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COPPINSIELLA AND *SEAWARDIELLA* – TWO NEW GENERA OF THE XANTHORIOIDEAE (TELOSCHISTACEAE, LICHEN-FORMING ASCOMYCOTA)

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The genera *Coppinsiella* and *Seawardiella* are described based on the combined phylogenetic analysis from ITS nrDNA, 28S nrLSU and 12S mtSSU sequences. The affinities of the new genera *Orientophila*, *Athallia*, *Flavoplaca* and *Calogaya* are discussed. The former *Caloplaca lobulata* group (or '*Xanthoria lobulata*-Gruppe' sensu Steiner et Poelt 1982) found to be positioned in the *Calogaya* clade based on ITS phylogeny while after a three gene phylogeny (based on ITS nrDNA, nrLSU and mtSSU sequences) two species (i.e.: *Seawardiella lobulata* and described as new *S. tasmaniensis*) were located in the *Seawardiella* clade of the Xanthorioideae. Three other species (i.e. *Lazarenkoella zoroasteriorum*, *L. persica* and *L. polycarpoides*) were positioned in the *Lazarenkoella*-clade of the Brownlielloideae. The position of all species of the *Calogaya* clade (after ITS phylogeny) should be re-evaluated based on three gene phylogeny from ITS nrDNA, nrLSU and mtSSU sequences. The new species *Seawardiella tasmaniensis* is described, illustrated and compared with closely related taxa.

New combinations are suggested for eight taxa (i.e. *Athallia inconnexa* (for *Lecanora inconnexa* Nyl.), *Calogaya safavidiorum* (for *Caloplaca safavidiorum* S. Y. Kondr., in Kondratyuk et al.), *Coppinsiella orbicularis* stat. et comb. nov. (for *Caloplaca substerilis* subsp. *orbicularis* M. Haji Moniri, Vondrák et Malíček), *Coppinsiella substerilis* (for *Caloplaca substerilis* Vondrák, Palice et van den Boom, in Vondrák *et al.*), *Coppinsiella ulcerosa* (for *Caloplaca ulcerosa* Coppins et P. James), *Lazarenkoella persica* (for *Xanthoria polycarpoides* var. *persica* J. Steiner); *Lazarenkoella polycarpoides* (for *Xanthoria polycarpoides* J. Steiner), and *Seawardiella lobulata* (for *Lecanora lobulata* Flörke)).

Key words: combined phylogenetic analysis, *Lazarenkoella*, new genera, Xanthorioideae

INTRODUCTION

More than 100 genera in the four subfamilies Xanthorioideae, Caloplacoideae, Teloschistoideae and Brownlielloideae in the Teloschistaceae have been separated based on a three gene phylogeny, i.e. on ITS nrDNA, nrLSU

and mtSSU sequences (Kondratyuk *et al.* 2017*a*, 2018*a*, *b*). Among the subfamilies the Xanthorioideae includes the highest number of genera, i.e. 39 (Kondratyuk *et al.* 2017*a*, 2018*a*). Several special papers on the molecular phylogeny of the representatives of the Xanthorioideae have been published (Fedorenko *et al.* 2009, 2012, Arup *et al.* 2013, Kondratyuk *et al.* 2014, 2015*a*, *b*, 2017*a*), while some monophyletic clades still wait for taxonomic treatment. The aim of this paper is the publication of the new genera *Coppinsiella* and *Seawardiella*, which apparently correspond with two branches of the phylogenetic tree of the Xanthorioideae known as the '*Caloplaca ulcerosa*' group and the former '*Calogaya lobulata*' group. The position of members of the *Calogaya* clade based on ITS phylogeny is furthermore discussed.

MATERIAL AND METHODS

The morphology was studied with a dissecting microscope (Nikon SMZ 645, Nikon, Tokyo, Japan), whereas anatomical structures were studied with an Olympus BX51 light microscope with an Olympus DP-Soft photo program (in MSK-L) and Nikon Eclipse E200 (Nikon, Tokyo, Japan), and Zeiss Scope A1 (Carl Zeiss, Oberkochen, Germany) with a digital camera AxioCam ERc 5s (in KoLRI).

Sequenced specimens in the genera *Coppinsiella*, *Seawardiella* and *Lazarenkoella* are listed below (Table 1). Data on ITS nrDNA, nrLSU and mtSSU of specimens of the other genera of the Xanthorioideae included in the phylogenetic trees have been provided in a previous paper (Kondratyuk *et al.* 2017*a*).

Small fragments were extracted using standard methods described in Fedorenko *et al.* (2009). Three gene regions were selected for the study, ITS nrDNA, nrLSU and mtSSU, using the primers ITS1 and ITS4 (Fedorenko *et al.* 2009), ITS1F (Gardes and Bruns 1993), LR5 (Vilgalys and Hester 1990), and mtSSU1-mtSSU3R and mtSSU2R (Zoller *et al.* 1999). The phylogenetic analyses of the manually aligned sequences were performed with PAUP version 4.0b (Swofford 2003). Trees were calculated using the general heuristic search option, maximising the number of saved trees to 1,000, whereas gaps were treated as missing characters.

RESULTS

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

MycoBank no.: MB 827054

Similar to the genus Athallia, *but differs in a more developed thallus, often with characteristic crater-like soralia and zeorine apothecia.*

Type species: *Coppinsiella ulcerosa* (Coppins et P. James) S. Y. Kondr. et L. Lőkös.

Table 1
Vouchers of the genera *Coppinsiella, Seawardiella* and *Lazarenkoella* included in the phylogenetic analysis

Species name	Country, voucher details	ITS	nrLSU	mtSSU
Coppinsiella orbicularis	Hungary, JV6368 (Vondrák *et al.* 2017*a*)	KU554430	KU554437	KU554435
Coppinsiella orbicularis	Czech Rep., JV12562, holotype (Vondrák *et al.* 2017*a*)	KU554427		KU554436
Coppinsiella orbicularis	Slovakia, ZP13441 (Vondrak *et al.* 2013)	KC416110		
Coppinsiella orbicularis	Slovakia, ZP13441 (Vondrák *et al.* 2017*a*)		KU554438	KU554433
Coppinsiella substerilis	Vondrák *et al.* 2013	KC416108		
Coppinsiella substerilis	Vondrák *et al.* 2013	KC416109		
Coppinsiella substerilis	Vondrák *et al.* 2013	KC416110		
Coppinsiella ulcerosa	Tunisia, PRA (Vondrák *et al.* 2017*a*)		KU554439	KU554434
Coppinsiella ulcerosa	Vondrák *et al.* 2009	GU080298		
Coppinsiella ulcerosa	Vondrák *et al.* 2013	KC416106		
Coppinsiella ulcerosa	Vondrák *et al.* 2013	KC416105		
Coppinsiella aff. *ulcerosa*	Vondrák *et al.* 2009 as '*Caloplaca*' aff. *ulcerosa*	GU080296		
Coppinsiella aff. *ulcerosa*	Vondrák *et al.* 2009 as '*Caloplaca*' aff. *ulcerosa*	GU080295		
Coppinsiella aff. *ulcerosa*	Vondrák *et al.* 2009 as '*Caloplaca*' aff. *ulcerosa*	GU080294		
Lazarenkoella persica	**SK D36,** Iran: Razavi Khorasan, 75 km route of Mashhad-Torbat-e Heidarieh, Bazehure, 35° 47′ N, 59° 22′ E, 1,500 m alt., 9.04.2013, M. Haji Moniri BH_S1, S. Parsa (KW-L)**, this paper**	**SK D36**		
Lazarenkoella persica	Vondrák *et al.* 2018	KY749002		
Lazarenkoella persica	Vondrák *et al.* 2018	KY748999		
Lazarenkoella polycarpoides	A45 (Kondratyuk *et al.* 2015*a* as *Lazarenkoella* aff. *zoroasteriorum*)	KT456215	KT456230	KT456245
Lazarenkoella polycarpoides	A51 (Kondratyuk *et al.* 2015*a Lazarenkoella* aff. *zoroasteriorum*)	KT456216	KT456231	KT456246
Lazarenkoella polycarpoides	Vondrák *et al.* 2018	KY749001		

Table 1 (continued)

Species name	Country, voucher details	ITS	nrLSU	mtSSU
Lazarenkoella polycarpoides	Vondrák *et al.* 2018	KY748998		
Lazarenkoella zoroasteriorum	A35 (Kondratyuk *et al.* 2015*a*)	KT456217	KT456232	KT456247
Lazarenkoella zoroasteriorum	Vondrák *et al.* 2018	KY749090		
Lazarenkoella zoroasteriorum	Vondrák *et al.* 2018	KY749091		
Seawardiella lobulata	Eichenberger *et al.*, as *Xanthoria* sp. L243t1b-117.9, not published	AM292829		
Seawardiella lobulata	Vondrák *et al.* 2017*b*	KU926999		
Seawardiella lobulata	Arup *et al.* 2013	KC179345		
Seawardiella lobulata	Vondrák *et al.* 2018	KY748950		
Seawardiella lobulata	Vondrák *et al.* 2018	KY748951		
Seawardiella lobulata	Vondrák *et al.* 2018	KY748954		
Seawardiella lobulata	Vondrák *et al.* 2018	KY748956		
Seawardiella lobulata	Vondrák *et al.* 2018	KY748957		
Seawardiella tasmaniensis	**SK 803, Australia, Tasmania, this paper**	**SK 803**	**SK 803**	**SK 803**
Seawardiella tasmaniensis	**SK 804, Australia, Tasmania, this paper**	**SK 804**	**SK 804**	**SK 804**
Seawardiella tasmaniensis	**SK 805, Australia, Tasmania, this paper**	**SK 805**	**SK 805**	**SK 805**

Thallus crustose, very thin, film-like, more or less continuous to endolithic or endophloeodal, and minutely squamulose, grey to whitish, K–, or yellowish and K+ violet; soralia scattered, hardly distinct or from well-developed, immersed, crater-like to irregular and confluent, sometimes on margins of thalline squamules or in substrate crevices; soredia light greenish grey, without greenish blue pigment. Apothecia zeorine or biatorine, thalline margin thin grey-whitish soon disappearing; own margin concolorous with disc, orange to bright orange, from concave to plane or convex; asci 8-spored; ascospores hyaline, bipolarilocular, widely ellipsoid with wide septum.

Chemistry: Thallus, soralia and soredia if greenish white or greyish white K–, if yellowish K+ violet; apothecia K+ purple.

Ecology: Growing on bark of deciduous trees such as *Ulmus*, *Fraxinus*, *Tilia*, *Acer*, on steams of steppe and maritime shrubs (*Limonium*), often in polluted and well-lit conditions, and on limestone. *Coppinsiella ulcerosa* shows tendency to sea coast distribution, while other taxa are more continental.

Etymology: It is named after the British lichenologist Brian J. Coppins (1949–) (E) (Edinburgh, Scotland) for his great contribution to lichenology and who described the type species of this genus.

Distribution: Eurasia (from Scotland, Southern Scandinavia and Estonia on the north to the Mediterranean regions of Spain to the Caspian Sea coast in the east, and Israel to the south), North Africa, some records known from North America (see special notes) as well as somewhat dubious records from the Southern Hemisphere.

The genus *Coppinsiella* includes four species, namely *Coppinsiella ulcerosa* (Coppins et P. James) S. Y. Kondr. et L. Lőkös (Northern Hemisphere), *C. orbicularis* (M. Haji Moniri, Vondrák et Malíček) S. Y. Kondr. et L. Lőkös (Europe), *C. substerilis* (Vondrák, Palice et van den Boom) S. Y. Kondr. et L. Lőkös (Europe), and a further taxon from North America and from the Austrian Alps, cited by Vondrák *et al.* (2013) as '*Caloplaca* aff. *ulcerosa*'.

Taxonomic and phylogenetic notes: The species included in the genus *Coppinsiella* are similar to *Caloplaca obscurella* (J. Lahm ex Körb.) Th. Fr., but differs from the latter in a film-like thallus (*vs*. areolate) and dispersed soralia, as well as in growing in lighter habitats. *Coppinsiella ulcerosa* is easily distinguishable after bright orange apothecia when fertile (not brown or dark brown and K– as in *Caloplaca obscurella*).

Species of the genus *Coppinsiella* may be sometimes mistaken as *Scythioria phlogina* (Ach.) S. Y. Kondr., Kärnefelt, Elix, A. Thell et J.-S. Hur, but the latter species differs by characters of soralia and soredia. Vondrák suggested a relationship of the *Coppinsiella* clade (as *Caloplaca ulcerosa* group) with the genera *Athallia* and *Orientophila* in a sister position to species in the genus *Orientophila* (Vondrák *et al.* 2017*a*). After combined dataset of ITS, nr LSU

and mtSSU sequences the *Coppinsiella* branch was found to be positioned in a sister position to the genus *Athallia* (Vondrák *et al.* 2017*a*). Unfortunately in Bayesian phylogeny of Xanthorioideae based on the combined dataset of ITS, mtSSU and nrLSU *Orientophila* was presented only by simple specimen of still undescribed taxon (mentioned as *Orientophila* sp.), while molecular data on the type species of genus *Orientophila*, i.e. *Orientophila subscopularis* Arup et Frisch, as well as *O. loekoesii* (S. Y. Kondr. et J.-S. Hur) Arup, Søchting et Frödén are hitherto available. Furthermore data on the type species of genera *Orientophila*, *Ovealmbornia*, *Athalia*, *Flavoplaca* and other genera of the Xanthorioideae were not included in the phylogenetic analysis.

Unfortunately, authors did not want to clarify the generic status of this group of species, and the new taxon *Caloplaca substerilis* subsp. *orbicularis* M. Haji Moniri, Vondrák et Malíček was described within the old genus *Caloplaca*. However, it is important to emphasise that Vondrák *et al.* (2017*a*) have provided nrLSU and mtSSU data for four samples, while ITS data were obtained for a number of specimens of this species group. These data allowed us now to include species of the *Caloplaca ulcerosa* group in three gene phylogeny provided within our study.

Originally the genus *Orientophila* was proposed exclusively for two eastern Asian species, i.e. *O. subscopularis*, type species of the genus, and *O. loekoesii* (S. Y. Kondr. et J.-S. Hur) Arup, Søchting et Frödén (Arup *et al.* 2013) However, it became evident that the genus *Orientophila* includes about 10 species (Kondratyuk *et al.* 2016, 2017*b*).

It was also studied here if the *Caloplaca ulcerosa* group was nested within the *Orientophila* clade. Molecular data from the type species of all genera of the Xanthorioideae is included in the analysis. The genus *Coppinsiella* formed a robust monophyletic separate branch in the *Athallia-Orientophila* clade of the Xanthorioideae from our ITS analysis as well as from combined dataset including all members of the Xanthorioideae (Figs 1–2).

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

MycoBank no.: MB 827055

Similar to the genus Calogaya, *but differs in having poorly developed thalline portions, and lacking vegetative propagules.*

Type species: *Seawardiella lobulata* (Flörke) S. Y. Kondr., I. Kärnefelt et A. Thell

Thallus from small rosette-like to indistinct or developed or only as tiny microlobules, irregular at the base of the apothecium, ± raised above the substrate level, whitish grey or yellowish grey to yellow. Apothecia zeorine to

biatorine, usually numerous, pronounced, often with a well-developed thalline stipe; disc plane to subconvex; both cortical layers of the thalline exciple and the true exciple paraplectenchymatous. Asci 8-spored. Ascospores hyaline, bipolarilocular, with wide septum.

Chemistry: Thallus if yellowish K+ purple and if not yellowish K+; epihymenium and true exciple K+ purple.

Ecology: It grows on bark of deciduous trees.

Etymology: The name of the new genus honours the British lichenologist and plant ecologist, our close friend and colleague Prof. Mark R. D. Seaward (1938–) to recognise his immense contribution to lichenology and to celebrate his 80th birthday.

Distribution: Widely distributed in both hemispheres.

The genus *Seawardiella* includes two species, i.e. *Seawardia lobulata* widely distributed in the Northern Hemisphere and *S. tasmaniensis*, appears semicryptic and its distribution is still poorly known, but a wide distribution in the Southern Hemisphere is assumed.

Taxonomic and phylogenetic notes: *Seawardiella lobulata* usually considered to be related to *Lazarenkoella polycarpoides* and *L. persica*. However, after combined three gene phylogeny (see Figs 2–3) the latter two taxa belong to the *Lazarenkoella* monophyletic branch of the Brownlielloideae (see also below description of *S. tasmaniensis*). It should be mentioned that after ITS phylogeny after data of Vondrák *et al.* (2018) these taxa (*Seawardiella lobulata* as well as *Lazarenkoella polycarpoides* and *L. persica*) belong to different monophyletic branches, too.

A Tasmanian collection of *Seawardiella* aff. *lobulata* was selected for describing new species more than 13 years ago. However we were waiting for confirmation of the hypothesis on new species by molecular data. Unfortunately specimens of *Seawardiella lobulata* is rather poorly represented in European herbaria. Therefore ITS data from only three specimens of *Seawardiella lobulata* were examined, but recently additional material of *S. lobulata* has been provided by Vondrák *et al.* (2018). New molecular data indicate that *S. lobulata* collected in Tasmania seems very unique.

In general *Seawardiella lobulata* belongs to the so-called the *Seawardiella lobulata* group (or '*Xanthoria lobulata*-Gruppe' sensu Steiner et Poelt 1982). Taxonomy of this group more or less completed after morphological point of view, and these results show good correlation with ITS phylogeny of taxa treated (Vondrák *et al.* 2018). Totally, the *Caloplaca lobulata* complex includes *Caloplaca lobulata*, *C. polycarpoides* and *C. persica*, all known from earlier as well as the recently described *Caloplaca zoroasteriorum.* These four taxa as well as *Seawardiella tasmaniensis* described here are positioned in distant positions after combined three gene phylogeny, which is discussed below in details (Figs 1–2).

All species of the former complex *Caloplaca lobulata* are still more or less nested in the *Calogaya* clade after ITS phylogeny (Fig. 1). Similar results were shown by Vondrák *et al.* (2018). However, they made incorrect conclusion that these taxa are members of the genus *Calogaya*. Unfortunately main portion, i.e. 10 of the 12 species were combined to the genus *Calogaya* only on the basis of ITS phylogeny by Arup *et al.* (2013), and the same conclusion was done by Vondrák *et al.* (2018).

After three gene phylogeny (based on ITS nrDNA, nrLSU and mtSSU sequences) two species (i.e.: *Seawardiella lobulata* and newly described *S. tasmaniensis*) are located in the *Seawardiella* branch of the Xanthorioideae, while three other species (i.e. *Lazarenkoella zoroasteriorum*, *L. persica* and *L. polycar-*

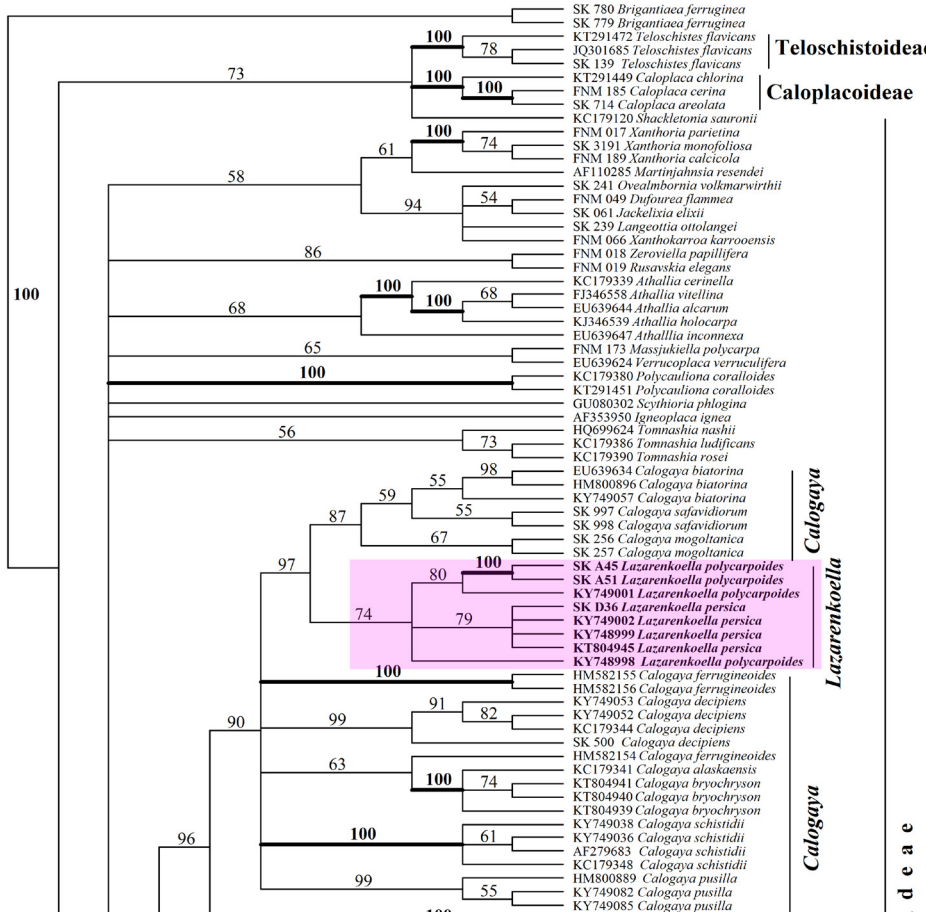

Fig. 1. Phylogenetic analysis of representatives of the subfamily Xanthorioideae after ITS data set

poides) are positioned in the *Lazarenkoella* branch of the subfamily Brownlielloideae (Fig. 3).

A final conclusion about position of members of the *Calogaya* clade after ITS phylogeny can be obtained only when we will have data on ITS nrDNA, nrLSU and mtSSU sequences of all specimens considered to be member of this genus. It is also very important to have results of three gene phylogeny based on data on ITS nrDNA, nrLSU and mtSSU sequences obtained from the same voucher specimen of all species of the *Calogaya* clade.

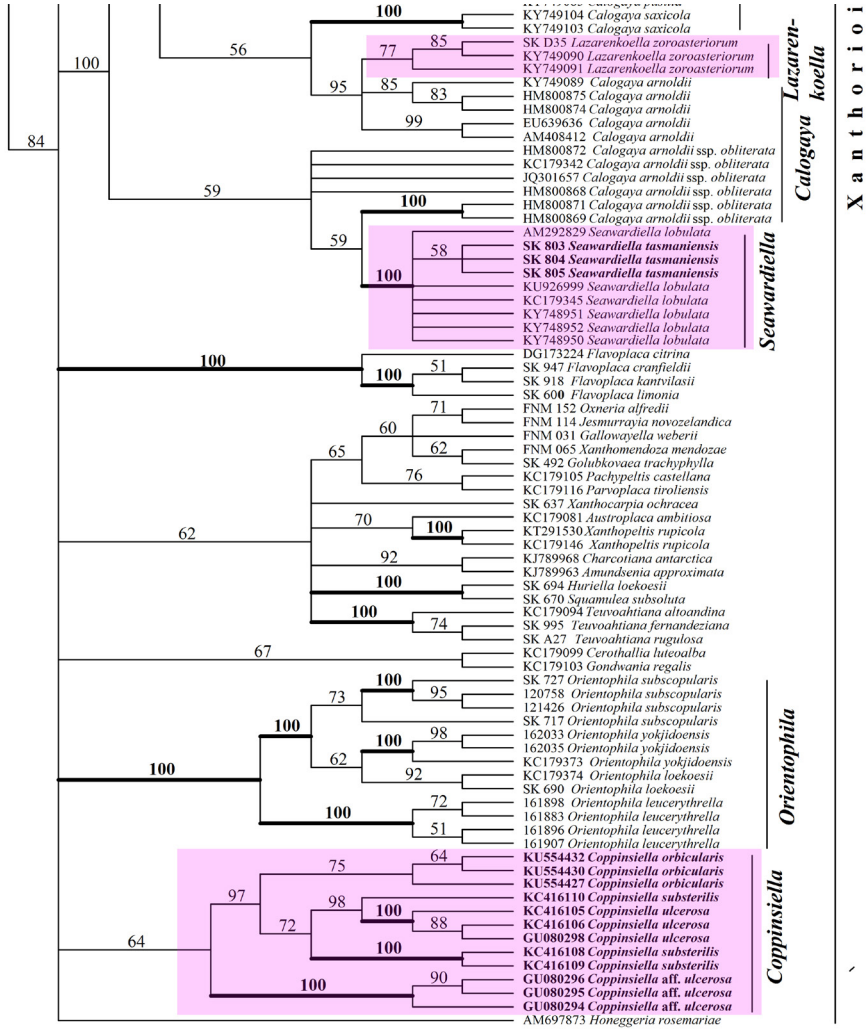

Fig. 1 (continued)

Thus a general conclusion that position of all species of the *Calogaya* clade (after ITS phylogeny) should be especially carefully clarified with three gene phylogeny based on data on ITS nrDNA, nrLSU and mtSSU sequences obtained from the same voucher specimen is made.

Seawardiella tasmaniensis S. Y. Kondr., I. Kärnefelt et A. Thell, *spec. nova*

MycoBank no.: MB 827056

Similar to Seawardiella lobulata, *but differs in having an undeveloped thallus consisting only of irregular single microlobules, in having larger and usually solitary*

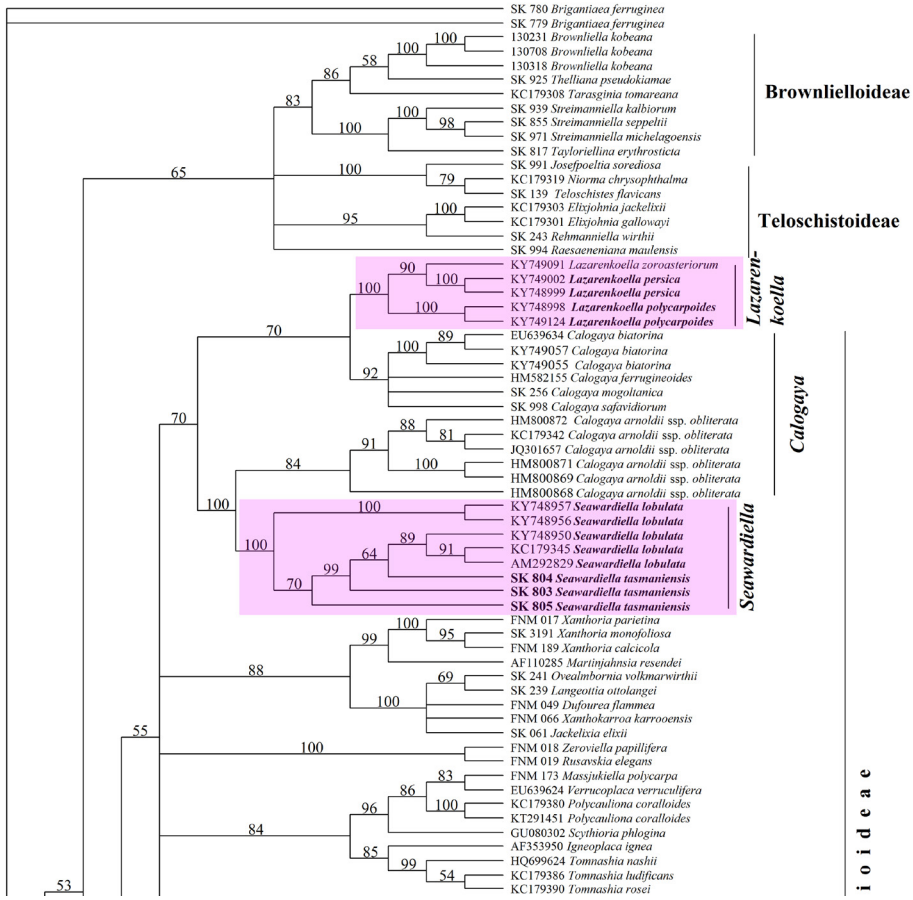

Fig. 2. Phylogenetic analysis of representatives of the subfamily Xanthorioideae after combined data set

apothecia, soon becoming biatorine, convex and emarginated, as well as in having somewhat shorter ascospores.

Type: Australia, Tasmania, North of Hobart along A1, after Kempton, 1 km before the turnoff to Oatlands, 42° 29.59′ S, 147° 11.16′ E [elevation is not mentioned], growing on [thick twigs of] *Crataegus*, locally abundant, *Seawardiella tasmaniensis* damaged by *Muellerella* sp. in places. Coll.: E. I. Kärnefelt (997001), 28.01.1999 (holotype: HO; isotypes: GZU, LD (vouchers SK 803, SK 804, SK 805), KW-L).

Thallus usually not developed or sometimes only as tiny microareoles up to 0.1–0.3 mm across appear solitary (hardly seen among numerous apothecia of *Seawardiella tasmaniensis* as well as apothecia of other associated crustose lichens, i.e. *Rinodina* species and others) or associated at one side of the apothecium stipa, very rarely may form 'rosette-like' aggregation to 0.7–1

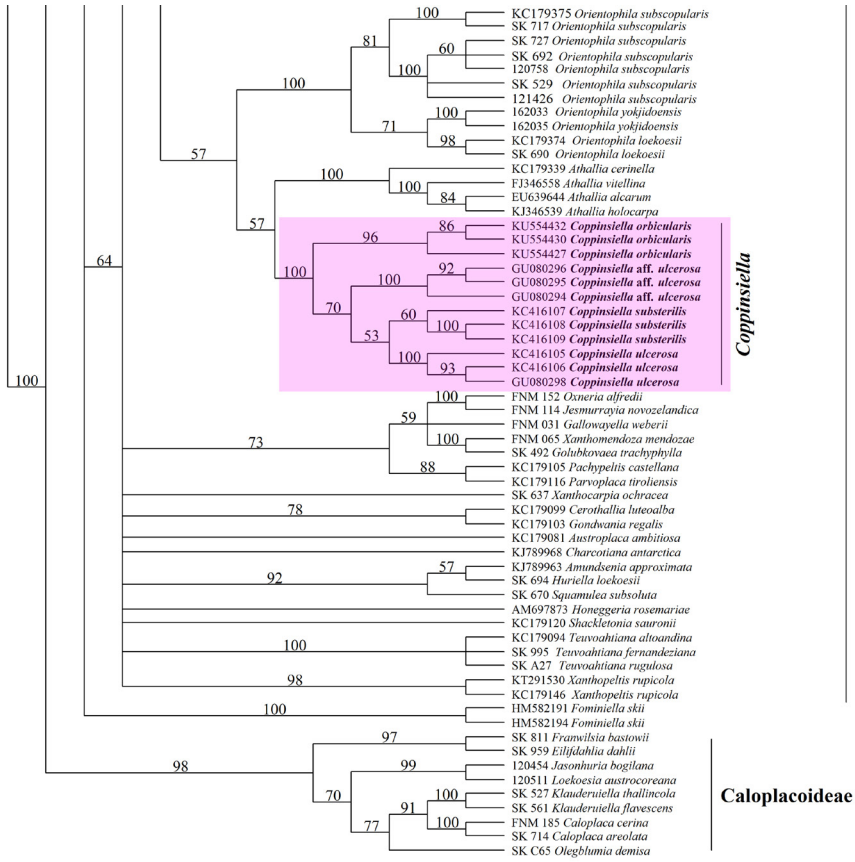

Fig. 2 (continued)

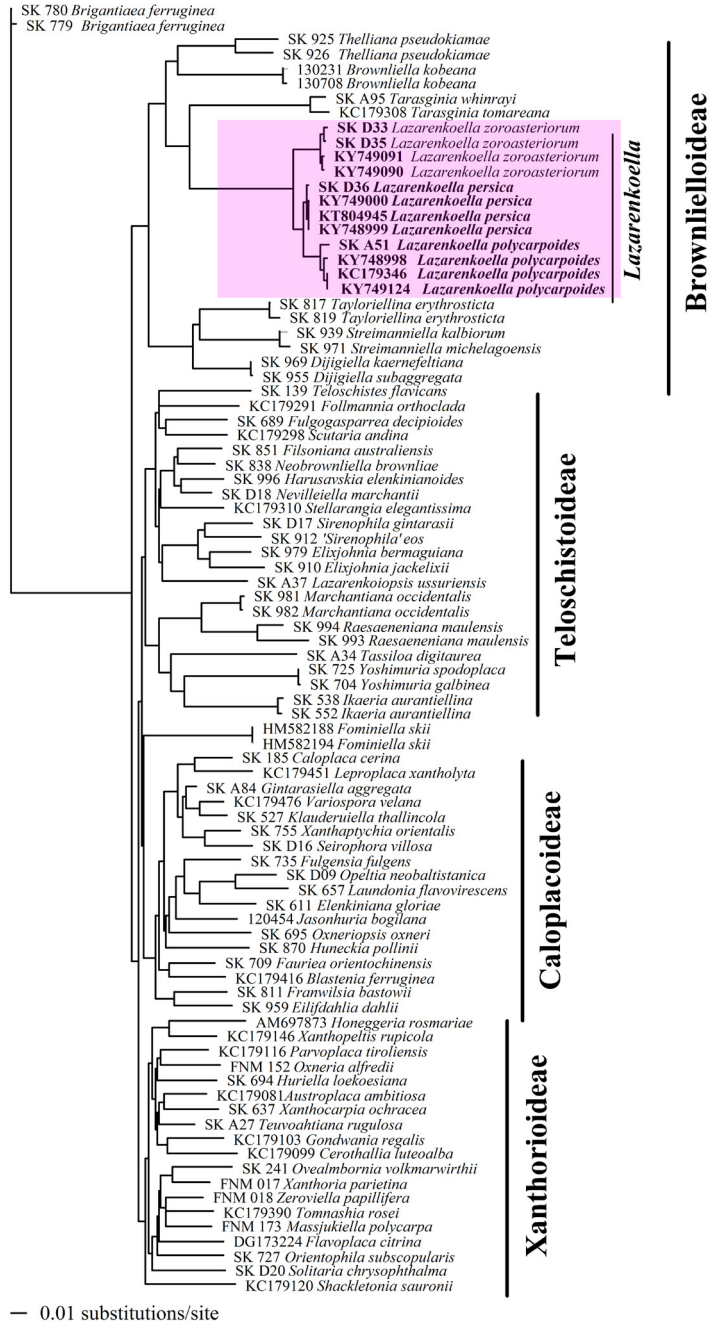

Fig. 3. Phylogenetic analysis of representatives of the subfamily Brownlielloideae after combined data set

mm across around adult apothecia (probably in shaded conditions, i.e. on underside of phorophyte branches), but commonly not distinct; usually only numerous apothecia are well developed. Apothecia 0.3–1.5(–3) mm diam. [in section to 0.6 mm thick], numerous, solitary or to densely aggregated per 2–4 or to 10–11 in aggregations, but apothecia aggregations are mainly not correlate with development of thalline areoles; at first (when they are 0.2–0.3 mm diam.) zeorine or biatorine with distinct yellowish true exciple to 50 μm wide, but soon becoming convex to very convex and emarginate, thalline exciple greyish or whitish from the beginning is situated much below of proper margin and then hardly seen as wall of apothecium stipa; in section cortical layer of thalline exciple of very thick walled cells 5–8(–12) μm diam./across; true exciple very thin, 5–7(–12) μm thick, (often only 1–2 cell layer present) or indistinct in basal portion, paraplectenchymatous; hymenium (55–)70–80 μm high; epihymenium brightly light yellow; uppermost cells of the paraphyses distinctly swollen to 6–7 μm diam.; asci 8-spored; ascospores widely ellipsoid, seem to be elongated owing to rather wide septum, 7–13(–14) × 5–7 μm in water and (7–)12–13 × (5–)6–7(–7.5) μm in K, septum (2–)4–6(–8) μm wide in water and (3–)6–8 μm wide in K.

Distribution and ecology: It is known so far only from one single collection from Tasmania, where it was found on bark of thick twigs of *Crataegus* growing together with the species of the genus *Rinodina* and other crustose lichens. Kärnefelt (2001) discovered *Seawardiella tasmaniensis* (as *Caloplaca lobulata*) in an exposed habitat in open agricultural land growing on twigs and trunks of introduced trees, mainly *Crataegus* and *Populus nigra*. In larger parts of Tasmania north of Hobart and along the northern coast this cultivated type of landscape is rather common. The trunks of the well-grown trees were partly covered by both *Seawardiella tasmaniensis* (as *C. lobulata*) and also by *Xanthoria* cf. *parietina*. Lower partly dead branches were also overgrown by lichens including *Seawardiella tasmaniensis* (as *C. lobulata*). Many members of the genera *Caloplaca* and *Xanthoria* are favoured by fertilisers from the agricultural land, which can be seen in many European countries. It is strange that *Seawardiella tasmaniensis* (as *C. lobulata)* was found in such an abundance in the single Tasmanian locality compared with a quite different situation from European countries.

Etymology: The new species is named after the island where the type locality and single confirmed locality is situated.

Taxonomic notes: A Tasmanian collection labelled *Seawardiella* aff. *lobulata* was selected as type material for the new species *S. tasmaniensis* more than 13 years ago. The present confirmation by molecular data made us confident to describe the new species below.

Table 2
Comparison of some morphological characters of *Seawardiella lobulata* and *S. tasmaniensis*

Characters	*S. lobulata*	*S. tasmaniensis*
Thallus	microrosette-like, to 2–3(–5) mm diam./across, surrounded by visible thalline portions, 0.4–0.9 mm across	undeveloped, only irregular single microlobules to 0.3 mm across, solitary or in aggregation with apothecia mainly in shaded conditions
Apothecia	0.2–0.6 mm diam., lecanorine with permanent thalline margin, usually 4–9 per thalline squamule	0.3–1.5(–3) mm diam., zeorine soon becoming convex and emarginated, no correlation with development of thalline areoles
Spores	10–16 × 5–8 µm	7–13(–14) × 5–7 µm
Septum	5–7 µm	(2–)4–6(–8) µm

Seawardiella tasmaniensis is similar to *S. lobulata*, but differs in having an undeveloped thallus consisting of irregular single microlobules only, to 0.3 mm across compared with the microrosette-like thallus of *S. lobulata* measuring 2–3(–5) mm diam./across, surrounded by 0.4–0.9 mm large thallus portions. Furthermore, the new species differs in having larger and usually solitary apothecia (0.3–1.5(–3) mm diam., solitary *vs*. 0.2–0.6 mm diam., 4–9 per thalline rosettes in *S. lobulata*). The apothecia of *S. tasmaniensis* soon becomes biatorine, convex and emarginated compared to lecanorine with a permanent thalline margin in *S. lobulata*. Finally, *S. tasmaniensis* differs by somewhat shorter ascospores, 7–13 µm *vs.* 10–16 µm long in *S. lobulata* (see also Table 2) (Kondratyuk *et al.* 2004).

Seawardiella tasmaniensis exists first of all as apothecia. A thallus is not present in all cases – or not seen – whereas a regular rosette-like thallus always surrounds the apothecia of *Caloplaca lobulata*. Furthermore, *Caloplaca lobulata* is characterised by having plane and regularly rounded discs with well-developed permanent thalline margins usually seen in all adult apothecia. Interestingly, European material of *Seawardiella lobulata* is never damaged by *Muelleriella*, while the entire material of *S. tasmaniensis* was ± damaged.

Molecular data confirm several taxa within the *S. lobulata* complex, of which a Tasmanian species is described here. *Seawardiella tasmaniensis* is without any doubts close to *C. lobulata* reminding of the latter's ability to form a microthallus. The new species is confirmed in the molecular phylogeny based on ITS1/ITS2 nrDNA, 28S nrLSU and 12S mtSSU (Figs 1–2).

New combinations

Athallia inconnexa (Nyl.) S. Y. Kondr. et L. Lőkös, *comb. nova* – MycoBank no.: MB 827519 – Basionym: *Lecanora inconnexa* Nyl., Flora, Regensburg 66: 100 (1883) ≡ *Caloplaca inconnexa* (Nyl.) Zahlbr., Cat. Lich. Univers. 7: 145 (1930)[1931].

Calogaya safavidiorum (S. Y. Kondr.) S. Y. Kondr. et L. Lőkös, *comb. nova* – MycoBank no.: MB 827520 – Basionym: *Caloplaca safavidiorum* S. Y. Kondr., in Kondratyuk, Lőkös, Zarei-Darki et Hur, Acta bot. hung. 54(3–4): 325 (2012).

Coppinsiella orbicularis (M. Haji Moniri, Vondrák et Malíček) S. Y. Kondr. et L. Lőkös, *stat. et comb. nova* – MycoBank no.: MB 827063 – Basionym: *Caloplaca substerilis* subsp. *orbicularis* M. Haji Moniri, Vondrák et Malíček, in Vondrák *et al.*, Nordic J. Bot. 35(3): 370 (2017). – Note: One more taxon mentioned as *Caloplaca* aff. *ulcerosa* (Vondrák *et al.* 2013) is still waiting for legal describing.

Coppinsiella substerilis (Vondrák, Palice et van den Boom) S. Y. Kondr. et L. Lőkös, *comb. nova* – MycoBank no.: MB 827057 – Basionym: *Caloplaca substerilis* Vondrák, Palice et van den Boom, in Vondrák *et al.*, Lichenologist 45(6): 715 (2013).

Coppinsiella ulcerosa (Coppins et P. James) S. Y. Kondr. et L. Lőkös, *comb. nova* – MycoBank no.: MB 827058 – Basionym: *Caloplaca ulcerosa* Coppins et P. James, Lichenologist 11(2): 139 (1979).

Lazarenkoella persica (J. Steiner) S. Y. Kondr. et L. Lőkös, *comb. nova* – MycoBank no.: MB 827059 – Basionym: *Xanthoria polycarpoides* var. *persica* J. Steiner, Annls mycol. 8(2): 241 (1910) ≡ *Caloplaca persica* (J. Steiner) M. Steiner et Poelt, Pl. Syst. Evol. 140(2–3): 168 (1982) ≡ *Xanthoria persica* (J. Steiner) Szatala, (1957) ≡ *Calogaya persica* (J. Steiner) Arup, Frödén et Søchting, Nordic J. Bot. 31(1): 39 (2013).

Lazarenkoella polycarpoides (J. Steiner) S. Y. Kondr. et L. Lőkös, *comb. nova* – MycoBank no.: MB 827060 – Basionym: *Xanthoria polycarpoides* J. Steiner, Annls mycol. 8(2): 241 (1910) ≡ *Caloplaca polycarpoides* (J. Steiner) M. Steiner et Poelt, Pl. Syst. Evol. 140(2–3): 168 (1982) ≡ *Calogaya polycarpoides* (J. Steiner) Arup, Frödén et Søchting, Nordic J. Bot. 31(1): 39 (2013).

Notes on the genus *Lazarenkoella*: Thanks to recent molecular data from *Calogaya polycarpoides*, *C. persica* and *Lazarenkoella zoroasteriorum* it became possible to delimit the genus *Lazarenkoella* more clearly. Two specimens, SK D36 and SK D35, cited as *Lazarenkoella* aff. *zoroasteriorum* by Kondratyuk *et al.* (2015*a*), in fact represents *Calogaya polycarpoides* and *C. persica*, respectively. The new combinations *L. polycarpoides* and *L. persica* are proposed here. The genus *Lazarenkoella* was positioned as a monophyletic branch in sister position to *Calogaya* in the subfamily Xanthorioidae in the study by Vondrák *et al.*

(2018). However, when adding representatives from all the four subfamilies of the Teloschistaceae, *Lazarenkoella* forms a monophyletic branch within the subfamily Brownlielloideae (Fig. 3). The combinations *Lazarenkoella polycarpoides* and *L. persica* should be confirmed in the future in molecular analyses, preferably based on the same three genes used in this study, and from the vouchers cited by Vondrák *et al.* (2018).

Seawardiella lobulata (Flörke) S. Y. Kondr., I. Kärnefelt et A. Thell, *comb. nova* – MycoBank no.: MB 827061 – Basionym: *Lecanora lobulata* Flörke, Mag. Neuesten Entdeck. Gesammten Naturf. Freunde Berlin 1: 219 (1820) ≡ *Xanthoria lobulata* (Flörke) B. de Lesd., Bull. Soc. bot. Fr. 54: 282 (1907) ≡ *Calogaya lobulata* (Flörke) Arup, Frödén et Søchting, Nordic J. Bot. 31(1): 39 (2013) = *Xanthoria boulyi* Zahlbr., Lich. rarior. exsicc., no. 119 (1909).

CONCLUSIONS

The new genera *Coppinsiella* and *Seawardiella* enlarged the number of genera in the Xanthorioideae to 41. The genus *Coppinsiella* includes three species earlier included in the *Caloplaca ulcerosa* group. The genus *Seawardiella* includes two species from the former '*Caloplaca*' *lobulata* aggregation ('*Xanthoria lobulata*-Gruppe' sensu Steiner et Poelt 1982), i.e. *Seawardiella lobulata* and the recently described *S. tasmaniensis*.

Three other species from the former '*Caloplaca*' *lobulata* aggregation (i.e. *Lazarenkoella zoroasteriorum*, *L. persica* and *L. polycarpoides*) are positioned in the *Lazarenkoella* branch of the Brownlielloideae based on ITS nrDNA, nrLSU and mtSSU sequences, while they are still positioned in the *Calogaya* clade after ITS phylogeny or if a limited number of taxa are included in the phylogenetic analysis of the Teloschistaceae.

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