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NEW MONOPHYLETIC BRANCHES OF THE TELOSCHISTACEAE (LICHEN-FORMING ASCOMYCOTA) PROVED BY THREE GENE PHYLOGENY

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Seventeen robust monophyletic branches newly discovered in the phylogenetic tree of the Teloschistaceae after separate nrITS, nrLSU and mtSSU, as well as combined phylogenetic analysis are proposed to consider as the following separate genera: *Dijigiella* S. Y. Kondr. et L. Lőkös *gen. nov.* for the *D. kaernefeltiana* group, *Elixjohnia* S. Y. Kondr. et J.-S. Hur *gen. nov.* for the *Sirenophila jackelixii* group, *Fominiella* S. Y. Kondr., D. Upreti et J.-S. Hur *gen. nov.* for the *F. tenerifensis* group; *Gintarasiella* S. Y. Kondr. et J.-S. Hur *gen. nov.* for *Caloplaca aggregata*, *Hanstrassia* S. Y. Kondr. *gen. nov.* for the *Elenkiniana lenae* group, *Harusavskia* S. Y. Kondr. *gen. nov.* for *H. elenkinianoides* sp. n., *Huriella* S. Y. Kondr. et D. Upreti *gen. nov.* for *H. loekoesiana* sp. n., *Ikaeria* S. Y. Kondr., D. Upreti et J.-S. Hur *gen. nov.* for *Caloplaca aurantiellina*, *Klauderuiella* S. Y. Kondr. et J.-S. Hur *gen. nov.* for the *Variospora thallincola* group, *Laundonia* S. Y. Kondr., L. Lőkös et J.-S. Hur *gen. nov.* for the *Gyalolechia flavovirescens* group, *Lazarenkoiopsis* S. Y. Kondr., L. Lőkös et J.-S. Hur *gen. nov.* for *Caloplaca ussuriensis*, *Nevilleiella* S. Y. Kondr. et J.-S. Hur *gen. nov.* for the *Caloplaca marchantii* group, *Opeltia* S. Y. Kondr. et L. Lőkös *gen. nov.* for the *Caloplaca neobaltistanica* group, *Oxneriopsis* S. Y. Kondr., D. Upreti et J.-S. Hur *gen. nov.* for the *Caloplaca oxneri* group, *Teuvoahtiana* S. Y. Kondr. et J.-S. Hur *gen. nov.* for the *Caloplaca rugulosa* group, *Tomnashia* S. Y. Kondr. et J.-S. Hur *gen. nov.* for the *Polycauliona rosei* group, and *Xanthaptychia* S. Y. Kondr. et S. Ravera *gen. nov.* for the *Seirophora orientalis* group.

Hitherto missing molecular data on three gene sequences of the type species of the genera *Seirophora* and *Sirenophila* are completed within this study.

Six new to science species (*Dijigiella kaernefeltiana* S. Y. Kondr. sp. n., *D. subaggregata* S. Y. Kondr. et Kärnefelt sp. n., *Fominiella tenerifensis* S. Y. Kondr., Kärnefelt, A. Thell et T. Feuerer sp. n., *Hanstrassia jaeseounhurii* S. Y. Kondr., Ch.-H. Park et L. Lőkös sp. n., *Harusavskia elenkinianoides* S. Y. Kondr., X. Y. Wang, S.-O. Oh et J.-S. Hur sp. n., *Huriella loekoesiana* S. Y. Kondr. et D. Upreti sp. n.) are described, compared with closely related taxa.

A total of 34 new combinations for genera mentioned above are proposed.

Key words: phylogenetic analysis, phylogenetic tree, Teloschistaceae, three gene phylogeny

INTRODUCTION

The taxonomy of the Teloschistaceae has undergone a radical change during recent years, including the creation of a large number of new genera, based mainly on molecular phylogeny (Arup *et al.* 2013*a*, Fedorenko *et al.* 2012, Gaya *et al.* 2012, Kondratyuk *et al.* 2013*b*, 2014*a*, *b*, 2015*a*, *c*, *d*, 2016*c*, *d*). Hence the number of genera in the Teloschistaceae has increased from 10 in the late 1990s (Kärnefelt 1989) to currently 80 (Arup *et al.* 2013*a*, Kondratyuk *et al.* 2013*b*, 2014*a*, *c*, 2015*a*, *c*, *d*, 2016*c*, *d*, Søchting *et al.* 2014*a*, *b*), and the family is divided in four subfamilies, Brownlielloideae, Caloplacoideae, Teloschistoideae and Xanthorioideae (Gaya *et al.* 2012, Arup *et al.* 2013*b*, Kondratyuk *et al.* 2015*d*).

New data on ITS1/ITS2 nrDNA, 28S nrLSU, and 12S mtSSU sequences for representatives of all four subfamilies of the Teloschistaceae accumulated during 2015 and 2016 were found to illustrate a number of new robust monophyletic branches within the phylogenetic tree of the Teloschistaceae.

The aim of this paper is to provide descriptions of newly discovered robust monophyletic branches, which are supported as separate ITS1/ITS2, nrLSU and mtSSU as combined phylogenetic analysis. Totally 17 robust monophyletic branches newly discovered in the phylogenetic tree of the Teloschistaceae after as separate nrITS, nrLSU and mtSSU, as combined phylogenetic analyses are proposed to consider as separate genera. Descriptions of six new to science species belonging to these genera are provided below, too.

MATERIALS AND METHODS

More than 1,000 Teloschistaceae specimens, collected in 2014–2016 and deposited in the Korean Lichen Research Institute, Sunchon National University, South Korea (KoLRI), as well as some duplicates in the Hungarian Natural History Museum (BP) and the Lichen Herbarium in the M. H. Kholodny Institute of Botany of National Academy of Sciences of Ukraine (KW-L) have been examined using standard microscopical techniques, and hand-sectioned under a dissecting microscope (Nikon SMZ 645; Nikon, Tokyo, Japan). Anatomical characters were observed using a Nikon Eclipse E200 microscope and a Zeiss Scope, complemented with a digital camera AxioCam ERc 5s. Sections of apothecia were tested with water, K and IKI (10% potassium iodide).

Total DNA was extracted directly from the thalli according to Ekman (1999) and was purified with DNeasy Plant Mini Kit (QIAGEN, Germany). The nuclear ribosomal RNA gene region including the internal transcribed spacers 1 and 2 and the 5.8S subunit (ITS) was amplified using the primers ITS1F (Gardes and Bruns 1993) and ITS4 (White *et al.* 1990), the 28S LSU using the primer LR5 (Vilgalys and Hester 1990), and the 12S mtSSU using the primers mtSSU1-mtSSU3R and mtSSU2R (Fedorenko *et al.* 2009, 2012).

The amplification was done using a Takara JP/TP600 PCR machine (Takara Bio Inc., Japan). One initial cycle of 5 min at 94 °C was followed by 30 cycles of the following steps: 30 seconds at 94 °C, 39 seconds at 57 °C and 1 min at 72 °C. Amplifications were ended with a final cycle at 72 °C for 10 min. PCR products were then sent to the sequencing facilities of the Genotech Cooperation, Seoul, South Korea, for cleaning and sequencing. The sequencing was carried out using the fluorescent marker BigDye and an ABI 3730xl sequencing machine (Applied Biosystems, Carlsbad, CA, USA).

The consensus sequence was aligned with all related species sequences retrieved from the GenBank database (Appendix). The consensus sequences were then deposited into GenBank under the accession numbers KY614390–KY614518. Phylogenetic analysis was performed using the ITS region and LSU gene of nrDNA and 12S SSU mtDNA sequences of 166 fungal taxa retrieved from the GenBank database and the 29 lichen-forming fungi investigated in this study. Sequence alignment was conducted in BioEdit and a phylogenetic tree was generated by the maximum parsimony (MP), minimum evolution (ME), 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.

Our taxon sampling consists of 52 taxa of the Xanthorioideae (Fig. 1), 72 taxa of the Caloplacoideae (Fig. 2), 48 taxa of the Teloschistoideae (Fig. 3) and about 74 taxa of the Browlielloideae (Fig. 4) with *Brigantiaea ferruginea* as outgroup (Appendix).

Totally 129 sequences on nrDNA and mtDNA are for the first time submitted to GenBank for 58 specimens of 29 taxa.

RESULTS AND DISCUSSIONS

Current stage of the phylogenetic tree of the Teloschistaceae

Phylogenetic trees of the teloschistoid, caloplacoid and xanthorioid lichens are presented in Figures 1–3 including respectively members of the subfamilies Teloschistoideae, Caloplacoideae and Xanthorioideae only. In this case all genera, which were described and discussed before, are presented only by type species, while new groups, discussed in this paper are presented by larger number (between three and five) specimens/species.

The aim of the phylogentic tree of the subfamily Brownlielloideae was also to show position of those taxa, which are in somewhat out position to main clades and subphylas of the subfamilies mentioned, while it includes

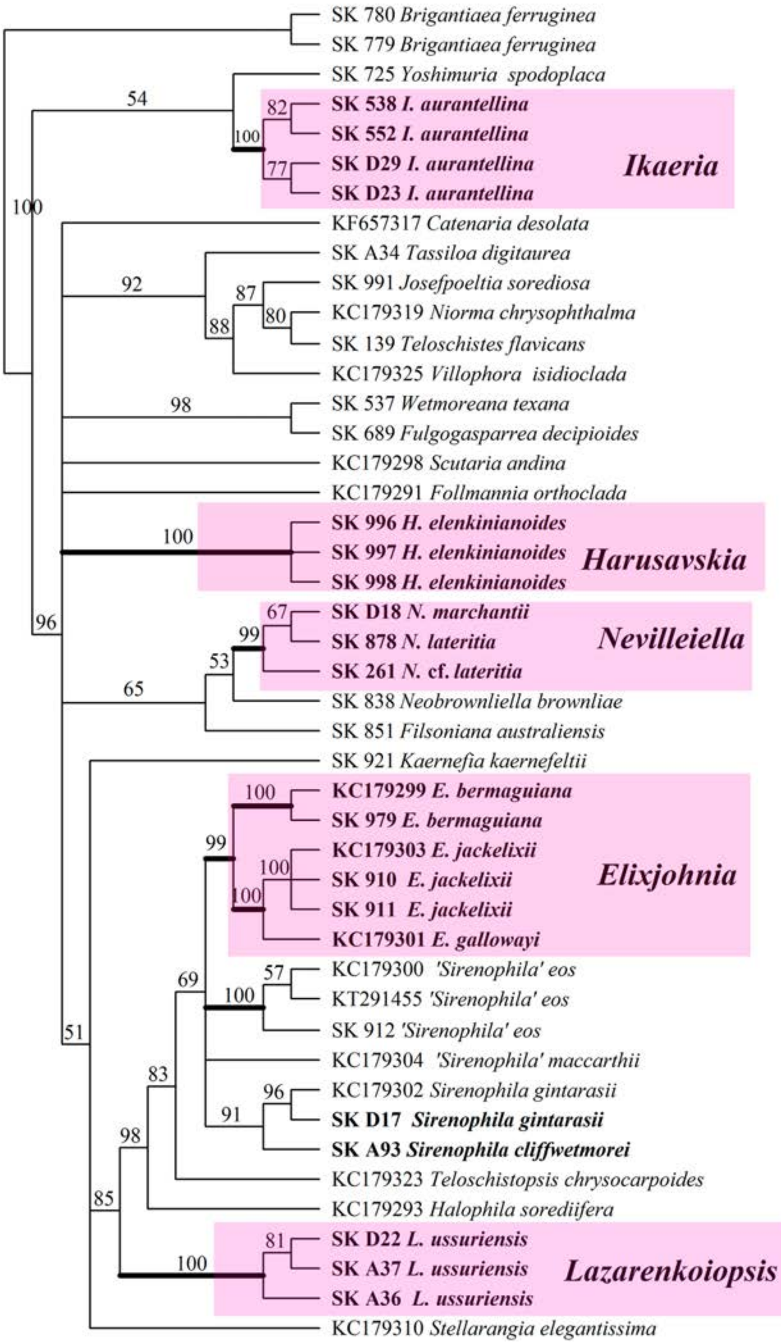

Fig. 1. Phylogenetic analysis of representatives of the subfamily Teloschistoideae after combined data set

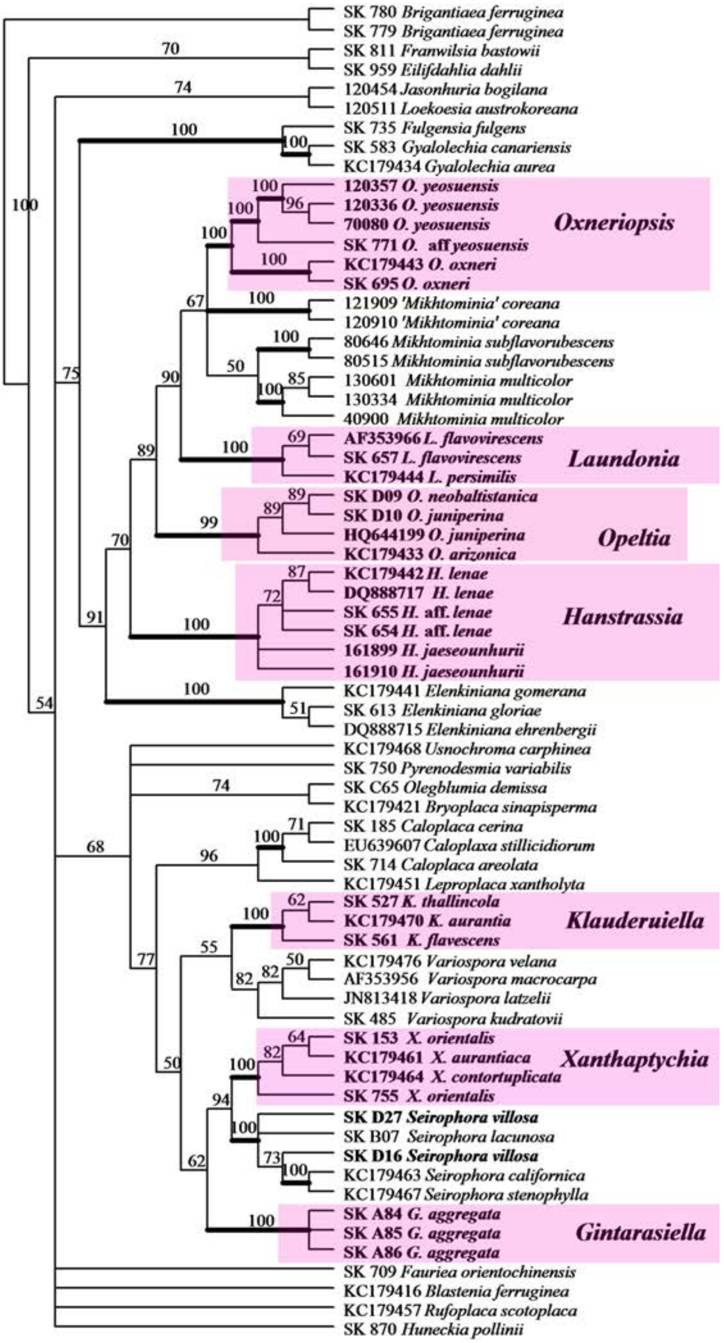

Fig. 2. Phylogenetic analysis of representatives of the subfamily Caloplacoideae after combined data set

somewhat limited list of taxa of the Xanthorioideae, Caloplacoideae and Teloschistoideae. Main point of that three was to analyse the position of such genera as *Franwilsia*, *Eilifdahlia* and *Huneckia* from the Caloplacoideae, genera *Honeggeria*, *Schackletonia*, and *Solitaria* from the Xanthorioideae and some others being in somewhat out position to subfamilies mentioned.

In general from current phylogenetic tree of the Teloschistaceae we can make conclusion that position of the major part of genera within the subfamilies Teloschistoideae and Xanthorioideae is more or less stable. Only a few new monophyletic branches were added to these subfamilies (i.e. 5 genera to Teloschistoideae and 3 genera to Xanthorioideae).

Twenty-five monophyletic branches of the subfamily Teloschistoideae form single phylum, in which there are the following clades: the *Teloschistes* s.l. clade with 8 branches, the *Follmannia* s.l. clade with 4 branches, the *Filsoniana* s.l. clade with 3 branches, the *Sirenophila–Teloschistopsis–Halophila* clade with 5 or 6 branches, as well as two genera i.e. *Kaernefia* and the genus *Stellarangia*, which are positioning in sister position to the *Sirenophila-Teloschistopsis-Halophila* clade.

New branches, i.e. the newly proposed genus *Ikaeria* is positioning in sister position to the genus *Yoshimuria* in the *Teloschistes* s.l. clade, the newly proposed genera *Harusavskia* and *Nevilleiella* are in the *Filsonniana* s.l. clade, and two newly proposed genera *Elixjohnia* and *Lazarenkoiopsis* are positioned in the *Sirenophila-Teloschistopsis-Halophila* branch (Fig. 1).

The subfamily Caloplacoideae at current stage includes 2 large subphyla, i.e.: the *Gyalolechia* s.l. subphylum with 9 monophyletic groups belonging mainly to the *Mikhtomia* s.l. clade, and genera *Jasonhuria, Loekoesia* and *Gyalolechia* s. str. as outgroups to the *Mikhtomia* s.l. clade, and the *Caloplaca* s.l. subphylum with 14 monophyletic groups, which mainly belong to the *Caloplaca* s.l. clade, and three genera, i.e.: *Blastenia, Fauriea* and *Rufoplaca* forming the *Blastenia* s.l. clade.

The genera *Huneckia, Franwilsia,* and *Eilifdahlia* are positioned in the out position to the both subphyla of the Caloplacoideae mentioned.

The newly proposed genera *Hanstrassia, Laundonia, Opeltia,* and *Oxneriopsis*, are members of the *Mikhtomia* s.l. clade, while *Klauderuiella, Xantaptychia* and *Gintarasiella* – are members of the *Caloplaca* s.l. clade (Fig. 2).

There are two large subphyla within the subfamily Xanthorioideae (Fig. 3). Eighteen genera/monophyletic groups of this subfamily form the *Xanthoria* s.l. subphylum among which the genera *Flavoplaca* and *Calogaya* are positioned in the outermost position. Seventeen monophyletic groups form the *Xanthomendoza* s.l. subphylum among which *Cerothallia* and *Austroplaca* appeared to be in the outermost position. Additionally to these 35 branches mentioned above the genera *Schackletonia* and *Honeggeria* are positioned in out position to both subphyla mentioned above. Level of support of 34 monophyletic branches was discussed before (Kondratyuk *et al.* 2014*c*, 2015*e*). Three

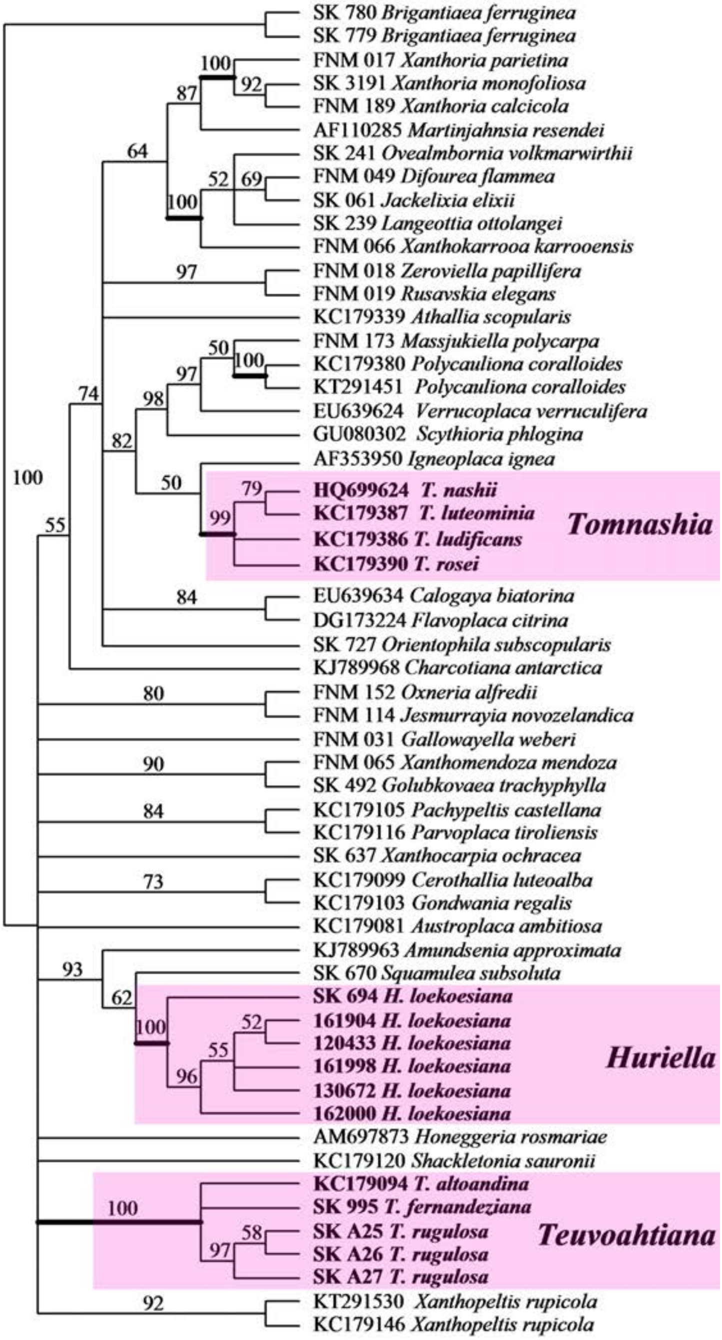

Fig. 3. Phylogenetic analysis of representatives of the subfamily Xanthorioideae after combined data set

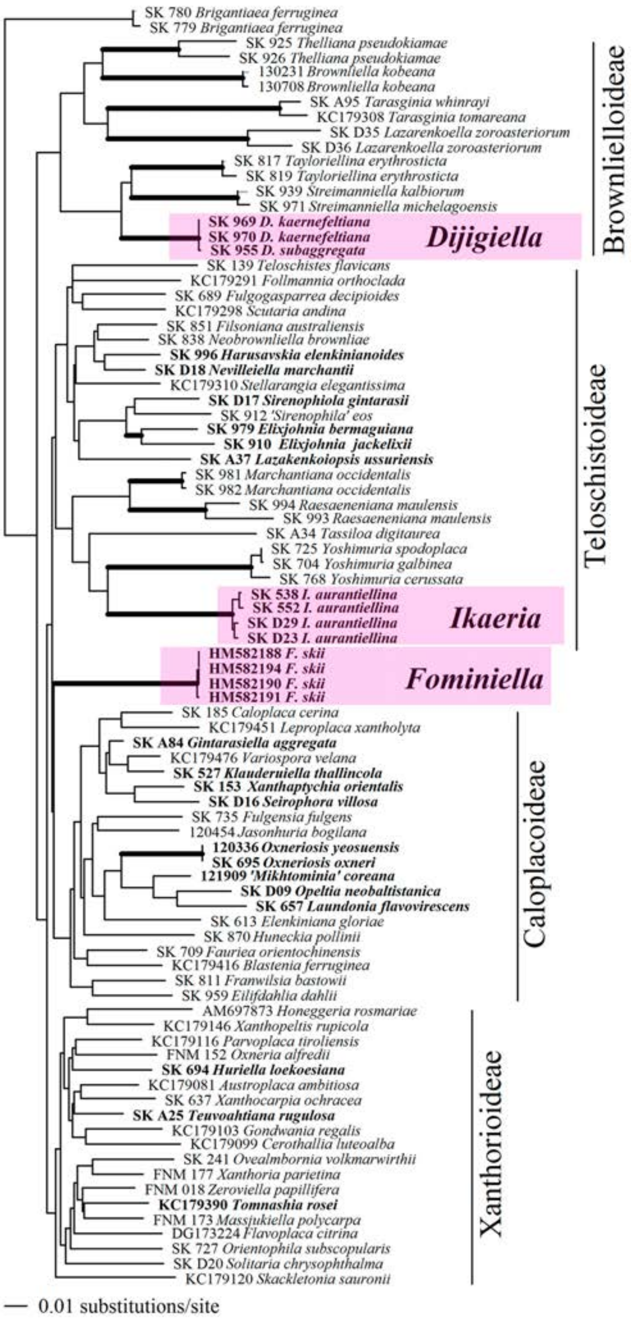

Fig. 4. Phylogenetic analysis of representatives of the subfamily Brownlielloideae after combined data set

groups, i.e.: *Huriella*, *Teuvoahtiana*, and *Tomnashia* are discussed below (in this paper). *Huriella* and *Teuvoahtiana* are members of the *Xanthomendoza* s.l. subphylum (i.e. of the *Xanthomendoza* s.l. clade and the *Xanthopeltis* s.l. clade, respectively), while *Tomnashia* is a member of the *Xanthoria* s.l. subphylum and the *Polycauliona* s.l. clade (Fig. 3).

The most unstable situation is with the subfamilies Brownlielloideae and Caloplacoideae and a number of taxa, which appeared to be in out position to all known subfamilies of the Teloschistaceae. Seven newly proposed genera are added to the subfamily Caloplacoideae (Fig. 3). The subfamily Brownlielloideae itself is almost with the same number of genera as it was in its original description (i.e. only one genus *Dijigiella* is added) (Fig. 4). However, the level of support of this branch is very low. The genus *Ikaeria* is positioned within the Caloplacoideae (compare Figs 1 and 4) and the genera *Fominiella* and *Solitaria* are in the out position to the subfamily Caloplacoideae, while the genus *Solitaria* was positioned in the subfamily Xanthorioideae before (Arup *et al.* 2013*a*, Kondratyuk *et al.* 2014*c*).

The new tendency that the subfamily Brownlielloideae will be divided into two or more separate subphyla with additional new members of this subphylum is found. However, new divisions of the Brownlielloideae can be observed only, when all monophyletic branches of the Teloschistaceae (as well as some still not analysed here) are included into analyses. In such case phylogenetic analysis is becoming more and more time consuming and in need of another computer facilities.

DESCRIPTIONS OF TAXA

Dijigiella S. Y. Kondr. et L. Lőkös, *gen. nov.*

MycoBank nr.: MB 819634.

Similar to the genus Marchantiana *of the Teloschistoideae, but differs in positioning in the Brownlielloideae of the Teloschistaceae.*

Type species: *Dijigiella kaernefeltiana* S. Y. Kondr.

Thallus small or indistinct, from endophloedal to corticolous, whitish grey to grey, continuous or more or less cracked to areolate, mainly distinct owing to bright yellow or yellow-orange apothecia, in some taxa densely aggregated in large groups.

Apothecia lecanorine to zeorine or biatorine, disc yellow to yellow-orange, dull brownish yellow to dull yellow-orange; true exciple scleroplectenchymatous or "textura intricata" with matrix to paraplectenchymatous with matrix, paraphyses broom-like, richly branched in the uppermost portion; asci 8-spored; ascospores bipolar, hyaline.

Ecology: Growing on bark of trees.

Distribution and species content: It hitherto contains two Australian taxa, while several taxa will probably be added in future.

Etymology: It is named after the well-known New Zealand lichenologist David J. Galloway in recognition of his contribution to the lichen flora of the Southern Hemisphere.

Taxonomic notes: After phylogenetic analysis this genus is positioned in the subfamily Brownlielloideae of the Teloschistaceae. From molecular data hitherto available the genus *Dijigiella* includes two species, i.e. *D. kaernefeltiana* and *D. subaggregata*.

A number of sorediate Australian taxa are still in progress of extracting DNA and getting sequences, and hopefully some of them will be added to this genus.

Dijigiella kaernefeltiana S. Y. Kondr., *spec. nova*

(Fig. 5)

MycoBank nr.: MB 819635.

Similar to Marchantiana occidentalis, *but differs in having greyish-greenish or greyish-whitish thallus, in having zeorine or lecanorine apothecia with bright orange disc and true exciple, in having scleroplectenchymatous or "textura intricata" true exciple, in having somewhat smaller ascospores, as well as in the lack of ascomatic acid, ascomatatic and 7-0-methylascomatatic acid.*

Type: Western Australia: Wicherina, E. of Geraldton, on the road to Mullewa, growing on dry shrubs together with *Streimanniella michelagoensis*, and species of the genera *Caloplaca*, *Buellia*, *Teloschistes* and *Candelariella*. Lat.: 28° 41′ 46.0″ S; Long.: 114° 56′ 40.1″ E. Coll.: Kärnefelt, I. (20042002), 07.01.2004 (LD1238056 sub *Streimanniella michelagoensis* – holotype).

Thallus of very small to 2–3(–5) mm across spots scattered among other lichens, i.e. *Streimanniella michelagoensis* thalli, greyish-whitish, from very thin consisting of very small *ca* 0.1–0.2 mm across irregular microareoles to rather thick among apothecia, and with rather larger size of "areoles" to 0.4–0.5 mm across, and easily distinct owing to bright yellow or yellow-orange discs or own margin of apothecia. Hypothallus not observed.

Apothecia (0.15–)0.3–0.6 mm diam. and to 0.18–0.2 mm thick in section; lecanorine or zeorine, if lecanorine with grey or grey-greenish thalline margin and yellow-orange or dull yellow-orange disc, if zeorine, own margin concolourous with disc dull yellow-orange observed; usually regularly

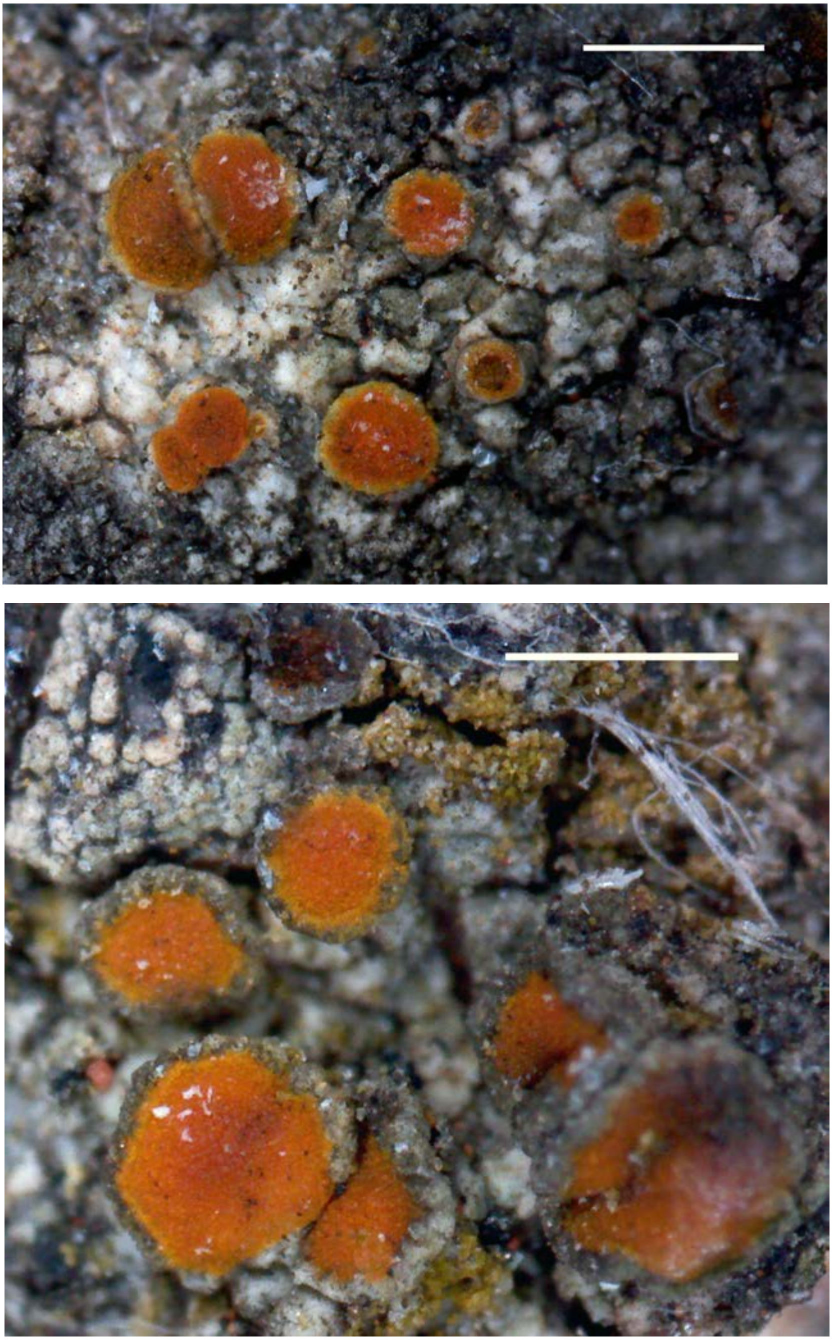

Fig. 5. Dijigiella kaernefeltiana (holotype), general habit. Scale 0.5 mm. (Photo of S. Kondratyuk)

rounded and distant, rarely aggregated and somewhat irregular, distinctly attenuated at the basis and uplifted above substrate level; in section true exciple to (10–)20–30 μm thick in the uppermost and the lower lateral portions, scleroplectenchymatous or "textura intricata" with matrix and radiating hyphae luminas, (10–)20–30 μm thick in basal portions paraplectenchymatous with matrix(?), cell lumina to 4 μm diam. (or cells to 7–9 μm across); thalline exciple to 50–70 μm thick, cortical layer absent or only of algal plectenchyma; hymenium to 50–60 μm high; paraphyses very richly branched at the tips, broom-like, to 3–4 μm diam. at the tips; subhymenium (50–)70–80 μm thick, straw yellow or to straw-brownish; asci 8-spored, with (2–4–)8 adult bipolar and young ascospores in the same ascus; ascospores bifusiform with somewhat attenuated ends, narrowly ellipsoid, (7.5–)8–13(–14) × 4.5–6 μm in water, and (7–)8–13(–15) × (4–)5–7(–8) μm in K, (in K becoming more or less widely ellipsoid), ascospores septum (2–)2.5–4 μm wide in water and (2–)3–6 μm wide in K.

Chemistry: Thalline cortical layer and algal plectenchyma of thalline exciple, and epihymenium K+ dirty crimson purple in places.

Etymology: Species is named after the well-known Swedish lichenologist Ingvar Kärnefelt (Lund, Sweden) in recognition of his contribution to lichenology, and who has kindly provided for us an opportunity to participate in a field trip to Australia in 2003–2004 and provided his earlier collections in our disposal.

Distribution: So far known from type locality in Western Australia.

Taxonomic notes: *Dijigiella kaernefeltiana* is similar to *Marchantiana occidentalis* (Elix, S. Y. Kondr. et Kärnefelt) S. Y. Kondr., Kärnefelt, A. Thell, Elix, J. Kim, A. S. Kondr. et Hur after having dull greenish-greyish or greenish greyish-whitish thallus, measurements of ascospores and having paraphyses richly branched in the upper portion and densely twisted above asci, but differs in having greyish-greenish or greyish-whitish thallus (vs. brown to dark brown, greenish areoles immersed in bark), and in having zeorine or lecanorine apothecia with bright orange disc and true exciple (vs. biatorine), in having scleroplectenchymatous or "textura intricata" true exciple (vs. pseudoprosoplectenchymatous in lateral portion and paraplectenchymatous in basal portion), as well as in the lack of ascomatic acid, ascomatatic and 7-0-methylascomatatic acid, and in having somewhat shorter ascospores (8–13 × 4.5–6 μm vs. (9–)11–13(–14) × (4–)4.5–6(–7) μm).

Dijigiella kaernefeltiana often growing side by side with *Streimanniella michelagoensis* from which it differs in having lighter and thicker (with somewhat subconvex areoles) thallus (vs. dark brownish-greenish grey to dark brownish grey, smooth or slightly cracked to indistinct), in having much larger and brighter light yellow-orange apothecia (0.3–0.6 mm vs. *ca* 0.2–0.3 mm diam., lecanorine apothecia with blackish grey or greenish-greyish brown thalline margin and somewhat dull yellow own margin and dull yellowish-blackish or yellowish, bluish-greyish to dull dark brownish orange disc), in having always hyaline ascospores of the same measurements (vs. bipolar ascospores becoming greyish or greyish-blackish at overmature, somewhat similar to *Rinodina* type ascospores), as well as in the lack of neochloroemodin (see also Kondratyuk *et al.* 2009). In type collection there is one more crustose member of the Teloschistaceae with rather thick to worthy, grey thallus. Unfortunately it was in insufficient amount for the further study. However, *Dijigiella kaernefeltiana* differs from this taxon in having lighter brownish-whitish-greyish thallus and in having much brighter dull yellow or dull yellow-orange disc and own margin of apothecia.

Dijigiella kaernefeltiana is similar to *'Caloplaca' ulcerosa* Coppins et P. James, but differs in having K+ cortical layer of thallus or thalline exciple and algal plectenchyma in both as well as in the lack of whitish or greyish soredia, and in the lack of pustule-like immersed/ulcer-like soralia. Unfortunately status of *'Caloplaca' ulcerosa* is still uncertain from molecular point of view. After ITS phylogeny it is positioned in the Caloplacoideae, but data on nrLSU and mtSSU are still missing for this taxon.

Dijigiella subaggregata S. Y. Kondr. et Kärnefelt, *spec. nova*

(Fig. 6)

MycoBank nr.: MB 819636.

Similar to Gintarasiella aggregata, *but differs in having thinner thallus, in having smaller and plane apothecia, in having hymenium and subhymenium without oil, in having smaller ascospores, in having wider ascospore septum, and in corticolous habit.*

Type: Australia: Victoria, Camperdown, in the central part of town, Wpt. 64, on bark of *Ulmus*, growing together with *Caloplaca hanneshertelii*, and species of the genera *Opegrapha*, *Hyperphyscia*, *Phaeophyscia*, *Lecanora* and *Physcia*. Lat.: 38° 14.37′ S; Long.: 143° 08.57′ E. Coll.: Kärnefelt, E. I. (996401), 21.01.1999 (LD 1275974 – holotype).

Thallus (0.25–)0.5–1.5(–2.5) cm across, usually indistinct, endophloedal or very thin, whitish or whitish-greyish, well contrasting to darker aggregated apothecia in the centre of thallus, becoming somewhat greyish or dirty white among apothecia or to whitish yellow in peripheral zone probably yellow tinge owing to numerous young apothecia; seen as very dense aggregations of dull yellow or dull brownish yellow apothecia. Hypothallus absent.

Apothecia (0.15–)0.3–0.6 mm diam./across, rather small but easily distinct because often aggregated in very dense aggregations (to 200 apothecia

Fig. 6. Dijigiella subaggregata (holotype), general habit. Scale 1 mm. (Photo of S. Kondratyuk)

per thallus), initially regularly rounded, immersed into substrate, then becoming sessile and aggregated in large aggregations, biatorine with lighter bright or pale yellow own margin to 40(–50) µm thick, at initial stages well distinct, somewhat arising disc level, later irregularly developed to disappearing in densely pressed, irregular apothecia; disc more or less plane, dull dark yellow to dull brownish yellow, matt, without pruina; in section biatorine to zeorine, where thalline exciple to 30–40 µm thick developed only on underside; true exciple to 20(–40) µm thick in the uppermost lateral and to 30 µm thick in the lower lateral portion, and not developed or only to 7 µm thick in basal portion, more or less paraplectenchymatous; hymenium to 55–60 µm high; epihymenium to 15 µm thick, dark orange, paraphyses with 1 or 2 uppermost cells distinctly widened to 3–4(–5) µm diam. towards the tips; subhymenium to 20–30(–40) µm thick, hyaline, without oil; asci 8-spored, often very variegating in measurements within the same ascus; ascospores rather small, but with rounded ends, mainly widely ellipsoid, widened at the septum, 7–10(–12) × (4–)5–6(–6.5) µm in water and (8–)9–13(–15) × (5–)6–8(–10) µm in K, septum (2–)3–4(–4.5) µm wide in water and (3–)3.5–5(–7) µm wide in K.

Chemistry: Epihymenium and outer layers of the true exciple K+ crimson purple, somewhat washing out in solution.

Etymology: It is named after similarities to *Gintarasiella aggregata*.

Distribution: So far known only from type collection, Victoria, southern Australia.

Taxonomic notes: *Dijigiella subaggregata* is similar to *Gintarasiella aggregata*, after having thallus dominated almost entirely by clustered apothecia, but differs in having thinner thallus (vs. rather pulvinate), in having smaller and plane apothecia (0.3–0.6 mm vs. 0.3–1 mm wide, becoming convex in the oldest apothecia), in having hymenium and subhymenium without oil (vs. hymenium and subhymenium especially heavily inspersed with oil droplets or irregular oil aggregations), in having smaller ascospores (7–10 × 5–6 µm vs. 10–13.5 × 5–6 µm), in having wider ascospore septum (3–4 µm vs. 2–3 µm wide), and in corticolous habit.

Dijigiella subaggregata is similar to *Athallia cerinelloides* (Erichsen) Arup, Frödén et Søchting, but differs in having endophloedal or very indistinct thallus (vs. light grey, film-like), in having apothecia densely aggregated in large groups, and in having shorter ascospores (7–10 × 5–6 µm vs. 9–13 × 5–7 µm).

Dijigiella subaggregata is similar to *Cerothallia luteoalba* (Turner) Arup, Frödén et Søchting, but differs in having wider ascospore septum (3–4 µm vs. 1–1.5 µm wide), while ascospores are almost the same (7–10 × 5–6 µm vs. 8–12 × 3–6 µm).

Dijigiella subaggregata is similar to '*Caloplaca*' *aegatica* Giralt, Nimis et Poelt (see also comments below the genus *Ikaeria*), but differs in having smaller ascospores (7–10 × 5–6 μm vs. 10–15 × 7–9 μm), and narrower ascospore septum (3–4 μm vs. 5–8 μm wide), in having endophloedal thallus (vs. greyish, dirty grey, grey-brown), and in having lighter apothecia (vs. orange to dark orange zeorine, with bright golden margin and disappearing thalline margin).

Dijigiella subaggregata is similar to *Fominiella skii* (Khodos., Vondrák et Šoun) S. Y. Kondr., D. Upreti et J.-S. Hur, but differs in having lecanorine to zeorine apothecia (vs. zeorine to biatorine) and larger (0.3–0.6 mm vs. 0.2–0.4 mm diam.) apothecia, in having smaller ascospores (7–10 × 5–6 μm vs. 9–11 × 4.5–5.5 μm) and narrower ascospore septum (3–4 μm vs. 4.5–5.7 μm wide), as well as in distribution (vs. the Canary Islands).

Elixjohnia S. Y. Kondr. et J.-S. Hur, *gen. nov.*

MycoBank nr.: MB 819637.

Similar to genus Sirenophila *of the subfamily Teloschistoideae, but forming separate robust monophyletic branch.*

Type species: *Elixjohnia jackelixii* (S. Y. Kondr., Kärnefelt et A. Thell) S. Y. Kondr. et J.-S. Hur.

Thallus distinctly zoned initially with brownish or dirty greenish yellow sterile circles of dull, smooth, continuous peripheral zones or without zonations; usually very thick towards the centre or evenly continuous; smooth and entire or distinctly areolate, whitish, yellowish or greyish to bright red or reddish orange; upper surface cracked and eroded, sometimes with isidia-like structures; medulla often visible through the numerous cracks. Protothallus well developed or absent. Apothecia common, small, zeorine (in some species at least initially), lecanorine or biatorine; disc brownish orange or yellowish brown, with a reddish tinge to dull orange, dark orange-red or scarlet; true exciple scleroplectenchymatous; oil cells in paraphyses of *bermaguiana*-type (see Kondratyuk *et al.* 2007, 2009, 2012); asci 8-spored, but 2–4–6 mature bipolar ascospores together with aborted spores often present; ascospores narrowly to broadly ellipsoid; conidia broad ellipsoid to broad bacilliform, (2–)2–3 × 1.2–1.7 μm.

Chemistry: It contains parietin (major).

Ecology: Species of the genus grow on exposed coastal rocks (quartzite, granite, basalt and dolerite), at or above the high tide level often together with each other (i.e. *E. jackelixii* and *E. gallowayi* often growing side by side), as well as together with species of the genera *Tarasginia whinrayi* (S. Y. Kondr. et Kärnefelt) S. Y. Kondr., Kärnefelt, A. Thell, Elix, J. Kim, A. S. Kondr. et Hur, *T. tomareana* (S. Y. Kondr. et Kärnefelt) S. Y. Kondr., Kärnefelt, A. Thell, Elix, J. Kim, A. S. Kondr. et Hur, *Sirenophila eos* (S. Y. Kondr. et Kärnefelt) Arup, Frödén et Søchting, *Jackelixia ligulata* (Körb.) S. Y. Kondr., Fedorenko, S. Stenroos, Kärnefelt et A. Thell, *Gondwania sublobulata* (Nyl.) S. Y. Kondr., Kärnefelt, Elix, A. Thell, J. Kim, M.-H. Jeong, N.-N. Yu, A. S. Kondratiuk et J.-S. Hur, *H. cribrosa* (Hue) Søchting, Frödén et Arup and *Caloplaca conranii* S. Y. Kondr. et Kärnefelt.

Distribution: Species of this genus widely distributed in southern and southeastern Australia, Tasmania and New Zealand.

Etymology: Genus is named after the well-known Australian lichenologist and chemist Elix John Alan ('Jack') in recognition of his contribution to lichenology.

Taxonomic notes: After combined phylogenetic analysis the genus *Elixjohnia* is a member of the large *Sirenophila-Teloschistopsis-Halophila* subclade of the Teloschistoideae. This branch includes three species, i.e. *E. bermaguiana*, *E. jackelixii* and *E. gallowayi* after molecular data hitherto available.

Since 2013, when genus *Sirenophila* was described, situation with taxa of this branch has been problematic, because the genus *Sirenophila* was in fact segregated only on the basis of ITS phylogeny. Only ITS data were provided for the rather rare Australian taxon *S. gintarasii* (S. Y. Kondr. et Kärnefelt) Arup, Frödén et Søchting (Arup *et al.* 2013*a*), type species of the genus *Sirenophila*.

We were able to get 28S nrLSU and 12S mtSSU data for this taxon from isotype kept in KW-L and they are presented here (Appendix).

From phylogenetic analysis (Fig. 1) it is seen that the genus *Sirenophila* s. str. includes only *S. gintarasii* and *S. cliffwetmorei* (S. Y. Kondr. et Kärnefelt) S. Y. Kondr., recently combines to this genus (Kondratyuk *et al.* 2015*e*). Status of *Sirenophila eos*, as well as of *S. maccarthii* is still questionable and should be repeatedly analysed, when more molecular data on this phylum will be available.

Two species of this genus, i.e.: *E. jackelixii* and *E. bermaguiana* were compared with *Tomnashia rosei* (see below), which belongs to the Xanthorioideae. Furthermore *E. bermaguiana* was compared also with *Caloplaca inconnexa* (Nyl.) Zahlbr. (supposedly the Xanthorioideae) and *Caloplaca nubigena* (Kremp.) Dalla Torre et Sarnth. (supposedly Caloplacoideae). Molecular data on *Caloplaca inconnexa* and *C. nubigena* are still missing. In original description *E. gallowayi* was compared only with *Sirenophila eos* (Kondratyuk *et al.* 2007).

Fominiella S. Y. Kondr., D. Upreti et J.-S. Hur, *gen. nov.*

MycoBank nr.: MB 819638.

Similar to genera Athallia *of the Xanthorioideae, but differs in having different measurements of ascospores as well as in positioning in distant position from the Teloschistoideae, as well as in out position to both subfamilies Caloplacoideae and Teloschistoideae.*

Type species: *Fominiella tenerifensis* S. Y. Kondr., Kärnefelt, A. Thell et T. Feuerer.

Thallus thin, film-like, inconspicuous, whitish to light grey or pale yellowish. Hypothallus not developed.

Apothecia zeorine to lecanorine or biatorine, disc yellow-orange, own margin yellow, always paler than disc; thalline exciple white, greyish to yellow-white, soon disappearing or permanent, true exciple leptodermatous paraplectenchymatous; asci 8-spored; ascospores polarilocular, hyaline.

Chemistry: Parietin (major), emodin, parietinic acid, fallacinal and teloschistin (trace).

Etymology: This genus is named after the well-known Ukrainian botanist Alexandr Valyljovych Fomin, specialists on cryptogamic plants, who is founder of several botanical institutions and periodicals in Georgia and Ukraine including recent institution known as M. H. Kholodny Institute of Botany, National Academy of Sciences of Ukraine.

Distribution and species diversity: So far genus includes two species, one of which, i.e.: *Fominiella skii* known from arid and semiarid conditions of southern and southeastern Europe and the Near East of Asia, and the second (*F. tenerifensis*) is known only from the Canary Islands.

Taxonomic notes and phylogenetic affiliations: After combined phylogenetic analysis the genus *Fominiella* is positioned in out position to all known subfamilies (Fig. 4). The genus includes two species, i.e.: *F. tenerifensis* and *F. skii* after molecular data hitherto available.

In original description (Vondrák *et al.* 2011) *Fominiella skii* was already compared with members of the following genera of the subfamily Xanthorioideae, i.e.: *Athallia* Arup, Frödén et Søchting (i.e.: *A. cerinelloides* (Erichsen) Arup, Frödén et Søchting), and *Xanthocarpia* (i.e.: *X. raesaenenii* (Bredkina) S. Y. Kondr.), with which it is similar in having very reduced thallus. Reduction of the thallus has occurred independently several times in the evolution of the Teloschistaceae (Kärnefelt 1989; Vondrák *et al.* 2011).

On the basis of ITS phylogeny *Fominiella skii* was also included into the genus *Athallia* (Arup *et al.* 2013*a*). However, providing data on nrLSU and mtSSU has allowed showing its positioning in rather distant position from Xanthorioideae and being in somewhat out position to both subfamilies Caloplacoideae and Teloschistoideae.

ITS sequence of the type specimen of *Fominiella skii* (HM582191) provided in original paper (Vondrák *et al.* 2011) is included into analysis. However, 28S nr LSU and 12S mtSSU were obtained from material of *F. tenerifensis* within this study only. Unfortunately we were not able to get ITS data on material investigated, while a number of special attempts were done. So this genus is in urgent need of confirmation by molecular data (data on three or more genes) obtained from the same specimen (of the same species).

Fominiella tenerifensis S. Y. Kondr., Kärnefelt, A. Thell et T. Feuerer, *spec. nova*

MycoBank nr.: MB 819639.

Similar to Fominiella skii, *but differs in having well-developed thalline exciple, in having longer and wider ascospores, and in the lack of true exciple in lateral portion.*

Type: Spain, Canary Islands, Tenerife Island, Santiago del Teide, on bark of *Spartocytisus* shrubs. Lat.: 28° 17.631′ N; Long.: 16° 48.989′ W. Alt.: 920 m a.s.l. Coll.: Kondratyuk, S. Y. (20917), 15.01.2009 (KW-L – holotype, LD, BP, B – isotypes).

Thallus thin, film-like, inconspicuous or visible only around apothecia, whitish, light grey or pale yellowish. Hypothallus not developed.

Apothecia 0.2–0.35 mm diam. and to 0.12 mm thick in section, lecanorine, very small and usually aggregated in groups, true exciple not present in the uppermost lateral and lower lateral portions, to 10–15 μm thick in basal portion, leptodermatous paraplectenchymatous, cell lumina 3–5 μm diam./across; thalline exciple 50–60 μm thick with cortical layer to 15–20 μm thick, paraplectenchymatous, K–; hymenium 70 μm high; epihymenium K+ purple; paraphyses almost not widened towards the tips, with uppermost cells to 3–3.5 μm diam. in water (and to 2–3 μm diam. in K), richly broom-like branched (better seen in K), with oil droplets, but very indistinct or badly seen owing to small measurements, to 2–3 μm diam. (better seen in K); subhymenium 20–30 μm thick; asci 8-spored; ascospores elongated ellipsoid, 12–13(–15) × (5.5–)6–7 μm in water and 12–14(–15) × (5–)6–7 μm in K; septum 5–6(–7) μm wide in water and (6–)7–8 μm wide in K.

Chemistry: Epihymenium and outermost portions of true exciple K+ purple.

Ecology: It grows on barks of twigs of shrubs often associated with *Ikaeria aurantiellina*.

Etymology: It is named after type collection, Tenerife Island of Spanish Canary Islands.

Distribution: It is so far known from several places within the same Tenerife Island, Spain, Canary Islands.

Taxonomic notes: *Fominiella tenerifensis* is similar to *F. skii*, but differs in having well-developed thalline exciple, in having longer and wider ascospores (12–13(–15) × (5.5–)6–7 μm vs. (7.5–)9–11(–12.8) × (3.5–)4.6–5.9(–6.5) μm) (while septum is almost the same (5–6(–7) μm vs. (3.5–)4.3–5.7(–6.5) μm)), and in the lack of true exciple in lateral portion.

Fominiella tenerifensis is similar to *Athallia cerinelloides* (Erichsen) Arup, Frödén et Søchting, but differs in having wider ascospore septum (5–6(–7) μm vs. 3–4 μm wide), while ascospores are almost the same (12–13(–15) × (5.5–)6–7 μm vs. 9–13 × 5–7 μm).

Gintarasiella S. Y. Kondr. et J.-S. Hur, *gen. nov.*

MycoBank nr.: MB 819640.

The genus is characterised by a unique combination of the following characters among representatives of the subfamily Teloschistoideae, i.e.: pulvinate habit, with densely clustered apothecia that essentially obscure the thallus, a very densely inspersed hymenium and subhymenium and relatively small ascospores.

Type species: *Gintarasiella aggregata* (Kantvilas et S. Y. Kondr.) S. Y. Kondr. et J.-S. Hur.

Thallus crustose, areolate, forming pulvinate patches, dominated almost entirely by clustered apothecia, yellow-orange. Apothecia from zeorine to biatorine, disc deep orange, somewhat darker than thallus, own margin concolourous with disc; true exciple paraplectenchymatous in basal portion and composed of radiating more or less parallel hyphae in the lateral portions; hymenium and subhymenium heavily inspersed with oil droplets or irregular oil aggregations; asci 8-spored; ascospores polarilocular, ellipsoid, hyaline. Conidiomata and conidia not observed.

Chemistry: Thallus and all elements of apothecia K+ crimson purple.

Etymology: This genus is named after our friend and colleague, Dr Gintaras Kantvilas (Hobart, Tasmania), in acknowledgement of his enormous contributions to the taxonomy of the Tasmanian and Australian lichens, especially.

Distribution and species diversity: So far the genus includes only type species, which known from limestone outcrops of Kangaroo Island, Southern Australia.

Taxonomic notes and phylogenetic affiliations: After separate and combined phylogenetic analysis the genus *Gintarasiella* belongs to the subfamily Teloschistoideae, where it forms separate robust branch within the *Sirenophila-Teloschistopsis-Halophila* subphylum as the most separate outgroup to this subphylum. From molecular data hitherto available the genus *Gintarasiella* includes only type species *G. aggregata*.

In original description the type species of this monotypic genus was already compared with members of the following genera of the subfamily Xanthorioideae, i.e.: *Flavoplaca* (i.e.: *F. mereschkowskiana* (S. Y. Kondr. et Kärnefelt) Arup, Frödén et Søchting), *Cerothallia* (i.e. *C. yorkensis* (S. Y. Kondr. et Kärnefelt) Arup, Frödén et Søchting), and *Xanthocarpia* (i.e.: *X. jerramungupensis* (S. Y. Kondr., Kärnefelt et Elix) S. Y. Kondr., Kärnefelt, A. Thell, Elix, J. Kim, A. S. Kondr. et J.-S. Hur) (Kantvilas 2016).

From morphological point of view after having inspersed hymenium and subhymenium it can be also compared with the members of the genus *Franwilsia* (subfamily Caloplacoideae), as well as after having pulvinate thallus with some *Calogaya* species (i.e. *C. lobulata* (Flörke) Arup, Frödén et Søchting known from bark of introduced trees in Tasmania) of the Xanthorioideae. However, it differs in having smaller ascospores and different chemistry, as well as in the positioning in the subfamily Teloschistoideae of the Teloschistaceae.

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

MycoBank nr.: MB 819641.

Similar to genus Elenkiniana*, but differs in having mainly areolate and sorediate thallus, and in positioning in separate robust monophyletic branch within the* Mikhtomia *s.l. clade of the Caloplacoideae.*

Type species: *Hanstrassia lenae* (Søchting et G. Figueras) S. Y. Kondr.

Thallus saxicolous or terricolous, areolate, effigurate or only weakly lobate at the margin, yellowish grey, pale yellow, ochre to orange or brownish yellow, often with a whitish pruina; areoles thick; soralia scarce or numerous, labriform, usually marginal, yellowish to ochre, usually brighter than the thallus; cortical layer pseudoprosoplectenchymatous or scleroplectenchymatous; medulla dense, consisting of interwoven hyphae, without a clear orientation.

Apothecia lecanorine to zeorine, few and dispersed; disc flat, later sometimes rather convex, deep orange to brownish, sometimes with whitish pruina at initial stages; true exciple prosoplectenchymatous; asci 8-spored; ascospores polarilocular. Conidia bacilliform, 3–3.5 × 1–1.25 µm.

Chemistry: Anthraquinone fragilin and depsidones caloploicin and vicanicin (major), and anthraquinones parietin, emodin, and depsidone isofulgidin in small concentrations.

Ecology: It grows on limestone and calcareous schist of vertical cliffs in dry continental conditions or on sandy soil in mountainous deserts of the Asian continent.

Etymology: It is named after the well-known Estonian lichenologist Hans Trass (02.05.1928–14.02.2017) in recognition of his contribution to lichenology and to geobotany, as well as for his contribution to Eurasian lichen flora.

Distribution and species diversity: Type species *Hanstrassia lenae* is known from northeastern Asia from the Altai Region in Siberia and the Mongolian People's Republic to Yakutia, while *H. jaeseounhurii* described here is so far known only from the type locality of China. Taxonomic status of material previously identified as *H. lenae* from Russia is in need of further clarifying.

Taxonomic notes and phylogenetic affinities: After combined phylogenetic analysis the genus *Hanstrassia* is positioned in separate robust monophyletic branch within the *Mikhtomia* s.l. branch, while after ITS phylogeny it was placed in the genus *Gyalolechia* s.l. (Arup *et al.* 2013*a*), and to the genus *Elenkiniana* (Kondratyuk *et al.* 2014*c*).

It is interesting to note, that in the first ITS phylogenetic tree published in the paper with original description of *H. lenae* it was positioned in sister position to the *Laundonia flavovirescens* (Søchting and Figueras 2007), and now the same position is confirmed by three gene phylogeny (Fig. 2).

Hanstrassia jaeseounhurii S. Y. Kondr., Ch.-H. Park et L. Lőkös, *spec. nova* (Figs 7–8)

MycoBank nr.: MB 819642.

Similar to Hanstrassia lenae, *but differs in having much larger thalline areoles, in having only areolate thallus, in having very scarce soredia and in having scleroplectenchymatous cortical layer of thallus.*

Type: China. Qinghai Province, between Jingtai and Zhongwei (close to Yellow River), along 201 Provincial Road, on soil, growing together with *Candelariella* sp. Lat.: 37° 25′ 19.78″ N; Long.: 104° 34′ 50.05″ E; Alt.: 1,686 m a.s.l. Coll.: Hur, J.-S. and Park, Ch.-H. (CH 160016), 17.06.2016 (KoLRI 041972 – holotype); the same locality and collectors, on soil, growing together with *Candelariella* sp., *Megaspora* sp. and *Catapyrenium* sp. (CH 160015) (KoLRI 041972 sub *Candelariella* – isotype).

Thallus to 2–3(–5) cm across, distinctly areolate, without lobes in peripheral position, brownish green-yellow, with whitish pruina towards the peripheral portion; areoles distant, scattered and regularly rounded, to (0.2–)0.5–1 mm diam./across in peripheral portion, and much larger to (0.5–)1–3(–4) mm across, in the centre, seem to be overlapping by marginal portions; sorediate. In section thalline areoles (0.3–)0.4–0.8 mm thick, while together with slightly brownish medullar layer (may be including overgrowing old portions?) to 1–1.6 mm thick; cortical layer 50–75(–100) μm thick, yellowish in upper portion or throughout, scleroplectenchymatous, cell lumina to 3–4(–5) μm diam., often with oxalate crystals to (5–)7–15(–20)[–40] μm across; K+ purple, while

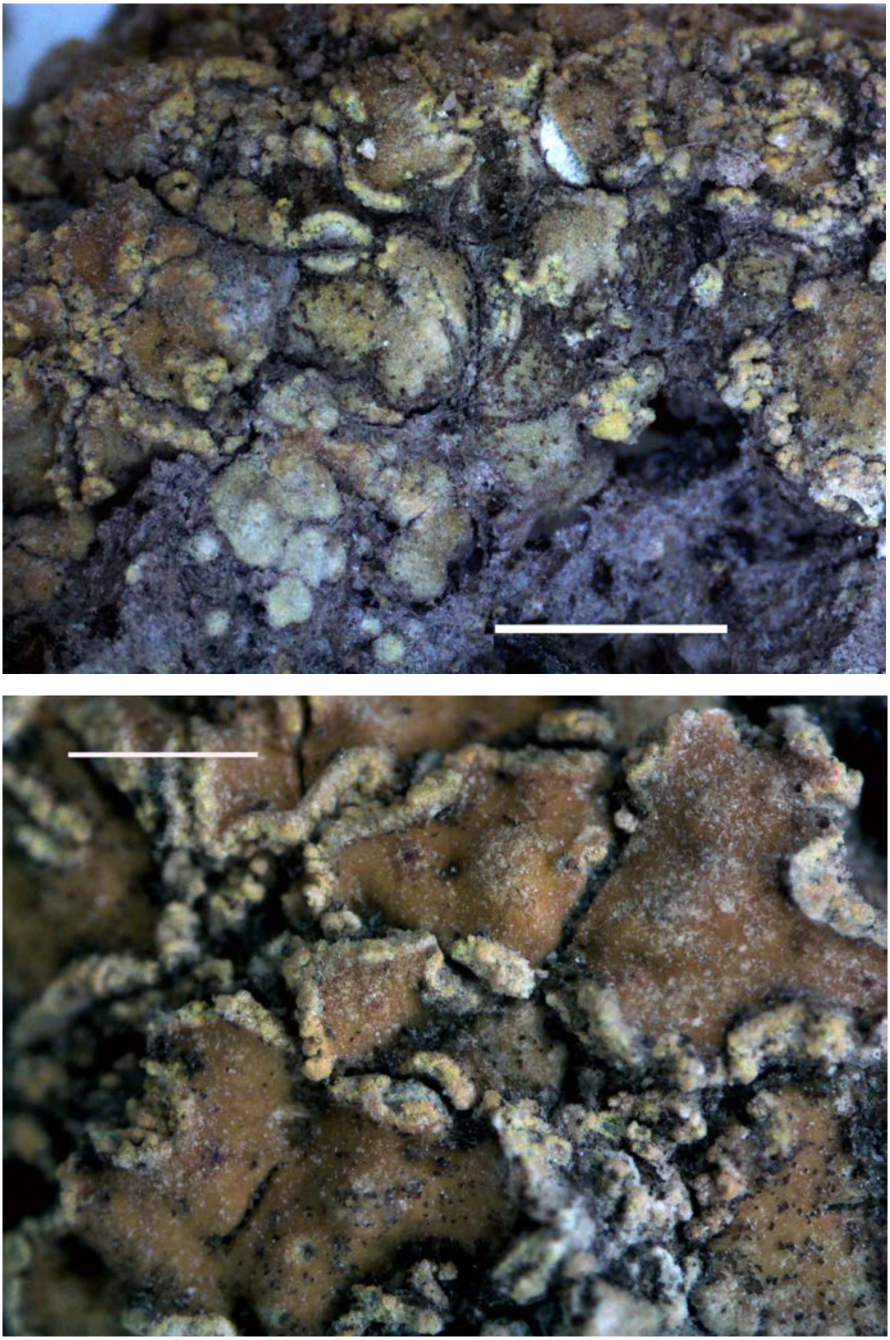

Fig. 7. *Hanstrassia jaeseounhurii* (holotype), general habit. Scale 2 mm (top) and 1 mm (bottom). (Photo of S. Kondratyuk)

portions with crystals K+ blackish purple in places; epinecral portions (better seen in K) to 20(–25) μm thick, in places dirty brownish; algal layer 50–70 (–150) μm thick, in places consisting of clusters, not entire, algal cells to 10–22.5 μm diam./ across; medulla white, compact (without hollows) to 0.4–1.4 mm thick, where upper portion to 0.4–0.5 mm thick below algal layer purely white, while lower portion (to 0.7–1 mm thick) straw yellowish or somewhat pale brownish, probably owing to dust/soil particles, usually hardly seen, owing to numerous crystals not dissolving in K. Soralia marginal, somewhat lip-like; soredia/schizidia usually rather scarce, 0.06–0.12(–0.2) mm diam./across, or rarely in larger aggregations, irregular, light yellow or lemon yellow (well contrasting to darker thallus). Apothecia, conidiomata, and conidia unknown.

Chemistry: Cortical layer of thallus K+ purple, while portions with numerous crystals K+ to blackish purple in places.

Ecology: Growing on soil among mosses and together with species of the genera *Candelariella*, *Placopyrenium*, *Collema* and *Megaspora*.

Etymology: It is named after Prof. Jae-Seoun Hur (Suncheon, Republic of Korea), who has collected the type material and has kindly provided it for our study.

Distribution: So far known only from the type locality in Inner Mongolia, Northern China, Asia.

Taxonomic notes: *Hanstrassia jaeseounhurii* is similar to *H. lenae*, but differs in having much larger thalline areoles (1–3(–4) mm vs. *ca* 1 mm diam./across), in having only areolate thallus (vs. sometimes slightly radially elongated at the periphery of the thallus and narrower, i.e. thallus is effigurate, but only weakly lobate at the margin), in having very scarce and much larger (0.06–0.12(–0.2) mm diam./across vs. 25–40(–50) μm diam.) soredia and in having scleroplectenchymatous (vs. prosoplectenchymatous) cortical layer of thallus.

Hanstrassia jaeseounhurii is similar to *Fulgensia desertorum* (Tomin) Poelt in having schizidia and crustose thallus often dispersed into elements, but differs in having distinctly areolate (vs. continuous crustose) and larger (2–3(–5) cm vs. 0.75–1.6 cm across) thallus, in having larger thalline areoles (1–3(–4) mm vs. 0.4–0.7 mm across), in the lack of lobate peripheral portion, in having much thicker cortical layer, in having distinct algal zone and medulla, as well as in positioning in separate monophyletic branch (vs. it is positioned in the *Gyalolechia* s.l. clade).

After lack of apothecia and non-lobate peripheral portion, and more or less warty squamulose thallus *Hanstrassia jaeseounhurii* is similar to *Fulgensia bracteata* subsp. *deformis* (Erichsen) Poelt, but differs in having distinctly areolate thallus (vs. warty crustose to squamulose), in having much larger areoles (1–3(–4) mm vs. only in peripheral zone distinct as *ca* 0.2–0.5 mm across), and in having scarce and smaller (0.06–0.12(–0.2) mm vs. 0.2–0.4 mm across) schizidia.

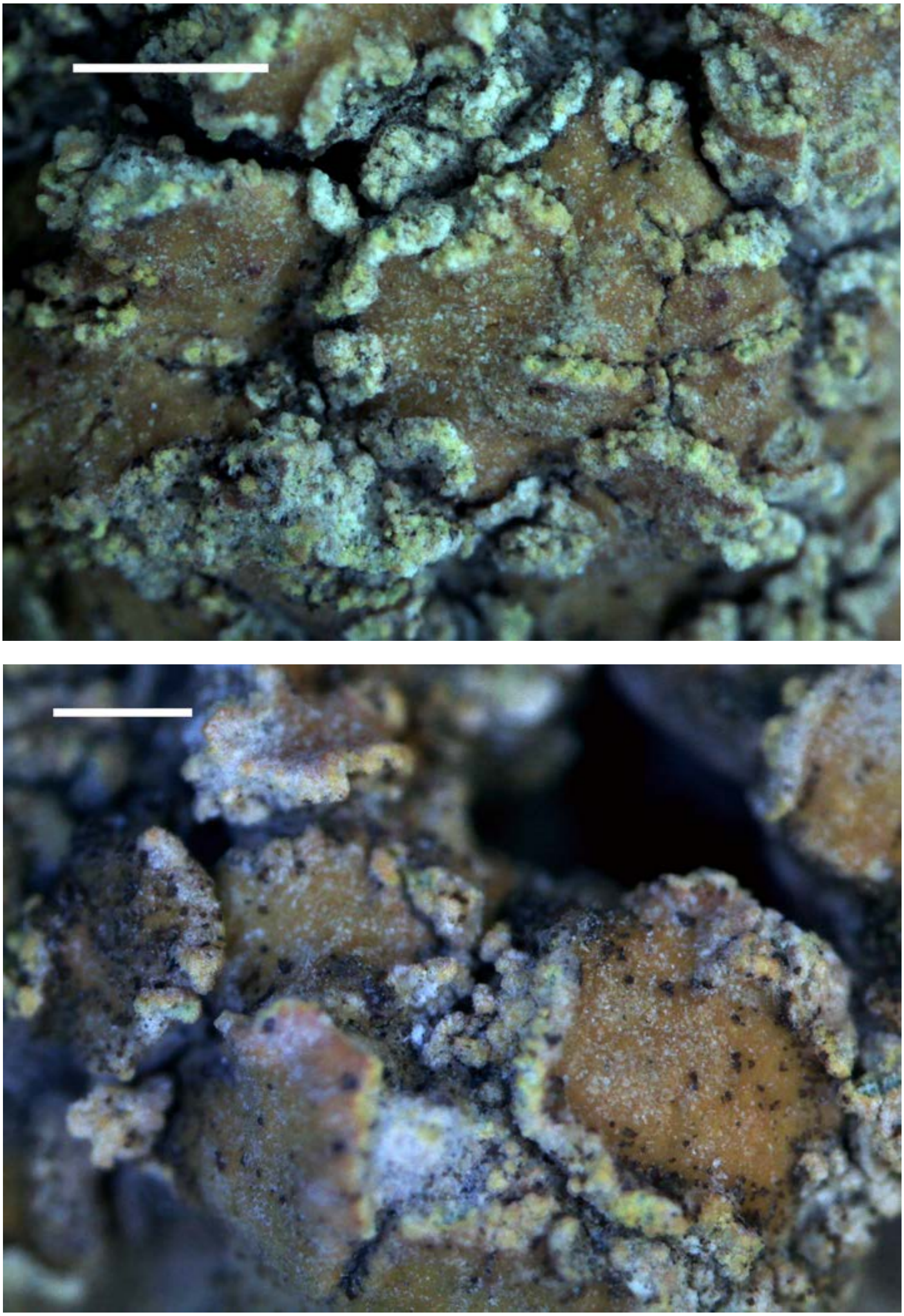

Fig. 8. *Hanstrassia jaeseounhurii* (holotype), enlarged portions with scarce schizidia. Scale 1 mm (top) and 0.5 mm (bottom). (Photo of S. Kondratyuk)

After having naked medulla in marginal soralia *Hanstrassia jaeseounhurii* is similar to *Megaspora rimisorediata* Valadbeigi et A. Nordin, growing on calcareous soil in desert conditions of Eurasia, but differs in having brownish green-yellow (vs. whitish or white grey) thallus and in having much larger (0.06–0.12(–0.2) mm vs. 0.05–0.07 mm) and lemon yellow (vs. blackish or bluish grey) soredia, as well as in having bright yellow medulla in naked portions (vs. medulla white).

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

MycoBank nr.: MB 819643.

Similar to the genus Rusavskia, *but differs in being distinctly areolate in the centre of the thallus, in the lack of lower cortical layer, in having narrower thalline lobes, in having ascospores with halo and in having very indistinct ascospore septum.*

Type species: *Harusavskia elenkinianoides* S. Y. Kondr., X. Y. Wang, S.-O. Oh et J.-S. Hur.

Thallus areolate in the centre and distinctly lobate, with well-developed lobes within peripheral zone; yellow-brownish orange to brownish yellow-orange in peripheral portions matt or somewhat shiny with rather scarce pseudocyphellae, while in the centre pseudocyphellae numerous forming eroded upper surface, whitish-brownish yellow-orange.

Apothecia lecanorine, where thalline exciple yellowish-brownish orange and disc mainly plane, dark brownish brick-orange; true exciple "textura intricata" or "textura globosa", with very thin cell walls; cortical layer of thalline exciple paraplectenchymatous; subhymenium with numerous oil droplets; asci 8-spored; ascospores seem to be simple, septum mainly not developed (not seen in water) or only juvenile stage of septum seen, with well distinct halo to 1–1.2(–1.5) µm wide in K.

Chemistry: Thallus K+ purple. Epihymenium and cortical layer of thalline exciple K+ bright crimson purple washing in liquid; cortex of thalline section K+ bluish, violet- or ink-purple.

Ecology: Growing on siliceous rock.

Distribution: So far known only from the type locality in Chile, South America.

Etymology: Genus *Harusavskia* named after ascospores having "halo", and after similarities with *Rusavskia elegans*, to which this material was originally included.

Taxonomic notes and phylogenetic affiliations: After combined phylogenetic tree this unique monotypic genus is positioned within the *Filsoniana* clade of the subfamily Teloschistoideae (Fig. 1). From all representatives of the Teloschistaceae this genus differs in having ascospores with halo.

Harusavskia elenkinianoides S. Y. Kondr., X. Y. Wang, S.-O. Oh et J.-S. Hur, *spec. nova*

(Fig. 9)

MycoBank nr.: MB 819644.

Similar to Elenkiniana gomerana, *but differs in having shorter and much wider thalline lobes, in having somewhat larger apothecia with lower cortical layer, in having much thicker true exciple especially in basal portion, and in having "textura intricata" or "textura globosa" of true exciple, in having higher hymenium, in having larger ascospores, and in having narrower ascospore septum, as well as in having ascospores with halo.*

Type: Chile. 'Laguna del Maule', Maule, on rock. Lat.: 35° 57′ 25.0″ S; Long.: 70° 34′ 23.9″ W; Alt.: *ca* 1,887 m alt. Coll.: Wang, X. Y., Oh, S.-O. and Hur, J.-S. (CL 120324), 30.01.2012 (KoLRI 014493 – holotype).

Thallus to several cm across, areolate in the centre and distinctly lobate, with well-developed lobes within peripheral zone to 2.5–3.5 mm wide; central portions more or less evenly areolate, areoles 0.4–0.8 mm across and to 0.2–0.3 mm thick, irregular; lobes to 2–3.5 mm long and (0.4–)0.8–1.2 mm wide towards the centre and widened towards the tips to 1–2 mm wide, dissected into secondary lobes to 0.7–1.5 mm long and to 0.7 mm wide (and to 0.4–0.5 mm thick); yellow-brownish orange to brownish yellow-orange in peripheral portions, matt or somewhat shiny with rather scarce pseudocyphellae, while towards the centre number of pseudocyphellae becoming larger/higher to totally eroded upper surface, whitish-brownish yellow-orange; thalline lobes convex, along the lobe ends in peripheral zone seen that the lower portion of lobe white.

Apothecia 0.4–1.3(–1.5) mm diam., and 0.5–0.6 mm thick in section; at first immersed into thalline lobes, then uplifted on thalline warts in the centre, but not constricted at the basis; usually very compactly aggregated covering almost the whole central part, and areoles of central part hardly recognise, because they are completely covered by apothecia; lecanorine to zeorine, where thalline exciple yellowish-brownish orange and disc mainly plane, dark brownish brick-orange. In section true exciple to 40–70(–120) µm thick in the uppermost lateral portion, to 30–70(–80) µm thick in lower lateral portion and (20–)30–60(–150) µm thick in basal portion, intermediate type between "textura intricata" and "textura globosa", with very thin cell walls, where cell lumina to 2–3(–4) μm across; thalline exciple to 100–150(–170) μm thick with cortical layer to 15 μm thick, paraplectenchymatous (in K to 30 μm thick of lax paraplectenchyma, cells to 5–7 μm across); algal cells to 10–11 μm diam.; hymenium 100–120 μm high; epihymenium to 25 μm thick in K more or less becoming darker; paraphyses gradually becoming wider towards the tips to 4–6 μm diam. in water (and distinctly widened towards the tips to 4–5 μm diam. in K); subhymenium to 70–110(–300) μm thick, with numerous oil droplets to 5–6 μm diam.; asci 8-spored, uniseriate; ascospores seem to be simple (see below), straight or somewhat curved, almost cylindrical (10.5–)11–16(–17) × (4.5–)5–6.5(–7) μm in water and (10–)12–15(–16) × (4–)5–7 μm in K (measurements mainly with halo); ascospore wall in water to 0.5 μm thick, and with halo well distinct to 1–1.2(–1.5) μm wide in K (while not seen in water); septum mainly not developed (not seen in water) or only juvenile stage of septum observed in K, to 1.5–2(–2.5) μm wide (septum developed only at spore wall and not developed in the centre).

Chemistry: Thallus K+ purple. Epihymenium and cortical layer of thalline exciple K+ bright crimson purple washing in liquid; cortex of thalline section K+ bluish, violet- or ink-purple.

Ecology: It grows on siliceous rock.

Distribution: So far known only from the type locality in Chile, South America.

Etymology: Species is named after similarities to the Canary Islands endemic *Elenkiniana gomerana*.

Taxonomic notes: This taxon is characterised by the following features: lobate peripheral zone, lobes mainly matt and slightly lighter at the tips, yellowish-brownish or yellow-brownish orange; areoles in the centre richly covered by pseudocyphellae and upper surface seem to be heavily eroded and whitish-yellowish brown in contrast to dark brick-orange discs of apothecia, which are very abundant, almost completely covered some parts in the centre; ascospores mainly simple (only very rarely juvenile septum seen); very soft tissue in the true exciple (well developed, but concave), as well as presence of halo in ascospores.

Harusavskia elenkinianoides is similar to the Canary Islands endemic *Elenkiniana gomerana* (J. Steiner) S. Y. Kondr., Kärnefelt, A. Thell, Elix, J. Kim, A. S. Kondr. et J.-S. Hur in having areolate in the centre and lobate in peripheral zone and the same colouration thallus, in having numerous pseudocyphellae in the centre and more or less immersed into the thallus apothecia, but differs in having shorter (2–3.5 mm vs. to 8 mm long after Steiner 1911), and much wider (0.8–1.2 mm wide towards the centre and to 1–2 mm wide towards the tips, vs. 0.3–0.7(–1) mm wide) thalline lobes, in having somewhat larger apothecia (0.4–1.3(–1.5) mm vs. 0.5–0.7(–1.2) mm diam.), in having lower cortical layer (to 15(–30) μm vs. 37–65 μm after Llimona and Werner 1975, and 16–28

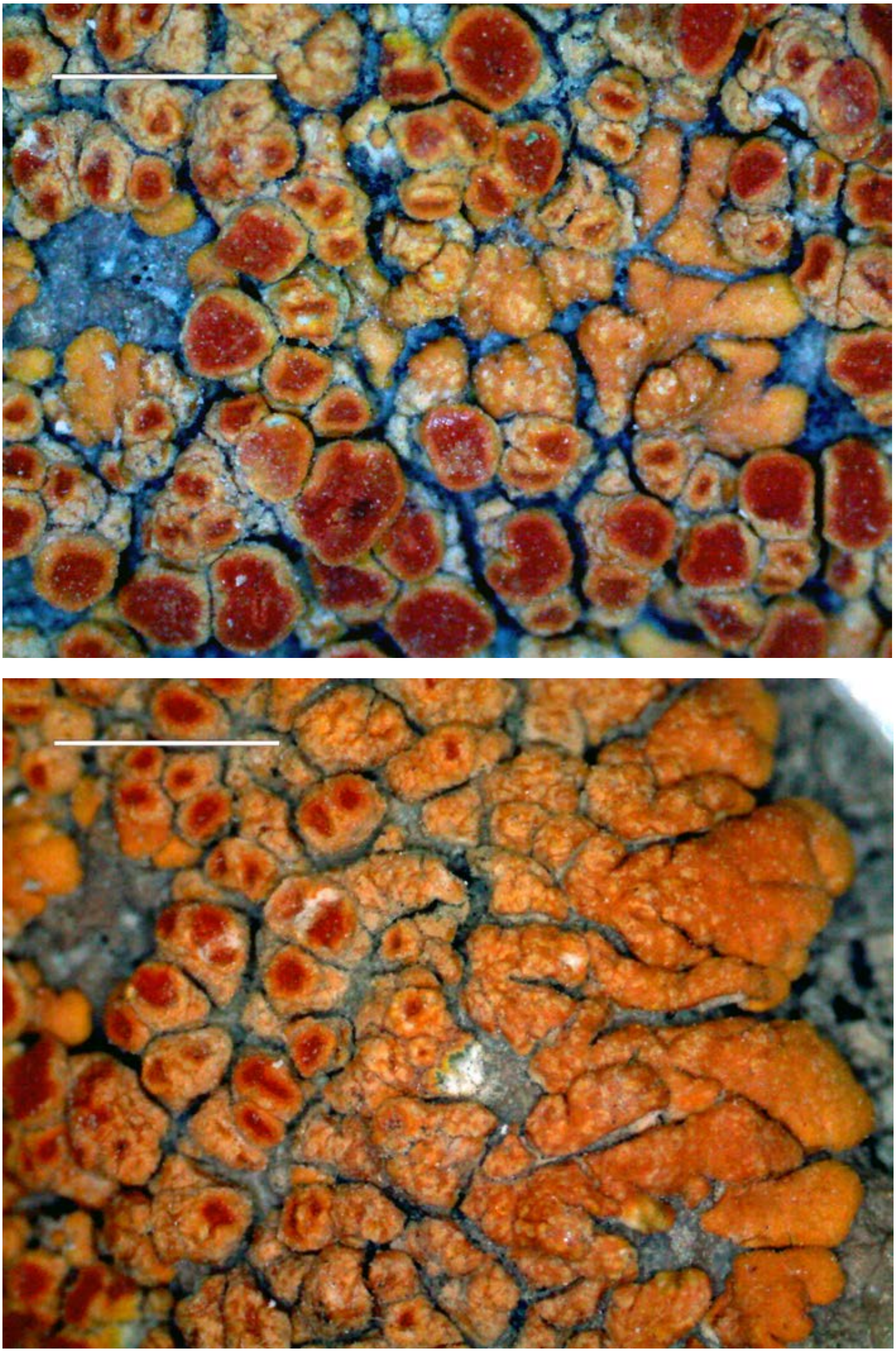

Fig. 9. *Harusavskia elenkinianoides* (holotype). Scale 2 mm. (Photo of S. Kondratyuk)

µm after Steiner 1911), in having much thicker true exciple especially in basal portion (30–60(–150) µm vs. 25 µm thick), and in having "textura intricata" or "textura globosa" of true exciple (vs. of parallel hyphae), in having higher hymenium (100–120 µm vs. 60–90 µm high), in having larger ascospores ((10.5)–11–16(–17) × (4.5–)5–6.5(–7) µm vs. 7.5–9.9–12.5 × 4–5.5–6 µm after Llimona and Werner 1975, and 7.5–11 × 5.5–6.5 µm after Steiner 1911), and in having narrower ascospore septum (1.5–2 µm vs. 2–4 µm wide), as well as in having ascospores with halo.

Harusavskia elenkinianoides is similar to the epiphytic Chilean taxon *Caloplaca chilensis* S. Y. Kondr., Kärnefelt, Frödén et Arup, but differs in having larger thallus (several cm vs. 8–15(–25) mm diam.), being areolate in the centre, in having much wider thalline lobes (0.8–1.2 mm vs. 0.2–0.4 mm wide), in having pseudocyphellae, in having wider paraphysis tips (4–6 µm vs. to 3 µm diam.), in the lack of rhizine-like structures on underside and prothallus, in having smaller and nonstipitate apothecia (0.4–1.3 mm vs. 0.4–2.7 mm diam., stipe 0.3–1 mm long), in having much narrower ascospore septum (1.5–2 µm vs. 4–6(–7.5) µm wide), as well as in saxicolous habit, and having ascospores with halo.

Unfortunately molecular data on *Caloplaca chilensis* are still not available, while data on 6 genes of *Caloplaca chilensis* were mentioned in literature (Gaya *et al.* 2012). However, in fact these data belong to another taxon of the genus *Follmannia*.

After having convex thalline lobes with white sides along the lobe ends in the peripheral zone, as well as after having indistinctly whitish in the centre thallus *Harusavskia elenkinianoides* is similar to *Calogaya mogoltanica* (S. Y. Kondr. et Kudratov) S. Y. Kondr., Kärnefelt, Elix, A. Thell, J. Kim, M.-H. Jeong, N.-N. Yu, A. S. Kondratiuk et J.-S. Hur known from limestone outcrops of Central Asia (Tadjikistan and Iran). However, *Harusavskia elenkinianoides* differs in having brownish orange, epruinose (vs. dirty greenish yellow pruinose) thallus, smooth in the centre (vs. papillate and verruculose in the centre), in having thinner thalline lobes (0.4–0.5 mm vs. to 1–2(–3) mm thick), which well deliminated by wide cracks between each others (vs. indistinct in the centre of thallus and only seen as upper portion of convex surface of cortical layer), in having pseudocyphellae (vs. pruinose but without pseudocyphellae), in having smaller (mainly to 1 mm vs. 0.8–1.8 mm diam. not constricted at the basis zeorine apothecia (lecanorine, with thick thalline margin, attenuated at the basis), in having "textura intricata" or "textura globosa" type of true exciple (vs. well-developed paraplectenchymatous with well-developed matrix) in having shorter ascospores (12–15 × 5–7 µm vs. 15–18 × 6–7 µm) (Kondratyuk and Kudratov 2003).

In contrast to *Rusavskia elegans* (Link) S. Y. Kondr. et Kärnefelt (to which this material was originally included), it has distinctly areolate central portion of thallus, and lobes do not have well-developed lower cortex, as well as ascospores have halo, while septum is not well distinct.

Huriella S. Y. Kondr. et D. Upreti, *gen. nov.*

MycoBank nr.: MB 819645.

Similar to the genus Squamulea *of the subfamily Teloschistoideae, but differs in having areolate (not squamulose!) thallus, smaller zeorine apothecia, in having narrower ascospores, as well as in positioning in separate robust monophyletic branch in the* Amundsenia-Squamulea *clade.*

Type species: *Huriella loekoesiana* S. Y. Kondr. et D. Upreti.

Thallus crustose, small, but often forming larger aggregations, areolate (not squamulose!), dull yellow-brownish or yellowish green. Cortical layer paraplectenchymatous. Hypothallus not observed.

Apothecia small, seem to be biatorine, but zeorine in section, 1(–3–4) per areole, disc dull yellow to bright yellow (especially at initial stages) to dark brownish yellow; own margin concolourous with disc; true exciple paraplectenchymatous; asci 8-spored; ascospores polarilocular, small, widely ellipsoid with rounded ends. Conidiomata and conidia not seen.

Chemistry and ecology see below in species description.

Distribution and species diversity: So far monotypic genus, while possibly includes complex of species. *H. loekoesiana* is known from numerous localities in South Korea, Eastern Asia.

Etymology: It is named after Prof. Jae-Seoun Hur (Suncheon, Republic of Korea), who has kindly supported our study of the Teloschistaceae.

Taxonomic notes and phylogenetic affiliations: After combined phylogenetic analysis, as well as after separate ITS and mtSSU analyses the genus *Huriella* is always positioned in a sister position to the genera *Squamulea* and *Amundsenia* (or between the *Amundsenia-Squamulea* and the *Xanthocarpia* clades, if limited number of genera are included into the phylogenetic analysis) as separate robust monophyletic branch, while the level of support of the whole *Amundsenia-Squamulea* clade in much lower.

After molecular data hitherto available the genus *Huriella* includes only the type species, while we expect in future recognising a complex of taxa. One more species very similar to *H. loekoesiana* is in preparation for official publication.

Huriella loekoesiana S. Y. Kondr. et D. Upreti, *spec. nova*
(Fig. 10)

MycoBank nr.: MB 819646.

Similar to Squamulea micromera, *but differs in having areolate (not squamulose!) thallus, in having larger thalline areoles, in having larger zeorine apothecia and in having narrower ascospores.*

Type: Republic of Korea. Gangwon-do: Jeongseon-gun, Buk-myeon, Mt Baennon, on rock, growing together with *Laundonia flavovirescens* agg., *Rinodina* sp. Lat.: 37° 26′ 34.9″ N; Long.: 128° 45′ 21.3″ E; Alt.: *ca* 748 m a.s.l. Coll.: Wang, X. Y., Jeon, H. S., Lü, L. and Ryu, J. A. (100803), 28.05.2010 (KoLRI 012491 – holotype).

Thallus 2–4(–10) mm across, but forming larger aggregations to 5–10 cm across, crustose, areolate (not squamulose!), dull yellow-brownish, yellow-greenish; areoles (0.2–)0.3–0.8(–1.0) mm across, from regularly rounded to irregular, somewhat distant and scattered, with more or less even surface, becoming thinner towards the edges (not uplifted towards the edges!). Thallus in section to (60–)70–100(–120) μm thick; cortical layer to 10–15 μm thick, outermost portion somewhat brownish-yellowish in places, paraplectenchymatous, cell lumina to 5–7 μm diam./across; algal layer to 40–70 μm thick; medulla not developed or *ca* 10–30 μm thick below the algal layer in places. Hypothallus not observed.

Apothecia 0.2–0.4(–0.5) mm diam., to 0.2 mm thick in the section; 1(–3–4) per areole, immersed in thallus at first then sessile, seem to be biatorine, but zeorine in section; disc dull yellow to bright yellow, especially at initial stages (lighter than thallus) to dark brownish yellow at overmature, own margin bright or light yellow, concolourous with disc of young apothecia; in section zeorine, true exciple to 40–50 μm wide in the uppermost lateral portion, consisting of rounded cells to 5–6(–7) μm diam./across, to 10–15 μm thick in lower lateral portion and to 25–30 μm thick in basal portion, paraplectenchymatous, cell lumina 3–5 μm diam./across; thalline exciple to 40–50 μm thick, with well-developed cortical layer to 10–15 μm thick, paraplectenchymatous; cell rounded 5–7 μm diam./across; algal layer below true exciple entire or in clusters, algal cells to 13–20(–23) μm diam.; hymenium to 50–60 μm high; paraphyses distinctly swollen towards the tips to 5(–6) μm diam.; subhymenium 20–30 μm thick, hyaline, without oil; asci 8-spored; ascospores widely ellipsoid with rounded ends, (8.5–)9–11(–12) × (4.5)5–6 μm in water and becoming especially wider to (8–)10–12(–13) × 6–7.5(–8) μm in K; septum (3.5–)4–5(–6) μm wide in water and 4–6(–7) μm wide in K. Conidiomata and conidia not seen.

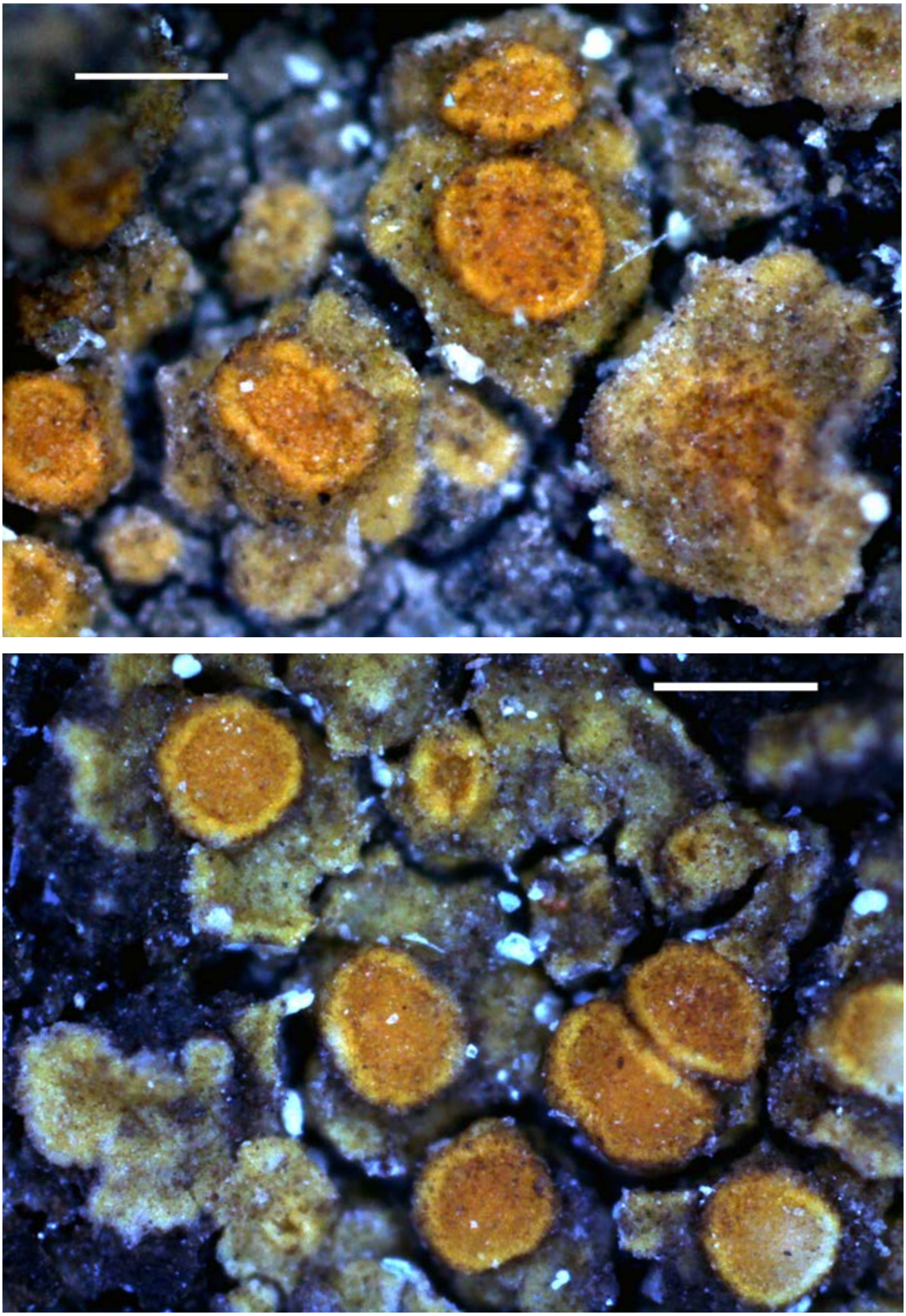

Fig. 10. Huriella loekoesiana (holotype), general habit. Scale 0.5 mm. (Photo of S. Kondratyuk)

Chemistry: Cortical layer of thallus, epihymenium and outer portion of true exciple and thalline exciple K+ purple; outer brownish portions of thalline cortical layer K+ dark brown purple; substances not studied.

Ecology: It grows on siliceous rocks growing often together with *Laundonia flavovirescens* agg., *Rinodina* sp.

Distribution: Known from scattered localities throughout the Republic of Korea, Eastern Asia.

Etymology: Species is named after our good friend and colleague, well-known Hungarian lichenologist László Lőkös (BP, Budapest) in recognition of his contribution to our recent knowledge on Korean lichen flora.

Taxonomic notes: *Huriella loekoesiana* is characterised by very small light yellow discs of apothecia, slightly lighter of (dull brownish yellow) colour of thallus, by areolate thallus with more or less rounded scattered areoles and small and especially narrow ascospores.

Huriella loekoesiana is similar to *Squamulea micromera* (Hue) S. Y. Kondr., L. Lőkös et J.-S. Hur, but differs in having areolate thallus (vs. squamulose), in having larger thalline areoles ((0.2–)0.3–0.8(–1.0) mm vs. 0.2–0.3 mm diam./across), in having larger zeorine apothecia (0.2–0.4(–0.5) mm vs. 0.2–0.3(–0.4) mm diam., biatorine), in having thinner true exciple in basal portion (25–30 μm vs. 40–60 μm thick), in having thinner subhymenium (20–30 μm vs. 50–60 μm thick), and in having narrower ascospores ((8.5–)9–11(–12) × (4.5–)5–6 μm vs. 9–12 × 6–7(–7.5) μm).

Huriella loekoesiana is similar to *Squamulea subsoluta* (Nyl.) Arup, Søchting et Frödén, the type species of genus *Squamulea* Arup, Søchting et Frödén, but differs in having smaller thalline areoles (not squamules, 0.3–0.8(–1.0) mm vs. 0.1–2.5 mm wide); in having smaller apothecia (0.2–0.4(–0.5) mm vs. 0.1–0.6 (–1.0) mm diam.), in having narrower ascospores ((8.5–)9–11(–12) × (4.5–)5–6 μm vs. 9.5–12.5(–14) × 5.5–7 μm), and in having wider ascospore septum (4–5 μm vs. 3–4 μm wide).

It should be emphasised that taxonomic status of *Squamulea micromera* is waiting for confirmation by molecular data from freshly collected specimens. In general, the type specimen of *S. micromera* may be considered within the variation of *S. subsoluta* (Nyl.) Arup, Søchting et Frödén (sensu Wetmore 2003). However, we prefer to keep *S. micromera* as separate taxon until molecular characters of this material will not be checked especially.

There is one more taxon, very similar to *Huriella loekoesiana*, but differing in having smaller ascospores and other anatomical characters, which is probably also the member of the genus *Huriella* is in preparation.

Other specimens studied selected: Republic of Korea. Chungcheongbuk-do, Danyang-gun, Danseong-myeon, Daejam-ri, 584 Road, near Sunam Valley, on rock growing together with *Phaeophyscia* and *Endocarpon*. Lat.: 36° 54′ 20.8″ N; Long.: 128° 18′ 42.9″ E; Alt.:

ca 207 m a.s.l. Coll.: Lee, B. G. (152763), 05.09.2015 (KoLRI 037750 sub *Huriella*). – Gyeongsangbuk-do, Ulleung-do Island, Ulleung-gun, Seo-myeon, Namyang-ri, Turtle Rock (Mt 18-1), seashore rocks, on basalt. Lat.: 37° 27′ 36.5″ N; Long.: 130° 51′ 27.9″ E; Alt.: 2 m a.s.l. Coll.: Kondratyuk, S. Y. and Lőkös, L. (161904), 10.07.2016. (KoLRI 40141 sub *Candelariella*). – Gyeongsangbuk-do, Ulleung-do Island, Ulleung-gun, Ulleung-eup, Dodong-ri, Seaside Trail near Dodong Port, on steep siliceous rocks, growing together with *Squamulea squamosa*. Lat.: 37° 28′ 59.9″ N; Long.: 130° 54′ 40.7″ E; Alt.: 20 m a.s.l. Coll.: Kondratyuk, S. Y. and Lőkös, L. (161998), 11.07.2016. (KoLRI 40236 sub *Squamulea squamosa*); the same locality, (162000), (KoLRI 40238 sub *Squamulea squamosa*). – Jeju-do, Seogwipo-si, Eongsan-eup, Goseong-ri, Seopjicoji, on rock growing together with *Buellia stellulata*, and *Agonimia cavernicola*. Lat.: 33° 19′ 21.0″ N; Long.: 126° 50′ 49.03″ E; Alt.: *ca* 69 m a.s.l. Coll.: Gagarina, L. (140363), 19.06.2014 (KoLRI 022729 sub *Buellia stellulata*); the same locality and collector, (140355), (KoLRI 022723). – Jeju-do, Seogwipo-si, Sangjeong-dong, Yeongtto waterfall, on rock, growing together with *Acarospora ulleungdoensis* [Note: first time recorded from Cheju-do Island]. Lat.: 33° 16′ 01.7″ N; Long.: 126° 29′ 49.00″ E; Alt.: *ca* 210 m a.s.l. Coll.: Joshi, Y. and So, J.-U. (140595), 19.06.2014 (KoLRI 022989). – Jeju-do, Jeju-si, Gujwa-eup, Gimnyeong-ri, Gimnyeong Beach, seaside, on rock, growing together with *Leptogium* sp., *Endocarpon* sp., *Pyrenopsis* sp. Lat.: 33° 33′ 53.91″ N; Long.: 126° 45′ 47.66″ E; Alt.: *ca* 10 m a.s.l. Coll.: Hur, J.-S., Wang, X. Y., Ryu, J. A. and Hur, J. Y. (090020), 19.04.2009 (KoLRI 009784). – Jeollanam-do, Yeosu-si, Nam-myeon, Dumo-ri, Jickpo coast, Geumo-do, on rock. Lat.: 34° 30′ 46.08″ N; Long.: 127° 44′ 16.04″ E; Alt.: *ca* 30 m a.s.l. Coll.: Jayalal, U., Park, J. S. and Ryu, J. A. (120433), 26.04.2012 (KoLRI 015423 sub *Squamulea subsoluta*). – Jeollanam-do, Yeosu-si, Nam-myeon, Simjang-ri, Geumo-do, on rock, growing together with *Thelidium japonicum*. Lat.: 34° 28′ 59.20″ N; Long.: 127° 48′ 15.48″ E; Alt.: *ca* 4 m a.s.l. Coll.: Halda, J. P. (160440), 10.06.2016 (KoLRI 038585 sub *Thelidium japonicum* (det. by Halda, J. P.)). – Jeollanam-do, Sinan-gun, Haui-myeon, Unggok-ri, Haui-do, seaside, on rock growing together with *Orientophila subscopularis*. Lat.: 34° 36′ 07.07″ N; Long.: 126° 00′ 52.02″ E; Alt.: *ca* 20 m a.s.l. Coll.: Oh, S.-O., Park, J. S. and Woo, J.-J. (130672), 28.06.2013 (KoLRI 019017 sub *Orientophila subscopularis*).

Ikaeria S. Y. Kondr., D. Upreti et J.-S. Hur, *gen. nov.*

MycoBank nr.: MB 819647.

Similar to Mikhtomia *of the subfamily Caloplacoideae, but differs in having zeorine or lecanorine apothecia, and in forming separate robust monophyletic branch in the Teloschistoideae.*

Type species: *Ikaeria aurantiellina* (Harm.) S. Y. Kondr., D. Upreti et J.-S. Hur.

Thallus crustose, continuous, yellowish or greyish or whitish yellow. Hypothallus sometimes present.

Apothecia zeorine or lecanorine, disc orange to brownish orange, true exciple of "textura intricata" or somewhat scleroplectenchymatous, asci 8-spored, ascospores polaribilocular.

Chemistry: Not studied.

Ecology: Growing on bark of twigs of shrubs or trees.

Distribution and species diversity: So far this genus is monophyletic and known only from the Canary Islands.

Etymology: The genus is named after the well-known Swedish lichenologist Ingvar Kärnefelt (Lund, Sweden) in recognition of his contribution to lichenology, and who has kindly provided for us an opportunity to participate in field trips to Australia and to the Canary Islands and provided his earlier collections in our disposal.

Taxonomic notes and phylogenetic affiliations: After combined phylogenetic analysis the genus *Ikaeria* is positioned in the subfamily Teloschistoideae. From molecular data hitherto available the genus is monotypic including only type species *I. aurantiellina*, known from the Canary Islands and southwestern Europe.

Ikaeria aurantiellina is similar to *Mikhtomia* of the subfamily Caloplacoideae (or to *Leutrouitia* of the Leutrouitiaceae), but differs in having zeorine or lecanorine apothecia, bipolar ascospores and in forming separate robust monophyletic branch in the Teloschistoideae.

Ikaeria aurantiellina is similar to taxa of the *Mikhtomia* s.l. subphylum, especially of the genera *Laundonia*, *Opeltia*, etc., but differs in positioning in somewhat out position to both Caloplacoideae and Teloschistoideae after ITS, nrLSU and mtSSU analysis, as well as after combined phylogenetic analysis.

This genus often forms common branch with the genus *Yoshimuria*, but level of support of this branch is rather low to make conclusion that they are congeneric. In contrast, both genera, *Ikaeria* and *Yoshimuria*, have the highest level of support if they are presented by the same number of specimens (not shown in Figs 1–4).

Data on unique position of the genus *Ikaeria* were already obtained several years ago. However, these data were obtained from different specimens. Several attempts to get three gene sequences from the same specimen were attempted, but they were unsuccessful. So this genus, the same as genus *Fominiella* (see above) is in urgent need of confirmation by molecular data obtained from the same specimen.

After having broom-like paraphyses often becoming brownish towards the tips the genus *Ikaeria* is similar to the Australian '*Caloplaca*' *marchantiorum* S. Y. Kondr. et Kärnefelt (Kondratyuk *et al.* 2009) (supposed member of the Teloschistoideae or Brownlielloideae). Molecular data on '*Caloplaca*' *marchantiorum* are still not available, while several attempts to extract DNA were attempted.

Van den Boom and Etayo (2006) argue that the name *Caloplaca aegatica* Giralt, Nimis et Poelt, known from western Europe, might be a later synonym of *Ikaeria aurantiellina*.

Klauderuiella S. Y. Kondr. et J.-S. Hur, *gen. nov.*

MycoBank nr.: MB 819648.

Similar to Variospora *of the subfamily Caloplacoideae, but differs in having lobate portions in peripheral portion of thallus, in having lecanorine apothecia, and in forming separate robust monophyletic branch.*

Type species: *Klauderuiella thallincola* (Wedd.) S. Y. Kondr. et J.-S. Hur.

Thallus distinctly lobate (at least in peripheral portions, while areolate in the centre); often large size, yellow to orange, sometimes central and peripheral zone differently coloured (various shades of orange colour), matt, epruinose or rarely pruinose; lobes plane or convex; cortical layer "pseudo" paraplectenchymatous (sensu Clauzade and Roux 1985).

Apothecia lecanorine to zeorine; true exciple scleroplectenchymatous with well-developed matrix in basal portion and to paraplectenchymatous in lateral portions; subhymenium with oil droplets or greyish owing to numerous crystals; ascospores often widened in equatorial portion to rhombic or citriform.

Ecology: Growing especially on calcium containing rocks.

Distribution: Members of this genus are known as widely distributed in the Northern Hemisphere.

Etymology: It is named after the well-known French lichenologist Claude Roux (Klaŭdo Roux in Esperanto) (1945–) in recognition of his enormous contribution to lichenology. He also excellently illustrated the *Klauderuiella thallincola* and *Klauderuiella aurantia* groups in the well-known work "Likenoj de Okcidenta Eŭropo. Illustrata determinlibro." (1985), as well as he is a great patriot of the Esperanto language.

Taxonomic notes and phylogenetic affiliations: In current phylogenetic tree the genus *Klauderuiella*, i.e.: the *Variospora thallincola* group has the highest level of support after combined three gene phylogeny in contrast to very low support of the *Variospora-Bryoplaca* subclade, where it is positioned (see Fig. 2). The latter subclade (i.e.: the *Variospora-Bryoplaca* subclade) is probably still heterogeneous.

After molecular data hitherto available the genus *Klauderuiella* includes three species, i.e.: *K. thallincola*, *K. aurantia* and *K. flavescens*.

From morphological point of view the genus *Klauderuiella* has very good (distinct) character – lobate in peripheral portion of the thallus in contrast to crustose members of the genus *Variospora* s. str. (i.e.: *V. velana* (A. Massal.) Arup, Søchting et Frödén, *V. latzelii* (Servit) S. Y. Kondr., *V. macrocarpa* (Anzi) Arup, Søchting et Frödén, *V. dolomiticola* (Hue) Arup, Søchting et Frödén and *V. kudratovii* (S. Y. Kondr., B. Zarei-Darki et Hur) S. Y. Kondr., Kärnefelt, A. Thell, Elix, J. Kim, A. S. Kondr. et Hur).

The *Klauderuiella* is somewhat analogous to genera *Flavocitrina* and *Calogaya* in the Xanthorioideae and *Filsoniana* in the Teloschistoideae. However, the genus *Klauderuiella* differs in having different type of paraplectenchymatous tissue in cortical layer, as well as in having typical bipolar ascospores (without thickening at poles).

Status of *Variospora latzelii* and *V. australis* hitherto included in this genus *Variospora* only after ITS phylogeny should be confirmed by data on nrLSU and mtSSU.

Possibly one more monophyletic group will be segregated from the *Variospora* s.l. branch of the Caloplacoideae in future.

Laundonia S. Y. Kondr., L. Lőkös et J.-S. Hur, *gen. nov.*

MycoBank nr.: MB 819649.

Similar to the genus Mikhtomia *of the subfamily Caloplacoideae, but forming separate robust monophyletic branch.*

Type species: *Laundonia flavovirescens* (Wulfen) S. Y. Kondr., L. Lőkös et J.-S. Hur.

Thallus crustose, continuous or areolate, margin thinning at edge, without elongated lobes; yellowish grey, yellowish orange, tan orange to greenish yellow or greenish orange, pruinose, without vegetative propagules or sorediate; prothallus absent or present, black.

Apothecia of medium size, lecanorine or biatorine, disc dark orange, reddish orange or brownish orange; true exciple consisting of radiating hyphae to "textura intricata" in basal portion; asci 8-spored; ascospores polaripolucar, hyaline.

Unfortunately data on conidia of type species and *L. persimilis* (see Wetmore 2007) not provided, while description of conidiomata present in descriptions.

Chemistry: Parietin, fallacinal, emodin, and teloschistin. Chemistry of *L. persimilis* was not especially investigated, however, C+ reaction may illustrate the presence of gyrophoric or lecanoric acids.

Ecology: It grows on wood or bark.

Etymology: It is named after the well-known British lichenologist Jack Rodney Laundon (1934–) who has made important contribution to taxonomy of this species complex.

Distribution: Type species, i.e. *Laundonia flavovirescens* is widely distributed in the Northern Hemisphere (see notes below), while *L. persimilis* is known only from western North America.

Taxonomic notes and phylogenetic affiliations: After combined phylogenetic analysis the genus *Laundonia* is positioned in out position to the other genera of the *Mikhtomia* clade of the Caloplacoideae (Fig. 2), and it includes two species, i.e.: *L. flavovirescens* and *L. persimilis*.

In premolecular era it was thought that *Laundonia flavovirescens* is a rather common taxon distributed worldwide (see Wetmore 2007). However, when we have started extraction DNA and further sequencing appeared material morphologically similar to *Laundonia flavovirescens* to belong to many other genera like *Yoshimuria* S. Y. Kondr., Kärnefelt, Elix, A. Thell et Hur, *Mikhtomia* S. Y. Kondr., Kärnefelt, Elix, A. Thell et J.-S. Hur (subfamily Caloplacoideae), *Orientophila* Arup, Søchting et Frödén (subfamily Xanthorioideae) (Kondratyuk *et al.* 2016*d*), while *Laundonia flavovirescens* is rather rare itself.

Species of the genus *Laundonia* are very similar to members of the genus *Mikhtomia* in its current sense, especially in the Eastern Asian region. Many species of the latter genus (i.e. *Mikhtomia*), as well as the genus *Oxneriopsis* were segregated from the so-called *Caloplaca flavovirescens* group.

However, genus *Laundonia* differs in having zeorine or lecanorine apothecia, in the lack of vegetative propagules, and in positioning in the outermost position to the genus *Mikhtomia* of the *Mikhtomia* s.l. clade.

It can be similar to some species of the genus *Tomnashia* of the Xanthorioideae (see below), but differs in having lecanorine mainly orange to dark orange apothecia (without reddish tinge), as well as in preference to non-calcareous rocks, while occasionally growing on calcareous rocks, too.

From morphological point of view the rare, Eastern Asian, recently described taxon *Caloplaca kedrovopadensis* S. Y. Kondr. et J.-S. Hur (Kondratyuk *et al.* 2014*b*, 2016*a*) can be also candidate in being member of the genus *Laundonia*. However, molecular data are still missing for this taxon.

Earlier species of this genus were included mainly after ITS phylogeny to the genus *Gyalolechia* s.l. (Arup *et al.* 2013*a*), which was characterised by dominance of fragilin and presence of smaller amounts of parietin and emodin (often/sometimes with additional depsidones). However, as it was later shown the *Gyalolechia* s. str. branch including *G. aurea* and *G. canariensis* has the highest level of support, but this branch is in out position to the *Mikhtomia* s.l. clade (Kondratyuk *et al.* 2014*c*, and Fig. 2 in this paper). The genus *Laundonia* forms separate robust monophyletic branch within the *Mikhtomia* s.l. clade.

Lazarenkoiopsis S. Y. Kondr., L. Lőkös et J.-S. Hur, *gen. nov.*

MycoBank nr.: MB 819650.

Similar to genus Solitaria *of the subfamily Xanthorioideae, but differs in having distinctly cracked-areolated, much thicker thallus, numerous oil droplets in the hymenium, "textura intricata" tissue in the true exciple, not swollen towards the tips of paraphyses, as well as in having higher concentrations of fragilin and detectable* *quantity of emodin, 7-chloro-emodin, erythroglaucin, 7-chloroparietinic acid, physcoin bysanthrone, physcoin 9-anthrone and physcoin 10-anthrone, as well as in positioning in the Caloplacoideae.*

Type species: *Lazarenkoiopsis ussuriensis* (Oxner, S. Y. Kondr. et Elix) S. Y. Kondr., L. Lőkös et J.-S. Hur.

Thallus rather thick in the centre and very thin at the periphery, smooth to distinctly cracked by rather broad cracks, upper surface whitish, dull greyish white to grey, greenish grey-brown or dull greenish yellow with well-contrasting bright yellow, dull yellow or dull brownish yellow soralia. Soralia initially rounded or irregular, usually at the margins of areoles, then becoming confluent and spectacular elongated, fissure-like. Sorediose mass convex, yellow to greenish yellow or dull brownish yellow.

Apothecia zeorine or lecanorine, disc brown to dark brown, own margin dull yellow to almost colourless; cortical layer of thalline exciple paraplectenchymatous; true exciple of "textura intricata" or poorly developed scleroplectenchyma with cell lumina of 1–1.5 μm diam.; asci 8-spored; ascospores broadly ellipsoid to almost spherical or elongated and fusiform.

Chemistry: It contains fragilin (major), parietin (major/minor), emodin and physcoin bysanthrone (minor), and 7-chloroemodin, erythroglaucin, 7-chloroparietinic acid, physcoin 9-anthrone, and physcoin 10-anthrone (trace).

Etymology: It is named after the well-known Ukrainian bryologist Andrij Sozontovych Lazarenko (1901–1979) for his contribution to the bryoflora of the Eastern Asian region.

Ecology: It grows on various deciduous trees, especially on *Acer pseudosieboldianum*, growing together with *Oxneriopsis oxneri* and *Caloplaca cerina*.

Taxonomic notes and phylogenetic affiliations: *Lazarenkoiopsis ussuriensis* is similar to *Solitaria chrysophthalma* (Degel.) Arup, Søchting et Frödén, but differs in having a much thicker, distinctly cracked-areolated thallus, numerous oil droplets in the subhymenium, more or less "textura intricata" tissue in the true exciple (scleroplectenchymatous in *S. chrysophthalma*), paraphyses not swollen towards the tips (4–6.5 μm wide in *S. chrysophthalma*), a thinner exciple, as well as higher concentrations of fragilin and detectable quantity of emodin, 7-chloroemodin, erythroglaucin, 7-chloroparietinic acid, physcoin bysanthrone, physcoin 9-anthrone, and physcoin 10-anthrone, as well as in positioning in the Teloschistoideae (Fig. 1). The dimensions of the ascospores and ascospore septa are very similar for these two species.

Lazarenkoiopsis ussuriensis regularly grows together with *Oxneriopsis oxneri* (S. Y. Kondr. et Søchting) S. Y. Kondr., D. Upreti et J.-S. Hur, so it often appears that the same thallus produces both isidia and soredia. The thalli of both species (especially after long storage in herbaria) are the same colour.

However, when growing side by side, *O. oxneri* differs by characteristic ascending thalline fragments exposing the white medulla, while upper surface of *Lazarenkoiopsis ussuriensis* is always entire and medulla not apparent (except for soralia). *Caloplaca cerina* (Ehrh. ex Hedw.) Th. Fr. is also sometimes associated with *Lazarenkoiopsis ussuriensis*, but differs by its bright yellowish discs with a greyish thalline margin (in contrast to the darker brown discs in *L. ussuriensis*), as well as in lacking of soralia.

Suggestion that "*Caloplaca oxneri* would appear to be closely related to *C. ussuriensis*, but differs in having phyllidia and schistidia rather than well-developed soralia and convex sorediose mass" (Kondratyuk *et al.* 1996) is not supported by current molecular data. These taxa are members of the different robust monophyletic branches, i.e. the *Oxneriopsis* and *Lazarenkoiopsis* of the subfamilies Caloplacoideae and the Teloschistoideae, respectively.

Nevilleiella S. Y. Kondr., et J.-S. Hur, *gen. nov.*

MycoBank nr.: MB 819651.

Similar to genus Filsoniana *of the subfamily Teloschistoideae, but differs in having crustose thallus and biatorine apothecia, as well as forming separate robust monophyletic branch.*

Type species: *Nevilleiella marchantii* (S. Y. Kondr. et Kärnefelt) S. Y. Kondr. et J.-S. Hur.

Thallus crustose, developing almost spherical pustule-like formations or comprised of discrete, rather scattered distant areoles (which do not form entire crust), brownish yellow to brownish orange, sometimes with whitish pruina; areoles very variable, often convex, warty to almost spherical, sometimes with schizidia-like formations, cortical layer palisade paraplectenchymatous. Apothecia biatorine, sometimes becoming zeorine; disc and own margin rusty brownish orange or brownish orange, concolourous with thallus; true exciple paraplectenchymatous with distinct matrix in basal portion; subhymenium with oil droplets; ascospores polarilocular with almost invisible septum mounted in water (better seen in K). Conidia narrowly bacilliform, 3–4 × 0.8–1 μm.

Chemistry: Parietin (major), fallacinal (submajor/minor), parietinic acid, teloschistin (minor/trace) present.

Ecology: It forms crust on clayey soil in saline areas, open localities or in mallee areas or on siliceous rocks along the coast and rough pasture, heathland and dry sclerophyll forest of Australian continent.

Etymology: This genus is named after Dr Neville Marchant, who kindly assisted us during our field work in Western Australia.

Distribution and species diversity: The genus includes two species rather widely distributed in Australia.

Taxonomic notes and phylogenetic affiliations: After combined phylogenetic analysis the genus *Nevilleiella* is positioned within the *Filsoniana* clade of the Teloschistoideae (Fig. 1).

The genus *Nevilleiella* is similar to genus *Filsoniana* S. Y. Kondr., Kärnefelt, Elix, A. Thell et J.-S. Hur of the subfamily Teloschistoideae, but differs in having crustose thallus and biatorine apothecia, as well as forming separate robust monophyletic branch.

The type species *Nevilleiella marchantii* was mentioned as the closest to the member of the genus *Filsoniana* S. Y. Kondr., Kärnefelt, Elix, A. Thell et J.-S. Hur, i.e. to *F. scarlatina* in the original publication (Kondratyuk *et al.* 2007). It was also compared with another Australian member of the same genus *Filsoniana* i.e.: *F. rexfilsonii* (S. Y. Kondr. et Kärnefelt) S. Y. Kondr., Kärnefelt, Elix, A. Thell et J.-S. Hur, but species of the genus *Nevilleiella* differs in the lack of oil droplets and oil cells in the paraphyses, and in having a very thin cortical layer, as well as much smaller, uniformly sized, ascospores in an ascus.

The taxonomic status of the second member of this genus, i.e. *Nevilleiella lateritia* is considered as rather questionable (Kantvilas 2016). Furthermore *Nevilleiella lateritia* considered as possible conspecific taxon with the *Filsoniana scarlatina* and *F. rexfilsonii*. However, molecular data confirm that these species have very good support as different species and that these taxa are members of two separate robust monophyletic branches (see also Kondratyuk *et al.* 2013*b*).

Opeltia S. Y. Kondr. et L. Lőkös, *gen. nov.*

MycoBank nr.: MB 819652.

Similar to the genus Blastenia, *but differs in having zeorine and rusty brown apothecia, in having paraplectenchymatous true exciple, in having hymenium and especially subhymenium inspersed with oil, and in forming separate robust monophyletic branch in the* Mikhtomia *s.l. clade.*

Type species: *Opeltia neobaltistanica* (S. Y. Kondr. et J.-S. Hur) S. Y. Kondr. et L. Lőkös.

Thallus crustose, areolate to subsquamulose, margin abrupt at edge, without elongated lobes; whitish to dirty white, weakly yellowish whitish in places or yellowish orange, without asexual propagules or sorediate; prothallus absent. Apothecia biatorine, zeorine to biatorine or lecanorine; disc dark reddish orange to rusty brown; true exciple paraplectenchymatous in basal portion to mesodermatous paraplectenchymatous with well-developed matrix; hymenium and especially subhymenium inspersed with oil; asci 8-spored, ascospores polarilocular, often very varying in shape.

Chemistry: Parietin and emodin are recorded, while chemistry of all species of this genus is not studied in the same extent.

Ecology: It grows on bark of *Juniperus*, growing together with species of the genera *Candelariella*, *Caloplaca*, *Lecidella*, *Rinodina*, *Phaeophyscia*, and *Physconia*.

Etymology: The genus is named after the well-known German lichenologist Josef Poelt, in recognition of his enormous contribution to lichenology.

Distribution and species diversity: Two taxa, including the type species *O. neobaltistanica*, and *O. juniperina*, are known from Eurasia, while one species (*O. arizonica*) is known from southern North America.

Taxonomic notes and phylogenetic affiliations: After combined analysis the genus *Opeltia* is a member of the *Mikhtomia* s.l. clade of the Caloplacoideae, but forming separate robust monophyletic branch (Fig. 2). After molecular data hitherto available the genus *Opeltia* includes three species, i.e.: *O. arizonica*, *O. juniperina* and *O. neobaltistanica*.

After having yellow-orange areolate thallus it is similar to species of genus *Laundonia* (i.e. *L. flavovirescens*), while mainly growing on bark (vs. on rock), and with the exception of *O. arizonica* apothecia do not have visible thalline margin.

As it was mentioned earlier species of this genus were included mainly after ITS phylogeny to the genus *Gyalolechia* s.l. (Arup *et al.* 2013*a*), which was characterised by dominance of fragilin and presence of smaller amounts of parietin and emodin (often/sometimes with additional depsidones). However, as it was later shown the *Gyalolechia* s. str. branch including *G. aurea* and *G. canariensis* has the highest level of support, but this branch is in out position to the *Mikhtomia* s.l. clade (Kondratyuk *et al.* 2014*c*). The genus *Opeltia* forms separate robust monophyletic branch within the *Mikhtomia* s.l. clade.

Oxneriopsis S. Y. Kondr., D. Upreti et J.-S. Hur, *gen. nov.*

MycoBank nr.: MB 819653.

Similar to the genus Mikhtomia *s. str., but differs in having more brownish orange to dark brown orange or even blackish brown-orange discs of apothecia and in forming separate robust monophyletic branch.*

Type species: *Oxneriopsis oxneri* (S. Y. Kondr. et Søchting) S. Y. Kondr., D. Upreti et J.-S. Hur.

Thallus crustose, continuous to cracked or areolated, often forming vegetative propagules, phyllidia or schizidia; greyish or greenish grey, while portions with phyllidia and schizidia bright yellow or greenish yellow to dull yellow.

Apothecia lecanorine to zeorine, disc yellow, yellow-orange to orange-brown, dark brown or blackish brown; thalline margin as usual bright yellow; hymenium inspersed with oil; asci 8-spored; ascospores polarilocular, hyaline. Conidia bacilliform, 2.5–3(–3.5) × 0.8–1 μm.

Chemistry: Fragilin (major) recorded for some taxa, however, chemistry of all taxa is not studied especially.

Ecology: It grows on bark of broad-leaved trees.

Distribution and species diversity: So far the genus includes Eastern Asian and North American taxa.

Etymology: It is named after the well-known Ukrainian lichenologist Alfred Mykolajovych Oxner (1898–1973) in recognition of his contribution to the Eurasian lichen flora.

Taxonomic notes and phylogenetic affinities: After ITS phylogeny species of genus *Oxneriopsis* were included into the genus *Gyalolechia* s.l. (Arup *et al.* 2013*a*). However, after combined phylogenetic analysis, based on nrITS, nrLSU and mtSSU sequences, the genus forms separate robust monophyletic branch within the *Mikhtomia* s.l. clade.

After molecular data hitherto available status of such species as *Oxneriopsis oxneri* and *O. yeosuensis* is confirmed within the genus. However, one more taxon (mentioned as *O.* aff *yeosuensis*) (see Fig. 2 and Appendix) is still under special revision and its status will be discussed separately.

It should be emphasised that within the genera *Oxneriopsis* and *Mikhtomia* we have the same tendency in forming phyllidia and schizidia, and two species *Oxneriopsis oxneri* and *Mikhtomia subflavorubescens* are sometimes morphologically totally the same. In this situation some specimens of *Mikhtomia subflavorubescens* were previously identified as "*Caloplaca oxneri*" (see Kondratyuk *et al.* 2014*a*) and superfluous combination "*Mikhtomia oxneri*" was proposed (Kondratyuk *et al.* 2014*a*). However, we should emphasise that combination was based on incorrectly identified specimens of *Mikhtomia subflavorubescens* and "*M. oxneri*" should be taken out from the usage. Correct place for this taxon is the *Oxneriopsis* branch. Fortunately Arup with colleagues (Arup *et al.* 2013*a*) have provided data on isotype specimens of the *Caloplaca oxneri*, and it allowed to clarify situation with real position of this taxon. After molecular data *Oxneriopsis oxneri* is very distinct, and appeared to be rather rare in South Korea for example (only a few specimens were confirmed as *Oxneriopsis oxneri*). At the same time *Mikhtomia subflavorubescens* is extremely common in this country, for which we have data more than 10 specimens, and almost half of specimens previously were incorrectly identified as "*M. oxneri*". However, they all are confirmed to be *Mikhtomia subflavorubescens* after molecular phylogeny.

A separate paper on the molecular characters of the members of the genus *Mikhtomia* is still in progress (Kondratyuk *et al.* in prep.), however, some preliminary results are included here as proposals to new combinations (see below).

Unfortunately molecular data are still absent on such rare recently described taxon as '*Caloplaca*' *taranii* S. Y. Kondr., S. I. Tchabanenko, I. Galanina et L. Yakovczenko (Kondratyuk *et al.* 2013*a*), which differs in forming confluent soredious mass, but in general very similar to *Oxneriopsis oxneri*. May be the future involving this taxon in molecular phylogeny of the Teloschistaceae will confirm its status inside of the *Oxneriopsis* branch.

After morphological data we would expect that another Eastern Asian taxon '*Caloplaca*' *kiewkaensis* Yakovczenko, Galanina et S. Y. Kondr. (Kondratyuk *et al.* 2011), may also belong to this genus. However, we still do not have molecular data on this rare taxon.

It should be emphasised that in general the problem of molecular phylogeny of the *Mikhtomia* s.l. branch is that we do not have molecular data on the type species of the genus *Mikhtomia*, i.e. *M. gordejevii*, which was described in the 1920s and type specimen is very old. This species should be recollected in the type locality for the further extraction DNA and getting sequences for inclusion in the phylogenetic tree. In that case we will understand better importance of morphological and chemical characters for taxonomy of all genera of the *Mikhtomia* s.l. branch.

Teuvoahtiana S. Y. Kondr. et J.-S. Hur, *gen. nov.*

MycoBank nr.: MB 819654.

In having lobate, areolate and squamulose representatives in the same robust monophyletic branch Teuvoahtiana *is similar to the Australian genus* Filsoniana *of the Teloschistoideae, but differs in positioning in the subfamily Xanthorioideae.*

Type species: *Teuvoahtiana rugulosa* (Nyl.) S. Y. Kondr. et J.-S. Hur.

Thallus crustose, areolate to squamulose, with rarely elongated in peripheral zone areoles to distinctly lobate; areolae and lobes usually very thick, convex, yellow-orange, dull yellowish brown to dull orange-brown, owing to numerous apothecia often dull reddish orange-brown; cortical layer paraplectenchymatous to mesodermatous paraplectenchymatous.

Apothecia of medium size to rather large, often densely aggregated, lecanorine to zeorine, disc plane, yellowish, roseus to pinkish orange-brown; true exciple of "textura intricata", asci (1–)2–4–6–8 spored, ascospores polaribilocular.

Chemistry is not studied in all members of this branch.

Ecology: It grows on non-calcareous rocks.

Etymology: It is named after the well-known Finnish lichenologist Teuvo Ahti (H, Helsinki, Finland) in recognition of his contribution to lichenology and especially to development of lichenological investigation in the South American continent.

Distribution: So far all members of this genus are distributed only within the South American continent.

Taxonomic notes: After combined phylogenetic analysis it is positioned in the Xanthorioideae as separate robust monophyletic branch or in some cases as sister branch to the *Xanthopeltis* branch (Fig. 3). The genus includes three South American species after molecular data hitherto available.

Teuvoahtiana rugulosa (Nyl.) S. Y. Kondr. et J.-S. Hur and *T. altoandiana* (Malme) S. Y. Kondr. et J.-S. Hur, as well as *T. fernandeziana* (Zahlbr.) S. Y. Kondr. et J.-S. Hur were compared to each other in original descriptions as the closest or the most similar taxa (Malme 1926, Zahlbruckner 1917). Molecular data entirely confirm their close relations.

Among taxa mentioned we have had difficulties only with identification of specimen of *Teuvoahtiana fernandeziana,* because our specimen differs in having somewhat thicker, somewhat *Toninia*-like thallus. However, as far details on ascospores and apothecia are within the *Teuvoahtiana fernandeziana* diagnosis (Malme 1926, Zahlbruckner 1917) we still hesitate to produce new taxon name. However, further molecular studies should clarify if position of this species in the genus *Teuvoahtiana* is correct, and if identification of specimen cited will be supported by further molecular data.

There are only a few genera in the Teloschistaceae, where we have distinctly lobate and crustose (elobate) taxa in the same monophyletic branches, i.e. the Australian genus *Filsoniana* (Teloschistoideae) and genera *Athallia, Gondwania, Orientophila* and *Teuvoahtiana* from the Xanthorioideae. In this case the distinctly lobate taxa *Filsoniana australiensis*, *Athallia scopularis*, *Orientophila subscopularis*, *O. yakjidoensis*, *O. jungakimae* and *Teuvoahtiana altoandina* are members of genera, where major portion of species diversity of the genera mentioned is represented by crustose representatives. In the genus *Gondwania* the majority of species is lobate taxa, while crustose lichens are also present (Kondratyuk *et al.* 2014*c*).

However, it should be mentioned that last data on *Orientophila* shows that this genus is more heterogeneous and more diverse as it was thought before (Arup *et al.* 2013*a*, Kondratyuk *et al.* 2013*b*, 2016*d*) and probably in the future the genus *Orientophila* will contain larger number of crustose species, or it will be divided into two or more separate branches. Special revision of this genus is also in progress (Kondratyuk *et al.* 2017).

Additionally to *Teuvoahtiana rugulosa*, *T. altoandina* and *T. fernandeziana* there are also undescribed taxa as '*Caloplaca* sp. 2' and '*Caloplaca* sp. 4' (sensu

Arup *et al.* 2013*a*), which belong to this monophyletic branch. However, they are still not legally described (not shown in the tree) unfortunately.

Arup with colleagues (Arup *et al.* 2013*a*) have recognised only *Caloplaca altoandina* and 4 undescribed taxa (mentioned as *Caloplaca* sp. 1–4), which were in sister position to the genus *Xanthopeltis*. After data of these authors monophyletic branch with *Xanthopeltis* has had high level of support, while *C. altoandina* did not have good support based on their matrix at that time. Taxa mentioned as *Caloplaca* sp. 1 and *Caloplaca* sp. 3 were included in this branch only after ITS phylogeny, while data on nrLSU and mtSSU were (and still are) missing.

Our data confirm previous data that *Teuvoahtiana* is closely related to the genera *Xanthopeltis* and *Austroplaca*. However, on another side, our data do not confirm previous data that *Austroplaca* is positioned in one clade with *Gondwania* and *Cerothallia*. The latter two genera are in somewhat out position to *Xanthomendoza* s.l. subphylum of the Xanthorioideae after our phylogenetic analysis.

Tomnashia S. Y. Kondr. et J.-S. Hur, *gen. nov.*

MycoBank nr.: MB 819655.

Similar to genus Blastenia *of the subfamily Caloplacoideae, but differs in having often yellow to yellowish orange or apricot orange thallus and mainly orange apothecia, as well as forming separate robust monophyletic branch in the Xanthorioideae.*

Type species: *Tomnashia rosei* (Hasse) S. Y. Kondr. et J.-S. Hur.

Thallus crustose, immersed into calcareous rock or absent, to continuous or areolate, white, grey, greenish yellow or yellowish orange to orange or apricot orange, in some taxa (*T. ludificans*) with a waxy translucent appearance, without asexual propagules. Prothallus absent, or yellow-orange if present.

Apothecia small biatorine, disc orange to reddish brown; true exciple consisting of radiating hyphae, in basal portion of "textura intricata"; asci 8-spored; ascospores polarilocular, hyaline.

Chemistry: Parietin, fallacinal, emodin, teloschistin and parietinic acid.

Ecology: It grows on calcareous rock, on soil and on non-calcareous rocks.

Etymology: It is named after the well-known American lichenologist Thomas H. Nash III (1945–) in recognition of his contribution to lichenology, especially of the North American lichen flora.

Distribution: Species of this genus are hitherto known only from North America, where mainly distributed in the southwestern part of the continent.

The genus *Tomnashia* similarly to the genera *Polycauliona* s. str. and *Igneoplaca* S. Y. Kondr., Kärnefelt, Elix, A. Thell et J.-S. Hur of the *Polycauliona* s.l. subphylum has rather limited distribution in coastal southwestern North America, while the other genera of the *Polycauliona* s.l. subphylum, like *Mass-*

jukiella S. Y. Kondr., Fedorenko, S. Stenroos, Kärnefelt, Elix, J.-S. Hur et A. Thell, *Verrucoplaca* S. Y. Kondr., Kärnefelt, Elix, A. Thell et J.-S. Hur, *Scythioria* S. Y. Kondr., Kärnefelt, Elix, A. Thell et J.-S. Hur are characterised by much wider distribution in the Northern Hemisphere or in the world.

Taxonomic notes and phylogenetic affiliations: After combined phylogenetic analysis the genus *Tomnashia* is positioned in the outermost position among monophyletic groups of the *Polycauliona* s.l. subclade (i.e. *Verrucoplaca, Igneoplaca, Massjukiella*) of the Xanthorioideae, which has rather low level of support (see tree Xanthorioideae), and in the most distant from the *Polycauliona* s. str. (i.e. *P. coralloides*) branch (Fig. 3).

From other members of the *Polycauliona* s.l. subphylum *Tomnashia* differs in having crustose, continuous, from immersed and indistinct to distinctly areolate thallus without elongated areoles at the margin, as well as mainly bright orange to reddish brown biatorine apothecia.

In having biatorine apothecia may be similar to the members of the genera *Blastenia* A. Massal. and *Eilifdahlia* S. Y. Kondr., Kärnefelt, Elix, A. Thell et J.-S. Hur, as well as of *Laundonia* S. Y. Kondr., L. Lőkös et J.-S. Hur and *Mikhtomia* S. Y. Kondr., Kärnefelt, Elix, A. Thell et J.-S. Hur of the subfamily Caloplacoideae, but the genus *Tomnashia* is positioned in separate robust monophyletic branch of the Xanthorioideae.

Additionally to *Tomnashia rosei, T. nashii, T. luteominia* and *T. ludificans* this branch includes also '*Polycauliona* sp. 37' (after Arup *et al.* 2013*a*), but this taxon is still not described (and not included in the final tree).

Xanthaptychia S. Y. Kondr. et S. Ravera, *gen. nov.*

MycoBank nr.: MB 819656.

Similar to the genus Seirophora, *but differs in having scleroplectenchymatous tissue in thallus and cortex of thalline margin of apothecia, and in distribution mainly in high altitude of mountainous regions of northern Eurasian or North American, as well as in forming separate robust monophyletic branch.*

Type species: *Xanthaptychia orientalis* (Frödén) S. Y. Kondr. et S. Ravera.

Thallus foliosus to subfruticose or caespitose to pulvinate, usually rosette-forming, small; lobes dorsiventral, horizontally orientated and three different portions (main lobes, secondary lobules and terminal portions observed (see also Kondratyuk *et al.* 2013*c*)), or overlapping and often ascending, branching mostly irregular to anastomosing, rarely podetium-like; upper surface whitish grey, often brownish grey partly brownish yellow to yellow, lower side whitish grey; tomentum often well developed on upper surface; in section cortical layer scleroplectenchymatous; lower cortex absent or developed only on small portions; some taxa with various vegetative propagules.

Apothecia laminal, lecanorine, usually very large, to 5(–10) mm diam., disc yellow, orange to reddish orange or brownish orange; cortex scleroplectenchymatous; asci 8-spored, polarilocular with narrow septa, hyaline; conidia narrowly bacilliform, 3–3.8 × 0.9–1 μm. [Note: data of Frödén and Litterski (2005) on conidia bacilliform to narrowly ellipsoid, (3–)3.5–4(4.5) × (1–)1.4–1.8(–2) μm for *Xanthaptychia orientalis* are very doubtful and they are need in verifying].

Chemistry: Parietin (major) and low concentrations of emodin, fallacinal, teloschistin, parietinic acid and erythroglaucin.

Ecology: Corticolous species growing on *Picea schrenkiana, Ephedra canisetina, Acer pubescens, A. regalis, Rhamnus sintesii, Pistacia vera, Sageretia laetevirens, Amygdalus buharica,* and species of the genera *Populus, Juniperus* and *Acer* in montane belt between altitudes 1,100–2,100 m.

Etymology: It is named after similarities with members of the genus *Anaptychia* of the Physciaceae (i.e. lack of lower cortical layer) and xanthorioid lichens of the Teloschistaceae (in having foliose thallus).

Distribution: Northern Hemisphere with tendency to high altitudes of mountainous regions or polar latitudes of Eurasia and North America. Soredious taxa *Xantaptychia contortuplicata* and *X. blumii* supposed to have wider distribution than the esoredious species *X. orientalis*. However, the latter two taxa are rather recently described and we still have limited data on their distribution (see Kondratyuk *et al.* 2013*c*, 2015*b*, 2016*b*). In the Mediterranean region species of the genera *Xantaptychia* and *Seirophora* (i.e.: *Xanthaptychia orientalis* and *Seirophora villosa*) are completely allopatric.

Taxonomic notes and phylogenetic affiliations: After combined phylogenetic analysis the genus positioned in the *Seirophora* s.l. clade of the Caloplacoideae, where it is forming separate robust monophyletic branch (Fig. 2). From molecular data hitherto available the genus *Xanthaptychia* includes four species, i.e.: *X. blumii, X. aurantiaca, X. contortuplicata* and *X. orientalis,* while status of the other *Seirophora* species including *S. scorigena, S. tenera* and others is still waiting for clarifying.

Similar to the genus *Seirophora,* but differs in having scleroplectenchymatous tissue in thallus and cortex of thalline margin of apothecia (vs. prosoplectenchymatous), and in distribution mainly in high altitude of mountainous regions of northern Eurasian or North American (vs. Mediterranean region with preference to its western regions), as well as in forming separate robust monophyleric branch.

From 2013 the position of genus *Seirophora* in phylogenetic tree of the Teloschistaceae was somewhat questionable because in fact this genus was not confirmed by three gene phylogeny. Only data on ITS nrDNA were provided for the type species of this genus, i.e. *S. villosa* (Arup *et al.* 2013*a*). Within our study it was special task to provide missing data on nrLSU and mtSSU data for *S. villosa*. After getting these data (see Appendix and Fig. 2) it became clear that the *Xanthaptychia* branch formed a separate robust monophyletic branch.

The type species of this genus, *Xanthaptychia orientalis* appeared to be described twice almost in the same time by Frödén and Litterski (2005) and one year later by Kondratyuk and Kudratov (2006) as *Xanthoanaptychia kotovii* S. Y. Kondr. et Kudratov (while manuscripts of both publications were submitted in 2005, in the same year). Description of the *Xanthoanaptychia kotovii* was based on specimens kept in KW-L and LE and it was somewhat wider and more detailed than in the earlier paper. In this paper type species of the genus *Xanthaptychia* was compared with *X. contortuplicata* and *Seirophora villosa*, as well as with *Massjukiella polycarpa* (Hoffm.) S. Y. Kondr., Fedorenko, S. Stenroos, Kärnefelt, Elix, J.-S. Hur et A. Thell (Xanthorioideae) and *Niorma chrysophthalma* (L.) S. Y. Kondr., Kärnefelt, Elix, A. Thell, N.-H. Jeong et J.-S. Hur (Teloschistoideae). Unfortunately data on conidia of the type species of the genus *Xanthaptychia* are especially different and they are in urgent need of repeated revision (see above).

In both original papers similarities and differences with *S. villosa* and *S. lacunosa* were emphasised, as well as *S. scorigena*. However, after segregation of the genus *Xanthaptychia* in separate genus all these characters are in need of the further revision.

Status of *Seirophora tenera* Frödén et Litterski is still waiting for clarifying, while some information was published that data on ITS region of *S. tenera* were obtained (Frödén and Litterski 2005). However, these data are still not available for wide access.

New combinations

Elixjohnia bermaguiana (S. Y. Kondr. et Kärnefelt) S. Y. Kondr. et J.-S. Hur, *comb. nova* – MycoBank nr.: MB 819657 – Basionym: *Caloplaca bermaguiana* S. Y. Kondr. et Kärnefelt, in Kondratyuk, Kärnefelt, Elix and Thell, Bibl. Lichenol. 95: 348 (2007).

Elixjohnia gallowayi (S. Y. Kondr., Kärnefelt et Filson) S. Y. Kondr. et J.-S. Hur, *comb. nova* – MycoBank nr.: MB 819658 – Basionym: *Caloplaca gallowayi* S. Y. Kondr., Kärnefelt et Filson, in Kondratyuk, Kärnefelt, Elix and Thell, Bibl. Lichenol. 95: 358 (2007).

Elixjohnia jackelixii (S. Y. Kondr., Kärnefelt et A. Thell) S. Y. Kondr. et J.-S. Hur, *comb. nova* – MycoBank nr.: MB 819660 – Basionym: *Caloplaca jackelixii* S. Y. Kondr., Kärnefelt et A. Thell, in Kondratyuk, Kärnefelt, Elix and Thell, Bibl. Lichenol. 100: 251 (2009).

Fominiella skii (Khodos., Vondrák et Šoun) S. Y. Kondr., D. Upreti et J.-S. Hur, *comb. nova* – MycoBank nr.: MB 819661. – Basionym: *Caloplaca skii* Khodos., Vondrák et Šoun, in Vondrák, Khodosovtsev, Šoun and Vondráková, Lichenologist 44(1): 83 (2011) (2012). ≡ *Athallia skii* (Khodos., Vondrák et Šoun) Arup, Frödén et Søchting (2013).

Gintarasiella aggregata (Kantvilas et S. Y. Kondr.) S. Y. Kondr. et J.-S. Hur, *comb. nova* – MycoBank nr.: MB 819697 – Basionym: *Caloplaca aggregata* Kantvilas et S. Y. Kondr., in Kantvilas, J. Adelaide Bot. Gard. 29: 56 (2016).

Hanstrassia lenae (Søchting et G. Figueras) S. Y. Kondr., *comb. nova* – MycoBank nr.: MB 819662 – Basionym: *Caloplaca lenae* Søchting et G. Figueras, Lichenologist 39(1): 8 (2007). ≡ *Gyalolechia lenae* (Søchting et G. Figueras) Søchting, Frödén et Arup, Nordic J. Bot. 31(1): 71 (2013).

Ikaeria aurantiellina (Harm.) S. Y. Kondr., D. Upreti et J.-S. Hur, *comb. nova* – MycoBank nr.: MB 819663 – Basionym: *Caloplaca aurantiellina* Harm., in Pitard and Harmand, Bull. Soc. bot. Fr. 58 (Mém. no. 22): 46 (1911).

Klauderuiella aurantia (Pers.) S. Y. Kondr. et J.-S. Hur, *comb. nova* – MycoBank nr.: MB 819664 – Basionym: *Lichen aurantius* Pers., Ann. Bot. (Usteri) 5: 14 (1794). ≡ *Variospora aurantia* (Pers.) Arup, Frödén et Søchting, Nordic J. Bot. 31(1): 76 (2013).

Klauderuiella flavescens (Huds.) S. Y. Kondr. et J.-S. Hur, *comb. nova* – MycoBank nr.: MB 819665 – Basionym: *Lichen flavescens* Huds., Fl. Angl.: 445 (1762). ≡ *Variospora flavescens* (Huds.) Arup, Frödén et Søchting, Nordic J. Bot. 31(1): 76 (2013).

Klauderuiella thallincola (Wedd.) S. Y. Kondr. et J.-S. Hur, *comb. nova* – MycoBank nr.: MB 819666 – Basionym: *Lecanora murorum* var. *thallincola* Wedd., Mém. Soc. natn. Sci. nat. Cherbourg 19: 274 (1875). ≡ *Variospora thallincola* (Wedd.) Arup, Frödén et Søchting, Nordic J. Bot. 31(1): 77 (2013).

Laundonia flavovirescens (Wulfen) S. Y. Kondr., L. Lőkös et J.-S. Hur, *comb. nova* – MycoBank nr.: MB 819667 – Basionym: *Lichen flavovirescens* Wulfen, Schr. Ges. naturf. Freunde, Berlin 8: 122 (1787). ≡ *Gyalolechia flavovirescens* (Wulfen) Søchting, Frödén et Arup, Nordic J. Bot. 31(1): 70 (2013).

Laundonia persimilis (Wetmore) S. Y. Kondr., L. Lőkös et J.-S. Hur, *comb. nova* – MycoBank nr.: MB 819668 – Basionym: *Caloplaca persimilis* Wetmore, Bryologist 107(4): 513 (2004). ≡ *Gyalolechia persimilis* (Wetmore) Søchting, Frödén et Arup, Nordic J. Bot. 31(1): 71 (2013).

Lazarenkoiopsis ussuriensis (Oxner, S. Y. Kondr. et Elix) S. Y. Kondr., L. Lőkös et J.-S. Hur, *comb. nova* – MycoBank nr.: MB 819695 – Basionym: *Caloplaca ussuriensis* Oxner, S. Y. Kondr. et Elix, Folia cryptog. Estonica 48: 21 (2011).

Nevilleiella marchantii (S. Y. Kondr. et Kärnefelt) S. Y. Kondr. et J.-S. Hur, *comb. nova* – MycoBank nr.: MB 819670 – Basionym: *Caloplaca marchantii* S. Y. Kondr. et Kärnefelt, in Kondratyuk, Kärnefelt, Elix and Thell, Bibl. Lichenol. 95: 367 (2007).

Nevilleiella lateritia (Taylor) S. Y. Kondr. et J.-S. Hur, *comb. nova* – MycoBank nr.: MB 819671 – Basionym: *Lecidea lateritia* Taylor, J. Bot (Hooker) 6: 149 (1847). ≡ *Caloplaca lateritia* (Taylor) Zahlbr., Cat. Lich. Univ. 7: 154 (1930).

Opeltia arizonica (H. Magn.) S. Y. Kondr. et L. Lőkös, *comb. nova* – MycoBank nr.: MB 819672 – Basionym: *Caloplaca arizonica* H. Magn., Bot. Notiser, p. 69 (1944). ≡ *Gyalolechia arizonica* (H. Magn.) Søchting, Frödén et Arup, Nordic J. Bot. 31(1): 70 (2013)

Opeltia juniperina (Tomin) S. Y. Kondr. et L. Lőkös, *comb. nova* – MycoBank nr.: MB 819673 – Basionym: *Caloplaca juniperina* Tomin, Bot. Materialy (Notul. System. E Sect. Cryptog. Inst. Bot. nomine V. L. Komarovii Acad. Sci. URSS, 11: 11(1953). ≡ *Gyalolechia juniperina* (Tomin) Søchting, Frödén et Arup, Nordic J. Bot. 31(1): 71 (2013).

Opeltia neobaltistanica (S. Y. Kondr. et J.-S. Hur) S. Y. Kondr. et L. Lőkös, *comb. nova* – MycoBank nr.: MB 819674 – Basionym: *Caloplaca neobaltistanica* S. Y. Kondr. et J.-S. Hur, in Kondratyuk, Lőkös, Farkas, Oh and Hur, Acta Bot. Hung. 57(1–2): 89 (2015).

Oxneriopsis oxneri (S. Y. Kondr. et Søchting) S. Y. Kondr., D. Upreti et J.-S. Hur, *comb. nova* – MycoBank nr.: MB 819675 – Basionym: *Caloplaca oxneri* S. Y. Kondr. et Søchting, in Kondratyuk, Søchting and Kärnefelt, Nat. Hist. Res. 4(1): 17 (1996). ≡ *Gyalolechia oxneri* (S. Y. Kondr. et Søchting) Søchting, Frödén et Arup, Nordic J. Bot. 31(1): 71 (2013).

Oxneriopsis yeosuensis (S. Y. Kondr. et J.-S. Hur) S. Y. Kondr., D. Upreti et J.-S. Hur, *comb. nova* – MycoBank nr.: MB 819696 – Basionym: *Caloplaca yeosuensis* S. Y. Kondr. et J.-S. Hur, in Kondratyuk, Lőkös, Zarei-Darki, Haji Moniri, Tchabanenko, Galanina, Yakovchenko, Hooshmand, Ezhkin and Hur, Acta Bot. Hung. 55(1–2): 52 (2013) nom invalid., validated here – MB 819676 – Type: South Korea, Jeollanam-do, Yeosu-si, Nam-myeon, Geumoh-do, Dumo-ri, Jickpo coast, on rock, growing together with *Caloplaca diffluens.* Lat.: 34° 30′ 45.00″ N; Long.: 127° 44′ 14.08″ E; Alt.: 6 m a.s.l. Coll.: U. Jayalal et al. (120360), 26.04.2012. Holotype: KoLRI 015350; Isotypes: KoLRI 015346 (120357); KoLRI 015349 (120359); KoLRI 015325 (120336); KoLRI 015321 (120332); KoLRI 015369 (120380); KoLRI 015367 (120378); KoLRI 015359 (120370).

Squamulea micromera (Hue) S. Y. Kondr., L. Lőkös et J.-S. Hur, *comb. nova* – MycoBank nr.: MB 819677 – Basionym: *Lecanora micromera* Hue, Ann. Mycol. 13: 82 (1915). ≡ *Caloplaca micromera* (Hue) Zahlbr., Cat. Lich. Univers. 7: 157 (1931).– Type: [Japan], Mt Jizagatake prope Kofu, 07.1903 Urbain Faurie No 5651 (KYO 00031292 – isotype, designated here).

Teuvoahtiana altoandina (Malme) S. Y. Kondr. et J.-S. Hur, *comb. nova* – MycoBank nr.: MB 819678 – Basionym: *Callopisma altoandinum* Malme, Ark. Bot. 20A(9): 18 (1926). ≡ *Caloplaca altoandina* (Malme) Zahlbr., Cat. Lich. Univers. 7: 211 (1931).

Teuvoahtiana fernandeziana (Zahlbr.) S. Y. Kondr. et J.-S. Hur, *comb. nova* – MycoBank nr.: MB 819679 – Basionym: *Blastenia fernandeziana* Zahlbr., K. svenska Vetensk-Akad. Handl. 57(6): 46 (1917). ≡ *Caloplaca fernandeziana* (Zahlbr.) Follmann et Redón, Willdenowia 6(3): 448 (1972).

Teuvoahtiana rugulosa (Nyl.) S. Y. Kondr. et J.-S. Hur, *comb. nova* – MycoBank nr.: MB 819680 – Basionym: *Placodium rugulosum* Nyl., Annls Sci. Nat., Bot., sér. 4, 3: 153 (1855). ≡ *Caloplaca rugulosa* (Nyl.) Zahlbr., Cat. Lich. Univers. 7: 263 (1931).

Tomnashia ludificans (Arup) S. Y. Kondr. et J.-S. Hur, *comb. nova* – MycoBank nr.: MB 819681 – Basionym: *Caloplaca ludificans* Arup, Bryologist 98(1): 107 (1995). ≡ *Polycauliona ludificans* (Arup) Arup, Frödén et Søchting, Nordic J. Bot. 31(1): 52 (2013).

Tomnashia luteominia (Tuck.) S. Y. Kondr. et J.-S. Hur, *comb. nova* – MycoBank nr.: MB 819682 – Basionym: *Placodium luteominium* Tuck. (as '*luteominium*'), Lichens of California (Berkeley): 18 (1866). ≡ *Polycauliona luteominia* (Tuck.) Arup, Frödén et Søchting, Nordic J. Bot. 31(1): 52 (2013).

Tomnashia nashii (Nav.-Ros., Gaya et Hladún) S. Y. Kondr. et J.-S. Hur, *comb. nova* – MycoBank nr.: MB 819683 – Basionym: *Caloplaca nashii* Nav.-Ros., Gaya et Hladún, Mycotaxon 79: 31 (2001). ≡ *Polycauliona nashii* (Nav.-Ros., Gaya et Hladún) Arup, Frödén et Søchting, Nordic J. Bot. 31(1): 53 (2013).

Tomnashia rosei (Hasse) S. Y. Kondr. et J.-S. Hur, *comb. nova* – MycoBank nr.: MB 819684 – Basionym: *Caloplaca rosei* Hasse, Bryologist 14: 102 (1911). ≡ *Polycauliona rosei* (Hasse) Arup, Frödén et Søchting, Nordic J. Bot. 31(1): 53 (2013).

Variospora latzelii (Servít) S. Y. Kondr., *comb. nova* – MycoBank nr.: MB 819685 – Basionym: *Blastenia latzelii* Servít (as '*latzeli*'), Hedwigia 74: 151 (1934). ≡ *Caloplaca latzelii* (Servít) Clauzade et Cl. Roux, Bull. Soc. bot. Centre-Ouest, Nouv. sér., num. spec. 7: 824 (1985).

Xanthaptychia aurantiaca (R. Br.) S. Y. Kondr. et S. Ravera, *comb. nova* – MycoBank nr.: MB 819686 – Basionym: *Borrera aurantiaca* R. Br., Suppl. to the Appendix of Cpt. Parrys Voyag., Nat. Hist.: CCCV (1824). ≡ *Seirophora aurantiaca* (R. Br.) Frödén, in Frödén et Lassen, Lichenologist 36(5): 295 (2004).

Xanthaptychia blumii (S. Y. Kondr. et Moniri) S. Y. Kondr. et S. Ravera, *comb. nova* – MycoBank nr.: MB 819785 – Basionym: *Seirophora blumii* S. Y. Kondr. et Moniri, in Kondratyuk, Lőkös, Tschabanenko, Moniri and Farkas, Acta Bot. Hung. 55(3–4): 275–349 (2013).

Xanthaptychia contortuplicata (Ach.) S. Y. Kondr. et S. Ravera, *comb. nova* – MycoBank nr.: MB 819688 – Basionym: *Parmelia contortuplicata* Ach., Syn. meth. lich. (Lund): 210 (1814). ≡ *Seirophora contortuplicata* (Ach.) Frödén, in Frödén and Lassen, Lichenologist 36(5): 297 (2004).

Xanthaptychia orientalis (Frödén) S. Y. Kondr. et S. Ravera, *comb. nova* – MycoBank nr.: MB 819689 – Basionym: *Seirophora orientalis* Frödén, in Frödén and Litterski, Graphis Scripta 17(1): 22 (2005). ≡ *Xanthoanaptychia kotovii* S. Y. Kondr. et Kudratov, Ukr. Botan. Zh. 63(3): 342 (2006).

Xanthocarpia raesaenenii (Bredkina) S. Y. Kondr., *comb. nova* – MycoBank nr.: MB 819690 – Basionym: *Caloplaca raesaenenii* Bredkina, Nov. sist. Niz. Rast. 23: 170 (1986). – Replaced synonym: *Placodium geophilum* Räsänen, Ann. bot. Soc. Zool.-Bot. fenn. Vanamo 12(1): 1 (1938), Nom. illegit., Art. 53.1 non *Placodium geophilum* Th. Fr. (1891).

CONCLUSIONS

Seventeen newly discovered robust monophyletic branches proved by combined phylogenetic analysis based on ITS nr DNA, 28S nrLSU and 12S mtSSU, which are proposed to consider as separate genera are added to the subfamilies Teloschistoideae (5), Caloplacoideae (7), Xanthorioideae (3) and Brownlielloideae (1). There are also genera *Fominiella* and *Ikaeria*, which are positioned in out position to known subfamilies and possibly illustrate that additional subfamilies of the Teloschistaceae still exist and are waiting for legal description.

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APPENDIX

Specimens included in the phylogenetic analysis with GenBank accession numbers. Newly submitted sequences are given in bold. Abbreviation: * = this paper

Species name	References / voucher details	ITS	LSU	mtSSU
Amundsenia approximata	Søchting *et al.* (2014)	KJ789964	KJ789972	KJ789974
Amundsenia approximata	Søchting *et al.* (2014)	KJ789963		
Athallia holocarpa	Arup (2009)	FJ346539		
Athallia holocarpa	Arup *et al.* (2013*a*)		KC179148	KC179478
Athallia scopularis	Arup *et al.* (2013*a*)	KC179339	KC179150	KC179480
Austroplaca ambitiosa	Arup *et al.* (2013*a*)	KC179081	KC179151	KC179481
Blastenia ferruginea	Arup *et al.* (2013*a*)	KC179416	KC179163	KC179493
Brigantiaea ferruginea	Kondratyuk *et al.* (2013*b*); SK-779	KF264622		KF264684
Brigantiaea ferruginea	Kondratyuk *et al.* (2013*b*); SK-780	KF264623		KF264685
Brigantiaea ferruginea	*South Korea, 06.07.2012, Kondratyuk, S. Y. (121967), KoLRI 16922	KY614393		
Brigantiaea ferruginea	*South Korea, 06.07.2012, Kondratyuk, S. Y. (121971), KoLRI 16926	KY614394		
Brigantiaea ferruginea	*South Korea, 06.07.2012, Kondratyuk, S. Y. (121981), KoLRI 16936	KY614395		
Brownliella kobeana	Kondratyuk *et al.* (2015*d*); 120032, KoLRI	KT456212	KT456227	KT456242

Species name	References / voucher details	ITS	LSU	mtSSU
Brownliella kobeana	Kondratyuk et al. (2015*d*); 130231, KoLRI	KT456213	KT456228	KT456243
Brownliella kobeana	Kondratyuk *et al.* (2015*d*); 130318, KoLRI	KT456214	KT456229	KT456244
Bryoplaca sinapisperma	Arup *et al.* (2013*a*)	KC179421		KC179495
Calogaya biatorina	Gaya *et al.* (2008)	EU639634		
Calogaya aff. *lobulata*	Kondratyuk *et al.* (2014*c*); SK-803	KJ133448	KJ133487	KJ133506
Calogaya aff. *lobulata*	Kondratyuk *et al.* (2014*c*); SK-804	KJ133449	KJ133488	KJ133507
Calogaya aff. *lobulata*	Kondratyuk *et al.* (2014*c*); SK-805	KJ133450	KJ133489	KJ133508
Calogaya mogoltanica	Kondratyuk *et al.* (2014*c*); SK-256	KJ133452	KJ133491	KJ133509
Calogaya mogoltanica	Kondratyuk *et al.* (2014*c*); SK-257	KJ133453	KJ133492	KJ133510
Caloplaca cerina	Fedorenko *et al.* (2009, 2012); FNM-185	EU681284		EU680863
Caloplaca cerina	Gaya *et al.* (2012)		JQ301549	
Caloplaca pelodella	Kondratyuk *et al.* (2013*b*); SK-714	KF264629		KF264689
Caloplaca stillicidiorum	Gaya *et al.* (2008)	EU639607		
Catenarina desolata	Søchting *et al.* (2014)	KF657317		KF657319
Cerothallia luteoalba	Arup *et al.* (2013*a*)	KC179099	KC179177	KC179511
Cerothallia yarraensis	Kondratyuk et al. (2014*c*); SK-890, isotype	KJ133454	KJ133493	KJ133511
Charcotiana antarctica	Søchting *et al.* (2014)	KJ789971	KJ789973	KJ789976
Charcotiana antarctica	Søchting *et al.* (2014)	KJ789968		
Dijigiella kaernefeltiana	*SK-969, Australia, 07.01. 2004, Kärnefelt, I. 20042002; LD 1238056, holotype	KY614396	KY614444	KY614475
Dijigiella kaernefeltiana	*SK-970, Australia, 07.01. 2004, Kärnefelt, I. 20042002; LD 1238056, holotype	KY614397	KY614445	KY614476
Dijigiella subaggregata	*SK-955, Australia: Victoria, 23.01.1999, Kärnefelt, I. 996401; LD 1275974, holotype	KY614398	KY614446	KY614477
Dufourea flammea	Arup *et al.* (2013)		KC179357	KC179183
Dufourea flammea	Fedorenko *et al.* (2009); FNM-083	EU681316		EU680898
Dufourea flammea	Fedorenko *et al.* (2009); FNM-049	EU681315		EU680897
Eilifdahlia dahlii	Kondratyuk *et al.* (2014*a*); SK-956	KJ021221	KJ021252	KJ021277
Eilifdahlia dahlii	Kondratyuk *et al.* (2014*a*); SK-959	KJ021318	KJ021253	KJ021279
Eilifdahlia wirthii	Kondratyuk *et al.* (2014*a*); SK-262	KJ021319	KJ021254	KJ021280
Elenkiniana ehrenbergii	Søchting and Figueras (2007)	DQ888715		
Elenkiniana gloriae	Kondratyuk *et al.* (2014*a*); SK-750	KJ021323		
Elenkiniana gloriae	Kondratyuk *et al.* (2014*a*); SK-611	KJ021321	KJ021256	KJ021282
Elenkiniana gloriae	Kondratyuk *et al.* (2014*a*); SK-613	KJ021322		KJ021283
Elixjohnia bermaguiana	Kondratyuk *et al.* (2013*c*, as *Sirenophila bermaguiana*); SK-979			KF264706
Elixjohnia bermaguiana	Arup *et al.* (2013*a*, as *Sirenophila bermaguiana*); isotype	KC179299	KC179245	KC179584
Elixjohnia gallowayi	Arup *et al.* (2013*a*, as *Sirenophila gallowayi*); isotype	KC179301	KC179247	KC179586
Elixjohnia jackelixii	Kondratyuk *et al.* (2013*c*, as *Sirenophila jackelixii*); SK-910	KF264655	KF264683	KF264707
Elixjohnia jackelixii	Kondratyuk *et al.* (2013*b*, as *Sirenophila jackelixii*); SK-911			KF264708
Elixjohnia jackelixii	Arup *et al.* (2013*a*, as *Sirenophila jackelixii*)	KC179303	KC179248	KC179587
Fauriea chujaensis	Kondratyuk *et al.* (2016*c*); SK-D07, isotype	KX793097	KX793100	KX793103
Fauriea orientochinensis	Kondratyuk *et al.* (2016*c*); SK-709	KX793095	KX793098	KX793101
Fauriea orientochinensis	Kondratyuk *et al.* (2016*c*); SK-710	KX793096	KX793099	KX793102
Filsoniana australiensis	Kondratyuk *et al.* (2013*c*); SK-751	KF264631	KF264665	KF264691
Flavoplaca citrina	Arup (2006)	DG173224		
Flavoplaca citrina	Arup *et al.* (2013*a*)		KC179186	KC179521
Flavoplaca aff. *lutea*	Kondratyuk *et al.* (2014*c*); SK-840	KJ133456	KJ133494	KJ133514
Flavoplaca aff. *lutea*	Kondratyuk *et al.* (2014*c*); SK-841	KJ133457	KJ133495	KJ133515
Flavoplaca aff. *lutea*	Kondratyuk *et al.* (2014*c*); SK-843	KJ133458	KJ133496	KJ133516
Follmannia orthoclada	Arup *et al.* (2013*a*)	KC179291		

Species name	References / voucher details	ITS	LSU	mtSSU
Fominiella skii	Vondrák *et al.* (2012), holotype	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, Spain: Tenerife, 15.01.2009, Kondratyuk, S. Y. 20916 KW-L, holotype		KY614447	KY614478
Franwilsia bastowii	Kondratyuk *et al.* (2014*a*); SK-810	KJ021324	KJ021257	KJ021284
Franwilsia kilcundaensis	Kondratyuk *et al.* (2014*a*); SK-920	KJ021326	KJ021259	KJ021286
Franwilsia renatae	Kondratyuk *et al.* (2014*a*); SK-235	KJ021329		KJ021289
Fulgensia cranfieldii	Kondratyuk *et al.* (2014*a*); SK-983	KJ021333	KJ021262	KJ021292
Fulgensia fulgens	Kondratyuk *et al.* (2014*a*); SK-735	KJ021335		KJ021295
Fulgensia poeltii	Gaya *et al.* (2008)	EU639586		
Fulgogasparrea decipioides	Kondratyuk *et al.* (2013*b*); SK-689	KF264644		KF264695
Fulgogasparrea decipioides	Kondratyuk *et al.* (2013*b*); SK-691	KF264643		KF264694
Fulgogasparrea decipioides	Arup *et al.* (2013*a*)	KC179333	KC179269	KC179608
Gallowayella borealis	Arup *et al.* (2013*a*)		KC179278	KC179617
Gallowayella fulva	Fedorenko *et al.* (2009); FNM-035	EU681352		
Gallowayella hasseana	Arup *et al.* (2013*a*)		KC179280	KC179619
Gallowayella poeltii	Fedorenko *et al.* (2009); FNM-111	EU681345		
Gallowayella poeltii	Arup *et al.* (2013*a*)		KC179282	KC179622
Gallowayella poeltii	Gaya *et al.* (2012)		JQ301583	
Gallowayella weberi	Fedorenko *et al.* (2009); FNM-031	EU681345		
Gintarasiella aggregata	*SK-A84, S Australia, 17.09.2012, Kantvilas, G. 476/12 HO 567239 – holotype	KY614390	KY614448	KY614479
Gintarasiella aggregata	*SK-A85, Australia: South Australia, 17.09.2012, Kantvilas, G. 476/12 KW-L ex HO 567239 – isotype	KY614391	KY614449	KY614480
Gintarasiella aggregata	*SK-A86, Australia: South Australia, 17.09.2012 Kantvilas, G. 476/12 KW-L ex HO 567239 – isotype	KY614392	KY614450	KY614481
Golubkovia trachyphylla	Kondratyuk *et al.* (2014*c*); SK-491	KJ133460		
Golubkovia trachyphylla	Kondratyuk *et al.* (2014*c*); SK-492			KJ133525
Golubkovia trachyphylla	Kondratyuk *et al.* (2014*c*); SK-486	KJ133459		KJ133524
Golubkovia trachyphylla	Arup *et al.* (2013*a*)	KC179283	KC179283	KC179623
Gondwania cribrosa	Arup *et al.* (2013*a*)	KC179102	KC179192	KC179526
Gondwania regalis	Arup *et al.* (2013*a*)	KC179103	KC179193	KC179527
Gondwania sejongensis	Kondratyuk *et al.* (2014*c*); SK-748, holotype	KJ133465	KJ133531	
Gondwania sejongensis	Kondratyuk *et al.* (2014*c*); SK-758	KJ133467		KJ133532
Gyalolechia aurea	Arup *et al.* (2013*a*)	KC179434	KC179196	KC179530
Gyalolechia canariensis	Gaya *et al.* (2008)	EU639587		
Gyalolechia canariensis	Kondratyuk *et al.* (2014*a*); SK-583	KJ021332		
Haloplaca sorediella	Arup *et al.* (2013*a*)	KC179293		
Haloplaca suaedae	Vondrák *et al.* (unpubl.)	HM582197		
Hanstrassia jaeseounhurii	*China, 17.06.2016, Park, Ch.-N., Hur, J.-S. (CH-160016) KoLRI 41972, holotype	KY614399		
Hanstrassia jaeseounhurii	*China, 17.06.2016, Park, Ch.-N., Hur, J.-S. (CH-160015) KoLRI 41971, isotype	KY614400		
Hanstrassia lenae	Søchting and Figueras (2007)	DQ888717		
Hanstrassia lenae	Arup *et al.* (2013*a*)	KC179442		
Hanstrassia **aff.** ***lenae***	*SK-655, Russia, 16.09.2011, Yakovchenko, L. S., T-461 KoLRI	KY614401		KY614482
Hanstrassia **aff.** ***lenae***	*SK-654, Russia, 16.09.2011, Yakovchenko, L. S., T-458 KoLRI	KY614402		KY614483

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Harusavskia elenkinianoides	*SK-996, Chile, 12.12.2012, Oh, S.-O., Hur, J.-S., CL-120324 KoLRI 14493, holotype	KY614403	KY614451	KY614484
Harusavskia elenkinianoides	*SK-997, Chile, 12.12.2012, Oh, S.-O., Hur, J.-S., CL-120324 KoLRI 14493, holotype	KY614404	KY614452	KY614485
Harusavskia elenkinianoides	*SK-269, Chile, 12.12.2012, Oh, S.-O., Hur, J.-S., CL-120324 KoLRI 14493 holotype	KY614405	KY614453	KY614486
Honeggeria rosmarieae	Eichenberger *et al.* (unpubl., as *Xanthomendoza weberi*)	AM697873		
Honeggeria rosmarieae	Arup *et al.* (2013*a*, as *Xanthomendoza weberi*)	KC179145	KC179285	KC179625
Huneckia pollinii	Kondratyuk *et al.* (2014*a*); SK-3206	KJ021336	KJ021265	KJ021296
Huneckia pollinii	Kondratyuk *et al.* (2014*a*); SK-870	KJ021337	KJ021266	KJ021297
Huneckia rheinigera	Kondratyuk *et al.* (2014*a*); SK-3204	KJ021222		
Huriella loekoesiana	Kondratyuk *et al.* (2014*c*, as *Squamulea subsoluta*); SK-694	KJ133481		
Huriella loekoesiana	*South Korea, 24.04.2012, Jayalal, U. *et al.* (120433), KoLRI 15423	KY614406		KY614487
Huriella loekoesiana	*South Korea, 28.06.2013, Oh, S.-O. *et al*. (130672), KoLRI 19017	KY614407		KY614488
Huriella loekoesiana	*South Korea, 10.07.2016, Kondratyuk, S. Y., Lőkös, L. (161904), KoLRI 40141	KY614408		
Huriella loekoesiana	*South Korea, 11.07.2016, Kondratyuk, S.Y., Lőkös, L. (161998), KoLRI 40236	KY614409		
Huriella loekoesiana	*South Korea, 11.07.2016, Kondratyuk, S. Y., Lőkös, L. (162000), KoLRI 40238	KY614410		
Igneoplaca ignea	Arup *et al.* (2013*a*)	KC179382	KC179219	KC179555
Igneoplaca ignea	Arup and Grube (1999)	AF353950		
Ikaeria aurantiellina	*SK-538, Spain, Tenerife, 15.01.2009, Kondratyuk, S. Y. 20916, KW-L	KY614411		KY614490
Ikaeria aurantiellina	*SK-552, Spain, Tenerife, 15.01.2009, Kondratyuk, S. Y. 20916, KW-L	KY614412		KY614491
Ikaeria aurantiellina	*SK-D29, Spain, Tenerife, 15.01.2009, Kondratyuk S. Y. 20916, KW-L	KY614413		KY614492
Ikaeria aurantiellina	*SK-D23, Spain, Tenerife, 15.01.2009, Kondratyuk S. Y. 20916, KW-L	KY614414		KY614493
Ioplaca pindarensis	Gaya *et al.* (2012)	JQ301672		
Jackelixia angustata	Fedorenko *et al.* (2009); FNM-064			EU680870
Jackelixia angustata	Arup *et al.* (2013)	KC179351		KC179180
Jackelixia dissectula	Arup *et al.* (2013)	KC179355	KC179182	KC179517
Jackelixia elixii	Fedorenko *et al.* (2009); FNM-061	EU681308		EU680877
Jasonhuria bogilana	Kondratyuk *et al.* (2015*c*); KoLRI 120454	KT220196	KT220205	KT220214
Jasonhuria bogilana	Kondratyuk *et al.* (2015*c*); KoLRI 120469	KT220197	KT220206	KT220215
Jasonhuria bogilana	Kondratyuk *et al.* (2015*c*); KoLRI 120641	KT220198	KT220207	KT220216
Jasonhuria bogilana	Kondratyuk *et al.* (2015*c*); KoLRI 120647	KT220199	KT220208	KT220217
Jesmurraya novozelandica	Arup *et al.* (2013*a*) (sub *Xanthomendoza novozelandica*)	KC179140		KC179621
Jesmurraya novozelandica	Fedorenko *et al.* (2009); FNM-114	EU681347		
Jesmurraya novozelandica	*SK-C82, New Zealand, Otago, 17.04. 2010, D. J. Galloway 6000, KW-L		KY614454	KY614489
Josefpoeltia sorediosa	Kondratyuk *et al.* (2013*b*); SK-991	KF264645	KF264673	KF264696
Kaernefia kaernefeltii	Kondratyuk *et al.* (2013*b*); SK-921	KF264652	KF264680	KF264703
Klauderuiella aurantia	Arup *et al.* (2013*a*)	KC179470	KC179261	KC179600
Klauderuiella aurantia	Gaya *et al.* (2008)	EU639602		
Klauderuiella aurantia	Gaya *et al.* (2015)			KT291479

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Klauderuiella flavescens	*SK-561, Spain, Tenerife, 16.01.2009, Kondratyuk, S. Y. 20925, KW-L	KY614416		KY614495
Klauderuiella thallincola	*SK-527, 18.08.1997, Kärnefelt, I. 970901 LD 1076480	KY614415		KY614494
Langeottia ottolangei	Kondratyuk *et al.* (2014*c*); SK-239	KJ133468	KJ133497	KJ133533
Langeottia ottolangei	Kondratyuk *et al.* (2014*c*); SK-240	KJ133469	KJ133498	KJ133534
Langeottia ottolangei	Kondratyuk *et al.* (2014*c*); SK-264	KJ133470	KJ133499	KJ133535
Langeottia ottolangei	Kondratyuk *et al.* (2014*c*); SK-265	KJ133471	KJ133500	KJ133536
Laundonia flavovirescens	*SK-657, Russia, 16.09.2011, Yakovchenko, L. S., T-461, KoLRI	KY614417		KY614496
Laundonia flavovirescens	Arup and Grube (1999)	AF353966		
Laundonia flavovirescens	Arup *et al.* (2013*a*)		KC179198	KC179532
Laundonia persimilis	Arup *et al.* (2013*a*)	KC179444		
Laundonia persimilis	Vondrák *et al.* (unpubl.)	KT804978		
Laundonia persimilis	Vondrák *et al.* (unpubl.)	KT804979		
Lazarenkoella zoroasteriorum	Kondratyuk *et al.* (2015*d*); SK-A45	KT456215	KT456230	KT456245
Lazarenkoella zoroasteriorum	Kondratyuk *et al.* (2015*d*); SK-A51	KT456216	KT456231	KT456246
Lazarenkoella zoroasteriorum	Kondratyuk *et al.* (2015*d*); SK A55	KT456217	KT456232	KT456247
Lazarenkoiopsis ussuriensis	*SK A36, Russia, 03.08.2013, Kondratyuk, S. Y., 213R3 130130 KoLRI			KY614497
Lazarenkoiopsis ussuriensis	*SK A37, Russia, 03.08.2013, Kondratyuk, S. Y., 213R3 130130 KoLRI	KY614418	KY614455	KY614498
Lazarenkoiopsis ussuriensis	*SK D22, Russia, 03.08.2013, Kondratyuk, S. Y., 213R3 130130 KoLRI	KY614419	KY614456	KY614499
Leproplaca obliterans	Arup *et al.* (2013*a*)	KC179449		KC179207
Leproplaca xantholyta	Arup *et al.* (2013*a*)	KC179451	KC179208	KC179542
Leproplaca xantholyta	Gaya *et al.* (2012)	JQ301670		JQ301565
Loekoesia austrocoreana	Kondratyuk *et al.*(2015*c*); KoLRI 120511	KT220200	KT220209	KT220218
Loekoesia austrocoreana	Kondratyuk *et al.*(2015*c*); KoLRI 120523	KT220201	KT220210	KT220219
Loekoesia austrocoreana	Kondratyuk *et al.* (2015*c*); SK-261	KT220202	KT220211	KT220220
Marchantiana kalbiorum	Kondratyuk *et al.* (2014*a*); SK-939	KJ021225	KJ023183	KJ021300
Marchantiana occidentalis	Kondratyuk *et al.* (2014*a*); SK-981	KJ021227	KJ021268	KJ021303
Marchantiana occidentalis	Kondratyuk *et al.* (2014*a*); SK-982	KJ021228	KJ021269	KJ021304
Martinjahnsia resendei	Martin and Winka (2000)	AF101285		
Martinjahnsia resendei	Arup *et al.* (2013*a*)		KC179290	KC179630
Massjukiella polycarpa	Arup *et al.* (2013*a*)	KC179389	KC179222	
Massjukiella polycarpa	Fedorenko *et al.* (2012); FNM-172			JN984146
Massjukiella polycarpa	Fedorenko *et al.* (2009); FNM-173	EU681333		EU680919
'Caloplaca' allochroa	Joshi *et al.* (2011)	HQ415800		
Mikhtomia gordejevii	Kondratyuk *et al.* (2014*a*); SK-80515	KJ021231		KJ021307
Mikhtomia gordejevii	*South Korea, 06.07.2012, Kondratyuk, S. Y. (121959), KoLRI 16914	KY614420	KY614457	
Mikhtomia gordejevii	*South Korea, 01.06.2012, collector unmentioned (120924), KoLRI 15954	KY614421	KY614458	
Mikhtomia gordejevii	Kondratyuk *et al.*(2014*a*); SK-80646	KJ021232		KJ021308
Mikhtomia multicolor	Kondratyuk *et al.* (2014*a*); SK-A14		KJ021272	
Mikhtomia multicolor	*South Korea, 28.06.2013, Oh, S.-O. et al. (130601), KoLRI 18946	KY614422	KY614459	
Mikhtomia multicolor	*South Korea, 29.08.2004, Hur, J.-S. (40900), KoLRI 001689	KY614423	KY614460	
Mikhtomia multicolor	*SK A19, South Korea, 11.05.2012, Oh, S.-O. (120832), KoLRI 15829	KY614424		
Mikhtomia multicolor	*South Korea, 28.06.2013, Oh, S.-O. *et al.* (130604), KoLRI 18949		KY614461	

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Mikhtomia subflavorubencens	Kondratyuk *et al.* (2014*a* as *M. oxnerii*); SK-90117	KJ021233		KJ021311
Mikhtomia subflavorubencens	Kondratyuk *et al.*(2014*a* as *M. oxnerii*); SK-90755	KJ021234		KJ021312
Neobrownliella brownlieae	Kondratyuk *et al.* (2013*b*); SK-831	KF264626	KF264661	KF264687
Neobrownliella brownlieae	Kondratyuk *et al.* (2013*b*); SK-838	KF264627	KF264662	KF264688
Neobrownliella montisfracti	Kondratyuk *et al.* (2013*b*); SK-230	KF264624	KF264659	
Nevilleiella lateritia	*SK-878, Australia, 10.01.1999, Kärnefelt, I. 990904, LD 1236736	KY614426	KY614463	KY614501
Nevilleiella lateritia	*SK-261, Australia, 10.01.1999, Kärnefelt, I. 990904, LD 1236736	KY614427	KY614464	KY614502
Nevilleiella marchantii	*SK-D18, Western Australia, 08.01.2004, Kondratyuk, S. Y. 20444, KW-L – isotype	KY614425	KY614462	KY614500
Niorma chrysophthalma	Eichenberger *et al.* (unpubl.)	AM292836		
Niorma chrysophthalma	Gaya *et al.* (2012)		JQ301576	JQ301518
Olegblumia demissa	Kondratyuk *et al.* (2015*c*); SK-C65	KT220203	KT220212	KT220221
Opeltia arizonica	Arup *et al.* (2013*a*)	KC179433	KC179195	KC179529
Opeltia juniperina	*SK-D10, China, 01.08.2013, Oh, S.-O., Hur, J.-S., CH 130112 KoLRI	KY614429		KY614504
Opeltia juniperina	Vondrák and Halici (unpubl.)	JN813383		
Opeltia juniperina	Joshi *et al.* (2011)	HQ644199		
Opeltia neobaltistanica	*SK-D09, China, 01.08.2013, Oh, S.-O., Hur, J.-S., CH 130098 KoLRI	KY614428		KY614503
Orientophila loekoesii	Kondratyuk *et al.* (2014*c*); SK-721			KJ133540
Orientophila loekoesii	Kondratyuk *et al.* (2014*c*); SK-692			KJ133539
Orientophila loekoesii	Kondratyuk *et al.* (2014*c*); SK-691			KJ133538
Orientophila loekoesii	Kondratyuk *et al.* (2014*c*); SK-690			KJ133537
Orientophila subscopularis	Arup *et al.* (2013*a*)	KC179375		KC179546
Orientophila subscopularis	Kondratyuk *et al.* (2014*c*); SK-727	KJ133476		
Orientophila subscopularis	Kondratyuk *et al.* (2014*c*); SK-692	KJ133475		
Orientophila subscopularis	Kondratyuk *et al.* (2014*c*); SK-717	KJ133474		
Ovealmbornia reginae	Arup *et al.* (2013*a*, as *Ovealmbornia bonae-spei*) (see Kondratyuk *et al.* 2015*f*)		KC179181	KC179516
Ovealmbornia volkmarwirthii	Arup *et al.* (2013*a*, as *Ovealmbornia bonae-spei*) (see Kondratyuk *et al.* 2015*f*)	KC179353		
Ovealmbornia volkmarwirthii	Kondratyuk *et al.* (2014*c*; 2015*f*); SK-241	KJ133477	KJ133501	KJ133541
Ovealmbornia volkmarwirthii	Kondratyuk *et al.* (2014*c*; 2015*f*); SK-242	KJ133478	KJ133502	KJ133542
Ovealmbornia sp.	Fedorenko *et al.* (2009, as *Ovealmbornia bonae-spei*); FNM-099 (see Kondratyuk *et al.* 2015*f*)	EU681319		EU680902
Oxneria alfredii	Fedorenko *et al.* (2009); FNM-152	EU681345		EU680933
Oxneria huculica	Fedorenko *et al.* (2009, as *Oxneria fallax*); FNM-199	EU681346		
Oxneria huculica	Gaya *et al.* (2012, as *Oxneria fallax*)		JQ301580	
Oxneria huculica	Arup *et al.* (2013, as *Xanthomendoza fallax*)		KC179279	
Oxneria huculica	Fedorenko *et al.* (2009, as *Oxneria fallax*); FNM-022			EU680931
Oxneriopsis oxneri	Arup *et al.* (2013, as *Caloplaca oxneri*)	KC179443		
Oxneriopsis oxneri	*SK-695, Russia, 17.09.2011 Kondratyuk, S. Y. 21138, KW-L	KY614430		KY614505
Oxneriopsis aff. ***oxneri***	*SK-771, Russia, 17.09.2011 Kondratyuk, S. Y. 21138, KW-L	KY614431		KY614506
Oxneriopsis yeosuensis	*South Korea, 24.03.2007, Hur, J.-S. (70080), KoLRI 007067	KY614432	KY614465	KY614507

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Oxneriopsis yeosuensis	*South Korea, 26.04.2012, Jayalal, U. *et al.* (120357), KoLRI 15346	KY614433	KY614466	KY614508
Oxneriopsis yeosuensis	*South Korea, 26.04.2012, Jayalal, U. *et al.* (120336), KoLRI 15325	KY614434	KY614467	KY614509
Pachypeltis castellana	Arup *et al.* (2013*a*)	KC179105		KC179547
Parvoplaca tiroliensis	Arup *et al.* (2013*a*)	KC179116	KC179216	KC179552
Polycauliona coralloides	Arup *et al.* (2013*a*)	KC179380	KC179218	KC179554
Polycauliona coralloides	Gaya *et al.* (2015)	KT291451	KT291539	KT291485
Pyrenodesmia alociza	Kondratyuk *et al.* (2014*a*); SK-747	KJ021239		KJ021313
Pyrenodesmia chalybaea	Gaya *et al.* (2012)	JQ301550		
Pyrenodesmia teicholyta	Vondrák *et al.* (2012)	JN641791		
Pyrenodesmia teicholyta	Arup *et al.* (2013*a*)		KC179176	
Pyrenodesmia variabilis	Gaya *et al.* (2003)	AY233224		
Raesaeneniana maulensis	Kondratyuk *et al.* (2015*d*); SK-993, holotype	KT456218	KT456233	KT456248
Raesaeneniana maulensis	Kondratyuk *et al.* (2014*a*); SK-994	KJ023182	KJ023184	
Rufoplaca scotoplaca	Arup *et al.* (2013*a*)	KC179457	KC179235	KC179573
Rusavskia dasanensis	Kondratyuk *et al.* (2015*e*); SK-702	KU056846		KU043372
Rusavskia elegans	Fedorenko *et al.* (2009); FNM-019	EU681336		EU680921
Rusavskia elegans	Arup *et al.* (2013*a*)		KC179238	KC179576
Rusavskia sorediata	Fedorenko *et al.* (2009); FNM-046, Finland	EU681335		EU680920
Rusavskia sorediata	Arup *et al.* (2013*a*)		KC179239	
Scutaria andina	Arup *et al.* (2013*a*)	KC179298	KC179242	KC179581
Scythioria phlogina	Arup (2006) (sub *Caloplaca phlogina*)	DQ173234		
Scythioria phlogina	Arup *et al.* (2013*a*, as *Polycauliona phlogina*)		KC179221	KC179557
Scythioria phlogina	Vondrák *et al.* (2010, as *Caloplaca scythica*)	GU080302		
Seirophora californica	Arup *et al.* (2013*a*)	KC179643		
Seirophora lacunosa	Kondratyuk *et al.* (2015*c*); SK-B07	KT220204	KT220213	KT220222
Seirophora stenophylla	Arup *et al.* (2013*a*)	KC179647		
Seirophora villosa	*SK-D27, Italy, 01.04.2015, Ravera, S. (specimens 1), KW-L	KY614435	KY614468	KY614510
Seirophora villosa	*SK-D16, Morocco, 25.03.2014, Guttová, A., KW-L ex BRA	KY614436	KY614469	KY614511
Seirophora villosa	Martin and Winka (2000)	AF098407		
Shackletonia hertelii	Arup *et al.* (2013*a*)	KC179118		KC179579
Shackletonia sauronii	Arup *et al.* (2013*a*)	KC179120	KC179241	KC179580
Sirenophila cliffwetmorei	*SK-A93, Australia, 15.09.2012, Kantvilas, G., 446/12 KW-L ex HO	KY614438	KY614471	KY614513
'Sirenophila' eos	Kondratyuk *et al.* (2013*b*); SK-912	KF264656		
'Sirenophila' eos	Arup *et al.* (2013*a*)	KC179300	KC179246	KC179585
'Sirenophila' eos	Gaya *et al.* (2015)	KT291455	KT291542	KT291489
Sirenophila gintarasii	Arup *et al.* (2013*a*)	KC179302		
Sirenophila gintarasii	*SK-D17, Australia, 19.01.2004, Kondratyuk, S. Y., KW-L – isotype	KY614437	KY614470	KY614512
'Sirenophila' maccarthyi	Arup *et al.* (2013*a*)	KC179304	KC179249	KC179588
Solitaria chrysophthalma	*SK-D20, Sweden, 27.01.2012, Arup, U., L 05051 LD 1109837	KY614439		KY614514
Squamulea squamosa	Arup *et al.* (2013*a*)	KC179125	KC179252	KC179591
Squamulea subsoluta	Arup (2006)	DQ173238		
Squamulea subsoluta	Arup *et al.* (2013*a*)		KC179253	KC179592
Squamulea subsoluta	Kondratyuk *et al.* (2014*c*); SK-670	KJ133480		
Stellarangia elegantissima	Arup *et al.* (2013*a*)	KC179310	KC179254	KC179593
Streimanniella kalbiorum	Kondratyuk *et al.* (2014*a*); SK-939	KJ021225	KJ023183	KJ021300
Streimanniella michelagoensis	Kondratyuk *et al.* (2014*a*); SK-971	KJ021226	KJ023185	KJ021301

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Streimanniella seppeltii	Kondratyuk *et al.* (2014*a*); SK-855	KJ021229	KJ023186	KJ021305
Tarasginia whinrayi	Kondratyuk *et al.* (2015*d*); SK-A95	KT456220	KT456235	KT456250
Tarasginia whinrayi	Kondratyuk *et al.* (2015*d*); SK-B02	KT456221	KT456236	KT456251
Tassiloa digitaurea	Kondratyuk *et al.* (2015*a*); SK-A34	KP096222		KP096224
Tayloriella erythrosticta	Kondratyuk *et al.* (2015*d*); SK-817	KT456222	KT456237	KT456252
Tayloriella erythrosticta	Kondratyuk *et al.* (2015*d*); SK-814	KT456223	KT456238	KT456253
Tayloriella erythrosticta	Kondratyuk *et al.* (2015*d*) SK-819	KT456224	KT456239	KT456254
Teloschistes flavicans	Fedorenko *et al.* (2009, 2012); FNM-139	EU681363		EU680955
Teloschistes flavicans	Arup *et al.* (2013*a*)	KC179317	KC179255	KC179594
Teloschistes flavicans	Fedorenko *et al.* (2009, 2012); FNM-218	EU681362		JN984150
Teloschistes flavicans	Gaya *et al.* (2012)		JQ301578	
Teloschistopsis bonae-spei	Arup *et al.* (2013*a*)	KC179322	KC179257	KC179596
Teloschistopsis chrysocarpoides	Arup *et al.* (2013*a*)	KC179323		
Teloschistopsis eudoxa	Arup *et al.* (2013*a*)	KC179324	KC179258	KC179597
Thelliana pseudokiamae	Kondratyuk *et al.* (2015*d*); SK-925	KT456225	KT456240	KT456255
Thelliana pseudokiamae	Kondratyuk *et al.* (2015*d*); SK-926	KT456226	KT456241	KT456256
Teuvoahtiana altoandina	Arup *et al.* (2013*a*, as '*Caloplaca*' *altoandina*)	KC179094	KC179170	KC179503
Teuvoahtiana fernandeziana	*SK-995, Chile, 27.01.2012, Wang, X. Y., Oh, S.-O., Hur, J.-S., CL-120121 KoLRI 14287	KY614440		KY614515
Teuvoahtiana rugulosa	*SK-A25, Chile, 30.01.2012, Wang, X. Y., Oh, S.-O., Hur, J.-S., CL-120331 KoLRI 14500	KY614441	KY614472	KY614516
Teuvoahtiana rugulosa	*SK-A26, Chile, 30.01.2012, Wang, X. Y., Oh, S.-O., Hur, J.-S., CL-120331 KoLRI 14500	KY614442	KY614473	KY614517
Teuvoahtiana rugulosa	*SK-A27, Chile, 30.01.2012, Wang, X. Y., Oh, S.-O., Hur, J.-S., CL-120331 KoLRI 14500	KY614443	KY614474	KY614518
Tomnashia ludificans	Arup *et al.* (2013*a*, as *Polycauliona ludificans*); holotype	KC179386		
Tomnashia luteominia	Arup *et al.* (2013*a*, as *Polycauliona luteominia*)	KC179387	KC179220	KC179556
Tomnashia nashii	Vondrák *et al.* (unpubl., as *Caloplaca nashii*)	HQ699624		
Tomnashia rosei	Arup *et al.* (2013*a*, as *Polycauliona rosei*)	KC179390	KC179223	KC179559
Usnochroma carphinea	Arup *et al.* (2013*a*)	KC179468	KC179259	KC179598
Usnochroma carphinea	Gaya *et al.* (2008)	EU639595		
Usnochroma carphinea	Gaya *et al.* (2012)		JQ301548	
Usnochroma scoriophila	Gaya *et al.* (2012)	JQ301664	JQ301560	
Variospora kudratovii	Kondratyuk *et al.* (2014*a*); SK-487	KJ021244	KJ021276	KJ023192
Variospora kudratovii	Kondratyuk *et al.* (2014*a*); SK-485	KJ021243	KJ021275	KJ023191
Variospora kudratovii	Kondratyuk *et al.* (2014*a*); SK-484	KJ021242	KJ021274	KJ023190
Variospora latzelii	Vondrák *et al.* (unpubl.)	JN813418		
Variospora macrocarpa	Arup and Grube (1999)	AF353956		
Variospora velana	Arup *et al.* (2013*a*)	KC179476	KC179265	KC179605
Verrucoplaca verruculifera	Arup *et al.* (2013*a*)	KC179404	KC179223	
Verrucoplaca verruculifera	Gaya *et al.* (2008)	EU639624		
Verrucoplaca verruculifera	Gaya *et al.* (2012)		JQ301564	JQ301500
Villophora isidioclada	Arup *et al.* (2013*a*)	KC179325	KC179266	KC179606
Wetmoreana texana	Kondratyuk *et al.* (2013*b*); SK-537	KF264657		KF264710
Wetmoreana texana	Kondratyuk *et al.* (2013*b*); SK-536	KF264658		KF264711
Wetmoreana texana	Arup *et al.* (2013*a*)	KC179337	KC179273	KC179612
Xanthaptychia aurantiaca	Arup *et al.* (2013*a*, as *Seirophora aurantiaca*)	KC179461		
Xanthaptychia blumii	Kondratyuk *et al.* (2015*d*, as *Seirophora blumii*); SK-A65	KT456219	KT456234	KT456249

Species name	References / voucher details	ITS	LSU	mtSSU
Xanthaptychia contortuplicata	Arup *et al.* (2013*a*, as *Seirophora contortuplicata*)	KC179464		
Xanthaptychia contortuplicata	Gaya *et al.* (2015, as *Seirophora contortuplicata*)	KT291471		KT291522
Xanthaptychia contortuplicata	Kondratyuk *et al.* (2014*a*, as *Seirophora contortuplicata*); SK-775			KJ021316
Xanthaptychia orientalis	Fedorenko *et al.* (2009, as *Seirophora orientalis*); FNM-153	EU681287		
Xanthaptychia orientalis	Kondratyuk *et al.* (2014*a*, as *Seirophora orientalis*); SK-756	KJ021241		
Xanthaptychia orientalis	Kondratyuk *et al.* (2014*a*, as *Seirophora orientalis*); SK-755	KJ021240		KJ023189
Xanthocarpia jerramungupensis	Kondratyuk *et al.* (2014*c*); SK-142	KJ133484	KJ133503	KJ133543
Xanthocarpia jerramungupensis	Kondratyuk *et al.* (2014*c*); SK-917	KJ133485	KJ133504	KJ133544
Xanthocarpia cf. *jerramungupensis*	Kondratyuk *et al.* (2014*c*); SK-247	KJ133486	KJ133505	KJ133545
Xanthocarpia ochracea	Kondratyuk *et al.* (2014*c*); SK-637	KJ133483		
Xanthocarpia ochracea	Arup *et al.* (2013*a*)	KC179132	KC179277	KC179617
Xanthokarrooa karrooensis	Fedorenko *et al.* (2009); FNM-066	EU681320		EU680903
Xanthomendoza mendozae	Fedorenko *et al.* (2009); FNM-215	EU681349		
Xanthomendoza mendozae	Fedorenko *et al.* (2009); FNM-065			EU680938
Xanthomendoza mendozae	Fedorenko *et al.* (2009); FNM-069			EU680939
Xanthomendoza mendozae	Arup *et al.* (2013*a*)	KC179138	KC179281	KC179620
Xanthopeltis rupicola	Arup *et al.* (2013*a*)	KC179146	KC179286	KC179626
Xanthopeltis rupicola	Gaya *et al.* (2015)		KT291570	KT291530
Xanthoria parietina	Fedorenko *et al.* (2009, 2012); FNM-177	EU681289		EU680868
Xanthoria parietina	Gaya *et al.* (2012)		JQ301589	
Xanthoria parietina	Fedorenko *et al.* (2009, 2012); FNM-177	EU681289		EU680868
Xanthoria parietina	Gaya *et al.* (2012)		JQ301589	
Xanthoria parietina	Fedorenko *et al.* (2009, 2012); FNM-017	EU681288	EU680867	
Xanthoria parietina	Lutzoni *et al.* (2001)		AF356687	
Yoshimuria cerussata	Kondratyuk *et al.* (2014*a*); SK-768	KJ021248		
Yoshimuria galbina	Kondratyuk *et al.* (2014*a*); SK-704			KJ023197
Yoshimuria spodoplaca	Kondratyuk *et al.* (2014*a*); SK-725	KJ021249		KJ023194
Zeroviella coreana	Kondratyuk *et al.* (2015*e*); SK-D06	KU056848		KU043373
Zeroviella esfahanensis	Kondratyuk *et al.* (2015*e*); SK-501	KU056849		KU043374
Zeroviella papillifera	Fedorenko *et al.* (2009); FNM-018	EU681331		EU680927
Zeroviella papillifera	Fedorenko *et al.* (2009); FNM-204	EU681330		EU680926
Zeroviella ussurica	Kondratyuk *et al.* (2015*e*); SK-D08, isotype	KU056857		KU043379