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Revision of *Marchantiana* (*Caloplacoideae*, *Teloschistaceae*) – a misconceived lichen genus

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Abstract. The genus *Marchantiana* has been a victim of changeable concepts, partly due to erroneous DNA sequences published with its description. Based on new molecular sequencing, new chemical analyses and additional field work, mainly in Patagonia, Tasmania and New Zealand, we present a new taxonomic classification for the genus and related species. *M. michelagoensis* is confirmed to belong to *Marchantiana*, and the genus *Streimanniella*, for which this species was the generic type, is synonymized with *Marchantiana*. We combine *Caloplaca haematommona*, *C. magnetensis*, *C. tomnashii* and *C. phaeocincta* into *Marchantiana* as *M. haematommona*, *M. magnetensis*, *M. tomnashii* and *M. phaeocincta*, respectively. A new genus *Taedigera* is described to cater for three previous *Marchantiana* species and one *Caloplaca* species, with the new names *T. pyramus*, *T. ramulicola*, *T. subpyracea* and *T. epibrya*, respectively. Two species, *T. flammea* and *T. gallowayi*, both twig epiphytes from New Zealand, and one species, *M. tasmanica*, from Tasmania, are described as new to science based on molecular and secondary chemical characters. *Marchantiana burneyensis*, *M. kalbiorum* and *M. seppeltii* are excluded from the genus *Marchantiana* based on newly generated sequences of type material. A key is provided to the species groups in Patagonia, Tasmania and New Zealand.

Key words: Falkland Islands, molecular taxonomy, New Zealand, Patagonia, *Taedigera*, Tasmania, *Yoshimuria*

Introduction

The genus *Marchantiana* S.Y. Kondr., Kärnefelt, Elix, A. Thell & Hur, primarily consisting of twig growing species with a poorly developed thallus, was described by Kondratyuk et al. (2014). They included six species: *M. burneyensis*, *M. kalbiorum*, *M. michelagoensis*, *M. occidentalis*, *M. seppeltii* and *M. maulensis*. It was accommodated in subfamily *Xanthorioideae* and the type of the genus was *M. occidentalis* (Elix, S.Y. Kondr. & Kärnefelt) S.Y. Kondr., Kärnefelt, Elix, A. Thell, Jung Kim, A.S. Kondr. & Hur. A year later, Kondratyuk et al. (2015) divided *Marchantiana* into three genera: *Raesaeneniana* S.Y. Kondr., Kärnefelt, A. Thell, Elix & Hur with *R. maulensis* (as type), *Streimanniella* S.Y. Kondr., Kärnefelt, A. Thell, Elix & Hur with *S. burneyensis*, *S. kalbiorum*, *S. michelagoensis* and *S. seppeltii* (with *S. michelagoensis* as type), and *Marchantiana* which included only *M. occidentalis* as type of the genus.

The molecular taxonomy of the three proposed genera was later revised by Wilk et al. (2021). As a result, *Marchantiana* was transferred to the subfamily *Caloplacoideae*, *Raesaeneniana* to *Teloschistoideae*, and *Streimanniella* was shown to be based on sequences not representing *Teloschistaceae*.

Based on molecular results, *Raesaeneniana maulensis* was subsequently shown to belong to the genus *Villophora* (Søchting et al. 2021).

Søchting et al. (2023) described two new species of *Marchantiana* from southern Patagonia, viz.: *M. pyramus* Søchting & Arup and *M. ramulicola* Søchting & Arup and combined three species into the genus, viz.: *M. epibrya* (Kantvilas & Søchting) Søchting & Arup, *M. queenslandica* (Kalb, S.Y. Kondr., Elix & Kärnefelt) Arup & Søchting and *M. subpyracea* (Nyl.) Søchting & Arup.

The molecular relationship between *Marchantiana* and *Yoshimuria* was discussed in detail by Søchting et al. (2023), who accepted *Yoshimuria* as an unsupported sister genus outside *Marchantiana*. Partly due to a multitude of erroneous DNA sequences, the original concept of the genus *Marchantiana* was corrupted from the beginning, but in the present paper we reconstruct the genus based

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on novel DNA sequences of type material, and separate four species to the new genus *Taedigera*. Furthermore, recent field activities in southern continents allow us to elucidate the taxonomy and phylogeography of the genus and its neighboring genera.

Material and methods

Material

Specimens of *Marchantiana* s.lat. were collected in southern Patagonia (including Tierra del Fuego), the Falkland Islands, Tasmania and New Zealand. Cited specimens are deposited in the University of Copenhagen herbarium (C) unless otherwise stated. *M. tomnashii* (S.Y. Kondr., Elix & Kärnefelt) Arup & Søchting, *M. magnetensis* (S.Y. Kondr., Elix, Kärnefelt & Kalb) Søchting & Arup, *M. haematommona* (Elix & S.Y. Kondr.) Søchting & Arup and *M. queenslandica* (Kalb, S.Y. Kondr., Elix & Kärnefelt) Arup & Søchting, all described from mainland Australia, are only superficially treated in the present study and not included in the key. The genus *Yoshimuria* from East Asia is included in the molecular phylogeny, but not studied in depth.

Morphology and anatomy

Macroscopic descriptions are based on observations made with an Olympus SZH dissecting microscope with an Olympus OM-D camera. Sections were made by hand or with a Reichert-Jung Cryostat 2800 Frigocut E microtome and studied with an Olympus BX60 microscope. All measurements were made on material mounted in water. Spores were measured outside the asci and the measurements given as averages and standard deviation of 'n' measurements with minimum and maximum measurements in brackets.

Secondary chemistry

Secondary metabolites were identified using HPLC. The relative composition of the secondary compounds was calculated based on absorbance at 270 nm (Søchting 1997). All yellow, orange or reddish parts are K+ purple.

Molecular analyses

PCR amplification was carried out on DNA extracts or using direct PCR following Arup et al. (2015). Amplifications were made of the internal transcribed spacer regions (nrITS) and the large subunit (nrLSU) of the nuclear ribosomal RNA genes, and the small subunit of the mitochondrial ribosomal RNA gene (mrSSU). Primers for amplification were ITS1F (Gardes & Bruns 1993), ITS4 (White et al. 1990), AL1R (Döring et al. 2000), LR5 or LR6 (Vilgalys & Hester 1990), mrSSU1 (Zoller et al. 1999) and mrSSU7 (Zhou & Stanosz 2001). The PCR parameters included an initial hold at 94°C for 5 min, then denaturation at 94°C for 1 min, annealing at 50 or 54°C (mrSSU) or 53–56°C (nrITS and nrLSU) for 1 min, decreasing 1°C per cycle for the first six of the 39 cycles (touch-down), and an extension at 72°C for 3 min.

Sequence alignment

Two different alignments were prepared, one for a combined analysis of the genes nrITS, nrLSU and mrSSU and one alignment of only nrITS sequences. The combined analysis included 83 sequences from most genera of the subfamily *Caloplacoideae* with *Amandinea punctata* (Hoffm.) Coppins & Scheid. and *Physcia aipolia* (Ehrh. ex Humb.) Fürnr. as outgroup. The ITS alignment included 46 *Marchantiana* sequences, 9 *Yoshimuria* sequences and the outgroup *Rufoplaca scotoplaca* (Nyl.) Arup, Søchting & Frödén. The sequencing was carried out by Macrogen Inc. (the Netherlands), using the same primers as for the PCR. The two resulting strands were assembled using CLC Main Workbench 4.1.2TM or Geneious v. 11.1.5. Subsequent alignments were performed in Geneious v. 11.1.15 using the MAFFT option (auto) and adjusted manually. Unalignable ends, introns in all the aligned genes and ambiguously aligned parts were excluded from the alignment. Sequences have been submitted to GenBank as indicated in Table 1. The alignments of the three different genes were first analyzed separately to check for incongruence between genes. A conflict between the datasets was assumed to be significant if two different relationships were both supported with posterior probabilities ≥ 0.95.

Phylogenetic analyses

Phylogenetic relationships were inferred using maximum likelihood (ML) as implemented in IQ-TREE 2 (Quang Minh et al. 2020) and Bayesian tree inference was carried out using Markov chain Monte Carlo (MCMC) as implemented in MrBayes v. 3.2 (Ronquist et al. 2012). In the combined analysis, the three included genes were treated as separate partitions. A suitable likelihood model for each of the genes was selected, using BIC as implemented in the software jModelTest v. 2.1.4 (Guindon & Gascuel 2003; Darriba et al. 2012), evaluating only the 24 models available in MrBayes (Ronquist et al. 2012). For the concatenated dataset, the GTR + I + G model was found to be optimal for all three genes. For the pure nrITS dataset, the evolutionary model SYM+G was found to be optimal. The parameters used in the analyses followed those of Arup et al. (2013), except for the branch length prior that was set to an exponential with mean 1/10. No molecular clock was assumed. Three parallel runs with 20,000,000 generations starting with a random tree and employing six simultaneous chains were executed, five of which were incrementally heated with a temperature of 0.10. Analyses were diagnosed every 1,000 generations in the last 50% of the tree sample and automatically halted when convergence was reached. Convergence was defined as a standard deviation of splits (of frequency 0.1) between runs below 0.01. Every 2,000th tree was sampled. A majority-rule consensus tree was constructed from the post-burn-in tree samples. The consensus trees were visualized using FigTree v. 1.4.4 and redrawn in Adobe Illustrator. The maximum likelihood analyses used the same evolutionary models as those used in the Bayesian analyses. Branch support values were computed via 1,000 non-parametric bootstrap replicates.

Table 1. Sequences used in the analyses, newly produced in bold and others downloaded from GenBank.

Species	Country, collector, collectors nr, herbarium	rnITS	rnLSU	mrSSU
Blastenia ammiospila	Austria, Søchting 9345, C (ITS, mrSSU); Norway, Søchting 10092, C (LSU)	KC179413	KC179161	KC179491
Blastenia crenularia	Iceland, Søchting 7523, C	KC179415	KC179162	KC179492
Blastenia relicta	Spain, Søchting 9996, C	KC179416	KC179163	KC179493
Bryoplaca jungermanniae	Greenland, Søchting 10451, C	KC179420	MT952895	MT95295
Bryoplaca sinapisperma	Norway, Arup L08184, LD (ITS, mrSSU); Norway, Arup L08184, LD (LSU)	KC179421	MT952896	KC179495
Bryoplaca tetraspora	Antarctica, Søchting 7979, C (ITS); Greenland, Søchting 10480, C (LSU, mrSSU)	KC179422	MT952897	KC179496
Caloplaca cerina	Svalbard, Elvebakk 03:109, TROM	KC179425	KC179168	KC179499
Caloplaca chlorina	Denmark, Søchting 7321, C	KC179426	KC179169	KC179500
Caloplaca turkuensis	Sweden, Frödén 1909, LD	KC179432	MT952899	KC179501
Eilifdahlia dahlii	Australia, Kärnefelt 20043101, LD	KJ021318	KJ021253	KJ021279
Eilifdalia wirthii	Australia, Wirth et al. 05.10.2011, STU	KJ021320	KJH021255	KJ021281
Fauriea chujaensis	South Korea, KoLRI 023698	KX793095	KX793098	KX793101
Fauriea orientochinensis	China, 2011 Wang, KoLRI 013959	KX793096	KX793099	KX793102
Franwilsia kilcundaensis	Australia, Kärnefelt 20047101, LD	KJ021327	KJ021260	KJ021287
Franwilsia bastowii	Australia, Kärnefelt 994301, LD	KJ021324	KJ021257	KJ021284
Gintarasiella aggregata	Australia, Kantvilas 476/12, HO	KY614392	KY614450	–
Gyalolechia arizonica	USA, Arizona, Nash 38931, C	KC179433	KC179195	KC170529
Gyalolechia aurea	Arup L97493, LD	KC179434	–	KC179530
Gyalolechia aurea	Austria, 1993, Poelt & Grube, GZU	–	KC179196	–
Gyalolechia bracteata	Austria, Lutzoni 96.08.30-19, C	AF277668	MT952900	MT952926
Gyalolechia canariensis	Spain, La Palma, Étayo & Rebolé 17566, C	KC179436	–	–
Gyalolechia flavorubescens	Estonia, Søchting 10127, C	KC179439	KC179197	KC179531
Gyalolechia flavovirescens	Russia, Søchting 8648, C	AF353966	KC179198	KC179532
Gyalolechia fulgens	Spain, Søchting 7306, C (ITS); Sweden, Arup L06206, LD (LSU)	KC179440	KC179199	–
Gyalolechia fulgens	Sweden, Søchting 10586, C (mrSSU)	–	–	KC179533
Gyalolechia stipitata	Mexico, Søchting US9917, C	KC179446	KC179202	KC179536
Huneckia crocina	Argentina, Ferraro et al. 10823, C	MT967384	MT952902	MT952928
Huneckia pollinii	USA, Kansas, Morse 14464, LD	KJ021336	KJ021265	KJ021296
Huneckia wrightii	Galapagos, Aptroot 63246, CDS (ITS); Miranda 962, CDS (LSU, mrSSU)	MT967388	MT952903	MT952929
Jasonhuria bogilana	South Korea, KoLRI 120454	KT220196	KT220205	KT220214
Kuettlingeria atroflava	Sweden, Arup L06010, LD	KC179424	KC179171	KC179504
Kuettlingeria albolutescens	Sweden, Arup L09030, LD	KC179423	MT952998	KC179502
Kuettlingeria erythrocarpa	Italy, Arup L07109, LD	KC179427	KC179173	KC179506
Kuettlingeria teicholyta	Denmark, Søchting 11195, C (ITS, LSU); Denmark, Søchting 9772, C (mrSSU)	KC179431	KC179176	KC179510
Lacrima epiphora	Panama, van den Boom 43698, priv. herb.	MT967392	MT952904	MT952930
Lacrima galapagoensis	Galapagos, Bungartz 4091, CDS (ITS); Ertz 22855, CDS (LSU, mrSSU)	MT967297	MT952905	MT952931
Lendemeriella aureopruinosa	Russia, Chesnokov 154, LE-L15207	MN814228	MW227504	MW227333
Lendemeriella reptans	USA, Lendemer 48186, NY	MH104934	MH100766	MH100796
Leproplaca chrysodeta	Sweden, Arup L07107, LD (ITS, LSU); Sweden, Arup L13261, LD (mrSSU)	KC179448	KC179206	MT952933
Leproplaca xantholyta	Austria, Arup L97278, LD (ITS); Spain, Søchting 9675, C (LSU, mrSSU)	KC179451	KC179208	KC179542
Leproplaca obliterans	Sweden, Arup L02331, LD (ITS, mrSSU), Norway, Arup L03472, LD (LSU)	KC179449	KC179207	KC179541
Leproplaca proteus	Sweden, Arup 02339, LD	KC179450	KC170557	KC179507
Loekoesia austrocoreana	South Korea, KoLRI 120523	KT220020	KT220210	KT220219
Loekoesia yuchiorum	USA, Lendemer 22026, LD	OQ678329	OQ678282	OQ678286
Marchantiana asserigena 1	Scotland, Arup L10184, LD	MT967307	MT952907	MT952934
Marchantiana asserigena 2	Sweden, Arup L15635, LD	**PQ340601**	**–**	**–**
Marchantiana asserigena 3	Norway, Tønsberg, BG-L-105220, BG	OK346333	–	–
Marchantiana asserigena 4	Denmark, Søchting 12490, C	**PQ340602**	**–**	**–**
Marchantiana cf. *asserigena 5*	New Zealand, Søchting 11987, C	OQ678333	–	–
Marchantiana cf. *asserigena 6*	Falkland Islands, Søchting 12604, C	**PQ393139**	**–**	**–**
Marchantiana haematommona	Australia, W. Australia, Elix 36452, LD	**PQ340603**	**–**	**–**
Marchantiana magnetensis	Australia, K. & A. Kalb 33555, CANB	**PQ340604**	**–**	**–**
Marchantiana michelagoensis	Australia, Elix 37402, LD	OQ678334	–	OQ678288

Table 1. Continued.

Species	Country, collector, collectors nr, herbarium	rnITS	rnLSU	mrSSU
Marchantiana occidentalis 1	Australia, Elix 32479, CANB	OQ678335	–	–
Marchantiana occidentalis 2	Australia, Kärnefelt 20042502, LD	MT964708	–	KJ021304
Marchantiana occidentalis 3	Australia, Elix 32479, CANB?	**PQ340605**	–	–
Marchantiana queenslandica	Australia, Kalb 27764, CANB	MT967409	MT952908	–
Marchantiana tasmanica 1	Australia, Søchting 11631, C	**PQ340606**	–	–
Marchantiana tasmanica 2	Australia, Søchting 11636, C	**PQ340607**	–	–
Marchantiana tasmanica 3	Australia, Søchting 11661, C	**PQ340608**	–	–
Marchantiana tomnashii	Australia, K. & A. Kalb 20365, CANB	**PQ340609**	–	–
Oceanoplaca caesioisidiata	Cape Verde, van den Boom 36538, LD	MT967411	MT952910	–
Oceanoplaca caesiosorediata	Cape Verde, van den Boom 36346, LD	MT967412	MT952911	MT952936
Oceanoplaca catillarioides	Cape Verde, van den Boom 36365, LD	MT967410	MT952909	MT952935
Oceanoplaca chemoisidiosa	Galapagos, Bungartz 6436, CDS 34651 (ITS, LSU), Aptroot 64354, CDS 30919 (mrSSU)	MT967413	MT952912	MT952937
Oceanoplaca isidiosa	Galapagos, Adsersen, LAM8-1, C	MT967416	MT952913	MT952938
Oceanoplaca sideritoides	Galapagos, Bungartz 3663, CDS 27481	MT967424	MT952915	MT952939
Obscuroplaca camptidia	USA, Morse 14420, LD	MT967431	MT952918	MT952942
Obscuroplaca ochrolechioides	Australia, Kalb & Rogers 18982, CANB	MT967432	MT952919	–
Obscuroplaca tortuca	Galapagos, Aptroot 65189, CDS	MT967433	–	MT952943
Olegblumia demissa	Italy, Arup L97911, LD	AF353960	KC179172	KC179505
Pisutiella conversa	Unknown, Vondrák 5538, PRA	MH104924	MH100750	MH100782
Pyrenodesmia alociza	Sweden, Arup L10185, LD	MT967436	MT952920	MT952944
Pyrenodesmia chalybaea	Austria, Søchting 9351, C	KC179454	MT952921	KC179571
Pyrenodesmia variabilis	Austria, Arup s.n., LD (ITS); Sweden, Arup L03134, LD (LSU, mrSSU)	AF353963	KC179234	KC179572
Rufoplaca scotoplaca	Sweden, Arup L10032, LD	KC179457	KC179235	KC179573
Rufoplaca sp.	California, Arup L09201, LD	KC179458	KC179236	KC179574
Rufoplaca tristiuscula	Norway, Arup L08171, LD	KC179460	KC179237	KC179575
Sanguinodiscus aractinus	Czech Republic, Vondrák 6702, PRA	MH104919	–	MH100773
Sanguinodiscus haematites	Ukraine, Vondrák 7278, PRA	MH104928	MH100789	MH100756
Seirophora scorigena	Lanzarote, Snogerup, S. & B. 17201, LD	KC179466	KC179244	KC179583
Seirophora villosa	Morocco, Guttova loc. num., KW-L ex BRA	KY614436	KY614469	KY614511
Sucioplaca diplacia	Galapagos, Ertz 11610, CDS 36936	MT967470	MT952922	MT952945
Taedigera epibrya 1	New Zealand, Søchting 11956,1, C	OQ678330	–	–
Taedigera epibrya 2	Tasmania, Kantvilas 95/12, C	OQ678331	OQ678283	OQ678287
Taedigera flammea 1	New Zealand, De Lange CH 2322, AK	OQ678356	–	–
Taedigera flammea 2	New Zealand, Søchting 12036, C	**PQ340610**	–	–
Taedigera pyramus 1	Chile, Søchting 11312, C	OQ678336	–	–
Taedigera pyramus 2	Chile, Søgaard 58, C	OQ678337	–	–
Taedigera pyramus 3	Chile, Søgaard 28, C	OQ678338	–	–
Taedigera pyramus 4	Chile, Søgaard 27B, C	OQ678339	–	–
Taedigera pyramus 5	Chile, Søchting 12241, C	OQ678340	–	–
Taedigera pyramus 6	Chile, Søchting US 11363, C	OQ678341	–	–
Taedigera pyramus 7	Falkland Islands, Upson HSG 091109-25, C	OQ678342	–	–
Taedigera pyramus 8	Falkland Islands, Søchting 12654, C	OQ678343	–	–
Taedigera pyramus 9	Falkland Islands, Søchting 11279, C	OQ678344	–	–
Taedigera pyramus 10	Chile, Søchting 12667, C	OQ678345	–	–
Taedigera pyramus 11	Chile, Søchting 10178, C	OQ678346	–	–
Taedigera pyramus 12	Chile, Søchting 12667, C	**PQ340611**	–	–
Taedigera pyramus 13	Chile, Søchting 10178, C	**PQ340612**	–	–
Taedigera ramulicola 1	Chile, Søchting 11353, C	OQ678347	–	–
Taedigera ramulicola 2	Chile, Søchting 11377, C	OQ678348	–	–
Taedigera ramulicola 3	Chile, Søchting 11367, C	OQ678349	–	–
Taedigera ramulicola 4	Chile, Søchting 12308, C	OQ678350	–	OQ678289
Taedigera subpyracea 1	New Zealand, Frödén 1317, LD	OQ678351	OQ678284	OQ678290
Taedigera subpyracea 2	New Zealand, Søchting 12013, C	OQ678352	–	–
Taedigera subpyracea 3	New Zealand, Søchting 11958,1, C	OQ678353	–	–
Taedigera subpyracea 4	New Zealand, Søchting 11959,1, C	OQ678354	–	–
Taedigera gallowayi 1	New Zealand, Søchting 11961, C	OQ678355	–	–
Taedigera gallowayi 2	New Zealand, Søchting 11805, C	**PQ340613**	–	–
Taedigera gallowayi 3	New Zealand, Søchting 11874, C	**PQ340614**	–	–
Taedigera gallowayi 4	New Zealand, Søchting 11955, C	**PQ340615**	–	–

Table 1. Continued.

Species	Country, collector, collectors nr, herbarium	rnITS	rnLSU	mrSSU
Upretia amarkantakana	India, 2010 LWG: 10-013313/B	MG652764	–	MG652767
Upretia squamulosa	China, Lisong Wang et al. 17-56088, KUN; China, Lisong Wang et al. 16-50174, KUN	MH497054	MH497052	–
Usnochroma carphinea	France, Roux 1998, C	KC179468	KC179259	KC179598
Usnochroma scoriophila	Tenerifa, 1995, Gómez-Bolea, C	KC179469	KC179260	KC179599
Variospora aurantia	Spain, 1998, Llimona, C (ITS, mrSSU); Italy, 2006, Lange, C (LSU)	KC179470	KC179261	KC179600
Variospora dolomiticola	Spain, Thell SP0514, LD	KC179471	KC179262	KC179601
Variospora flavescens	Denmark, Søchting US9601, C (ITS), Sweden, Arup L03060, LD (LSU, mrSSU)	KC179473	KC179263	KC179602
Variospora glomerata	Sweden, Arup L03119, LD	KC179474	KC179264	KC179603
Variospora thallincola	Sweden, Søchting 7481, C (ITS); Sweden, Gaya et al. s.n., BCN (LSU)	KC179475	JQ301563	–
Variospora thallincola	UK, Wales, Arup L92148, LD (mrSSU)		–	KC179604
Variospora velana	Italy, Arup L07194, LD (ITS); Italy, Arup L07123, LD (LSU, mrSSU)	KC179476	KC179265	KC179605
Xanthoria parietina	Denmark, 2002, Søchting, C (ITS, mrSSU); Denmark, Søchting 7157, C (LSU)	KC179411	KC179289	KC179629
Yoshimuria "*cerussata*"	King George Island, Hur ANT07055, KolRi 006575	KJ021248	–	–
Yoshimuria galbina 1	South Korea, Wang & Ryu 110482, KoLRI 013527	KJ021250	–	–
Yoshimuria galbina 2	South Korea, Wang & Ryu 110871, KoLRI 013868	KJ021251	–	–
Yoshimuria galbina 3	South Korea, Arup L15370, LD (ITS); Arup 15500, LD (LSU, mrSSU)	MT967482	MT952923	MT952946
Yoshimuria spodoplaca 1	Japan, Sakata 3516, CBM	LC643774	–	–
Yoshimuria spodoplaca 2	Japan, Harada et al. 32277, CBM	LC643773	–	–
Yoshimuria spodoplaca 3	South Korea, Wang & Ryu 110364, KoLRI (ITS, mrSSU); Arup L15575, LD (LSU)	KJ021249	MT952924	KJ023194
Yoshimuria spodoplaca 4	Japan, Harada et al. 32242, CBM	LC643772	–	–
Yoshimuria spodoplaca 5	Japan, Sakata 3556, CBM	LC490370	–	–

Results and discussion

Molecular analysis

We generated 15 new nrITS sequences. The alignment for the first analysis consisted of 83 terminals of 2,036 aligned nucleotide sites, of which 598 were parsimony-informative. The nrITS partition consisted of 521 sites (284 informative), the nrLSU partition of 700 sites (135 informative) and the mrSSU partition of 816 sites (182 informative). The Bayesian analysis halted after 4,460,000 generations and a 50% majority-rule tree with posterior probabilities is shown in Fig. 1. The second analysis of only nrITS data consisted of 56 terminals of 554 sites, of which 183 were parsimony-informative. This analysis halted after 2,060,000 generations and the 50% majority-rule tree with posterior probabilities is shown above the branches in Fig. 2. The maximum likelihood and Bayesian analyses yielded very similar trees and so only the Bayesian trees are displayed.

Molecular phylogeny and generic taxonomy

Both the three-gene phylogeny (Fig. 1) and the ITS phylogeny (Fig. 2) show a strong support for the clade with *Marchantiana* s.lat. and *Yoshimuria*. Both analyses also show that the species of *Yoshimuria* form a clade that divides *Marchantiana* s.lat. into two groups. This topology was already known to Søchting et al. (2023). They analysed a smaller sample of species, but because of distributional and morphological similarities they decided to keep the two *Marchantiana* clades united. With more species available for analysis, we decided to divide *Marchantiana* into two genera. With *M. occidentalis* remaining as the generic type of *Marchantiana*, this genus will also now include *M. asserigena*, *M. haematommona*, *M. magnetensis*, *M. michelagoensis*, *M. occidentalis*, *M. queenslandica* and *M. tasmanica*. They are all species native to Australia, except *M. asserigena*, which is widely occurring in Europe, and also occurs in the Falkland Islands. The other clade, which is described under the generic name *Taedigera* includes the morphologically similar *T. epibrya*, *T. flammea*, *T. gallowayi*, *T. pyramus*, *T. ramulicola* and *T. subpyracea*. They are all native to New Zealand and Patagonia, with the exception of *T. epibrya* which is also known from Tasmania.

Yoshimuria S.Y. Kondr., Kärnefelt, Elix, A. Thell & Hur described by Kondratyuk et al. (2014) includes three species: *Y. cerussata* (Hue) S.Y. Kondr., et al., *Y. galbin*a (S.Y. Kondr. & Hur) S.Y. Kondr. et al., and *Y. spodoplaca* (Nyl.) S.Y. Kondr. However, *Y. cerussata* was suggested as misplaced (Fryday et al. 2022), and most likely belongs to the genus *Hueidea* (Søchting et al. 2024). *Y. galbina* and *Y. spodoplaca* are known from East Asia, mainly Japan and Korea. They have well-developed saxicolous thalli and rather large apothecia. These characters justify a generic segregation from *Marchantiana* and *Taedigera* which apart from the molecular differences are small, epiphytic and almost exclusively restricted to the southern Hemisphere.

The formal taxonomic treatment is provided in the following text.

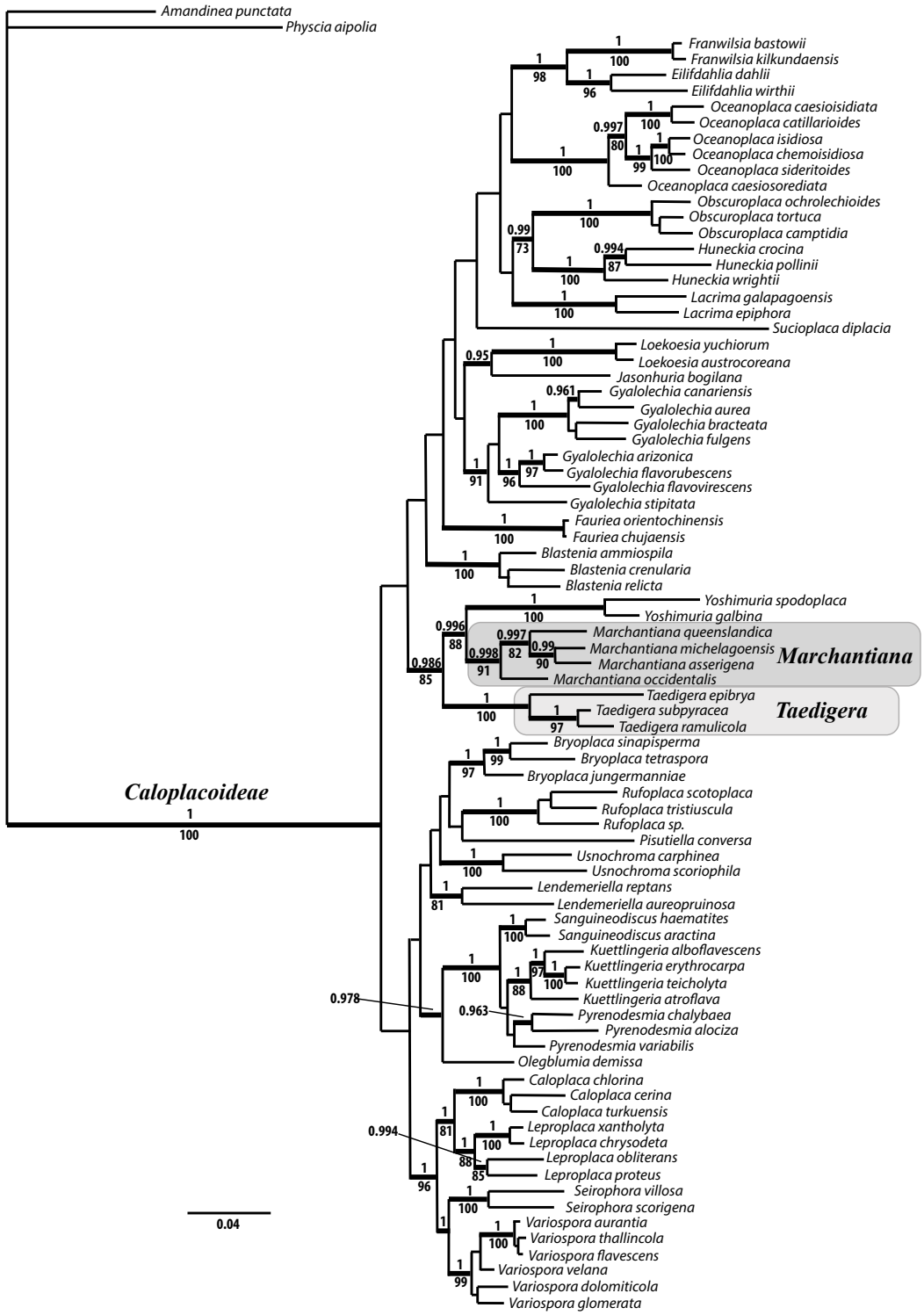

Figure 1. Majority-rule consensus tree based on a Bayesian MCMC analysis of a combined data set of the nrITS, nrLSU and mrSSU genes showing the position of *Marchantiana* in relation to *Yoshimuria* and the here proposed genus *Taedigera*. Branches with posterior probabilities higher or equal to 0.95 are shown in bold. Bootstrap values and posterior probabilities are presented below and above the branches, respectively.

Secondary chemistry

Seven chemotypes are known in *Marchantiana* and *Taedigera*.

1. Dominant parietin and very minor proportions of the oxidation products teloschistin, fallacinal, parietinic acid and emodin – Type A of Søchting (1997). Found in *M. magnetensis* (*fide* protologue), *M. occidentalis*, *M. tasmanica*, *T. ramulicola* and *T. subpyracea.*

2. Emodin only – A new type, here named E, found in *T. flammea*.

3. Dominant emodin (21–58%), but also with significant proportions of the oxidation products citreorosein (28–52%), emodinal (11–29%) and emodinic acid (13–39%) – A type named E3 (Søchting et al. 2023). Found in *T. epibrya*, *T. pyramus* and *T. gallowayi*.

4. Neochloroemodin. – This has been suggested, but not proven to be 4-chloroemodin (Elix, in litt.). Found

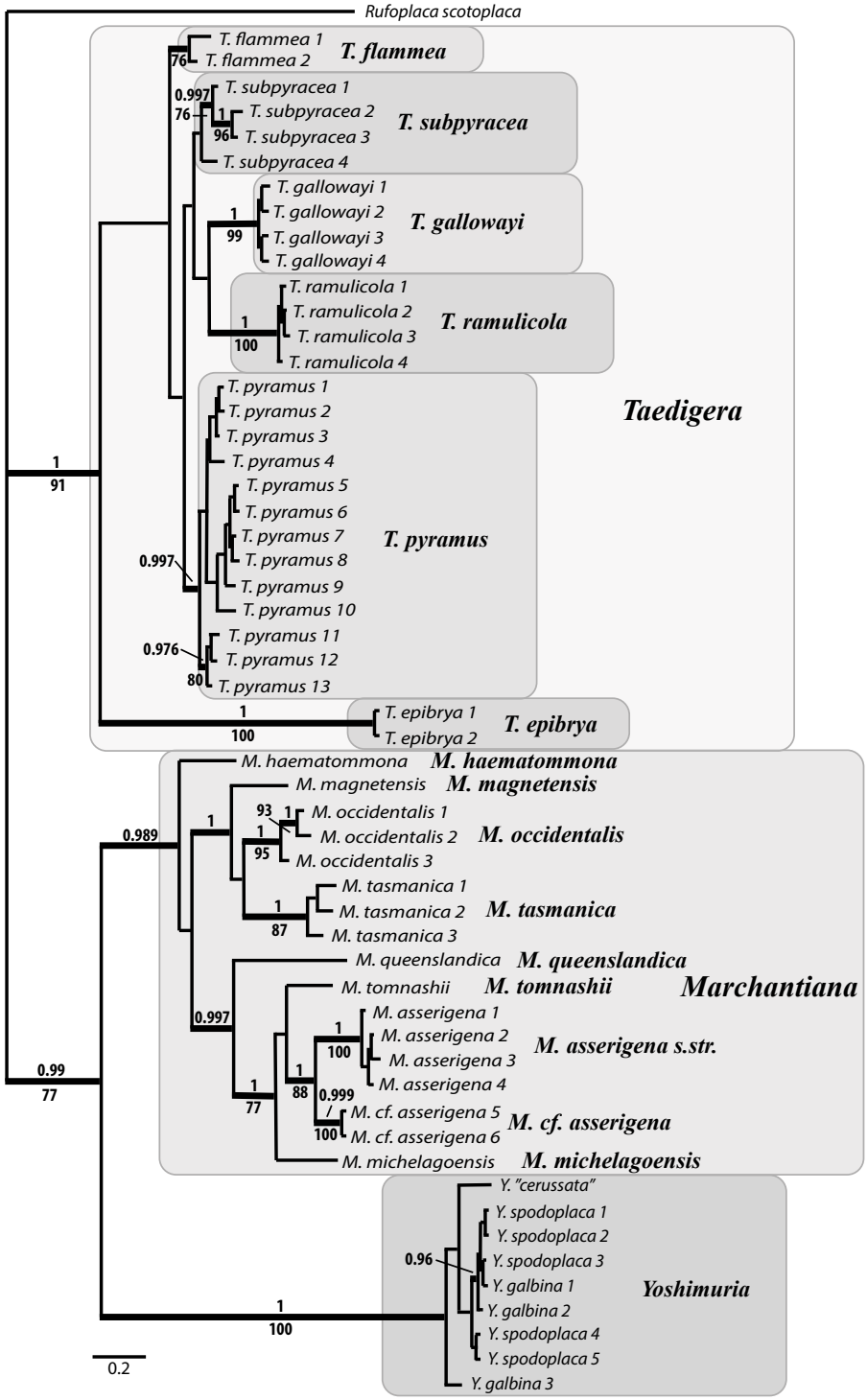

Figure 2. Majority-rule consensus tree based on a Bayesian MCMC analysis of ITS data of *Marchantiana*, *Yoshimuria and Taedigera*. Branches with posterior probabilities higher or equal to 0.95 are shown in bold. Bootstrap values and posterior probabilities are presented below and above the branches, respectively.

in *M. asserigena* (Søchting & Arup 2018), *M. michelagoensis*, *M. marchantiorum* (Kondratyuk et al. 2009), and *M. phaeocincta* (Kondratyuk et al. 2011).

5. 5-chloroemodin dominant – Found in *M. haematommona*.

6. Caloploicin (major), vicanicin (minor), isofulgidin (minor), and diploicin (trace) – Recorded from *M. tomnashii* (Kondratyuk et al. 2011). This needs verification.

7. Caloploicin (major), O-metylvioxanthin (minor), 7-chloroemodin (minor), atranorin (minor), fulgidin (minor), isofulgidin (minor), vicanicin (minor), diploicin (trace), and parietin (trace) – Recorded from *M. queenslandica* (Kondratyuk et al. 2010). This also needs verification.

The secondary chemistry in *Taedigera* is characterized by syndromes dominated by parietin or emodin. *Marchantiana* has a diverse secondary chemistry including the chlorinated neochloroemodin and 5-chloroemodin and the depsidones vicanicin, isofulgidin and caloploicin.

Taxonomy of *Marchantiana*, *Taedigera* and *Yoshimuria*

Marchantiana S.Y. Kondr., Kärnefelt, Elix, A. Thell & Hur, in Kondratyuk, Jeong, Yu, Kärnefelt, Thell, Elix, Kim, Kondratiuk & Hur, Acta Bot. Hung. 56(1–2): 103. 2014.

MycoBank MB 807181

Generic type: *Marchantiana occidentalis* (Elix, S.Y. Kondr. & Kärnefelt) S.Y. Kondr., Kärnefelt, A. Thell, Elix, J. Kim, A.S. Kondr. & Hur, Acta Bot. Hung. 56(1–2): 103. 2014.

= *Streimaniella* S.Y. Kondr., Kärnefelt, A. Thell, Elix & Hur, in Kondratyuk, Kärnefelt, Thell, Elix, Kim, Kondratiuk & Hur, Acta Bot. Hung. 57(3–4): 334. 2015.

Generic type: *S. michelagoensis* (Elix, S.Y. Kondr. & Kärnefelt) S.Y. Kondr., Kärnefelt, A. Thell, Elix, J. Kim, A.S. Kondr. & Hur.

Description. Thallus crustose, poorly developed, on bark. Apothecia small, zeorine, yellow to orange. Spores polardiblastic. Neochloroemodin present in several species, but other chemosyndromes occur. Reported mainly from Australia with one species widespread.

Marchantiana asserigena (J. Lahm) Søchting & Arup, Graphis Scripta 30(6): 118. 2018.

MycoBank MB 825549

Basionym: *Callopisma asserigenum* J. Lahm, Zusammenst. Westfal. Flech.: 107. 1883; MycoBank MB 381175.

Lectotype: Deutschland. Nordrhein-Westphalen: An Bretterzäunen zu Welbergen. August 1862. Lahm (M-0289846)

Chemistry. Neochloroemodin (Søchting & Arup 2018).

Notes. See Søchting & Fröberg (2003), Søchting & Arup (2018), and Søchting et al. (2023). It is the only *Marchantiana* species widely distributed in Europe; it shares chemistry with the molecularly closely related *M. michelagoensis* and with the morphologically similar *M. marchantiorum* (Kondratyuk et al. 2009) and *M. phaeocincta* (Kondratyuk et al. 2011). If further studies indicate that the four species cannot be separated, *M. asserigena* takes priority. The ITS phylogeny shows two specimens, *M. asserigena* 5 & 6 from New Zealand and the Falkland Islands to be located on a separate clade. Future studies may show them to represent a separate species.

Specimen studied (see also Søchting & Arup 2018 and Søchting et al. 2023). NEW ZEALAND. South Island, Canterbury, 25 km W of Twizel, Ohau, E-exposed mountain slope with *Nothofagus*. 44.2374°S, 169.8059°E, 650 m, *Nothofagus* twig, 07.02.2012, US 11952.

Marchantiana haematommona (Elix & S.Y. Kondr.) Søchting & Arup, comb. nov.

MycoBank MB 854251

Basionym: *Caloplaca haematommona* Elix & S.Y. Kondr., in Kondratyuk, Kärnefelt, Elix & Thell, Biblthca Lichenol. 95: 361. 2007; MycoBank MB 529531.

Holotype: Elix 36452 (PERTH).

Chemistry. 5-chloroemodin in isotype (LD).

Ecology and distribution. Only known from a dead shrub in Western Australia.

Notes. In the protologue the species is claimed to contain the compounds haematommone and atranorin. This surprising data is in conflict with our analysis of the isotype and may be due to missampling for analysis of nearby *Haematomma* specimens.

Marchantiana magnetensis (S.Y. Kondr., Elix, Kärnefelt & Kalb) Søchting & Arup, comb. nov.

MycoBank MB 854217

Basionym: *Caloplaca magnetensis* S.Y. Kondr., Elix, Kärnefelt & Kalb, in Kondratyuk, Kärnefelt, Elix & Thell, Biblthca Lichenol. 100: 260. 2009; MycoBank MB 540361.

Holotype: Kalb 30555 (Herb. Kalb).

Chemistry. According to protologue: parietin (major) and emodin (minor), which correspond to chemosyndrome A (Søchting 1997).

Ecology and distribution. On bark of trees and shrubs. Western Australia.

Marchantiana marchantiorum (S.Y. Kondr. & Kärnefelt) Søchting & Arup, comb. nov.

MycoBank MB 854252

Basionym: *Caloplaca marchantiorum* S.Y. Kondr. & Kärnefelt, in Kondratyuk, Kärnefelt, Elix & Thell, Biblthca Lichenol. 100: 261. 2009; MycoBank MB 540362.

Holotype: Kondratyuk 20458 (CANB).

Chemistry. According to protologue, neochloroemodin (major).

Ecology and distribution. On bark of trees and shrubs. Known from Western Australia, Victoria and Tasmania.

Notes. This species is assumed to be closely related to *M. asserigena* and *M. michelagoensis* with which it shares morphology and a unique chemistry. Material has not been available for molecular studies, but if future molecular studies prove it to be conspecific with *M. asserigena*, that name will have priority over *M. marchantiorum*.

Marchantiana michelagoensis (Elix, S.Y. Kondr. & Kärnefelt) S.Y. Kondr., Kärnefelt, Elix, A. Thell, Jung Kim, A.S. Kondr. & Hur, in Kondratyuk, Jeong, Yu, Kärnefelt, Thell, Elix, Kim, Kondratiuk & Hur, Acta Bot. Hung. 56(1–2): 112. 2014.

MycoBank MB 807198

Basionym: *Caloplaca michelagoensis* Elix, S.Y. Kondr. & Kärnefelt, in Kondratyuk, Kärnefelt, Elix & Thell, Biblthca Lichenol. 100: 262. 2009; MycoBank MB 540363.

Holotype: Kondratyuk 20495 (CANB).

≡ *Streimanniella michelagoensis* (Elix, S.Y. Kondr. & Kärnefelt) S.Y. Kondr., Kärnefelt, A. Thell, Elix, Jung Kim, A.S. Kondr. & Hur, in Kondratyuk, Kärnefelt, Thell, Elix, Kim, Kondratiuk & Hur, Acta Bot. Hung. 57(3–4): 340. 2015; MycoBank MB 813924.

Chemistry. According to protologue, neochloroemodin (major).

Ecology and distribution. Bark of *Eucalyptus*. New South Wales.

Notes. This species is closely related to the widespread species *M. asserigena* (Fig. 2) with which it shares chemistry. If conspecific, *M. asserigena* has priority over *M. michelagoensis*. *Streimanniella michelagoensis* was designated as type of the genus *Streimanniella* by Kondratyuk et al. (2015).

Marchantiana occidentalis (Elix, S.Y. Kondr. & Kärnefelt) S.Y. Kondr., Kärnefelt, Elix, A. Thell, Jung Kim, A.S. Kondr. & Hur, in Kondratyuk, Jeong, Yu, Kärnefelt, Thell, Elix, Kim, Kondratiuk & Hur, Acta Bot. Hung. 56(1–2): 112. 2014.

MycoBank MB 807199

Basionym: *Caloplaca occidentalis* Elix, S.Y. Kondr. & Kärnefelt, in Kondratyuk, Kärnefelt, Elix & Thell, Biblthca Lichenol. 100: 264. 2009; MycoBank MB 540366.

Holotype: Elix 32479 (CANB).

Chemistry. Chemosyndrome A (confirmed). According to the protologue, there are additional traces of ascomatic acid, methyl ascomatate and 7-O-methylascomatic acid.

Ecology and distribution. Bark of twigs, and dry wood. Western Australia.

Marchantiana phaeocincta (S.Y. Kondr. & Elix) Søchting & Arup, comb. nov.

MycoBank MB 569758

Basionym: *Caloplaca phaeocincta* (S.Y. Kondr. & Elix), in Kondratyuk, Elix, Kärnefelt & Thell, Biblthca Lichenol. 106: 182. 2011.

Holotype: Hafellner 18864 (CANB).

Chemistry. Caloploicin (major), neochloroemodin (major), vicanicin (minor), isofulgidin (minor), and diploicin (trace) (Kondratyuk et al. 2011).

Ecology and distribution. On bark of twigs. Queensland.

Notes. In the protologue it is noted that the species may be closely related to *M. marchantiorum*, *M. michelagoensis* and *M. tomnashii.*

The inclusion of the species in *Marchantiana* is based on morphology and the content of neochloroemodin, a compound not known outside the genus *Marchantiana*.

Marchantiana queenslandica (Kalb, S.Y. Kondr., Elix & Kärnefelt) Arup & Søchting, in Søchting, Sancho & Arup, Lichenologist 55(Special issue 5): 385. 2023.

MycoBank MB 848018

Basionym: *Caloplaca queenslandica* Kalb, S.Y. Kondr., Elix & Kärnefelt in Australas. Lichenol. 66: 35. 2010; MycoBank MB 548337.

Type: Kalb et al., 29 Aug. 1995 (CANB).

Chemistry. According to the protologue it contains caloploicin (major), O-metylvioxanthin (minor), 7-chloroemodin (minor), atranorin (minor), fulgidin (minor), isofulgidin (minor), vicanicin (minor), diploicin (trace) and parietin (trace).

Ecology and distribution. On siliceous rocks. Queensland, Australia.

Marchantiana tasmanica Søchting, sp. nov. (Fig. 3)

MycoBank MB 854253

Diagnosis: Thallus crustose, tinged yellow; apothecia zeorine, orange, with dominant parietin; paraphyses mostly simple, slim; ascospores 12 ± 1.3 × 5.8 ± 0.6 µm, septum 3.4 ± 0.8 µm; on bark in Tasmania.

Type: Australia, Tasmania, 37 km ENE of Bridport, Tomahawk Point, 41.876°S, 147.773°E, 2 m, *Acacia* in coastal shrub vegetation, 22 Feb. 2011, U. Søchting 11661 (C – holotype, LD, HOB – isotypes).

Description. Thallus crustose, thin, smooth to slightly areolate, cream to pale yellowish, up to 7 mm diam. Apothecia dispersed, sessile, regular, zeorine, 0.3–0.4 mm diam.; margin initially prominent, 40–60 µm thick, eventually level with disc; thalline margin pale yellow, proper margin orange (somewhat shining); disc flat, orange. Proper exciple fan-shaped, laterally 40–55 µm; hymenium 50–60 µm; paraphyses mostly simple, 1–1.5 µm thick, terminal cells slim, up to 2 µm thick; asci clavate, with 8 spores; ascospores ellipsoid, polardiblastic, (10)12 ± 1.3(14.5) × (4.3)5.8 ± 0.6(6.5) µm, length/width ratio 2.1 ± 0.3, septum (2.5)3.4 ± 0.8(5.6) µm, length/septum ratio 3.7 ± 0.8 [n = 21].

Etymology. Named after the type locality, Tasmania.

Chemistry. Chemosyndrome A (Søchting 1997).

Ecology and distribution. Known so far only from Tasmania, where it grows on dead *Acacia* near the coast.

Notes. A number of more or less similar *Caloplaca* species has been recorded from Southern Australia (Kantvilas 2016) and could potentially represent *M. tasmanica*. They are, however, all assigned to other genera based on molecular data. The species are: *Cerothallia subluteoalba* (S.Y. Kondr. & Kärnefelt) Arup, Frödén & Søchting, *Eilifdahlia dahlii* (Elix, S.Y. Kondr. & Kärnefelt) S.Y. Kondr., Kärnefelt, Elix, A. Thell, Jung Kim, A.S. Kondr. & Hur, *Franwilsia bastowii* (S.Y. Kondr. & Kärnefelt) S.Y. Kondr., Kärnefelt, Elix, A. Thell, Jung Kim, A.S. Kondr. & Hur, *Sirenophila cliffwetmorei* (S.Y. Kondr.

Figure 3. *Marchantiana tasmanica*, holotype. Scale = 0.5 mm.

& Kärnefelt) S.Y. Kondr. and *S. maccarthyi* (S.Y. Kondr., Kärnefelt & Elix) Arup, Frödén & Søchting.

Additional specimens studied. AUSTRALIA. Northeast Tasmania, 10 km NE of St. Helens, Binalong Bay, coastal granite rocks, 10 m from the sea, 41.249°S, 148.310°E, 1 m, dead *Acacia* twigs on coast, 21.02.2011, U. Søchting 11636; 10 km NE of St. Helens, Mt Pearson, regrowth *Eucalyptus* forest. 41.253°S, 148.302°E, 50 m, twigs, 20.02.2011, U. Søchting 11631.

Marchantiana tomnashii (S.Y. Kondr., Elix & Kärnefelt) Arup & Søchting, comb. nov.

MycoBank MB 854254

Basionym: *Caloplaca tomnashii* S.Y. Kondr., Elix & Kärnefelt, in Kondratyuk, Elix, Kärnefelt & Thell, Biblthca Lichenol. 106: 184. 2011; MycoBank MB 569760.

Holotype: CANB, Kalb 20365.

Chemistry. According to protologue caloploicin (major), vicanicin (minor), isofulgidin (minor) and diploicin (trace).

Ecology and distribution. Epiphyte. Known from New South Wales, Australia.

Notes. According to protologue it resembles *Caloplaca* (*Marchantiana*) *marchantiorum*.

Taedigera Søchting & Arup, gen. nov.

MycoBank MB 854255

Diagnosis: Thallus crustose, poorly developed, on bark. Apothecia small, zeorine, yellow to orange, with parietin or emodin as dominant anthraquinones. Spores polardiblastic. Known from southern Patagonia, New Zealand, and Tasmania.

Generic type: *Taedigera epibrya* (Kantvilas & Søchting) Søchting & Arup.

Chemistry. The genus includes species with three different chemosyndromes: 1. Syndrome A, with dominant parietin, which is the most frequent chemosyndrome in *Teloschistaceae*; 2. Syndrome E with emodin as the sole secondary compound; 3. Syndrome E3 with emodin and a significant proportion of its oxidation products (Søchting et al. 2023). Syndromes 2 and 3 are not known in *Marchantiana*.

Etymology. The name *Taedigera* meaning 'torchbearer' refers to the flame color of the apothecia.

Ecology and distribution. On living or dead twigs, rarely moss. Known from southern Patagonia, New Zealand and Tasmania.

Notes. This unspectacular genus comprises species that share a habitat of slender twigs in the two distant regions, S. America and New Zealand. It is remarkable that the genus is apparently restricted to cool regions, whereas the closely related genus *Marchantiana* is found in warmer mainland Australia.

Taedigera epibrya (Kantvilas & Søchting) Søchting & Arup, comb. nov.

MycoBank MB 854256

Basionym: *Caloplaca epibrya* Kantvilas & Søchting, Kanunnah 6: 110. 2013; MycoBank MB 805211.

Type: Australia, Tasmania: Skullbone Plains, 42°02′S 146°19′E, 1000 m alt., amongst mosses on boulders in open heathland, 20 February 2012, G. Kantvilas 95/12 (HO – holotype; C – isotype).

≡ *Marchantiana epibrya* (Kantvilas & Søchting) Søchting & Arup.

Chemistry. Emodin with emodic acid, emodinal and high proportion of citreorosein (Kantvilas & Søchting 2013). Chemosyndrome E3.

Notes. For description, see Kantvilas & Søchting (2013).

Taedigera flammea Søchting, sp. nov. (Fig. 4)

MycoBank MB 854257

Diagnosis: Thallus crustose, thin with black hypothallus; apothecia zeorine to biatorine, up to 0.5 mm diam. with coarse, orange disc and blackish proper margin; ascospores 13.3 ± 0.9 × 7.2 ± 0.5 µm, septum 5.7 ± 0.7 µm; secondary compound emodin only. On bark, New Zealand.

Type: New Zealand, South Island, Canterbury, Kaikoura, limestone outcrop, 100 m from the coast, 42.3855°S, 173.5086°E, 110 m, *Populus* twigs, 14 Feb. 2012, U. Søchting 12036 (C – holotype; LD, CHR – isotypes).

Description. Thallus crustose, thin, grey surrounded by a black hypothallus. Apothecia numerous, dispersed, regular, sessile, zeorine to biatorine, up to 0.5 mm diam. Proper margin 50–60 µm thick, persistent, prominent, laterally blackened with an orange red rim towards the disc, surrounded by the dark zone and the suppressed exterior grey thalline margin; disc orange red, darker than the margin, with coarse epipsamma. Hypothecium hyaline, dense; proper exciple fan-shaped, 60 µm broad; hymenium 90 µm high; paraphyses simple to apically rarely branched, ~1.5 µm thick, terminal cells 3–4 µm thick; asci clavate, with 8 spores; ascospores ellipsoid, polardiblastic, (10.7)13.3 ± 0.9(14.8) × (6.5)7.2 ± 0.5(8.5) µm, length/width ratio 1.9 ± 0.2, septum (4.6)5.7 ± 0.7(7.8) µm, (n = 8), length/septum ratio 2.3 ± 0.3 (n = 23).

Figure 4. *Taedigera flammea*, holotype. Scale = 0.5 mm.

Etymology. The epithet refers to the apothecia looking like little flames, *flammae* in latin.

Chemistry. Emodin 100%. Chemosyndrome E. All reddish orange parts C+ red, K+ purple.

Ecology and distribution. *Taedigera flammea* is epiphytic on slender branches of *Sarothamnus* and *Populus*, and on twigs of shrubs such as *Salix* and *Ribes*. It seems to be fairly common in New Zealand.

Notes. *Taedigera flammea* had previously been included in the morphologically very similar *Taedigera subpyracea*. It is, however, very distinct molecularly. It is of particular interest due to the complete (100%) dominance of emodin, a chemosyndrome very rare in *Teloschistaceae*.

Additional specimens studied. NEW ZEALAND. South Island, Otago, 35 km SW of Dunedin, Taieri Beach, basaltic rocks along river close to ocean, 46.1071°S, 170.1792°E, 2 m, twigs of *Ribes*, 28.01.2012, US 11761; Taieri River outlet, *Salix* on riverbank, 46.0478°S, 170.1884°E, 10 m, thin twigs, 28.01.2012, US 11774; dead *Sarothamnus*, 28.01.2012, US 11773; Canterbury, Kaikoura Waikene Lodge, 42.4051°S, 173.4542°E, 145 m, *Populus* bark, 14.02.2012, US 12037; Banks Peninsula, Hinewai Reserve, bushes along forest track, 43.8106°S, 173.0293°E, dead twigs, 12.02.2012, US 12001; Southland, 40 km S of Te Anau, Monowai Power Plant, *Salix* by river, 45.7755°S, 167.6175°E, 133 m, *Salix* twigs, US 11855; 40 km S of Te Anau, 45.7812°S, 167.6091°E, 162 m, roadside *Populus* trees, 02.02.2012, US 11862; Chatham Islands, Mangape Creek, 43.9500°S, 176.6167°E, *Populus* twig, 13.09.2007, De Lange CH 2322 (AK).

Taedigera gallowayi Søchting, sp. nov. (Fig. 5)

MycoBank MB 854258

Diagnosis: Thallus crustose, thin; apothecia zeorine to biatorine with orange disc; ascospores 11.8 ± 0.6 × 6.7 ± 0.6 µm, septum 5.3 ± 0.4 µm; secondary compounds emodin, citreorosein, emodinal, and emodinic acid. On bark, New Zealand.

Type: South Island, Canterbury, 15 km NE of Twizel, Lake Pukaki, 44.1700°S, 170.2082°E, 553 m, twigs, 7 Feb. 2012, U. Søchting 11955 (C – holotype; CHR – isotype).

Description. Thallus crustose, thin to well-developed, greyish-cream. Apothecia few to numerous, regular, zeorine to biatorine, initially immersed, later sessile, 0.3–0.4 mm diam.; thalline margin soon suppressed; proper margin well-developed, prominent and persistent, 50–60 µm thick, orange, sometimes with an olive tinge; disc flat, orange, darker than the margin, with coarse epipsamma; proper exciple fan-shaped, laterally up to ~70 µm; hymenium 60–80 µm; paraphyses simple to apically branched, ~1.5 µm thick, terminal cells slightly thickend, up to 2.5 µm; asci clavate, with 8 spores; ascospores ellipsoid, polardiblastic, (10.7)11.8 ± 0.6(12.6) × (5.3)6.7 ± 0.6(7.6) µm, length/width ratio 1.8 ± 0.1, septum (4.3)5.3 ± 0.4(6) µm, (n = 20), length/septum ratio 2.2 ± 0.2 (n = 20).

Etymology. The epithet honors David Galloway for his tremendous contributions to New Zealand lichenology, his friendship and hospitality towards visiting lichenologists.

Figure 5. *Taedigera gallowayi*, holotype. Scale = 0.5 mm.

Chemistry. Citreorosein, emodinal, emodinic acid, emodin. Chemosyndrome E3. Orange parts K+ red, C+ red.

Notes. *Taedigera gallowayi* was earlier included in *T. subpyracea*, but is molecularly well separated from that species and the other similar species, *T. flamm*ea. Although they share a similar morphology, they are distinguished by their different chemosyndromes.

Additional specimens studied. NEW ZEALAND. South Island, Canterbury, 25 km W of Twizel, Ohau, E-exposed mountain slope with *Nothofagus*, 44.2374°S, 169.8059°E, 650 m, dead twigs, 07.02.2012, U. Søchting 11953, 11954; Otago, 25 km SW of Alexandra, Old Man Range, Mitchel's Cottage, 45.3430°S, 169.2897°E, 460 m, *Sorbus intermedia*, 30.01.2012, U. Søchting 11805; 15 km E of Queenstown, The Remarkables, NW exposed subalpine grassland with schist outcrops, 45.0261°S, 168.7719°E, 738 m, dead twigs of bush, 03.02.2012, U. Søchting 11874, 11884.

Taedigera pyramus (Søchting & Arup) Søchting & Arup, comb. nov.

MycoBank MB 854259

Basionym: *Marchantiana pyramus* Søchting & Arup, in Søchting, Sancho & Arup, Lichenologist 55: 385. 2023; MycoBank MB 848019.

Holotype: Søchting 11272.2a (C).

Chemistry. Emodin 20–60%, citreorosein 30–50%, emodinal 20–30%, emodinic acid 15–40%. Chemosyndrome E3. Thallus K−; apothecia K+ purple and C+ dark reddish.

Ecology and distribution. Very common species on slender living or dead twigs in Patagonia, but one specimen has been collected on dead *Eucalyptus* twigs in Tasmania (Craddle Mts., 23 Feb. 2011, US 11663).

Notes. See description in Søchting et al. (2023).

Taedigera ramulicola (Søchting & Arup) Søchting & Arup, comb. nov.

MycoBank MB 854260

Basionym: *Marchantiana ramulicola* Søchting & Arup, in Søchting, Sancho & Arup, Lichenologist 55: 385. 2023; MycoBank MB 848020.

Holotype: Søchting 11377 (C).

Chemistry. Chemosyndrome A (Søchting 1997).

Ecology and distribution. The species grows on thin, dead branches and twigs of e.g., *Chillotrichum* and *Fuchsia*. It is so far only known from three localities in southern Chile.

Notes. For description, see Søchting et al. (2023).

Taedigera subpyracea (Nyl.) Søchting & Arup, comb. nov. (Fig. 6)

MycoBank MB 854261

Basionym: *Lecanora subpyracea* Nyl., Lich. Nov. Zel.: 59. 1888; MycoBank MB 389373.

Lectotype, designated by Galloway (1985: 67), not Søchting et al. (2023): New Zealand. s.l., ann. 1867, *Charles Knight* (H – NYL 29847).

≡ *Marchantiana subpyracea* (Nyl.) Søchting & Arup.

Description. Thallus thin, white, whitish green to pale greyish, irregular, up to ~1 cm diam. Apothecia zeorine, sessile, scattered, immersed at first, erupting from and initially surrounded by thallus, up to 0.5 mm diam., disc concave to flat, pale mustard-yellow; thalline margin ~50 µm thick, soon suppressed, concolorous with thallus; proper margin ~50 µm thick, entire, greyish yellow, slightly prominent, glossy. Proper exciple fan-shaped, laterally up to ~80 µm; hymenium 80 µm; paraphyses simple to apically branched, ~1.5 µm thick, terminal cells thickened, up to 4 µm; asci clavate, with 8 spores; ascospores ellipsoid, polardiblastic, (10.5)12.4 ± 0.9(14) × (6)8.5 ± 0.6(7.1) µm, length/width ratio 1.8 ± 0.2, septum (4.9)6.5 ± 0.7(7.5) µm, length/septum ratio 1.9 ± 0.2 (n = 21).

Chemistry. Chemosyndrome A (Søchting 1997).

Ecology and distribution. *Marchantiana subpyracea* is a species growing on smooth bark, particularly on twigs. According to Galloway (2007), it is widely distributed in New Zealand up to Wellington in the North Island, but his records may also include *T. gallowayi* and *T. flammea*. Occurrence in Tasmania and mainland Australia has not been confirmed by us.

Notes. There are three clades representing what has been called *Caloplaca subpyracea* in New Zealand (Fig. 2).

Figure 6. *Taedigera subpyracea*, US 11959,1. Scale = 0.5 mm.

Two of our collections originate 40 km outside Greymouth, the locality for the syntype of *C. subpyracea*. Their characters are similar to those of the syntype. The other taxa described here as *Taedigera gallowayi* and *T. flammea* are morphologically very similar, but molecularly distinct, and have different chemosyndromes.

Specimens studied. NEW ZEALAND. South Island, 40 km SE of Greymouth, Mt. Alexander trail, 42.9084°S, 171.5773°E, 1404 m, 09.02.2012, US 11958,1; 12 km SW of Greymouth, Gladstone, *Salix* shrub behind beach, 42.5501°S, 171.1396°E, 10 m, 9.2.2012, US 11959,1; Canterbury, Banks Peninsula, Hinewai Reserve, 43.8334°S, 173.0533°E, bark of *Salix* branch in pasture, 16 m, 12.02.2012, US 12013.

Yoshimuria S.Y. Kondr., Kärnefelt, Elix, A. Thell & Hur, in Kondratyuk, Jeong, Yu, Kärnefelt, Thell, Elix, Kim, Kondratiuk & Hur, Acta Bot. Hung. 56(1–2): 105. 2014.

Generic type: *Yoshimuria spodoplaca* (Nyl.) S.Y. Kondr., Kärnefelt, A. Thell, Elix, J. Kim, A.S. Kondr. & Hur.

Notes. *Yoshimuria* was shown by Søchting et al. (2023) to be in a sister position to *Marchantiana*. Kondratyuk et al. (2014) included three species: *Y. cerussata*, *Y. galbina* and *Y. spodoplaca*. *Y.* '*cerussata*', which appears on the ITS phylogeny in Fig. 2 must be based on a misapplied sequence as all other data locate the taxon in *Huea* (now *Hueidea*, see Søchting et al. 2024). The species taxonomy of *Yoshimuria* was not critically studied by us.

Yoshimuria galbina (S.Y. Kondr. & Hur) S.Y. Kondr., Kärnefelt, Elix, A. Thell, Jung Kim, A.S. Kondr. & Hur, in Kondratyuk, Jeong, Yu, Kärnefelt, Thell, Elix, Kim, Kondratiuk & Hur, Acta Bot. Hung. 56(1–2): 113. 2014.

MycoBank MB 807212

Notes. *Y. galbina* is a saxicolous species with a well-developed grey thallus and orange brown discs. Recorded from Korea. It contains parietin and a number of compounds related to caloploicin.

Yoshimuria spodoplaca (Nyl.) S.Y. Kondr., Kärnefelt, Elix, A. Thell, Jung Kim, A.S. Kondr. & Hur, in Kondratyuk, Jeong, Yu, Kärnefelt, Thell, Elix, Kim, Kondratiuk & Hur, Acta Bot. Hung. 56(1–2): 113. 2014.

MycoBank MB 807213

Notes. *Y. spodoplaca* is a saxicolous species with a well-developed grey thallus and orange brown discs. It is recorded from Japan. Its secondary chemistry belongs to chemosyndrome A (Søchting 1997).

Excluded species

Marchantiana burneyensis (S.Y. Kondr. & Kärnefelt) S.Y. Kondr., Kärnefelt, Elix, A. Thell, Jung Kim, A.S. Kondr. & Hur. 2014.

≡ *Streimanniella burneyensis* (S.Y. Kondr. & Kärnefelt) S.Y. Kondr., Kärnefelt, A. Thell, Elix, Jung Kim, A.S. Kondr. & Hur, in Kondratyuk, Kärnefelt, Thell, Elix, Kim, Kondratiuk & Hur, Acta Bot. Hung. 57(3–4): 340. 2015.

Chemistry. Contains parietin (major), fallacinal (submajor), parietinic acid (minor), teloschistin (minor), atranorin (trace) (Elix, in litt. 2017).

Notes. Based on the ITS sequence of the isotype (GenBank: MBPQ362083) the species belongs in *Teloschistoideae.*

Marchantiana kalbiorum (S.Y. Kondr. & Kärnefelt) S.Y. Kondr., Kärnefelt, Elix, A. Thell, Jung Kim, A.S. Kondr. & Hur. in Kondratyuk, Jeong, Yu, Kärnefelt, Thell, Elix, Kim, Kondratiuk & Hur, Acta Bot. Hung. 56(1–2): 111. 2014

≡ *Streimanniella kalbiorum* (S.Y. Kondr. & Kärnefelt) S.Y. Kondr., Kärnefelt, A. Thell, Elix, Jung Kim, A.S. Kondr. & Hur. 2015

Chemistry. Lichexanthone (according to protologue).

Notes. The published DNA sequences of *Marchantiana kalbiorum* belong to the genus *Umbilicaria*, but our ITS sequence of the holotype (GenBank: BPQ362084) shows it to be closer to the genus *Caloplaca* s. str., even though its asserted secondary chemistry does not correspond to that genus.

Marchantiana seppeltii (S.Y. Kondr. & Kärnefelt) S.Y. Kondr., Kärnefelt, Elix, A. Thell, Jung Kim, A.S. Kondr. & Hur, in Kondratyuk, Jeong, Yu, Kärnefelt, Thell, Elix, Kim, Kondratiuk & Hur, Acta Bot. Hung. 56(1–2): 112. 2014.

≡ *Streimanniella seppeltii* (S.Y. Kondr. & Kärnefelt) S.Y. Kondr., Kärnefelt, A. Thell, Elix, Jung Kim, A.S. Kondr. & Hur. 2015.

Chemistry. *Marchantiana seppeltii* contains fragilin (major), 8-O-methylfragilin (major), 7-chloroparietinic acid (trace) (Elix, in litt.). An alternative chemical composition was published with the original description (Kondratyuk et al. 2009).

Notes. Based on the ITS sequence (GenBank: MBPQ362085) the holotype belongs in the *Teloschistoideae* and is not related to *Marchantiana*.

Key to *Marchantiana* and *Taedigera* species groups in southern Patagonia, Tasmania and New Zealand

1 In southern Patagonia and the Subantarctic islands . . 2
In New Zealand and Tasmania 3

2(1) Apothecia C+ dark reddish; chemosyndrome E3 . . . . . ***T. pyramus***
Apothecia C–; chemosyndrome A . . . . . ***T. ramulicola***

3(1) On moss . . . . . ***T. epibrya***
On bark 4

4(3) Apothecia C– 5
Apothecia C+ red; emodin and derivatives dominant, chemosyndrome E or E3 7

5(4) Apothecia with neochloroemodin (TLC) . . . . . ***M. asserigena***
Apothecia with parietin as the dominant compound, chemosyndrome A (TLC) 6

6(5) Ascospore septum <5 µm . . . . . ***M. tasmanica***
Ascospore septum >5 µm . . . . . ***T. subpyracea***

7(4) Emodin the only lichen compound present (TLC), chemosyndrome E; inside of proper margin often blackish . . . . . ***T. flammea***
Emodin occurring together with oxidation products (TLC), chemosyndrome E3; proper margin orange, sometimes darker at the outer edge . . . . . ***T. gallowayi*** and ***T. pyramus*** (rare in Tasmania)

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