

SUPPLEMENT 1

MATERIALS AND METHODS

Gene and taxon sampling.—We collected molecular data for five different loci: nucSSU, nucLSU, mitSSU, *RPB1* and *RPB2*. Three different taxon sets (according to the availability of sequence data for these five genetic loci) were used for phylogenetic analyses (TABLE I). Taxa with all five genes complete or partially available (139) were retrieved from the AFTOL WASABI database (<http://ocid.nacse.org/research/aftol>) to form the 5-gene dataset. For the 5+4-gene dataset, the 5-gene dataset was extended with taxa for which at least four of the 5 genes were available, resulting in a total of 198 taxa: 174 taxa from AFTOL and 24 taxa from GenBank. The 5+4+3-gene dataset was generated by adding to the 5+4-gene dataset all available taxa with at least three of the five targeted genes, resulting in a total of 284 taxa: 180 taxa from AFTOL and 104 taxa from GenBank. GenBank sequences shorter than 100 base pairs were not included in our datasets. After performing congruence tests (see phylogenetic analyses), the resulting three datasets contained 111 taxa with five genes, 188 taxa with five and four genes, and 274 taxa with five, four and three genes.

Our largest 5+4+3-gene dataset (274 taxa) includes 261 members from three recognized subclasses within the Lecanoromycetes: Acarosporomycetidae (15 taxa), Ostropomycetidae (50 taxa) and Lecanoromycetidae (192 taxa); three genera (*Boreoplaca*, *Lopezaria* and *Strangospora*) with unknown placement in the Lecanoromycetes; four representatives of the family *Baeomycetaceae*, a family of uncertain position within the Ascomycota according to Eriksson

(2006); and 10 outgroup genera selected from the Lichinomycetes (Peltulaceae) and Leotiomycetes (including Geoglossaceae). Our choice of outgroup taxa was based on Spatafora et al (2006) showing a sister relationship between the Lecanoromycetes and Geoglossaceae + Peltulaceae. Within the Acarosporomycetidae we sampled five of seven genera. For the Ostropomycetidae, taxa from all orders, except the Trichotheliales, were included, representing nine of 14 recognized families and 22 of 128 genera classified in orders Agyriales, Gyalectales, Ostropales and Pertusariales. We also included two members of the family Hymeneliaceae (*Aspicilia* and *Hymenelia*) with uncertain placement in the Ostropomycetidae according to Eriksson (2006). Our sampling for the Lecanoromycetidae encompasses 19 of 29 families from the order Lecanorales; all families recognized in the order Peltigerales including suborders Collematineae (four families) and Peltigerineae (three families); and the order Teloschistales (three families). Three families of uncertain positions in the Lecanoromycetidae (Eriksson 2006), the Fuscideaceae, Phlyctidaceae and Umbilicariaceae, also were sampled (TABLE II).

Molecular data and phylogenetic analyses.—From a total of 1210 sequences included in this study 436 (36%) are published here for the first time. Sources for laboratory protocols and primers used for generating these new sequences, as well as information about alignments can be found in Lutzoni et al (2004) and Hofstetter et al (2007).

TABLE I. Summary of datasets including number of taxa, length of alignments and number of analyzed characters for each gene separately and when combined after removal of conflicting taxa. The 5-gene dataset includes taxa for which complete or partial data from all five loci (nucSSU, nucLSU, mitSSU, *RPB1* and *RPB2*) were available. The 5+4-gene and 5+4+3-gene datasets include taxa for which at least four or three genes were sequenced, respectively.

Dataset/taxa+alignment		5-gene dataset	5+4-gene dataset	5+4+3-gene dataset
Number of taxa	Number of taxa before testing for congruence	139	198	284
	Number of taxa after testing for congruence	111	188	274
nucSSU	Alignment length	7445	7228	7215
	Characters included	1125	1085	1071
nucLSU	Alignment length	5162	5151	5096
	Characters included	1141	1121	1122
mitSSU	Alignment length	2635	2691	2862
	Characters included	471	437	445
<i>RPB1</i>	Alignment length	3159	3243	3229
	Characters included	2688	2676	2673
<i>RPB2</i>	Alignment length	2291	2349	2409
	Characters included	1932	1851	1803
Combined data	Alignment length	20 692	20 662	20 811
	Characters included	7357	7170	7114
	percent of missing data	17	26	37

TABLE II. Taxa included in this study according to the classification by Eriksson 2006 (Outline of Ascomycota, <http://www.fildmuseum.org/myconet/outline.asp>) and sequence source information. GenBank identification numbers are provided for sequences obtained from GenBank, and accession numbers are provided for new sequences generated as part of the Assembling the Fungal Tree of Life project (AFTOL). Sequences of *RPBI* and *RPB2* are divided into two amplicons (A-F, F-G and 5-7, 7-11, respectively) to indicate parts for these two genes that were included in this study. In the source column GB refers to GenBank as a source of all sequences for particular taxon, whereas numbers refer to the AFTOL database. For each family number of genera included in this study is shown before the slash and a total number of recognized genera based on Eriksson (2006) is shown after the slash. ? = the position of the taxon is uncertain in Eriksson's classification (2006).

Classification (Eriksson 2006)		Taxon	Source	nucSSU	nuLSU	mitSSU	RPBI (A-F)	RPBI (F-G)	RPB2 (5-7)	RPB2 (7-11)
Lecanoromycetes										
Lecanoromycetidae										
Acarosporales										
Acarosporaceae 5/7										
		<i>Acarospora bullata</i>	GB	52699728	52699687	—	—	—	52699767	52699767
		<i>Acarospora canadensis</i>	GB	52699729	52699688	—	—	—	52699769	52699769
		<i>Acarospora cervina</i>	GB	52699730	52699689	—	—	—	52699771	52699771
		<i>Acarospora clauzadeana</i>	GB	52699735	52699694	—	—	—	52699787	52699787
		<i>Acarospora complanata</i>	GB	15216664	15216665	46411448	—	—	52699773	52699773
		<i>Acarospora hilaris</i>	GB	52699731	52699690	—	—	—	52699775	52699775
		<i>Acarospora laqueata</i>	1007	52699732	52699691	DQ991757	DQ782860	DQ782860	52699777	52699777
		<i>Acarospora macrospora</i>	GB	52699733	52699692	—	—	—	52699779	52699779
		<i>Acarospora schlaicheri</i>	1005	52699734	52699693	46411449	DQ782859	—	52699773	52699773
			345							
		<i>Glypholecia scabra</i>	GB	52699739	52699699	—	—	—	52699811	52699811
		<i>Pleopsidium</i>	1004	DQ525541	DQ842017	DQ991756	DQ782858	DQ782858	DQ525474	DQ525474
		<i>chlorophanum</i>								
		<i>Pleopsidium gobiense</i>	1003	DQ525573	DQ883698	DQ991755	DQ883746	DQ883746	DQ525452	DQ525452
		<i>Polysporina simplex</i>	GB	52699748	52699709	62005392	—	—	52699858	52699858
		<i>Sarcogyne regularis</i>	GB	52699751	52699712	—	—	—	52699869	52699869
		<i>Sarcogyne similis</i>	GB	52699753	52699714	—	—	—	52699871	52699871
Lecanoromycetes										
Lecanoromycetidae										
Lecanorales										
		? <i>Arthrorhaphis citrinella</i>	GB	12025058	12025059	62005365	—	—	—	—
		<i>Calicium viride</i>	GB	15216680	44903359	33304586	—	—	52699791	52699791
		<i>Thoburnia dissimilis</i>	1695	DQ973002	—	DQ972974	—	—	DQ973086	—
		<i>Sporastatia polyspora</i>	GB	52699756	52699716	46411479	—	—	52699879	52699879
		<i>Sporastatia testudinea</i>	GB	52699757	52699717	46411480	—	—	52699881	52699881
		<i>Cetradonia</i> sp.	1657	DQ973003	DQ973026	DQ972975	DQ973050	DQ973050	DQ973087	—

TABLE II. Continued

Classification (Eriksson 2006)	Taxon	Source	nucSSU	nuclSSU	mitSSU	RPBI (A-F)	RPBI (F-G)	RPB2 (5-7)	RPB2 (7-11)
Cladoniaceae 6/15	<i>Cladia retipora</i>	GB	3360250	34148718	34148561	—	—	—	—
	<i>Cladonia caroliniana</i>	3	46411405	46411429	46411379	DQ782816	DQ782816	46451691	46451691
	<i>Cladonia rangiferina</i>	GB	10441368	46852258	32141054	—	—	—	—
	<i>Heterodea muelleri</i>	GB	10441369	34148723	34148568	—	—	—	—
	<i>Metus conglomeratus</i>	GB	10441370	34148733	34148584	—	—	—	—
	<i>Pilophorus cereolus</i>	GB	10441371	34148737	34148590	—	—	—	—
	<i>Pilophorus strumaticus</i>	GB	10441373	34148738	34148591	—	—	—	—
	<i>Pycnothelia papillaria</i>	1377	DQ983481	DQ986800	DQ986783	DQ986856	—	DQ992473	DQ992473
	<i>Crocymia pyxinoidea</i>	111	46411418	46411442	46411380	DQ883735	—	DQ883748	DQ883748
	<i>Candelaria concolor</i>	1706	—	DQ986791	DQ986806	—	—	DQ992419	DQ992419
Crocyiaceae 1/1	<i>Candelariella reflexa</i>	1271	DQ912309	DQ912331	DQ912272	DQ912354	DQ912354	DQ912380	DQ912380
	<i>Candelariella terrigena</i>	227	DQ986730	DQ986745	DQ986884	DQ986816	—	DQ992427	DQ992427
	<i>Lecanora achamana</i>	1693	DQ973004	DQ973027	DQ972976	DQ973051	DQ973088	—	—
	<i>Lecanora concolor</i>	GB	52699741	52699702	—	—	52699826	52699826	52699826
	<i>Lecanora contractula</i>	877	DQ986741	DQ986746	DQ986898	DQ986817	—	DQ992428	DQ992428
	<i>Lecanora hybocarpa</i>	639	DQ782883	DQ782910	DQ912273	DQ782829	DQ782871	DQ782871	DQ782871
	<i>Lecanora intumescens</i>	GB	9828144	37960800	32141065	—	—	—	—
	<i>Lecanora polytropa</i>	1798	DQ986701	DQ986792	DQ986807	—	DQ992418	DQ992418	DQ992418
	<i>Lecidella elaeochroma</i>	1275	DQ986719	DQ986747	—	DQ986818	—	DQ992429	DQ992429
	<i>Lecidella euphorea</i>	1374	DQ983482	—	DQ986784	DQ986857	—	DQ992479	—
Lecideaceae 2/9	<i>Lecidella meiococca</i>	GB	9828141	37960801	32141066	—	—	—	—
	<i>Pyrrhospora quercea</i>	GB	9828142	37960817	32141081	—	—	—	—
	<i>Sclotiosporum umbrinum</i>	GB	9828145	52699715	32141084	—	—	—	—
	<i>Hypocenomyce scalaris 1</i>	687	DQ782886	DQ782914	DQ912274	DQ782854	DQ782854	DQ782875	DQ782875
	<i>Hypocenomyce scalaris 2</i>	1025	—	DQ986748	DQ986861	DQ986819	—	DQ992430	DQ992430
	<i>Lecidea fuscoatra</i>	589	DQ912310	DQ912332	DQ912275	DQ912355	DQ912381	DQ912381	DQ912381
	<i>Lecidea laboriosa</i>	1388	DQ986727	—	DQ986882	DQ986821	—	DQ992432	DQ992432
	<i>Lecidea silacea</i>	1368	DQ986723	—	DQ986878	DQ986820	—	DQ992431	DQ992431
	<i>Loxospora cismonica</i>	878	DQ986742	DQ986749	DQ986899	—	—	DQ992433	DQ992433
	<i>Loxospora ochrophaea</i>	879	—	DQ986750	DQ986900	DQ986822	DQ986822	DQ992434	DQ992434
Mycoblastaceae 1/1	<i>Mycoblastus sanguinariis</i>	196	DQ782879	DQ912333	DQ912276	DQ782827	DQ782827	DQ782867	DQ782867
	<i>Ophioparma lapponica</i>	1707	DQ973005	DQ973028	DQ972977	DQ973052	DQ973052	DQ973089	—

TABLE II. Continued

Classification (Eriksson 2006)		Source	nucSSU	nuLSU	mitSSU	RPBI (A-F)	RPBI (F-G)	RPB ₂ (5-7)	RPB ₂ (7-11)
Parmeliaceae 27/89									
	<i>Alectoria ochroleuca</i>	209	DQ983483	DQ986801	DQ986785	DQ986858	DQ986858	DQ992474	DQ992474
	<i>Asahinea scholanderi</i>	235	—	DQ973029	—	DQ973053	DQ973053	DQ973090	DQ973090
	<i>Bryoria trichodes</i> 1	205	DQ986728	DQ986751	DQ986883	DQ986823	—	DQ992438	DQ992438
	<i>Bryoria trichodes</i> 2	872	DQ986740	DQ986752	DQ986896	DQ986824	—	DQ992439	—
	<i>Canoparmelia caroliniana</i>	6	46411399	46411423	46411378	DQ782817	DQ782817	46451690	46451690
	<i>Cetraria islandica</i>	211	DQ912311	DQ912334	DQ912277	DQ912356	DQ912356	DQ912382	DQ912382
	<i>Dactylina arctica</i>	225	DQ983484	DQ986802	DQ986786	DQ986859	—	DQ992475	DQ992475
	<i>Evernia prunastri</i>	GB	6684446	6318536	15987426	—	—	—	—
	<i>Flavocetraria nivalis</i>	231	DQ883786	DQ883795	DQ912278	DQ883758	DQ883751	DQ883751	DQ883751
	<i>Flavoparmelia caperata</i>	2	464114043	46411428	46411382	DQ883778	46411493	46411493	46411493
	<i>Flavopunctelia flaventior</i>	317	DQ912312	DQ912335	DQ912279	DQ912357	—	—	DQ912383
	<i>Hypogymnia physodes</i>	195	DQ973006	DQ973030	DQ972978	—	—	DQ973091	DQ973091
	<i>Hypotrachyna caracensis</i>	312	DQ912313	DQ912336	DQ912280	DQ912358	DQ912358	DQ912384	DQ912384
	<i>Hypotrachyna degelii</i>	324	DQ912314	DQ912337	DQ912281	DQ912359	DQ912359	DQ912385	DQ912385
	<i>Imshaugia aleurites</i>	1044	—	DQ986753	DQ986864	DQ986825	—	DQ992440	DQ992440
	<i>Masonhalea richardsonii</i>	1710	—	DQ973031	DQ972979	DQ973054	DQ973054	DQ973092	DQ973092
	<i>Melanelixia fuliginosa</i>	1370	DQ983485	DQ986803	DQ986787	DQ986860	—	DQ992476	DQ992476
	<i>Menegazzia terebrata</i>	10	46411402	46411426	46411389	—	—	DQ973093	—
	<i>Myelochroa aurulentata</i>	206	DQ973001	DQ973025	DQ972972	DQ973049	DQ973049	DQ973070	DQ973070
	<i>Parmelia saxatilis</i>	GB	6684444	37960808	34148588	—	—	—	—
	<i>Parmotrema austrosinense</i>	89	DQ912315	DQ912338	DQ912282	DQ912360	DQ912386	DQ912386	DQ912386
	<i>Parmotrema reticulatum</i>	8	DQ912316	DQ912339	DQ912283	DQ912361	DQ912387	DQ912387	DQ912387
	<i>Parmotrema tinctorum</i>	7	46411400	46411424	46411392	DQ912362	—	46411497	46411497
	<i>Platismatia glauca</i> 1	201	DQ973007	DQ973032	DQ972980	DQ973055	—	—	DQ973094
	<i>Platismatia glauca</i> 2	203	DQ912317	DQ912340	DQ912284	DQ912363	DQ912363	DQ912388	DQ912388
	<i>Pleurosticta acetabulum</i>	GB	6684450	50953143	50953258	—	—	—	—
	<i>Pseudevernia consocians</i>	1243	DQ986714	DQ986754	DQ986868	DQ986826	—	DQ992441	—
	<i>Pseudevernia furfuracea</i>	GB	46254373	50953329	119633194	—	—	—	—
	<i>Punctelia hypoleucites</i>	85	46411411	46411435	46411394	DQ912364	—	46411501	46411501
	<i>Punctelia rudecta</i>	9	46411401	46411425	46411395	DQ912365	—	DQ912389	DQ912389
	<i>Tuckermannopsis ciliaris</i>	1245	DQ986715	DQ986755	DQ986870	DQ986827	—	DQ992442	—
	<i>Usnea antarctica</i>	813	DQ883702	DQ883692	DQ990920	DQ883721	—	DQ883709	DQ883709
	<i>Usnea sphacelata</i>	816	DQ883703	DQ883693	DQ990919	DQ883722	—	DQ883710	DQ883710
	<i>Usnea strigosa</i>	5	DQ973008	DQ973033	DQ972981	—	—	DQ973095	DQ973095
	<i>Vulpicida juniperina</i>	GB	6684449	34148753	34148609	—	—	—	—
	<i>Vulpicida pinastri</i>	198	DQ912318	DQ912341	DQ912285	DQ912366	DQ912366	DQ912390	DQ912390
	<i>Xanthoparmelia conspersa</i>	4	46411406	46411430	46411398	DQ912367	DQ912367	46488901	46488901

TABLE II. Continued

Classification (Eriksson 2006)		Taxon	Source	nucSSU	nuLSU	mitSSU	RPBI (A-F)	RPBI (F-G)	RPB2 (5-7)	RPB2 (7-11)
Physciaceae 12/34		<i>Amandinea punctata</i> 1	GB	45433320	54873375	33304583	—	—	—	—
		<i>Amandinea punctata</i> 2	1306	DQ986721	DQ986756	DQ986873	—	—	DQ992435	DQ992435
		<i>Anaptychia palmulata</i>	648	DQ883792	DQ883801	DQ912286	DQ883744	DQ883744	DQ883757	DQ883757
		<i>Anaptychia runcinata</i>	GB	21955817	54873376	44307549	—	—	—	—
		<i>Buellia diabyta</i>	573	DQ973009	—	DQ972982	DQ973056	DQ973056	DQ973096	DQ973096
		<i>Buellia fimbriata</i>	1051	DQ973010	DQ973034	—	DQ973057	—	DQ973097	DQ973097
		<i>Buellia frigida</i>	889	DQ883699	DQ883695	DQ986903	DQ883724	—	DQ883712	DQ883712
		<i>Buellia stillingiana</i>	571	DQ912319	DQ912342	DQ912287	DQ912368	DQ912368	DQ912391	DQ912391
		<i>Dirinaria appplanata</i>	839	DQ973011	DQ973035	DQ972983	—	—	DQ973098	DQ973098
		<i>Hafellia discoformis</i>	GB	10998394	34148715	33304585	—	—	—	—
		<i>Heteroderma vulgare</i>	320	DQ883789	DQ883798	DQ912288	DQ883741	DQ883741	DQ883754	DQ883754
		<i>Phaeophyscia orbicularis</i>	1308	DQ912320	DQ912343	DQ912289	DQ912369	—	DQ912392	DQ912392
		<i>Physcia aipolia</i>	84	DQ782876	DQ782904	DQ912290	DQ782820	—	DQ782862	DQ782862
		<i>Physconia muscigena</i>	220	DQ912321	DQ912344	DQ912291	DQ912370	—	DQ912393	DQ912393
	Porpidiaceae 1/16		<i>Pyxine soredata</i>	207	DQ973012	DQ973036	DQ972984	—	—	DQ973071
		<i>Pyxine subcinerea</i>	686	DQ883793	DQ883802	DQ912292	DQ883745	DQ883745	DQ883758	DQ883758
		<i>Rinodina tephropsis</i>	1314	DQ912322	DQ912345	DQ912293	DQ912371	—	DQ912394	DQ912394
		<i>Tornabaea scutellifera</i>	1061	DQ973013	DQ973037	DQ972985	DQ973058	—	—	—
		<i>Porpidia arborescens</i>	1246	DQ986716	DQ986757	DQ986871	DQ986828	—	DQ992443	DQ992443
		<i>Porpidia spetrea</i>	1050	DQ986711	DQ986758	DQ986865	DQ986829	DQ986829	DQ992444	DQ992444
		? <i>Lecidoma demissum</i>	1376	DQ986726	DQ986759	DQ986881	—	—	DQ992445	DQ992445
		<i>Protoblastenia calva</i>	992	34148570	46852266	DQ986904	DQ986830	—	DQ992446	DQ992446
		<i>Psora decipiens</i>	GB	DQ986710	DQ986760	DQ986863	—	—	DQ992447	—
		<i>Psora rubiformis</i>	1032	DQ986729	DQ986761	—	DQ986831	DQ986831	DQ992448	DQ992448
Ramalinaceae 8/36		<i>Bacidia rosella</i>	GB	9828143	37960788	32141050	—	—	—	—
		<i>Bacidia rubella</i>	1793	—	DQ986793	DQ986808	—	—	DQ992422	DQ992422
		<i>Bacidia schweinitzii</i>	642	—	DQ782911	DQ972998	—	—	DQ782872	DQ782872
		<i>Bacidina arnoldiana</i>	1845	DQ986702	DQ986798	DQ986810	DQ782830	DQ782830	DQ992423	DQ992423
		<i>Lecania cyrtella</i>	GB	9828147	37960799	32141064	—	—	—	—
		<i>Niebla cephalota</i>	777	—	DQ986762	DQ986893	DQ986832	—	DQ992436	—
		<i>Ramalina complanata</i> 1	86	—	DQ973038	DQ972986	DQ973059	DQ973059	DQ973072	DQ973072
		<i>Ramalina complanata</i> 2	966	—	DQ883783	DQ972986	DQ883782	DQ883782	DQ883762	DQ883762
		? <i>Squammarina cartilaginea</i>	1281	DQ986720	DQ986763	—	DQ986833	—	DQ992449	DQ992449
		? <i>Squammarina gypsacea</i>	1701	DQ986703	—	—	DQ986853	—	DQ992420	DQ992420
Psoraceae 3/7		<i>Tephromela atra</i> 1	780	DQ986737	DQ986764	DQ986894	DQ986834	—	DQ992450	DQ992450
		<i>Tephromela atra</i> 2	1328	DQ986722	DQ986765	DQ986875	—	—	DQ992451	DQ992451
		<i>Tephromela atra</i> 3	1373	DQ986724	DQ986766	DQ986879	—	—	DQ992452	DQ992452
		<i>Tominia sedifolia</i>	213	DQ973014	DQ973039	DQ972987	—	—	DQ973073	—

TABLE II. Continued

Classification (Eriksson 2006)	Taxon	Source	nucSSU	nuLSU	mitSSU	RPBI (A-F)	RPBI (F-G)	RPB2 (5-7)	RPB2 (7-11)
Rhizocarpaceae 2/4	<i>?Catelechia wahlenbergii</i>	1743	DQ986704	DQ986794	DQ986811	—	—	DQ992424	DQ992424
	<i>Rhizocarpon dispersum</i>	GB	15216688	15216689	—	—	—	52699865	52699865
	<i>Rhizocarpon geographicum</i>	GB	4731136	62005347	29837334	—	—	—	—
Sphaerophoraceae 2/5	<i>Rhizocarpon oederi</i>	1372	DQ983486	DQ986804	DQ986788	—	—	DQ992477	DQ992477
	<i>Rhizocarpon superficiale</i>	1708	DQ973015	—	DQ972988	DQ973060	DQ973060	DQ973074	DQ973074
	<i>Neophyllis melacarpa</i>	GB	6690342	34148734	34148585	—	—	—	—
	<i>Sphaerophorus fragilis</i>	226	DQ983487	DQ986805	DQ986789	—	—	—	DQ995360
	<i>Sphaerophorus globosus</i>	1057	DQ986712	DQ986767	DQ986866	DQ986836	—	DQ992453	DQ992453
Stereocaulaceae 2/4	<i>Lepraria incana</i>	1792	—	DQ986795	DQ986812	—	—	—	DQ995361
	<i>Lepraria lobificans</i> 1	325	DQ986733	DQ986768	DQ986887	—	—	DQ992454	DQ992454
	<i>Lepraria lobificans</i> 2	1244	—	—	DQ986869	—	—	DQ992455	—
	<i>Stereocaulon paschale</i>	GB	8163581	12025096	34148599	—	—	52699883	52699883
	<i>Stereocaulon tomentosum</i>	GB	70779661	34148745	34148600	—	—	—	—
Peltigerales									
Coccocarpiaceae 1/5	<i>Coccocarpia erythroxyli</i>	333	DQ883791	DQ883800	DQ912294	DQ883743	DQ883743	DQ883756	DQ883756
	<i>Coccocarpia domingensis</i>	122	DQ912323	DQ912346	DQ912295	—	—	DQ912395	DQ912395
Collemataceae 2/8	<i>Collema cristatum</i>	1013	DQ917410	DQ917408	DQ917409	—	DQ923121	—	DQ917411
	<i>Leptogium cyanescens</i>	GB	15216682	15216683	34148570	—	—	52699830	52699830
Lobariaceae 3/4	<i>Leptogium gelatinosum</i>	GB	40557685	40557700	34148571	—	—	—	—
	<i>Leptogium lichenoides</i>	1015	DQ917413	DQ917412	DQ923120	—	—	DQ917415	DQ917415
	<i>Lobaria amplissima</i>	GB	40557669	40557694	34148574	—	—	—	—
	<i>Lobaria pubmonaria</i>	GB	6739627	8476003	34148578	—	—	—	—
	<i>Lobaria quercizans</i>	GB	12025079	12025080	46411465	—	—	—	—
	<i>Lobaria scrobiculata</i>	128	46411420	46411444	46411386	DQ883736	DQ883736	52699832	52699832
	<i>Lobariella pallida</i> 1	310	DQ883787	DQ883796	DQ912296	DQ883739	DQ883739	DQ883749	—
Nephromataceae 1/1	<i>Lobariella pallida</i> 2	314	DQ883788	DQ883797	DQ912297	DQ883740	DQ883740	DQ883752	DQ883752
	<i>Pseudocyphellaria anomala</i>	132	DQ833785	DQ883794	DQ912298	DQ883737	DQ883737	DQ883750	DQ883750
	<i>Pseudocyphellaria crocata</i>	GB	40557672	15293979	34148595	—	—	—	—
	<i>Sticta beauvoisii</i>	1242	DQ986713	DQ986769	DQ986867	—	—	DQ992456	DQ992456
	<i>Sticta fuliginosa</i>	GB	40557674	14423025	22213559	—	—	—	—
Nephromataceae 1/1	<i>Sticta limbata</i>	GB	40557673	40557695	34148605	—	—	—	—
	<i>Nephroma arcticum</i>	1711	DQ973016	DQ973040	DQ972989	—	—	DQ973076	—
	<i>Nephroma bellum</i>	GB	40557682	40557699	22213576	—	—	—	—
	<i>Nephroma parile</i>	131	46411445	46411421	46411390	DQ973061	DQ973061	DQ973075	—
<i>Nephroma resupinatum</i>	GB	40557683	14423030	22213566	—	—	—	—	

TABLE II. Continued

Classification (Eriksson 2006)	Taxon	Source	nucSSU	nuLSU	miSSU	RPBI (A-F)	RPBI (F-G)	RPB2 (5-7)	RPB2 (7-11)
Pannariaceae 7/17	<i>Degelia plumbea</i> 1	990	DQ912324	DQ912347	DQ912299	DQ912373	DQ912373	DQ912396	DQ912396
	<i>Degelia plumbea</i> 2	1046	DQ912325	DQ912348	DQ912300	DQ912374	DQ912374	DQ912396	DQ912396
Pannariaceae 3/12	<i>Erioderma verruculosum</i>	337	DQ973017	DQ973041	DQ972990	DQ973062	DQ973062	DQ973077	—
	<i>Fuscopannaria ignobilis</i>	1011	DQ986708	DQ917417	DQ917416	DQ986839	—	—	DQ992457
	<i>Pannaria mediterranea</i>	1014	—	DQ917419	DQ917418	—	—	DQ992437	DQ992437
	<i>Pannaria</i> sp.	309	DQ973018	—	DQ972991	DQ973063	—	DQ973078	DQ973078
	<i>Parmeliella appalachensis</i>	1655	DQ973019	—	DQ972992	DQ973064	—	DQ973079	DQ973079
	<i>Parmeliella</i> sp.	334	—	DQ973042	DQ972993	DQ973065	DQ973065	DQ973080	DQ973080
	<i>Protopannaria pezizoides</i>	129	DQ912327	DQ912349	DQ912302	DQ912376	—	—	DQ912397
	<i>Protopannaria pezizoides</i> ¹	222	DQ912326	DQ912350	DQ912301	DQ912375	DQ912375	DQ912397	—
	<i>Psoroma hypnorum</i>	GB	40557680	40557698	34148597	—	—	—	—
	<i>Peltigera aphthosa</i>	GB	40557644	14422959	22213560	—	—	—	—
Peltigeraceae 2/2	<i>Peltigera canina</i>	GB	15216692	14423022	—	—	—	52699840	52699840
	<i>Peltigera degenii</i>	134	46411422	46411446	46411393	DQ782826	DQ782826	46411499	46411499
	<i>Peltigera leucophlebia</i>	GB	40557647	14422953	22213564	—	—	—	—
	<i>Peltigera membranacea</i>	GB	40557655	32364274	—	—	—	45545340	45545340
	<i>Peltigera praetextata</i>	GB	40557656	14423014	22213565	—	—	—	—
	<i>Peltigera</i> sp.	1838	DQ986705	DQ986796	DQ986809	DQ986854	—	DQ992425	DQ992425
	<i>Solorina crocea</i>	1619	DQ973020	DQ973043	—	DQ973066	—	DQ973081	DQ973081
	<i>Solorina saccata</i> 1	127	DQ973021	DQ973044	DQ972994	—	—	—	—
	<i>Solorina saccata</i> 2	GB	40557639	40557688	34148598	—	—	—	—
	<i>Placynthium flabelliforme</i>	1663	DQ973024	DQ973047	DQ972999	—	—	—	—
Placynthiaceae 2/7	<i>Placynthium nigrum</i>	GB	15216684	15216685	46411472	—	—	52699852	52699852
	<i>Polychidium muscicola</i>	230	DQ986731	DQ986770	DQ986885	—	—	DQ992426	DQ992426
	<i>Massalongia carnosia</i>	GB	40557684	14423027	34148583	—	—	—	—
?									
Teloschistales									
Letroitiaceae 1/1	<i>Letroitia dominicensis</i>	102	46411437	46411413	46411384	DQ883734	DQ883734	DQ883747	DQ883747
	<i>Megalospora tuberculosa</i>	107	46411439	46411415	46411388	DQ883781	—	DQ883761	DQ883761
Teloschistaceae 3/12	<i>Caloplaca flavorubescens</i>	GB	10998391	13810817	33304587	—	—	—	—
	<i>Xanthomendoza fallax</i>	GB	52699766	52699727	46411486	—	—	52699907	52699907
	<i>Xanthoria elegans</i>	214	DQ912329	DQ912352	DQ912304	DQ912378	DQ912378	DQ912400	DQ912400
	<i>Xanthoria parietina</i>	GB	10998392	13810818	33304592	—	—	—	—
<i>Xanthoria polycarpa</i>	200	DQ912328	DQ912351	DQ912303	DQ912377	DQ912377	DQ912399	DQ912399	

TABLE II. Continued

Classification (Eriksson 2006)		RPB1 (A-F)	RPB1 (F-G)	RPB2 (5-7)	RPB2 (7-11)
Lecanoromycetidae					
?					
?Fuscideaceae 2/3	<i>Fuscidea bygaea</i>	—	—	52699809	52699809
	? <i>Maronea chilensis</i>	—	—	52699834	52699834
Phlyctidaceae 1/2	<i>Phlyctis argena</i>	DQ986771	—	DQ992458	DQ992458
Umbilicariaceae 2/2	<i>Lasallia papulosa</i>	DB883691	DQ883720	DQ883708	DQ883708
	<i>Lasallia pennsylvanica</i>	15216676	—	52699824	52699824
	<i>Lasallia pustulata</i>	DB883690	DQ883719	DQ883707	DQ883707
	<i>Umbilicaria aprina</i>	DQ986799	DQ986840	DQ992459	DQ992459
	<i>Umbilicaria arctica</i>	DQ986717	DQ986841	DQ992460	DQ992460
	<i>Umbilicaria mammulata</i>	645	DQ782831	DQ782873	DQ782873
	<i>Umbilicaria muehlenbergii</i>	GB	—	52699903	52699903
	<i>Umbilicaria polyphylla</i>	404	—	—	—
	<i>Umbilicaria rigida</i>	GB	DQ986873	DQ992461	DQ992461
	<i>Umbilicaria spodochoera</i>	1267	DQ986844	DQ992462	DQ992462
		555	DQ986773	DQ986815	DQ986844
Lecanoromycetes					
Ostropomycetidae					
Agyriales					
Agyriaceae 5/16	<i>Orceolina kerguelensis</i>	296	90103012	14318290	91717263
	<i>Placopsis gelida</i>	GB	7105704	28916546	—
	<i>Placopsis perrugosa</i>	GB	15216670	15216671	—
	<i>Placynthiella uliginosa</i>	1365	—	DQ986774	DQ986845
	<i>Trapelia involuta</i>	GB	7105701	8926420	—
	<i>Trapelia placodioides</i>	962	7105702	8926425	—
	<i>Trapeliopsis flexuosa</i>	1028	DQ986709	8926440	91717261
	<i>Trapeliopsis granulosa</i>	GB	12025097	DQ986862	DQ986846
		GB	12025098	14318296	—
Gyalectales					
Coenogoniaceae 1/2	<i>Coenogonium lepreurii</i>	GB	19171992	46411453	—
	<i>Coenogonium luteum</i>	GB	12025069	46411454	—
Gyalectaceae 1/7	<i>Gyalecta hypoleuca</i>	GB	19171995	19171988	—
	<i>Gyalecta jenensis</i>	GB	12025073	34148567	52699815
	<i>Gyalecta ulmi</i>	GB	4731127	32141061	52699817

TABLE II. Continued

Classification (Eriksson 2006)	Taxon	Source	nucSSU	nuLSU	mitSSU	RPBI (A-F)	RPBI (F-G)	RPB2 (5-7)	RPB2 (7-11)
Ostropales									
Graphidaceae 3/20	<i>Fissurina insidiosa</i>	1662	DQ973022	DQ973045	DQ972995	—	—	DQ973083	DQ973083
	<i>Graphina poitiaei</i>	GB	19171994	19171982	—	—	—	52699813	52699813
Solorinellaceae 1/2	<i>Graphis scripta</i>	GB	3004976	55139924	62005378	—	—	—	—
	<i>Gyalidea hyalinus</i>	332	DQ973023	DQ973046	DQ972996	—	—	DQ973084	DQ973084
Stictidaceae 3/19	<i>Acarosporina microspora</i>	78	46411408	46411432	46411377	DQ782818	—	46411489	46411489
	? <i>Petractis luetkemuelleri</i>	GB	19171996	19171989	46411469	—	—	52699850	52699850
	<i>Stictis populorum</i>	GB	3885423	48995464	34148564	—	—	—	—
	<i>Stictis radiata</i>	GB	669005	15216674	32141087	—	—	52699885	52699885
	<i>Stictis urceolatum</i>	96	DQ983488	51945063	DQ986790	—	—	DQ992478	DQ992478
	GB	328	DQ883790	DQ883799	DQ912306	DQ883742	—	DQ883755	DQ883755
Thelotremales									
Thelotremales 2/15	<i>Diploschistes cinereocoesius</i>	GB	—	37960795	32141059	—	—	45545328	45545328
	<i>Diploschistes muscorum</i>	GB	8926433	8926416	20334361	—	—	—	—
Pertusariales	<i>rampoddensis</i>	GB	12025071	12025072	46411447	—	—	52699807	52699807
	<i>Diploschistes scruposus</i>	GB	8926434	8926417	20334362	—	—	—	—
Icmadophilaceae 4/6	<i>Diploschistes thunbergianus</i>	83	—	37960825	DQ972997	DQ973067	—	DQ973085	DQ973085
	<i>Thelotrema lepadinum</i>	GB	—	—	—	—	—	—	—
Icmadophilaceae 4/6	<i>Dibaeis baeomyces</i>	358	6502558	12025068	46411459	DQ842011	—	52699803	52699803
	GB	875	DQ883704	DQ883694	DQ986897	DQ883723	—	DQ883711	DQ883711
Pertusariales	<i>Icmadophila ericetorum</i>	849	DQ986738	DQ986775	62005399	DQ986847	—	DQ992464	—
	<i>Siphula ceratites</i>	GB	—	—	—	—	—	—	—
Pertusariales	<i>Thamnomia subuliformis</i>	GB	6502560	15216690	46411483	—	—	52699897	52699897
	<i>Thamnomia vermicularis</i>	GB	714613	62005353	62005400	—	—	45545350	45545350

TABLE II. Continued

Classification (Eriksson 2006)	Taxon	Source	nuclSSU	nuclLSU	mitSSU	RPBI (A-F)	RPBI (F-G)	RPB2 (5-7)	RPB2 (7-11)
Pertusariaceae 2/5	<i>Ochrolechia balcanica</i>	GB	56555556	13241947	13241946	—	—	—	—
	<i>Ochrolechia frigida</i>	GB	12025085	12025086	32141071	—	—	—	—
	<i>Ochrolechia juvenalis</i>	GB	52699745	52699705	—	—	52699838	52699838	—
	<i>Ochrolechia parella</i>	GB	8926431	8926419	13241949	—	—	—	—
	<i>Ochrolechia szatalaensis</i>	GB	8926430	8926424	45643390	—	—	—	—
	<i>Ochrolechia trochophora</i>	880	DQ986743	—	DQ986901	—	—	—	DQ992465
	<i>Ochrolechia yasudae</i>	882	DQ986744	DQ986776	DQ986902	DQ986848	—	DQ992466	DQ992466
	<i>Ochrolechia</i> sp.	318	DQ986732	DQ986777	DQ986886	DQ986849	—	DQ992467	DQ992467
	<i>Pertusaria amara</i>	1067	8926426	8926423	32141073	DQ973048	—	DQ973069	DQ973069
	<i>Pertusaria dactylina</i>	224	DQ782880	DQ782907	DQ972973	DQ782828	DQ782828	DQ782868	DQ782868
	<i>Pertusaria erythrella</i>	GB	8926428	8926422	20334365	—	—	—	—
	<i>Pertusaria hemisphaerica</i>	959	DQ902340	AF381556	DQ973000	DQ902341	—	DQ902342	DQ902342
	<i>Pertusaria scaberrula</i>	GB	8926427	8926421	20334366	—	—	—	—
	Ostropomycetidae								
?									
Hymeneliaceae	<i>Aspicilia caesiocinerea</i> s.l.	653	DQ986736	DQ986778	DQ986892	DQ986851	DQ986851	DQ992469	DQ992469
	<i>Aspicilia cinerea</i> s.l.	647	DQ986735	DQ986779	DQ986890	DQ986850	DQ986850	—	DQ992468
	<i>Aspicilia contorta</i>	1358	—	DQ986782	DQ986876	DQ986852	—	DQ992470	—
	<i>Hymelia lacustris</i>	GB	52699740	52699701	46411463	—	—	52699823	52699823
Lecanoromycetes									
?									
?									
Boreoplaca <i>ultrafrigida</i>		1702	—	DQ986797	DQ986813	DQ986855	—	DQ992421	DQ992421
	<i>Lopezaria versicolor</i>	108	DQ912330	DQ912353	DQ912308	DQ912379	—	DQ912401	DQ912401
	<i>Strangospora pinicola</i>	GB	52699758	52699718	—	—	—	52699718	52699718
Ascomycota									
?									
?									
Baecomycetaceae	<i>Baeomyces placophyllus</i>	GB	15216668	15216669	32141051	—	—	52699785	52699785
	<i>Phyllobaëis erythrella</i> 1	GB	23451995	62005341	62005389	—	—	—	—
	<i>Phyllobaëis erythrella</i> 2	329	DQ986734	DQ986780	DQ986888	DQ990921	—	DQ992471	DQ992471
	<i>Phyllobaëis imbricata</i>	852	DQ986739	DQ986781	DQ986895	—	—	DQ992472	DQ992472

TABLE II. Continued

Classification (Eriksson 2006)	Taxon	Source	nucSSU	nuLSU	mitSSU	RPBI (A-F)	RPBI (F-G)	RPB2 (5-7)	RPB2 (7-11)
Leotiomycetes (outgroup)									
Helotiales									
Dermataceae	<i>Dermea acerina</i>	941	DQ247809	DQ247801	DQ976373	DQ471164	—	DQ247791	DQ247791
	<i>Modisia cinerea</i>	76	DQ470990	DQ470942	DQ976372	DQ471122	—	DQ470883	DQ470883
Geoglossaceae	<i>Geoglossum nigratum</i>	56	45775623	45775579	45775669	DQ471115	—	DQ470879	DQ470879
	<i>Trichoglossum hirsutum</i>	64	45775626	45775582	45775687	DQ471119	—	DQ470881	DQ470881
Helotiaceae	<i>Chlorociboria aeruginosa</i>	151	45775642	45775598	45775663	DQ471125	—	DQ470886	DQ470886
	<i>Cudoniella clavus</i>	166	DQ470992	DQ470944	DQ471056	DQ471128	—	DQ470888	DQ470888
Leotiaceae	<i>Leotia lubrica</i>	1	45775616	45775573	45775676	DQ471113	—	34369059	34369059
Sclerotiniaceae	<i>Botryotinia fucheliana</i>	59	45775624	45775580	45775661	DQ471116	—	DQ247786	DQ247786
Lichinomycetes (outgroup)									
Lichinales									
Peltulaceae	<i>Peltula auriculata</i>	892	DQ832332	DQ832330	DQ922953	DQ782856	DQ782856	DQ832331	DQ832331
	<i>Peltula umbilicata</i>	891	DQ782887	DQ832334	DQ922954	DQ782855	DQ782855	DQ832335	DQ832335

Models of evolution for all analyses were estimated with the hierarchical likelihood ratio test as implemented in Modeltest v3.5 (Posada and Crandall 1998). Bayesian Metropolis coupled Markov chain Monte Carlo analyses (B-MCMCMC) were conducted with MrBayes v3.1.1 (Huelsenbeck and Ronquist 2001). The combined dataset was divided into nine partitions (nucSSU, nucLSU, mitSSU, *RPB1* 1st/2nd/3rd and *RPB2* 1st/2nd/3rd). All Bayesian analyses were run with four independent chains for 20 000 000 generations, sampling every 500th tree, using a six-parameter model for nucleotide substitution (GTR, Rodríguez et al 1990) with a gamma distribution approximated with four categories, and a proportion of invariable sites. All model parameters were unlinked. Four independent B-MCMCMC runs were conducted to ensure that all runs reached stationarity and converged at the same log-likelihood level (verified by eye and with AWYT option, Wilgenbusch et al 2004). After discarding the burn-in, the last 10 000 trees of each run were pooled to calculate a 50% majority rule consensus tree.

Phylogenetic confidence was estimated for each dataset (5-gene, 5+4-gene and 5+4+3-gene) with Bayesian posterior probabilities (PP) obtained from MrBayes, and maximum likelihood bootstrap proportions. Bootstrap proportions were calculated with 250 bootstrap replicates using both PHYML v2.4.4 (PHYML-BS, Guindon and Gascuel 2003) implementing a GTR model with gamma distribution, approximated with four categories, and proportion of invariable sites, and RAxML version VI (RAxML-BS, Stamatakis et al 2005) implementing a GTR model with gamma distribution, approximated with four categories. Bootstrap proportions $\geq 70\%$, and posterior probabilities $\geq 95\%$, were considered significant. Internodes with at least one bootstrap value $\geq 70\%$ from RAxML or PHYML and at least one posterior probability $\geq 95\%$ for any of the three-taxon samplings (i.e. a minimum of one black box in the last column and one black box in one of the first two columns of the internodal grids of Fig. 1) were considered strongly supported. Internodes with at least one bootstrap value $\geq 70\%$ without a posterior probability $\geq 95\%$ also were interpreted as well supported (see Lutzoni et al 2004 and Alfaro et al 2003 for a discussion on the interpretation of support values).

To detect topological incongruences among single gene datasets, a reciprocal 70% neighbor joining bootstrap support criterion (NJ-BS) was implemented (Mason-Gamer and Kellogg 1996, Reeb et al 2004). A conflict was assumed to be significant if a group of taxa was supported ($\geq 70\%$ NJ-BS) as monophyletic in one tree but supported as nonmonophyletic in another. NJ-BS trees were obtained in PAUP v4b10 (Swofford 2002) with ML distances. The program compat.py (written by FK and available at www.lutzonilab.net) was used to detect conflicts among data partitions. Each pairwise combination of the five genetic loci was subjected to this screening for conflicts. For the *RPB1* and *RPB2* loci, this criterion was applied on each amplicon separately (two amplicons per locus). Taxa in conflict were removed from further analyses, and the test was repeated until no conflict was detected. The nexus 5+4+3-gene dataset is available on the AFTOL Website and

in TreeBASE (www.treebase.org) under accession number SN3062.

Alignments.—A summary of alignment lengths and number of included sites for each dataset after removal of conflicting taxa is provided (TABLE I). Due to detected incongruence when using our reciprocal 70% NJ-BS criterion, 28 taxa were removed from the initial 5-gene alignment for 139 taxa, resulting in a total number of 111 taxa included in the 5-gene dataset analyses. Ten taxa were removed from both the 5+4-gene and the 5+4+3-gene datasets for the final number of 188 and 274 taxa, respectively. The *RPB1* and *RPB2* loci provided the largest number of characters included in phylogenetic analyses. Compared to ribosomal loci these two genes contained the lowest proportion of ambiguously aligned characters (15–25% vs. 78–85%), which had to be excluded from the analyses. The proportion of missing data increased from 17% in the 5-gene alignment to 26% in the 5+4-gene alignment and 37% in the 5+4+3-gene alignment, mostly due to the missing *RPB1* and *RPB2* sequences (132 *RPB1* [A–F], 210 *RPB1* [F–G], 67 *RPB2* [5–7] and 84 *RPB2* [7–11] missing sequences in the 5+4+3-gene dataset). The number of characters for taxa part of the dataset with the greatest frequency of missing sequences (5+4+3-gene dataset) varied from 7114 characters for taxa with all genes included to 2638 characters for taxa with only nucSSU, nuLSU and mitSSU present.

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