boom, P., Vivas Rebuelta, M., Wedin, M., Will-Wolf, S., Wirth, V., Wirtz, N., Yahr, R., Yeshitela, K., Ziemmeck, F., Wheeler, T. and Lücking, R. (2011): One hundred new species of lichenized fungi: a signature of undiscovered global diversity. – *Phytotaxa* **18**: 1–137.

Nimis, P. L. (1993): *The Lichens of Italy*. – Museo Regionale di Scienze Naturali, Torino, 897 pp.

Nimis, P. L. (2016): *The Lichens of Italy – a second annotated catalogue*. – EUT Edizioni Università di Trieste, Trieste, 740 pp.

Poelt, J. and Kalb, K. (1985): Die Flechte Caloplaca congrediens und ihre Verwandten: Taxonomie, Biologie und Verbreitung. – *Flora* **176**: 129–140. https://doi.org/10.1016/s0367-2530(17)30108-1

Redchenko, O., Vondrák, J. and Kosnar, J. (2012): The oldest sequenced fungal herbarium sample. – *Lichenologist* **44**: 715–718. https://doi.org/10.1017/s002428291200031x

Søchting, U. and Sancho, L. G. (2012): Caloplaca magellanica sp. nov., a southern Patagonian parasite on Zahlbrucknerella. – *Bibl. Lichenol.* **108**: 213–218.

Søchting, U., Søgaard, M. Z., Elix, J. A., Arup, U., Elvebakk, A. and Sancho, L. G. (2014*a*): Catenarina (Teloschistaceae, Ascomycota), a new Southern Hemisphere genus with 7-chlorocatenarin. – *Lichenologist* **46**: 175–187. https://doi.org/10.1017/s002428291300087x

Søchting, U., Garrido-Benavent, I., Seppelt, R., Castello, M., Pérez-Ortega, S., De Los Ríos Murillo, A., Sancho, L. G., Frödén, P. and Arup, U. (2014*b*): Charcotiana and Amundsenia, two new genera in Teloschistaceae (lichenized Ascomycota, subfamily Xanthorioideae) hosting two new species from continental Antarctica, and Austroplaca frigida, a new name for a continental Antarctic species. – *Lichenologist* **46**: 763–782. https://doi.org/10.1017/s0024282914000395

Søchting, U., Søgaard, M. Z., Sancho, L. G., Fröden, P. and Arup, U. (2016): Sirenophila ovis-atra a new species of maritime Teloschistaceae from the Southern Hemisphere. – *Opusc. Philolichenum* **15**(2): 1–5.

Swofford, D. L. (2003): *PAUP*, Phylogenetic analysis using parsimony (*and other methods)*. – Sunderland, Sinauer Associates, Massachusetts.

Tamura, K., Peterson, D., Peterson, N., Stecher, G., Nei, M. and Kumar, S. (2011): MEGA5: molecular evolutionary genetics analysis using maximum likelihood, evolutionary distance, and maximum parsimony methods. – *Mol. Biol. Evol.* **28**: 2731–2739. https://doi.org/10.1093/molbev/msr121

Telfer, A. C., Young, M. R., Quinn, J., Perez, K., Sobel, C. N., Sones, J. E., Levesque-Beaudin, V., Derbyshire, R., Fernandez-Triana, J., Rougerie, R., Thevanayagam, A., Boskovic, A., Borisenko, A. V., Cadel, A., Brown, A., Pages, A., Castillo, A. H., Nicolai, A., Glenn Mockford, B. M., Bukowski, B., Wilson, B., Trojahn, B., Lacroix, C. A., Brimblecombe, C., Hay, C., Ho, C., Steinke, C., Warne, C. P., Garrido Cortes, C., Engelking, D., Wright, D., Lijtmaer, D. A., Gascoigne, D., Hernandez Martich, D., Morningstar, D., Neumann, D., Steinke, D., Marco Debruin, D. D., Dobias, D., Sears, E., Richard, E., Damstra, E., Zakharov, E. V., Laberge, F., Collins, G. E., Blagoev, G. A., Grainge, G., Ansell, G., Meredith, G., Hogg, I., Mckeown, J., Topan, J., Bracey, J., Guenther, J.,

Sills-Gilligan, J., Addesi, J., Persi, J., Layton, K. K., D'Souza, K., Dorji, K., Grundy, K., Nghidinwa, K., Ronnenberg, K., Lee, K. M., Xie, L., Lu, L., Penev, L., Gonzalez, M., Rosati, M. E., Kekkonen, M., Kuzmina, M., Iskandar, M., Mutanen, M., Fatahi, M., Pentinsaari, M., Bauman, M., Nikolova, N., Ivanova, N. V., Jones, N., Weerasuriya, N., Monkhouse, N., Lavinia, P. D., Jannetta, P., Hanisch, P. E., Mcmullin, R. T., Ojeda Flores, R., Mouttet, R., Vender, R., Labbee, R. N., Forsyth, R., Lauder, R., Dickson, R., Kroft, R., Miller, S. E., Macdonald, S., Panthi, S., Pedersen, S., Sobek-Swant, S., Naik, S., Lipinskaya, T., Eagalle, T., Decaens, T., Kosuth, T., Braukmann, T., Woodcock, T., Roslin, T., Zammit, T., Campbell, V., Dinca, V., Peneva, V., Hebert, P. D. and Dewaard, J. R. (2015): Biodiversity inventories in high gear: DNA barcoding facilitates a rapid biotic survey of a temperate nature reserve. – *Biodiv. Data J.* **3**: e6313. https://doi.org/10.3897/BDJ.3.e6313.

Vondrák, J., Khodosovtsev, A., Šoun, J. and Vondráková, O. (2012): Two new European species from the heterogeneous Caloplaca holocarpa group (Teloschistaceae). – *Lichenologist* **44**(1): 73–89. https://doi.org/10.1017/s0024282911000636

Vondrák, J., Shahidin, H., Moniri, M. H., Halıcı, G. and Košnar, J. (2018): Taxonomic and functional diversity in Calogaya (lichenised Ascomycota) in dry continental Asia. – *Mycol. Progress* **17**(8): 897–916. https://doi.org/10.1007/s11557-018-1402-9

Vondrák, J., Frolov, I., Davydov, E. A., Yakovchenko, L., Malíček, J., Svoboda, S. and Kubásek, J. (2019): The lichen family Teloschistaceae in the Altai-Sayan region (Central Asia). – *Phytotaxa* **396**: 1–66. https://doi.org/10.11646/phytotaxa.396.1.1

Wetmore, C. M. (1994): The lichen genus Caloplaca in North and Central America with brown or black apothecia. – *Mycologia* **86**(6): 813–838. https://doi.org/10.1080/00275514.1994.12026488

Wetmore, C. M. (1996): The Caloplaca sideritis group in North and Central America. – *Bryologist* **99**(3): 292–314. https://doi.org/10.2307/3244301

Appendix

Specimens included in the phylogenetic analysis with GenBank accession numbers. Newly proposed names of lichen taxa are in bold

Species name	Voucher details / references	ITS nr DNA	nrLSU	mtSSU
Austroplaca ambitiosa	Arup *et al.* (2013)	KC179081	KC179151	KC179481
Blastenia ferruginea	Arup *et al.* (2013)	KC179416	KC179163	KC179493
Brigantiaea ferruginea	SK779, Kondratyuk *et al.* (2013)	KF264622		KF264684
Brigantiaea ferruginea	SK780, Kondratyuk *et al.* (2013)	KF264623		KF264685
Brigantiaea ferruginea	121967, Kondratyuk *et al.* (2017)	KY614393		
Brigantiaea ferruginea	121971, Kondratyuk *et al.* (2017)	KY614394		
Brownliella kobeana	120032, KoLRI, Kondratyuk *et al.* (2015*d*)	KT456212	KT456227	KT456242
Brownliella kobeana	130231, KoLRI, Kondratyuk *et al.* (2015*d*)	KT456213	KT456228	KT456243
Brownliella kobeana	130318, KoLRI, Kondratyuk *et al.* (2015*d*)	KT456214	KT456229	KT456244
Caloplaca cerina	FNM185, Fedorenko *et al.* (2009, 2012)	EU681284		EU680863
Caloplaca cerina	Gaya 16, Gaya *et al.* (2012)	JQ301658	JQ301549	JQ301483
Catenarina desolata	Søchting *et al.* (2014*a*)	KF657317		KF657319
Catenarina vivaziana	Søchting *et al.* (2014*a*)	KF657309		KF657318
Cerothallia luteoalba	Arup *et al.* (2013)	KC179099	KC179177	KC179511
Dijigiella kaernefeltiana	SK 969, Kondratyuk *et al.* (2017)	KY614396	KY614444	KY614475
Dijigiella kaernefeltiana	SK 970, Kondratyuk *et al.* (2017)	KY614397	KY614445	KY614476
Dijigiella subaggregata	SK 955, Kondratyuk *et al.* (2017), holotype	KY614398	KY614446	KY614477
Eilifdahlia dahlii	SK956, Kondratyuk *et al.* (2014*a*)	KJ021221	KJ021252	KJ021277
Eilifdahlia dahlii	SK959, Kondratyuk *et al.* (2014*a*)	KJ021318	KJ021253	KJ021279
Elenkiniana gloriae	SK750, Kondratyuk *et al.* (2014*a*)	KJ021323		
Elenkiniana gloriae	SK611, Kondratyuk *et al.* (2014*a*)	KJ021321	KJ021256	KJ021282
Elenkiniana gloriae	SK613, Kondratyuk *et al.* (2014*a*)	KJ021322		KJ021283
Elixjohnia bermaguiana	SK979, Kondratyuk *et al.* (2013 sub *Sirenophila bermaguiana*)			KF264706
Elixjohnia bermaguiana	Type, Arup *et al.* (2013 sub *Sirenophila bermaguiana*)	KC179299	KC179245	KC179584
Elixjohnia jackelixii	SK910, Kondratyuk *et al.* (2013 sub *Sirenophila jackelixii*)	KF264655	KF264683	KF264707
Elixjohnia jackelixii	SK911, Kondratyuk *et al.* (2013 sub *Sirenophila jackelixii*)			KF264708
Elixjohnia jackelixii	Arup *et al.* (2013 sub *Sirenophila jackelixii*)	KC179303	KC179248	KC179587
Elixjohnia ovis-atra	Søchting *et al.* (2016)	KU578083		
Elixjohnia ovis-atra	Søchting *et al.* (2016)	KU578081		
Elixjohnia ovis-atra	Søchting *et al.* (2016)	KU578078		

Appendix (continued)

Species name	Voucher details / references	ITS nr DNA	nrLSU	mtSSU
Erichansenia cryodesertorum	Garrido-Benavent *et al.* (2016)	JX036132		***Erichanse-***
nia cryodesertorum	Garrido-Benavent *et al.* (2016)	JX036057		KU599932
Erichansenia cryodesertorum	Garrido-Benavent *et al.* (2016)	JX036132	KU599931	KU599931
Erichansenia epithallina	Vondrák *et al.* (2019)	MH155282		
Erichansenia epithallina	Vondrák *et al.* (2019)	MH155283		
Erichansenia epithallina	Vondrák *et al.* (2019)	MG954201		
Erichansenia sauronii	Arup *et al.* (2013)	KC179120	KC179241	KC179580
Fauriea orientochinensis	SK709, Kondratyuk *et al.* (2016)	KX793095	KX793098	KX793101
Fauriea orientochinensis	SK710, Kondratyuk *et al.* (2016)	KX793096	KX793099	KX793102
Filsoniana australiensis	SK751, Kondratyuk *et al.* (2013)	KF264631	KF264665	KF264691
Filsoniana rexfilsonii	SK 3199, Kondratyuk *et al.* (2013)	KF264635		
Filsoniana rexfilsonii	SK 861, Kondratyuk *et al.* (2013)	KF264636	KF264670	
Filsoniana rexfilsonii	SK 3200, Kondratyuk *et al.* (2013)	KF264637		
Filsoniana rexfilsonii	SK 859, Kondratyuk *et al.* (2013)	KF264638	KF264671	
Filsoniana rexfilsonii	SK 860, Kondratyuk *et al.* (2013)	KF264635		KF264693
Flavoplaca citrina	Arup (2006)	DQ173224		
Flavoplaca citrina	Arup *et al.* (2013)		KC179186	KC179521
Follmannia orthoclada	Arup *et al.* (2013)	KC179291		
Follmannia orthoclada	SK J76, Kondratyuk *et al.* (2018*b*)	MG811841		
Follmannia orthoclada	SK J79, Kondratyuk *et al.* (2018*b*)	MG811843		
Fominiella skii	Holotype, Vondrák *et al.* (2012)	HM582191		
Fominiella skii	Vondrák *et al.* (2012)	HM582188		
Fominiella skii	Vondrák *et al.* (2012)	HM582194		
Fominiella skii	Vondrák *et al.* (2012)	HM582190		
Fominiella tenerifensis	SK D19, Kondratyuk *et al.* (2017)		KY614447	KY614478
Franwilsia bastowii	SK810, Kondratyuk *et al.* (2014*a*)	KJ021324	KJ021257	KJ021284
Fulgensia fulgens	Gaya 39, Gaya *et al.* (2012)	JQ301671	JQ301567	JQ301503
Fulgensia fulgens	SK735, Kondratyuk *et al.* (2014*a*)	KJ021335		KJ021295
Fulgogasparrea appressa	Arup *et al.* (2013)	KC179332		
Fulgogasparrea decipioides	Cadec188, Gaya *et al.* (2015)	KT291453	KT291540	KT291487
Fulgogasparrea decipioides	Type, Arup *et al.* (2013*a*)	NR_120243		

Appendix (continued)

Species name	Voucher details / references	ITS nr DNA	nrLSU	mtSSU
Fulgogasparrea decipioides	SK689, Kondratyuk *et al.* (2013)	KF264644		KF264695
Fulgogasparrea decipioides	SK691, Kondratyuk *et al.* (2013)	KF264643		KF264694
Fulgogasparrea decipioides	Arup *et al.* (2013)	KC179333	KC179269	KC179608
Gintarasiella aggregata	SK A84, holotype, Kondratyuk *et al.* (2017)	KY614390	KY614448	KY614479
Gintarasiella aggregata	SK A85, isotype, Kondratyuk *et al.* (2017)	KY614391	KY614449	KY614480
Gintarasiella aggregata	SK267, isotype, Kondratyuk *et al.* (2017)	KY614392	KY614450	KY614481
Gondwania regalis	Arup *et al.* (2013)	KC179103	KC179193	KC179527
Harusavskia elenkinianoides	SK 996, Kondratyuk *et al.* (2017)	KY614403	KY614451	KY614484
Harusavskia elenkinianoides	SK 997, Kondratyuk *et al.* (2017)	KY614404	KY614452	KY614485
Harusavskia elenkinianoides	SK 269, Kondratyuk *et al.* (2017)	KY614405	KY614453	KY614486
Harusavskia elenkinianoides	SK 269, Kondratyuk *et al.* (2017)	NR_154101		
Honeggeria rosmariae	Eichenberger *et al.* (unpubl. as *Xanthomendoza weberi*)	AM697873		
Honeggeria rosmariae	Arup *et al.* (2013 as *Xanthomendoza weberi*)	KC179145	KC179285	KC179625
Hosseusiella chilensis	Gaya 68, Gaya *et al.* (2012)	JO301660	JO301551	JO301485
Hosseusiella chilensis	SK J44, Kondratyuk *et al.* (2018*b*)	MG811845		
Hosseusiella chilensis	SK J43, Kondratyuk *et al.* (2018*b*)	MG811844		
Hosseusiella gallowayiana	SK J71, Kondratyuk *et al.* (2018*b*)	MG811848		
Hosseusiella pergracilis	SK J48, Kondratyuk *et al.* (2018*b*)	MG811849		
Huneckia pollinii	SK3206, Kondratyuk *et al.* (2014*a*)	KJ021336	KJ021265	KJ021296
Huneckia pollinii	SK870, Kondratyuk *et al.* (2014*a*)	KJ021337	KJ021266	KJ021297
Huriella loekoesiana	SK694, Kondratyuk *et al.* (2014*b*, sub *Squamulea subsoluta*)	KJ133481		
Huriella loekoesiana	120433, KoLRI 15423, Kondratyuk *et al.* (2017)	KY614406		KY614487
Huriella loekoesiana	130672, KoLRI 19017, Kondratyuk *et al.* (2017)	KY614407		KY614488
Huriella loekoesiana	161904, KoLRI 40141, Kondratyuk *et al.* (2017)	KY614408		
Huriella loekoesiana	161998, KoLRI 40236, Kondratyuk *et al.* (2017)	KY614409		
Huriella loekoesiana	162000, KoLRI 40238, Kondratyuk *et al.* (2017)	KY614410		
Ikaeria aurantiellina	SK 538, Kondratyuk *et al.* (2017)	KY614411		KY614490
Ikaeria aurantiellina	SK 552, Kondratyuk *et al.* (2017)	KY614412		KY614491
Ikaeria aurantiellina	SK D29, Kondratyuk *et al.* (2017)	KY614413		KY614492
Ikaeria aurantiellina	SK D23, Kondratyuk *et al.* (2017)	KY614414		KY614493
Jasonhuria bogilana	KoLRI 120454, Kondratyuk *et al.* (2015*d*)	KT220196	KT220205	KT220214

Appendix (continued)

Species name	Voucher details / references	ITS nr DNA	nrLSU	mtSSU
Jasonhuria bogilana	KoLRI 120469, Kondratyuk *et al.* (2015*d*)	KT220197	KT220206	KT220215
Jasonhuria bogilana	KoLRI 120641, Kondratyuk *et al.* (2015*d*)	KT220198	KT220207	KT220216
Jasonhuria bogilana	KoLRI 120647, Kondratyuk *et al.* (2015*d*)	KT220199	KT220208	KT220217
Kaernefeltia albocrenulata	SK 245, Kondratyuk *et al.* (2013)	KF264647	KF264675	KF264698
Kaernefeltia albocrenulata	SK 246, Kondratyuk *et al.* (2013)	KF264648	KF264676	KF264699
Kaernefeltia gilfiniarum	SK 253, Kondratyuk *et al.* (2013)	KF264649	KF264677	KF264700
Kaernefeltia gilfiniarum	SK 999, Kondratyuk *et al.* (2013)	KF264650	KF264678	KF264701
Kaernefia kaernefeltii	SK921, Kondratyuk *et al.* (2013)	KF264652	KF264680	KF264703
Klauderuiella thallincola	SK 527, Kondratyuk *et al.* (2017)	KY614415		KY614494
Klauderuiella thallincola	Gaya 22, Gaya *et al.* (2012)	JQ301667	JQ301563	JQ301498
Laundonia flavovirescens	SK 657, Kondratyuk *et al.* (2017)	KY614417		KY614496
Laundonia flavovirescens	Arup and Grube (1999)	AF353966		
Laundonia flavovirescens	Telfer *et al.* (2015)	KT695342		
Laundonia flavovirescens	Telfer *et al.* (2015)	KT695371		
Laundonia flavovirescens	Arup *et al.* (2013)		KC179198	KC179532
Lazarenkoella persica	Vondrák *et al.* (2018)	KY749002		
Lazarenkoella persica	Vondrák *et al.* (2018)	KY749000		
Lazarenkoella persica	Vondrák *et al.* (2018)	KY748999		
Lazarenkoella persica	Vondrák, unpubl.	KT804945		
Lazarenkoella polycarpoides	Arup *et al.* (2013)	KC179346		
Lazarenkoella polycarpoides	Vondrák *et al.* (2018)	KY749124		
Lazarenkoella polycarpoides	Vondrák *et al.* (2018)	KY749088		
Lazarenkoella polycarpoides	Vondrák *et al.* (2018)	KY749001		
Lazarenkoella zoroasteriorum	SK A45, Kondratyuk *et al.* (2015*d*)	KT456215	KT456230	KT456245
Lazarenkoella zoroasteriorum	SK A51, Kondratyuk *et al.* (2015*d*)	KT456216	KT456231	KT456246
Lazarenkoella zoroasteriorum	SK A55, Kondratyuk *et al.* (2015*d*)	KT456217	KT456232	KT456247
Lazarenkoiopsis ussuriensis	SK A37, Kondratyuk *et al.* (2017)	KY614418	KY614455	KY614498
Lazarenkoiopsis ussuriensis	SK D22, Kondratyuk *et al.* (2017)	KY614419	KY614456	KY614499
Lendemeriella borealis	Vondrák *et al.* (2019)	MG954129		
Lendemeriella borealis	Frolov and Konoreva (2016)	KX216688		
Lendemeriella borealis	Frolov and Konoreva (2016)	KX216686		

Appendix (continued)

Species name	Voucher details / references	ITS nr DNA	nrLSU	mtSSU
Lendemeriella borealis	Frolov and Konoreva (2016)	KX216687		
Lendemeriella exsecuta	Vondrák *et al.* (2019)	MG954211		
Lendemeriella exsecuta	Vondrák *et al.* (2019)	MG954213		
Lendemeriella exsecuta	Vondrák *et al.* (2019)	MG954224		
Lendemeriella exsecuta	Vondrák *et al.* (2019)	MG954227		
Lendemeriella lucifuga	Vondrák *et al.* (2019)	MG954215		
Lendemeriella lucifuga	Vondrák *et al.* (2019)	MG954216		
Lendemeriella lucifuga	Vondrák *et al.* (2019)	MG954217		
Lendemeriella nivalis	Vondrák *et al.* (2019)	MG954222		
Lendemeriella reptans	F330, Frolov, Vondrák, unpubl.	MH104934	MH100766	MH100796
Lendemeriella reptans	NY177, Hodkinson and Lendemer (2012)	JQ686192		JQ686191
Lendemeriella tornoensis	Vondrák *et al.* (2019)	MG954220		
Lendemeriella tornoensis	Vondrák *et al.* (2019)	MG954221		
Leproplaca xantholyta	Arup *et al.* (2013)	KC179451	KC179208	KC179542
Loekoesia austrocoreana	KoLRI 120511, Kondratyuk *et al.* (2015*d*)	KT220200	KT220209	KT220218
Loekoesia austrocoreana	KoLRI 120523, Kondratyuk *et al.* (2015*d*)	KT220201	KT220210	KT220219
Loekoesia austrocoreana	SK261, Kondratyuk *et al.* (2015*d*)	KT220202	KT220211	KT220220
Loekoeslaszloa geumohdoensis	Republic of Korea, KoLRI 039592, Kondratyuk *et al.* (2019)	161384		161384
Loekoeslaszloa geumohdoensis	Republic of Korea, KoLRI 039579, Kondratyuk *et al.* (2019)			161371
Loekoeslaszloa geumohdoensis	Republic of Korea, KoLRI 039583, Kondratyuk *et al.* (2019)			161375
Loekoeslaszloa geumohdoensis	Republic of Korea, KoLRI 039668, Kondratyuk *et al.* (2019)			161450
Loekoeslaszloa huriana	Republic of Korea, KoLRI 040090 – holotype, Kondratyuk *et al.* (2019)	161853		
Loekoeslaszloa huriana	Republic of Korea, KoLRI 040235, Kondratyuk *et al.* (2019)	161997		
Marchantiana occidentalis	SK981, Kondratyuk *et al.* (2014*a*)	KJ021227	KJ021268	KJ021303
Marchantiana occidentalis	SK982, Kondratyuk *et al.* (2014*a*)	KJ021228	KJ021269	KJ021304
Massjukiella polycarpa	AFTOL-ID 200		DQ912351	DQ912303
Massjukiella polycarpa	Arup *et al.* (2013)	KC179389	KC179222	
Massjukiella polycarpa	FNM 172, Fedorenko *et al.* (2012)			JN984146
Massjukiella polycarpa	FNM 173, Fedorenko *et al.* (2009)	EU681333		EU680919
Neobrownliella brownlieae	SK831, Kondratyuk *et al.* (2013)	KF264626	KF264661	KF264687

Appendix (continued)

Species name	Voucher details / references	ITS nr DNA	nrLSU	mtSSU
Neobrownliella brownlieae	SK838, Kondratyuk *et al.* (2013)	KF264627	KF264662	KF264688
Nevilleiella marchantii	SK D18, isotype, Kondratyuk *et al.* (2017)	KY614425	KY614462	KY614500
Opeltia neobaltistanica	SK D09, Kondratyuk *et al.* (2017)	KY614428		KY614503
Orientophila loekoesii	Arup *et al.* (2013*a*)	KC179374		
Orientophila loekoesii	SK 721, Kondratyuk *et al.* (2014*b*)			KJ133540
Orientophila loekoesii	SK 692, Kondratyuk *et al.* (2014*b*)			KJ133539
Orientophila loekoesii	SK 691, Kondratyuk *et al.* (2014*b*)			KJ133538
Orientophila loekoesii	SK 690, Kondratyuk *et al.* (2014*b*)			KJ133537
Orientophila subscopularis	Arup *et al.* (2013*a*)	KC179375		KC179546
Orientophila subscopularis	SK 727, Kondratyuk *et al.* (2014*b*)	KJ133476		
Orientophila subscopularis	SK 692, Kondratyuk *et al.* (2014*b*)	KJ133475		
Orientophila subscopularis	SK 717, Kondratyuk *et al.* (2014*b*)	KJ133474		
Ovealmbornia volkmarwirthii	SK241, Kondratyuk *et al.* (2014*b*; 2015*f*)	KJ133477	KJ133501	KJ133541
Ovealmbornia volkmarwirthii	SK242, Kondratyuk *et al.* (2014*b*; 2015*f*)	KJ133478	KJ133502	KJ133542
Oxneriopsis yeosuensis	*A10* 120380 KoLRI 015369, Kondratyuk *et al.* (2014*a as Mikhtomia yeosuensis*)	KJ021236		KJ021271
Oxneriopsis yeosuensis	*A05* 120360 KoLRI 015350, Kondratyuk *et al.* (2014*a as Mikhtomia yeosuensis*)	KJ021235		KJ021270
Oxneriopsis yeosuensis	Harada 32642, unpubl.	LC490367		
Pisutiella congrediens	Vondrák *et al.* (2019)	MG954115		
Pisutiella conversa	Vondrák, unpubl.	KT804951		
Pisutiella conversa	Vondrák, unpubl.	KT804952		
Pisutiella conversa	Vondrák, unpubl.	KT804953		
Pisutiella conversa	Gaya 152 voucher E. Gaya 03.03.10-2C and F. Lutzoni (DUKE), Gaya *et al.* (2015)	KT291450	KT291554	KT291504
Pisutiella conversa	V780, Frolov, Vondrák, unpubl.	MH104924	MH100750	MH100782
Pisutiella furax	Gaya 46, Gaya *et al.* (2012)	JQ301662	JQ301554	JQ301490
Pisutiella furax	Redchenko *et al.* (2012)	HQ644341		
Pisutiella furax	F498, Frolov, Vondrák, unpubl.			MN305827
Pisutiella ivanpisutii	SK D49, this paper	SK D49		
Pisutiella phaeothamnos	Vondrák *et al.*, unpubl.	JN813419		

Appendix (continued)

Species name	Voucher details / references	ITS nr DNA	nrLSU	mtSSU
Pisutiella phaeothamnos	Vondrák *et al.*, (2019)	MG954114		
Pyrenodesmia albolutescens	F495, Frolov, Vondrák, unpubl.	MN305804		MN305824
Pyrenodesmia alociza	V776, Frolov, Vondrák, unpubl.		MH100742	MH100772
Pyrenodesmia alociza	V357, Frolov, Vondrák, unpubl.	KC884522		
Pyrenodesmia aractina	V973, Frolov, Vondrák, unpubl.	MH104919	KC611270	MH100773
Pyrenodesmia atroflava	Gaya 109, Gaya *et al.* (2015)	KT291444	KT291560	KT291511
Pyrenodesmia atroflava	V74, Frolov, Vondrák, unpubl.	MH104921	MH100744	MH100775
Pyrenodesmia badioreagens	V772, Frolov, Vondrák, unpubl.		MH100745	MH100776
Pyrenodesmia bicolor	V798, Frolov, Vondrák, unpubl.	MH104922	MH100746	MH100777
Pyrenodesmia chalybaea	V24, Frolov, Vondrák, unpubl.	KC884498	MH100747 KC611268	MH100779
Pyrenodesmia chalybaea	Gaya 38, Gaya *et al.* (2012)	JQ301659	JQ301550	JQ301484
Pyrenodesmia concreticola	V98, Frolov, Vondrák, unpubl.	KC884506		MH100781
Pyrenodesmia duplicata	Redchenko *et al.* (2012)	HQ611272		
Pyrenodesmia erodens	V662, Frolov, Vondrák, unpubl.	MH104927	MH100755	MH100788
Pyrenodesmia erythrocarpa	F504, Frolov, Vondrák, unpubl.	MN305806		MN305824
Pyrenodesmia molariformis	V26, Frolov, Vondrák, unpubl.	KC416145	MH100761	MH100793
Pyrenodesmia neotaurica	F503, Frolov, Vondrák, unpubl.	MN305807	MN305849	MN305829
Pyrenodesmia peliophylla	V827, Frolov, Vondrák, unpubl.	MH104930		
Pyrenodesmia teicholyta	V76, Frolov, Vondrák, unpubl.	MH104935	MH100767	MH100797
Pyrenodesmia teicholyta	Ctei13695 voucher E. Gaya 203 and P. Navarro-Rosines (BCN 13695), Gaya *et al.* (2008, 2015)	EU639592		KT291512
Pyrenodesmia variabilis	V29, Frolov, Vondrák, unpubl.			MH100800
Pyrenodesmia variabilis	V414, Frolov, Vondrák, unpubl.	KC884535		
Pyrenodesmia variabilis	Cavar189 voucher U. Arup L07196 (LD), Gaya *et al.* (2015)	KT291466	KT291561	KT291514
Raesaeneniana maulensis	SK993, Holotype, Kondratyuk *et al.* (2015*d*)	KT456218	KT456233	KT456248
Raesaeneniana maulensis	SK994, Kondratyuk *et al.* (2014*a*)	KJ023182	KJ023184	
Rehmanniella wirthii	SK 243, Kondratyuk *et al.* (2018*b*)	MG811851	MG811852	MG811853
Rehmanniella wirthii	SK 244, Kondratyuk *et al.* (2018*b*)			MG811854
Scutaria andina	Arup *et al.* (2013)	KC179298	KC179242	KC179581
Seirophora villosa	SK D27, Kondratyuk *et al.* (2017)	KY614435	KY614468	KY614510

Appendix (continued)

Species name	Voucher details / references	ITS nr DNA	nrLSU	mtSSU
Seirophora villosa	SK D16, Kondratyuk *et al.* (2017)	KY614436	KY614469	KY614511
Shackletonia buelliae	Arup *et al.* (2013)	KC179117		KC179578
Shackletonia hertelii	Arup *et al.* (2013)	KC179118		KC179579
Shackletonia insignis	Arup *et al.* (2013)	KC179119		
Shackletonia siphonospora	Arup *et al.* (2013)	KC179121		
Sirenophila cliffwetmorei	SK A93, Kondratyuk *et al.* (2017)	KY614438	KY614471	KY614513
Sirenophila eos	SK912, Kondratyuk *et al.* (2013)	KF264656		
Sirenophila eos	Arup *et al.* (2013)	KC179300	KC179246	KC179585
Sirenophila eos	TYPE, Gaya *et al.* (2015)	KT291455	KT291542	KT291489
Sirenophila gintarasii	Arup *et al.* (2013)	KC179302		
Sirenophila gintarasii	SK D17, isotype, Kondratyuk *et al.* (2017)	KY614437	KY614470	KY614512
Solitaria chrysophthalma	SK D20, Kondratyuk *et al.* (2017)	KY614439		KY614514
Solitaria chrysophthalma	Gaya 157 or Cchr157 voucher E. Gaya 03.08.10-4 and F. Lutzoni (DUKE), Gaya *et al.* (2015)	KT291446	KT291537	KT291484
Stellarangia elegantissima	Cele75 voucher P. Crittenden, Gaya *et al.* (2015)	KT291454	KT291541	KT291488
Stellarangia elegantissima	Arup *et al.* (2013)	KC179310	KC179254	KC179593
Streimanniella kalbiorum	SK939, Kondratyuk *et al.* (2014*a*)	KJ021225	KJ023183	KJ021300
Streimanniella michelagoiensis	SK971, Kondratyuk *et al.* (2014*a*)	KJ021226	KJ023185	KJ021301
Tarasginia tomareana	Arup *et al.* (2013)	KC179308		
Tarasginia whinrayi	SK A95, Kondratyuk *et al.* (2015*d*)	KT456220	KT456235	KT456250
Tarasginia whinrayi	SK B02, Kondratyuk *et al.* (2015*d*)	KT456221	KT456236	KT456251
Tassiloa digitaurea	SK A34, Kondratyuk *et al.* (2015*d*)	KP096222		KP096224
Tassiloa magellanica	Søchting and Sancho (2012)	JF910105		
Tassiloa wetmorei	Lumbsch *et al.* (2011)	HQ317923		
Tayloriellina erythrosticta	SK 817, Kondratyuk *et al.* (2015*d*)	KT456222	KT456237	KT456252
Tayloriellina erythrosticta	SK 814, Kondratyuk *et al.* (2015*d*)	KT456223	KT456238	KT456253
Tayloriellina erythrosticta	SK 819, Kondratyuk *et al.* (2015*d*)	KT456224	KT456239	KT456254
Teloschistes flavicans	FNM-218, Fedorenko *et al.* (2009, 2012)	EU681362		JN984150
Teloschistes flavicans	Gaya 1b_15, Gaya *et al.* (2012)	JQ301685	JQ301578	JQ301520
Teloschistes flavicans	Tflav103 voucher E. Gaya 02.26.10-8 and F. Lutzoni (DUKE), Gaya *et al.* (2015)	KT291472		KT291523

Appendix (continued)

Species name	Voucher details / references	ITS nr DNA	nrLSU	mtSSU
Teuvoahtiana rugulosa	SK A25, Kondratyuk *et al.* (2017)	KY614441	KY614472	KY614516
Teuvoahtiana rugulosa	SK A26, Kondratyuk *et al.* (2017)	KY614442	KY614473	KY614517
Teuvoahtiana rugulosa	SK A27, Kondratyuk *et al.* (2017)	KY614443	KY614474	KY614518
Thelliana pseudokiamae	SK925, Kondratyuk *et al.* (2015*d*)	KT456225	KT456240	KT456255
Thelliana pseudokiamae	SK926, Kondratyuk *et al.* (2015*d*)	KT456226	KT456241	KT456256
Tomnashia rosei	Arup *et al.* (2013 sub *Polycauliona rosei*)	KC179390	KC179223	KC179559
Variospora velana	Arup *et al.* (2013)	KC179476	KC179265	KC179605
Variospora velana	Gaya 192, Gaya *et al.* (2015)	KT291467		KT291515
Wetmoreana texana	SK537, Kondratyuk *et al.* (2013)	KF264657		KF264710
Wetmoreana texana	SK536, Kondratyuk *et al.* (2013)	KF264658		KF264711
Wetmoreana texana	Arup *et al.* (2013)	KC179337	KC179273	KC179612
Xanthaptychia orientalis	FNM 153, Fedorenko *et al.* (2009, sub *Seirophora orientalis*)	EU681287		
Xanthaptychia orientalis	SK 756, Kondratyuk *et al.* (2014*a* sub *Seirophora orientalis*)	KJ021241		
Xanthaptychia orientalis	SK 755, Kondratyuk *et al.* (2014*a* sub *Seirophora orientalis*)	KJ021240		KJ023189
Xanthocarpia ochracea	Gaya 21, Gaya *et al.* (2012)	JQ301663	JQ301558	JQ301494
Xanthocarpia ochracea	SK637, Kondratyuk *et al.* (2014*b*)	KJ133483		
Xanthocarpia ochracea	Arup *et al.* (2013)	KC179132	KC179277	KC179617
Xanthopeltis rupicola	Arup *et al.* (2013)	KC179146	KC179286	KC179626
Xanthoria parietina	Xatrup246 voucher R. Vargas 3638 and A. Ugarte, Gaya *et al.* (2015)		KT291570	KT291530
Yoshimuria galbina	SK704, Kondratyuk *et al.* (2014*a*)			KJ021196
Yoshimuria galbina	SK722, Kondratyuk *et al.* (2014*a*)	KJ021251		KJ021195
Yoshimuria galbina	SK778, Kondratyuk *et al.* (2014*a*)	KJ021250		KJ021196
Yoshimuria spodoplaca	SK725, Kondratyuk *et al.* (2014*a*)	KJ021249		KJ023194
Yoshimuria stipitata	Gaya 164, Gaya *et al.* (2015)	KT291465	KT291543	KT291490
Yoshimuria stipitata	Arup *et al.* (2013)	KC179446	KC179202	KC179536
Zeroviella papillifera	FNM 018, Fedorenko *et al.* (2009)	EU681331		EU680927
Zeroviella papillifera	FNM 204, Fedorenko *et al.* (2009)	EU681330		EU680926