

Supplemental Information for:

**The complexity of symbiotic interactions influences the ecological amplitude of the host:
a case study in *Stereocaulon* (lichenized Ascomycota)**

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Table of Contents:

Table S1	Page 2-15
Table S2	Page 16
Table S3	Page 17
Table S4	Page 18
Table S5	Page 19-23
Figure S1	Page 24
Figure S2	Page 25
Figure S3	Page 26
Figure S4	Page 27
Figure S5	Page 28
Figure S6	Page 29

Table S1. Details of the material, the area of collection and GenBank accession numbers of *Stereocaulon* samples (newly obtained in bold).

algal ITS accession	fungal ITS accession	actin accession	sample ID	mycobiont morphospecies	mycobiont OTU	substrate	locality	GPS
<i>Asterochloris echinata</i>								
AM905992		AM906017	Peksa 186	<i>Lepraria rigidula</i>		on bryophytes	Czech Republic, Lužické hory Mts, Klíč Mt.	50.787 14.571
FM955667		FM955671	Peksa 551	<i>Lepraria caesioalba</i>		on bryophytes on basalt	Czech Republic, Lužické hory Mts, Klíč Mt.	50.788743 14.569291
<i>Asterochloris erici</i>								
AF345440		AM906018	UTEX911	<i>Cladonia cristatella</i>			USA, Whitinsville, Massachusetts	42.105512 -71.666335
AF345442			Normore 375	<i>Stereocaulon dactylophyllum</i>			Canada, Nova Scotia, Harmony Mills	44.415606 -65.088607
<i>Asterochloris excentrica</i>								
AM905993		AM906019	UTEX 1714	<i>Stereocaulon dactylophyllum</i>			USA, Stowe, Vermont	44.475278 -72.702221
<i>Asterochloris friedlii</i>								
DQ229877		DQ229898	Nelsen 3974	<i>Lepraria finkii</i>			USA, Wisconsin, Ridgeway Township	42.98942 -90.009868
AM905995		AM906021	Peksa 235	<i>Lepraria caesioalba</i>		on bryophytes (orthogneiss)	Slovakia, Slovenské Rudohorie Mts, Klenovský Vepor Mt.	48.691 19.764
<i>Asterochloris gaertneri</i>								
AM905997		AM906023	Peksa 236	<i>Lepraria rigidula</i>		on bark of Acer pseudoplatanus	Czech Republic, Králický Sněžník Mts	50.193 16.856
FM955669		FM955673	Peksa 900	<i>Lepraria rigidula</i>		on bark of Pinus sylv.	Czech Republic, Šumava Mts, Svojše	49.0370561 13.5399211
<i>Asterochloris glomerata</i>								
MH415301	MH415061		VancurovaA59	<i>Stereocaulon arcticum</i>	OTU10	volcanic soil	Iceland	63.85567 -19.23119
MH415302			VancurovaA6	<i>Stereocaulon cf. alpinum</i>		soil	Argentina, Santa Cruz	-49.336382 -72.946899
MH415393	MH415153		VancurovaO14	<i>Stereocaulon cf. grande</i>	OTU29	rock/mosses	Finland	61.191902 25.227629
MH415396	MH415156		VancurovaO20	<i>Stereocaulon symphycheilum</i>	OTU50	sandstone	Czech Republic	50.881398 14.293097
MH415427	MH415187	MH382148	VancurovaO75	<i>Stereocaulon pileatum</i>	OTU3	weathered volcanic rock	Portugal, Madeira	32.816195 -17.190006
MH415433	MH415193		VancurovaO85	<i>Stereocaulon rivulorum</i>	OTU10		Denmark, Faroe Islands	62.2368 -6.6174
MH415204	MH414970		Peksa 1012	<i>Stereocaulon pileatum</i>	OTU3	on siliceous rock	Slovakia, Nízke Tatry Mts, Špania dolina	48.808947 19.134917
AM905998		AM906026	Peksa 498	<i>Diploschistes muscorum</i>		on basalt	Czech Republic, Lužické hory Mts, Studenec Mt.	50.831 14.45

algal ITS accession	fungal ITS accession	actin accession	sample ID	mycobiont morphospecies	mycobiont OTU	substrate	locality	GPS	
FM945392	MH414974		Peksa 801	<i>Stereocaulon saxatile</i>	OTU47	mine-spoil heaps, on soil	Slovakia, Nízke Tatry Mts, Špania dolina	48.808947	19.134917
AF345407			UTEX 1713	<i>Stereocaulon pileatum</i>			USA, Bare Mountain, Amherst, Massachusetts	42.303424	-72.531476
FJ626732			UTEX 894	<i>Stereocaulon evolutoides</i>		rock	USA, Princeton, Wachusett Mt.	42.488979	-71.887019
AF345382		AM906024	UTEX 895	<i>Stereocaulon evolutoides</i>		rock	USA, Princeton, Wachusett Mt.	42.488979	-71.887019
AF345404			UTEX 896	<i>Stereocaulon pileatum</i>		rock	USA, Princeton, Wachusett Mt.	42.488979	-71.887019
AF345405			UTEX 897	<i>Stereocaulon pileatum</i>		rock	USA, Princeton, Wachusett Mt.	42.488979	-71.887019
<i>Asterochloris irregularis</i>									
MH415259			VancurovaA380	<i>Stereocaulon arcticum</i>		rock	Iceland, Kleifarvatn	63.94037	-21.98406
MH415260	MH415025		VancurovaA382	<i>Stereocaulon vesuvianum</i>	OTU10		Iceland, Kleifarvatn	63.94037	-21.98406
MH415261	MH415026		VancurovaA383	<i>Stereocaulon vesuvianum</i>	OTU10		Iceland, Kleifarvatn	63.94037	-21.98406
MH415262	MH415027		VancurovaA384	<i>Stereocaulon arcticum</i>	OTU10	gravel pit	Iceland	63.85957	-22.3474
MH415265	MH415030		VancurovaA387	<i>Stereocaulon arcticum</i>	OTU10	soil	Iceland	64.21289	-19.2558
MH415266	MH415031		VancurovaA389	<i>Stereocaulon arcticum</i>	OTU10		Iceland	63.8685	-21.75556
MH415267	MH415032		VancurovaA390	<i>Stereocaulon vesuvianum</i>	OTU10		Iceland	64.12108	-19.78241
MH415268	MH415033		VancurovaA391	<i>Stereocaulon cf. alpinum</i>	OTU10		Iceland	64.21289	-19.2558
MH415270	MH415035		VancurovaA397	<i>Stereocaulon arcticum</i>	OTU10	soil	Iceland, Öxl	64.83202	-14.66373
MH415271	MH415036		VancurovaA398	<i>Stereocaulon arcticum</i>	OTU10	soil	Iceland, Öxl	64.83202	-14.66373
MH415272	MH415037		VancurovaA399	<i>Stereocaulon vesuvianum</i>	OTU10		Japan, Fuji Mt.	35.352726	138.736932
MH415279	MH415040		VancurovaA422	<i>Stereocaulon sp.</i>	OTU35		Austria, Stubai Thal	47.104488	11.295766
MH415300	MH415060		VancurovaA58	<i>Stereocaulon vesuvianum</i>	OTU10	lava	Iceland	63.72311	-19.44964
MH415306	MH415097		VancurovaDS1.1	<i>Stereocaulon sp.</i>	OTU47		Russia, Eastern Siberia	57.98387	127.06477
MH415308			VancurovaDS4.1	<i>Stereocaulon sp.</i>			Russia, Eastern Siberia	57.98387	127.06477
MH415309			VancurovaDS6.1	<i>Stereocaulon sp.</i>			Russia, Eastern Siberia	57.98387	127.06477
MH415310	MH415073		VancurovaFB1	<i>Stereocaulon vesuvianum</i>	OTU10	rock	Czech Republic, Jizerské hory Mts	50.853333	15.224722
MH415314	MH415076		VancurovaL1058	<i>Stereocaulon apocalypticum</i>	OTU49	boulder	USA, Alaska	63.466413	-148.808811
MH415315	MH415077		VancurovaL1059	<i>Stereocaulon intermedium</i>	OTU31	boulder	USA, Alaska	63.466413	-148.808811
MH415316	MH415078		VancurovaL1060	<i>Stereocaulon intermedium</i>	OTU47	boulder	USA, Alaska	63.466413	-148.808811
MH415317	MH415079		VancurovaL1061	<i>Stereocaulon intermedium</i>	OTU47	boulder	USA, Alaska	63.466413	-148.808811
MH415318	MH415080		VancurovaL1062	<i>Stereocaulon paschale</i>	OTU47	boulder	USA, Alaska	63.466413	-148.808811

algal ITS accession	fungal ITS accession	actin accession	sample ID	mycobiont morphospecies	mycobiont OTU	substrate	locality	GPS	
MH415319	MH415081		VancurovaL1063	<i>Stereocaulon paschale</i>	OTU47	boulder	USA, Alaska	63.466413	-148.808811
MH415320	MH415082		VancurovaL1064	<i>Stereocaulon paschale</i>	OTU47	boulder	USA, Alaska	63.466413	-148.808811
MH415321			VancurovaL1065	<i>Stereocaulon apocalypticum</i>		boulder	USA, Alaska	63.466413	-148.808811
MH415324	MH415084		VancurovaL1068	<i>Stereocaulon sp.</i>	OTU45	soil/siliceous rock	USA, Alaska	60.574207	-149.572659
MH415325	MH415085		VancurovaL1069	<i>Stereocaulon paschale</i>	OTU47	soil/siliceous rock	USA, Alaska	60.574207	-149.572659
MH415326			VancurovaL1070	<i>Stereocaulon botryosum</i>		gravel	USA, Alaska	68.129396	-149.475919
MH415327			VancurovaL1071	<i>Stereocaulon sp.</i>		gravel	USA, Alaska	68.129396	-149.475919
MH415328	MH415086		VancurovaL1073	<i>Stereocaulon sp.</i>	OTU31	soil/siliceous rock	USA, Alaska	60.574207	-149.572659
MH415331	MH415089		VancurovaL1076	<i>Stereocaulon sp.</i>	OTU31	soil/siliceous rock	USA, Alaska	60.574207	-149.572659
MH415332			VancurovaL1077	<i>Stereocaulon paschale</i>		soil/siliceous rock	USA, Alaska	60.574207	-149.572659
MH415333	MH415090		VancurovaL1078	<i>Stereocaulon sp.</i>	OTU31	soil/siliceous rock	USA, Alaska	60.574207	-149.572659
MH415335	MH415092		VancurovaL1080	<i>Stereocaulon paschale</i>	OTU47	soil/siliceous rock	USA, Alaska	66.370472	-150.476282
MH415336	MH415093		VancurovaL1081	<i>Stereocaulon sp.</i>	OTU31	boulder	USA, Alaska	63.48861	-148.78547
MH415340	MH415097		VancurovaL1248	<i>Stereocaulon sp.</i>	OTU47		Russia, Eastern Siberia	57.98387	127.06477
MH415356	MH415117		VancurovaL1641	<i>Stereocaulon paschale</i>	OTU47	gneiss/soil	Greenland, Ilulissat	69.200829	-51.066389
MH415358	MH415119		VancurovaL1643	<i>Stereocaulon alpinum</i>	OTU29	basalt/soil	Greenland, Disko Island	69.240059	-53.542775
MH415359	MH415120		VancurovaL1644	<i>Stereocaulon cf. arcticum</i>	OTU10	basalt/soil	Greenland, Disko Island	69.240059	-53.542775
MH415360	MH415121	MH382139	VancurovaL1645	<i>Stereocaulon alpinum + paschale</i>	OTU29	gneiss/soil	Greenland, Ilulissat	69.200829	-51.066389
MH415361	MH415122	MH382140	VancurovaL1646	<i>Stereocaulon alpinum</i>	OTU29	basalt/soil	Greenland, Disko Island	69.240059	-53.542775
MH415362	MH415123		VancurovaL1647	<i>Stereocaulon paschale</i>	OTU47	gneiss/soil	Greenland, Ilulissat	69.200829	-51.066389
MH415363	MH415124		VancurovaL1648	<i>Stereocaulon sp. + paschale</i>	OTU47	gneiss/soil	Greenland, Ilulissat	69.200829	-51.066389
MH415368	MH415129		VancurovaL990	<i>Stereocaulon tomentosum/ sasakii</i>	OTU29		USA, Alaska	63.3	-149.00000
MH415369	MH415130		VancurovaL991	<i>Stereocaulon symphycheilum</i>	OTU50	siliceous rock	Austria, Styria	47.084722	14.547222
MH415370	MH415131	MH382143	VancurovaL992	<i>Stereocaulon vesuvianum</i>	OTU10	siliceous rock	Austria, Styria	47.084722	14.547222

algal ITS accession	fungal ITS accession	actin accession	sample ID	mycobiont morphospecies	mycobiont OTU	substrate	locality	GPS
MH415377	MH415137		VancurovaO108	<i>Stereocaulon rivulorum</i>	OTU10		Denmark, Faroe Islands	62.0196944 -6.8256111
MH415387	MH415147		VancurovaO12	<i>Stereocaulon vesuvianum</i>	OTU10	among stones	Czech Republic, Krkonoše	50.760844 15.642404
MH415392	MH415152		VancurovaO13	<i>Stereocaulon cf. paschale</i>	OTU47	granite boulder	Finland, Helsinki	60.241903 25.123181
MH415394	MH415154		VancurovaO15	<i>Stereocaulon alpinum</i>	OTU29	granite boulder	Finland	61.495167 23.733665
MH415397	MH415157		VancurovaO21	<i>Stereocaulon symphycheilum</i>	OTU50	sandstone	Czech Republic	50.870574 14.38281
MH415398	MH415158		VancurovaO22	<i>Stereocaulon symphycheilum</i>	OTU50	sandstone	Czech Republic, České	50.881722 14.300444
MH415399	MH415159		VancurovaO23	<i>Stereocaulon paschale</i>	OTU47	gneiss	Russia, Altai Mts, Turochak	51.81357 87.19102
MH415405	MH415165		VancurovaO32	<i>Stereocaulon vesuvianum</i>	OTU10	rock	Norway	60.2924910 5.3989633
MH415406	MH415166		VancurovaO33	<i>Stereocaulon dactylophyllum</i>	OTU47	rock outcrop in forest	Finland	60.37492 24.505448
MH415413	MH415173		VancurovaO5	<i>Stereocaulon vesuvianum</i>	OTU10	waste rock	Czech Republic, Krušné	50.384092 12.891422
MH415434	MH415194		VancurovaO89	<i>Stereocaulon vesuvianum</i>	OTU10		Denmark, Faroe Islands	62.3501667 -6.5978611
MH415205	MH414971		Peksa 1013	<i>Stereocaulon vesuvianum</i>	OTU10	on siliceous rock	Slovakia, Nízke Tatry Mts, Špania dolina	48.808947 19.134917
AM905999		AM906028	Peksa 999	<i>Stereocaulon pileatum</i>		on sandstone	Czech Republic, České Švýcarsko NP	50.883931 14.281506
DQ229880		DQ229889	Talbot 153	<i>Stereocaulon botryosum</i>		rock	USA, Alaska, Selawik NWR	66.439531 -157.177426
DQ229881		DQ229890	Talbot 167	<i>Stereocaulon subcoralloides</i>		rock	USA, Alaska, Selawik NWR	66.439531 -157.177426
AF345411		AM906027	UTEX 2236	<i>Stereocaulon sp.</i>			Iceland, Langa River	66.028176 -23.169434
<i>Asterochloris italiana</i>								
MH415217		MH382121	VancurovaA10	<i>Stereocaulon alpinum</i>		soil	Argentina, Tierra del Fuego	-54.835598 -68.484391
MH415230	MH414997		VancurovaA322	<i>Stereocaulon azureum</i>	OTU13	rock/moss	Portugal, Madeira	32.745833 -16.858867
MH415231	MH414998		VancurovaA323	<i>Stereocaulon azureum</i>	OTU13	soil	Portugal, Madeira	32.759017 -17.054433
MH415246	MH415012		VancurovaA352	<i>Stereocaulon azureum</i>	OTU13	soil	Portugal, Madeira	32.749317 -16.9323
MH415253	MH415019		VancurovaA366	<i>Stereocaulon azureum</i>	OTU13	rock/moss	Portugal, Madeira	32.741533 -16.890233
MH415254	MH415020		VancurovaA370	<i>Stereocaulon azureum</i>	OTU13	rock/moss	Portugal, Madeira	32.728867 -16.880083
AM906001		AM906030	CCAP 219/5B	<i>"Xanthoria parietina"</i>			Italy	
MH415339	MH415096		VancurovaL1232	<i>Stereocaulon condensatum</i>	OTU37	půda	Germany, Hesse	50.345411 8.087378
MH415423	MH415183		VancurovaO71	<i>Stereocaulon azureum</i>	OTU13	shallow soil in rock	Portugal, Madeira	32.829467 -17.190556
MH415439	MH415198		VancurovaO99	<i>Stereocaulon rivulorum</i>	OTU10		Denmark, Faroe Islands	62.0196944 -6.8256111
<i>Asterochloris leprarii</i>								

algal ITS accession	fungal ITS accession	actin accession	sample ID	mycobiont morphospecies	mycobiont OTU	substrate	locality	GPS	
AM906002		AM906031	Peksa 183	<i>Lepraria neglecta</i>		on siliceous rock	Czech Republic, Šumava Mts.	49.034	13.475
<i>Asterochloris lobophora</i>									
MH415297	MH415057		VancurovaA51	<i>Stereocaulon alpinum</i>	OTU35	soil	Georgia	42.502231	45.291398
MH415298	MH415058		VancurovaA53	<i>Stereocaulon alpinum</i>	OTU35	soil	Georgia	42.516667	45.25
MH415299	MH415059		VancurovaA55	<i>Stereocaulon alpinum</i>	OTU35	soil	Georgia	42.517599	45.275016
MH415307	MH415072	MH382136	VancurovaDS3.1	<i>Stereocaulon sp.</i>	OTU12	soil	Russia, Eastern Siberia	57.98387	127.06477
DQ229878		DQ229892	Nelsen 3950	<i>Lepraria finkii</i>		bark	USA, Wisconsin, Patterson Hemlocks State Natural Area, Minocqua	45.897558	-89.9625
MH415206	MH414972		Peksa 1014	<i>Stereocaulon nanodes</i>	OTU40	on siliceous rock	Slovakia, Nízke Tatry Mts, Špania dolina	48.808947	19.134917
AM906008		AM906037	Peksa 166	<i>Lepraria caesioalba</i>		on siliceous rock	Czech Republic, Šumava Mts., Kašperk Mt.	49.16598	13.564892
FM945391	MH414973		Peksa 786	<i>Stereocaulon tomentosum</i>	OTU35	mine-spoil heaps, on soil	Slovakia, Volovské vrchy Mts, Gelnica	48.856804	20.924723
FN556044		KP318679	Peksa 866	<i>Lepraria borealis</i>		on bryophytes and siliceous rock	Czech Republic, Šumava Mts	49.107	13.584
<i>Asterochloris magna</i>									
AM906012		AM906041		<i>Pilophorus aciculare</i>			USA, Olympic National Park, Washington	47.971407	-123.490524
<i>Asterochloris mediterranea</i>									
KP257384		KP257351	C19	<i>Cladonia convoluta/foliacea</i>		miocene gypsum	Spain, Villena, Alicante	38.6572222	-0.9369444
MH415313	MH415075		VancurovaKO25.2	<i>Stereocaulon vesuvianum</i>	OTU11	soil	Spain, Canary Islands, La	28.761944	-17.876111
<i>Asterochloris phycobiontica</i>									
MH415334	MH415091		VancurovaL1079	<i>Stereocaulon alpinum</i>	OTU35	soil	Austria, Tyrol	46.95984	10.972236
AM900490,		AM906042	SAG 26.81	<i>Anzina carneonivea</i>		bark	Italy, Trento, Madonna di Campiglio	46.231886	10.829
GU017647									
<i>Asterochloris woessiae</i>									
MH415232	MH414999		VancurovaA329	<i>Stereocaulon azureum</i>	OTU13	rock	Portugal, Madeira	32.763533	-16.92975
MH415234	MH415001		VancurovaA331	<i>Stereocaulon sp.</i>	OTU22		Portugal, Madeira	32.763133	-16.93295
MH415235	MH415002		VancurovaA333	<i>Stereocaulon azureum</i>	OTU13	rock	Portugal, Madeira	32.763133	-16.93295
MH415237	MH415004		VancurovaA336	<i>Stereocaulon sp.</i>	OTU13	rock/soil	Portugal, Madeira	32.76125	-16.935783
MH415238	MH415005	MH382127	VancurovaA337	<i>Stereocaulon azureum</i>	OTU13	rock	Portugal, Madeira	32.75315	-17.0263
MH415244	MH415010		VancurovaA350	<i>Stereocaulon sp.</i>	OTU13	rock	Portugal, Madeira	32.747383	-16.9339
MH415252	MH415018	MH382128	VancurovaA359	<i>Stereocaulon azureum</i>	OTU13	rock/soil	Portugal, Madeira	32.758983	-16.93945

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MH415256 AM900492	MH415022	AM906045	VancurovaA375 Bayerová 3401	<i>Stereocaulon azureum</i> <i>Lepraria borealis</i>	OTU13	rock/moss on sunlit slate rock and over moss in fissures of rock	Portugal, Madeira Bulgaria, Stara planina Mts	32.770317 -16.947617 42.653028 24.8065	
MH415379 MH415383 MH415418 MH415419 MH415424 MH415425 MH415426	MH415139 MH415143 MH415178 MH415179 MH415184 MH415185 MH415186	MH382145	VancurovaO110 VancurovaO115 VancurovaO66 VancurovaO67 VancurovaO72 VancurovaO73 VancurovaO74	<i>Stereocaulon sp.</i> <i>Stereocaulon alpinum</i> <i>Stereocaulon azureum</i> <i>Stereocaulon azureum</i> <i>Stereocaulon azureum</i> <i>Stereocaulon pileatum</i> <i>Stereocaulon pileatum</i>	OTU35 OTU35 OTU13 OTU13 OTU13 OTU3 OTU3	among mosses soil volcanic rock/soil shallow soil in rock shallow soil in rock weathered volcanic weathered volcanic rock	Denmark, Faroe Islands Denmark, Faroe Islands Portugal, Madeira Portugal, Madeira Portugal, Madeira Portugal, Madeira Portugal, Madeira	62.3173611 -7.1034444 62.3105833 -7.1059167 32.765147 -16.92206 32.796111 -17.183689 32.849795 -17.210457 32.796111 -17.183689 32.796111 -17.183689	
KP318667	MH414986		VancurovaA116	<i>Stereocaulon cf. azureum</i>	OTU13	rock	Spain, Canary Islands, La Gomera	28.108417 -17.253611	
A11									
FN556043		FN556052	Peksa 870	<i>Lepraria sp.</i>		on rock and bryophytes	USA, California, Sierra Nevada Mts, Sequoia NP, Moro Rock	36.545429 -118.766128	
FN556042		FN556051	Peksa 873	<i>Lepraria caesioalba</i>		on serpentine rock	USA, California, Mt. Tamalpais State Park, Pantoll	37.906541 -122.60934	
A4									
KP318676		KP318681	Peksa 495	<i>Diploschistes muscorum</i>		on siliceous rock	Czech Republic, Lužické hory Mts.	50.805485 14.858081	
FN556031		FN556047	Peksa 855	<i>Lepraria rigidula</i>		on bark of Pinus sylvestris	Czech Republic, Brdy Mts, Hřebenec Nature Reserve	49.5812481 13.7651575	
A9									
MH415218 MH415223 MH415226 MH415264 MH415274 MH415290	MH414985 MH414990 MH414993 MH415029 MH415038 MH415051	MH382122 MH382125 MH382130	VancurovaA11 VancurovaA2 VancurovaA3 VancurovaA386 VancurovaA400 VancurovaA5	<i>Stereocaulon cf. vesuvianum</i> <i>Stereocaulon cf. alpinum</i> <i>Stereocaulon vesuvianum</i> <i>Stereocaulon cf. alpinum</i> <i>Stereocaulon vesuvianum</i> <i>Stereocaulon vesuvianum</i>	OTU42 OTU43 OTU10 OTU32 OTU11 OTU10	mosses/rock soil rock soil lava soil	Argentina, Tierra del Fuego Argentina, Santa Cruz Argentina, Santa Cruz Iceland Italy, Sicily Argentina, Santa Cruz, PN los Glaciares	-54.783333 -68.383333 -49.266667 -72.983333 -49.266667 -72.983333 64.12108 -19.78241 37.84069 15.08844 -49.316667 -72.983333	
MH415303	MH415062		VancurovaA7	<i>Stereocaulon sp.</i>	OTU43	soil	Argentina, Santa Cruz, PN los Glaciares	-49.316667 -72.983333	

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MH415203	MH414969	MH382116	Peksa 1011	<i>Stereocaulon nanodes</i>	OTU40	on siliceous rock	Slovakia, Nízke Tatry Mts, Špania dolina	48.808947	19.134917
FN556035		FN556048	Peksa 860	<i>Lepraria alpina</i>		on siliceous rock	Spain, Somiedo Mts, St. Maria del Puerto	43.02851	-6.235686
clade 12									
MH415322			VancurovaL1066	<i>Stereocaulon rivulorum</i>		soil	USA, Alaska	62.739173	-150.118637
MH415374	MH415134	MH382144	VancurovaO10	<i>Stereocaulon sp.</i>	OTU35	sediment	Mexico, Oaxaca	20.624466	-100.355976
MH415395	MH415155		VancurovaO17	<i>Stereocaulon dactylophyllum</i>	OTU35	moss	Czech Republic, Slavkovský les	50.06513	12.750625
FM945378		FM955677	Peksa 921	<i>Cladonia rei</i>		on naked soil	Czech Republic, East Bohemia, Chvaletice	50.0363411	15.44485
DQ229887		DQ229891	Talbot 101	<i>Stereocaulon paschale</i>		soil	USA, Alaska, Riverside	63.161183	-142.114083
clade 8									
MH415415	MH415175		VancurovaO51	<i>Stereocaulon cf. grande</i>	OTU38	soil	Canada	49.693841	-125.364318
MH415451	MH415202		VancurovaOP1134.2	<i>Stereocaulon dactylophyllum</i>	OTU35	on basalt	Czech Republic, Lužické hory Mts, Javor Mt.	50.828765	14.504255
FM945380		FM955675	Peksa 787	<i>Cladonia rei</i>		mine-spoil heaps, on	Slovakia, Volovské vrchy	48.856804	20.924723
FM945358		FM955674	Peksa 796	<i>Cladonia fimbriata</i>		mine-spoil heaps, on	Slovakia, Nízke Tatry Mts,	48.808947	19.134917
clade 9									
HE803038		KP318682	IH20	<i>Cladonia scabriuscula</i>		rock with mosses	India	17.921556	73.673167
EU008684		EU008711	L54	<i>Lepraria sp.</i>		soil	Costa Rica, Cartago	9.716609	-83.849965
I1									
HE803029		MH382117	I6	<i>Cladonia rangiferina</i>		soil	India	30.220544	80.22085
HE803033		MH382119	IH31	<i>Cladonia corymbescens</i>		soil	India	29.970917	80.655472
I2									
HE803036		MH382118	IH23	<i>Cladonia furcata</i>		soil	India	11.395944	76.726833
S1									
DQ229884		DQ229896	Nelsen 2181b	<i>Stereocaulon sp.</i>			Costa Rica, San José	9.864167	-84.026686
S3									
DQ229886		DQ229897	Talbot KIS 187	<i>Stereocaulon saxatile</i>			USA, Alaska, Kiska Island,	51.978383	177.53985
Asterochloris aff. italiana									
MH415255	MH415021		VancurovaA371	<i>Stereocaulon sp.</i>	OTU13	stone	Portugal, Madeira	32.7294667	-16.8853
MH415391	MH415151		VancurovaO128	<i>Stereocaulon dactylophyllum</i>	OTU35	siliceous rock	Sweden, Värnamo	57.2495833	13.9591111

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MH415422	MH415182	MH382147	VancurovaO70	<i>Stereocaulon azureum</i>	OTU13	shallow soil in rock crevices	Portugal, Madeira	32.816195 -17.190006	
Asterochloris aff. irregularis									
MH415263	MH415028		VancurovaA385	<i>Stereocaulon arcticum</i>	OTU10		Iceland	64.21289 -19.2558	
MH415323	MH415083		VancurovaL1067	<i>Stereocaulon tomentosum/sasakii</i>	OTU29	soil	USA, Alaska, Peninsula Kenai, Lost Lake Trail	60.270019 -149.4295	
MH415367	MH415128	MH382142	VancurovaL988	<i>Stereocaulon paschale</i>	OTU47	soil	USA, Alaska	63.295365 -149.189554	
MH415378	MH415138		VancurovaO109	<i>Stereocaulon arcticum</i>	OTU10		Denmark, Faroe Islands	62.3173611 -7.1034444	
MH415407	MH415167		VancurovaO35	<i>Stereocaulon pileatum</i>	OTU35	siliceous rock	Austria	47.441389 14.411389	
MH415408	MH415168		VancurovaO36	<i>Stereocaulon cf. alpinum</i>	OTU50	siliceous rock	Austria	47.441389 14.411389	
MH415409	MH415169		VancurovaO38	<i>Stereocaulon alpinum</i>	OTU29	on soil associated with mosses	Canada	50.494722 -116.053889	
DQ229885		DQ229888	Talbot 281	<i>Stereocaulon vesuvianum</i>		rock	USA, Alaska, Sviechnikof	52.05913 -173.398884	
StA1									
MH415375	MH415135		VancurovaO104	<i>Stereocaulon rivulorum</i>	OTU10		Denmark, Faroe Islands	62.0196944 -6.8256111	
MH415376	MH415136		VancurovaO106	<i>Stereocaulon vesuvianum</i>	OTU10		Denmark, Faroe Islands	62.0196944 -6.8256111	
MH415380	MH415140		VancurovaO111	<i>Stereocaulon sp.</i>	OTU10		Denmark, Faroe Islands	62.3173611 -7.1034444	
MH415381	MH415141		VancurovaO112	<i>Stereocaulon cf. vesuvianum</i>	OTU10		Denmark, Faroe Islands	62.0334167 -6.8348056	
MH415382	MH415142		VancurovaO113	<i>Stereocaulon rivulorum</i>	OTU10		Denmark, Faroe Islands	62.0334167 -6.8348056	
MH415384	MH415144		VancurovaO116	<i>Stereocaulon vesuvianum</i>	OTU10		Denmark, Faroe Islands	62.0334167 -6.8348056	
MH415385	MH415145		VancurovaO117	<i>Stereocaulon vesuvianum</i>	OTU10		Denmark, Faroe Islands	62.2362778 -6.6166389	
MH415386	MH415146		VancurovaO118	<i>Stereocaulon rivulorum</i>	OTU10	among mosses	Denmark, Faroe Islands	62.3501667 -6.5978611	
MH415388	MH415148		VancurovaO120	<i>Stereocaulon cf. rivulorum</i>	OTU10		Denmark, Faroe Islands	62.3428 -6.5876	
MH415389	MH415149		VancurovaO122	<i>Stereocaulon cf. rivulorum</i>	OTU10		Denmark, Faroe Islands	62.3428 -6.5876	
MH415390	MH415150		VancurovaO126	<i>Stereocaulon rivulorum</i>	OTU10		Denmark, Faroe Islands	62.3428 -6.5876	
MH415428	MH415188	MH382149	VancurovaO76	<i>Stereocaulon vesuvianum</i>	OTU10		Denmark, Faroe Islands	62.3270111 -6.4870639	
MH415429	MH415189		VancurovaO78	<i>Stereocaulon vesuvianum</i>	OTU10		Denmark, Faroe Islands	62.2974722 -6.6772222	
MH415430	MH415190		VancurovaO81	<i>Stereocaulon rivulorum</i>	OTU10		Denmark, Faroe Islands	62.2634 -6.6171	
MH415431	MH415191		VancurovaO83	<i>Stereocaulon rivulorum</i>	OTU10		Denmark, Faroe Islands	62.2368 -6.6174	
MH415432	MH415192		VancurovaO84	<i>Stereocaulon vesuvianum</i>	OTU10		Denmark, Faroe Islands	62.2368 -6.6174	
MH415435	MH415195		VancurovaO91	<i>Stereocaulon cf. rivulorum</i>	OTU10		Denmark, Faroe Islands	62.0196944 -6.8256111	
MH415436	MH415196		VancurovaO93	<i>Stereocaulon vesuvianum</i>	OTU10		Denmark, Faroe Islands	62.0196944 -6.8256111	
MH415437	MH415197		VancurovaO95	<i>Stereocaulon rivulorum</i>	OTU10		Denmark, Faroe Islands	62.0196944 -6.8256111	

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StA2								
MH415257	MH415023	MH382129	VancurovaA378	<i>Stereocaulon alpinum</i>	OTU35		Iceland, Southern Peninsula	63.81887 -22.68194
MH415258	MH415024		VancurovaA379	<i>Stereocaulon alpinum</i>	OTU35	with mosses	Iceland	64.12108 -19.78241
MH415269	MH415034	MH382131	VancurovaA392	<i>Stereocaulon saxatile</i>	OTU35		Iceland	63.91209 -17.71864
StA3								
MH415438		MH382150	VancurovaO98	<i>Cladonia macrophylla</i>			Denmark, Faroe Islands	62.0196944 -6.8256111
MH415212			RidkaT8	<i>Stereocaulon vesuvianum</i>		volcanic rock	Tanzania, Little Meru Mt.	-3.238287 36.762194
StA4								
MH415281	MH415042		VancurovaA442	<i>Stereocaulon sp.</i>	OTU34	gravel bar	Sweden, Vålådalen Nature	63.040556 12.898611
MH415329	MH415087	MH382137	VancurovaL1074	<i>Stereocaulon sp.</i>	OTU36	soil/siliceous rock	USA, Alaska	60.574207 -149.572659
MH415330	MH415088		VancurovaL1075	<i>Stereocaulon sp.</i>	OTU36	soil/siliceous rock	USA, Alaska	60.574207 -149.572659
MH415357	MH415118	MH382138	VancurovaL1642	<i>Stereocaulon alpinum</i>	OTU34	basalt/soil	Greenland, Disko Island	69.240059 -53.542775
MH415364	MH415125		VancurovaL1649	<i>Stereocaulon alpinum</i>	OTU35	gneiss/soil	Greenland, Ilulissat	69.240059 -53.542775
DQ229882		DQ229893	Talbot 400	<i>Stereocaulon paschale</i>		moss	USA, Alaska, Aleutians East,	54.90003 -159.26669
StA5								
MH415221	MH414988		VancurovaA16	<i>Stereocaulon alpinum</i>	OTU35	with rhododendron,	Georgia	42.502235 45.355319
MH415222	MH414989		VancurovaA18	<i>Stereocaulon alpinum</i>	OTU35	with rhododendron,	Georgia	42.502235 45.355319
MH415224	MH414991		VancurovaA20	<i>Stereocaulon alpinum</i>	OTU35	with rhododendron,	Georgia	42.502235 45.355319
MH415225	MH414992		VancurovaA22	<i>Stereocaulon alpinum</i>	OTU35	grass, mosses and with rhododendron,	Georgia	42.502235 45.355319
MH415282	MH415043		VancurovaA445	<i>Stereocaulon vesuvianum</i>	OTU35	grass, mosses and soil, among low plants	Georgia	42.65884 44.57376
MH415291	MH415052		VancurovaA50	<i>Stereocaulon cf. alpinum</i>	OTU35	soil	Georgia	42.502231 45.291398
MH415366	MH415127	MH382141	VancurovaL958	<i>Stereocaulon alpinum</i>	OTU35	acidic soil	Austria, Tyrol	47.047778 12.690278
MH415410	MH415170		VancurovaO40	<i>Stereocaulon alpinum</i>	OTU39	soil	Canada	49.693841 -125.364318
MH415411	MH415171		VancurovaO42	<i>Stereocaulon cf. grande</i>	OTU39	soil	Canada	49.693841 -125.364318
MH415412	MH415172		VancurovaO43	<i>Stereocaulon cf. grande</i>	OTU39	soil	Canada	49.693841 -125.364318
MH415414	MH415174	MH382146	VancurovaO50	<i>Stereocaulon cf. alpinum</i>	OTU39	soil	Canada	49.693841 -125.364318
StA6								
MH415216	MH414982	MH382120	VancurovaA1	<i>Stereocaulon cf. alpinum</i>	OTU44	soil	Argentina, Santa Cruz	-49.266667 -72.983333
MH415273			VancurovaA4	<i>Stereocaulon cf. alpinum</i>		soil	Argentina, Santa Cruz	-49.266667 -72.983333
StA7								
MH415219		MH382123	VancurovaA13	<i>Stereocaulon cf. vesuvianum</i>		soil	Argentina, Tierra del Fuego	-54.835598 -68.484391

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AF345437			Hammer 7000	<i>Cladia aggregata</i>			Australia		
StA8									
MH415229	MH414996	MH382126	VancurovaA319	<i>Stereocaulon myriocarpum</i>	OTU35		Costa Rica, PN Chirripó	9.4503278 -83.5122194	
MH415287	MH415048	MH382132	VancurovaA496	<i>Stereocaulon myriocarpum</i>	OTU35	rock	Venezuela, Pico Bolívar	8.475131 -71.057945	
MH415288	MH415049	MH382133	VancurovaA498	<i>Stereocaulon myriocarpum</i>	OTU35		Venezuela, Pico Bolívar	8.525631 -71.026659	
MH415294	MH415054	MH382134	VancurovaA502	<i>Stereocaulon myriocarpum</i>	OTU35	rock	Venezuela, Pico Bolívar	8.54806 -71.024835	
URa14									
EU008690		EU008715	L60	<i>Lepraria sp.</i>		bark	China, Yunnan, Chuxiong Co., mountains above city of Chuxiong	24.998611 101.432819	
other <i>Asterochloris</i>									
MH415210			RidkaT20	<i>Stereocaulon vesuvianum</i>		volcanic substrate	Tanzania, Mt. Kilimanjaro	-3.06127 37.31287	
MH415220	MH414987	MH382124	VancurovaA14	<i>Stereocaulon sp.</i>	OTU43	volcanic soil	Argentina, Neuquén, PN	-39.566667 -71.433333	
MH415296	MH415056	MH382135	VancurovaA504	<i>Stereocaulon cf. obesum</i>	OTU10	rock	Panama	8.8176944 -82.5943611	
<i>Chloridium angustoellipsoideum</i>									
MH415249	MH415015		VancurovaA356	<i>Stereocaulon meyeri</i>	OTU11		Portugal, Madeira	32.755231 -16.93837	
MH415277	MH415039		VancurovaA421.2	<i>Stereocaulon sp.</i>	OTU10	stones/wall	Guatemala	14.785906 -91.548994	
MH415311	MH415074		VancurovaJM1734	<i>Stereocaulon nanodes</i>	OTU40	rail	Czech Republic, Lednice	48.781547 16.803266	
MH415372	MH415132		VancurovaLV5.2	<i>Stereocaulon nanodes</i>	OTU40	sludge bed, textile	Czech Republic, Nové Hodějovice	48.95446 14.512725	
MH415416	MH415176		VancurovaO64	<i>Stereocaulon vesuvianum</i>	OTU11	volcanic stone	Portugal, Madeira	32.776658 -17.08028	
MH415443	MH415200		VancurovaOP1083.1	<i>Stereocaulon nanodes</i>	OTU40	siliceous rock	Czech Republic, Slavkovský les	50.122591 12.799761	
MH415444	MH415200		VancurovaOP1083.2	<i>Stereocaulon nanodes</i>	OTU40	siliceous rock	Czech Republic, Slavkovský les	50.122591 12.799761	
MH415445	MH415200		VancurovaOP1083.3	<i>Stereocaulon nanodes</i>	OTU40	siliceous rock	Czech Republic, Slavkovský les	50.122591 12.799761	
MH415447	MH415200		VancurovaOP1083.5	<i>Stereocaulon nanodes</i>	OTU40	siliceous rock	Czech Republic, Slavkovský les	50.122591 12.799761	
MH415448	MH415200		VancurovaOP1083.6	<i>Stereocaulon nanodes</i>	OTU40	siliceous rock	Czech Republic, Slavkovský les	50.122591 12.799761	
MH415449	MH415201		VancurovaOP1118.1	<i>Stereocaulon nanodes</i>	OTU40	slag	Czech Republic, Kladno	50.179026 14.142936	

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<i>Chloroidium ellipsoideum</i>									
MH415207	MH414975		RidkaNZ23	<i>Stereocaulon sp.</i>	OTU57		New Zealand, Jackson Bay	-43.973416	168.613791
MH415213	MH414979		Vancurova10	<i>Stereocaulon sp.</i>	OTU40	sludge bed, textile	Czech Republic, Nové	48.95446	14.512725
MH415233	MH415000		VancurovaA33	<i>Stereocaulon vesuvianum</i>	OTU11	rock	Italy, Vesuvius Mt.	40.830634	14.426971
MH415239	MH415006		VancurovaA339	<i>Stereocaulon vesuvianum</i>	OTU11	rock	Portugal, Madeira	32.724867	-16.98815
MH415247	MH415013		VancurovaA353	<i>Stereocaulon vesuvianum</i>	OTU11	rock	Portugal, Madeira	32.749317	-16.9323
MH415250	MH415016		VancurovaA357	<i>Stereocaulon vesuvianum</i>	OTU23		Portugal, Madeira	32.755231	-16.93837
MH415280	MH415041		VancurovaA426	<i>Stereocaulon vesuvianum</i>	OTU11	stone	Italy, Sicily	37.6537	14.98072
MH415283	MH415044		VancurovaA450	<i>Stereocaulon vesuvianum</i>	OTU11	volcanic rock	Italy, Isola di Vulcano	38.39078	14.96562
MH415284	MH415045		VancurovaA451	<i>Stereocaulon vesuvianum</i>	OTU11	volcanic rock	Italy, Isola di Vulcano	38.39078	14.96562
MH415285	MH415046		VancurovaA478	<i>Stereocaulon vesuvianum</i>	OTU11	lava	Italy, Isola Stromboli	38.80256	15.22885
MH415286	MH415047		VancurovaA485	<i>Stereocaulon vesuvianum</i>	OTU11	lava	Italy, Isola Stromboli	38.80081	15.2272
MH415337	MH415094		VancurovaL1221	<i>Stereocaulon vesuvianum</i>	OTU10	rail	Czech Republic, Pilsen	49.738805	13.373389
MH415338	MH415095		VancurovaL1227	<i>Stereocaulon vesuvianum</i>	OTU10		Czech Republic, Prague	50.066024	14.32807
MH415354	MH415115		VancurovaL1638	<i>Stereocaulon vesuvianum</i>	OTU11	volcanic rock	Spain, Canary Islands, La Palma	28.760833	-17.872778
MH415355	MH415116		VancurovaL1639	<i>Stereocaulon vesuvianum</i>	OTU11	wall/volcanic stones	Spain, Canary Islands, La Palma	28.648611	-17.838333
MH415446	MH415200		VancurovaOP1083.4	<i>Stereocaulon nanodes</i>	OTU40	siliceous rock	Czech Republic, Slavkovský les	50.122591	12.799761
<i>Chloroidium aff. ellipsoideum</i>									
MH415214	MH414980		Vancurova1077	<i>Stereocaulon vesuvianum</i>	OTU10	on industrial foam	Czech Republic, Dobřany	49.659041	13.297867
MH415312	MH415075		VancurovaKO25.1	<i>Stereocaulon vesuvianum</i>	OTU11	rock	Spain, Canary Islands, La Palma	28.761944	-17.876111
MH415236	MH415003		VancurovaA335	<i>Stereocaulon vesuvianum</i>	OTU11	rock/soil	Portugal, Madeira	32.76125	-16.935783
MH415240	MH415007		VancurovaA340	<i>Stereocaulon vesuvianum</i>	OTU11	rock/soil	Portugal, Madeira	32.735217	-16.985483
MH415241	MH415008		VancurovaA348	<i>Stereocaulon vesuvianum</i>	OTU11	rock/soil	Portugal, Madeira	32.739367	-16.937717
MH415242	MH415009		VancurovaA349	<i>Stereocaulon vesuvianum</i>	OTU11	rock	Portugal, Madeira	32.747383	-16.9339
MH415245	MH415011		VancurovaA351	<i>Stereocaulon vesuvianum</i>	OTU11		Portugal, Madeira	32.749317	-16.9323
MH415248	MH415014		VancurovaA354	<i>Stereocaulon vesuvianum</i>	OTU11	rock	Portugal, Madeira	32.758417	-16.94195
MH415251	MH415017		VancurovaA358	<i>Stereocaulon vesuvianum</i>	OTU11		Portugal, Madeira	32.755231	-16.93837
MH415276	MH415039		VancurovaA421.1	<i>Stereocaulon sp.</i>	OTU10	stones/wall	Guatemala	14.785906	-91.548994
MH415278	MH415039		VancurovaA421.3	<i>Stereocaulon sp.</i>	OTU10	stones/wall	Guatemala	14.785906	-91.548994

algal ITS accession	fungal ITS accession	actin accession	sample ID	mycobiont morphospecies	mycobiont OTU	substrate	locality	GPS	
MH415289	MH415050		VancurovaA499	<i>Stereocaulon cf. atlanticum</i>	OTU23		Venezuela, Pico Bolívar	8.525631	-71.026659
MH415292	MH415053		VancurovaA500	<i>Stereocaulon vesuvianum</i>	OTU10	rock	Venezuela, Pico Bolívar	8.54806	-71.024835
MH415293			VancurovaA501	<i>Stereocaulon vesuvianum</i>		rock	Venezuela, Pico Bolívar	8.54806	-71.024835
MH415304	MH415126		VancurovaCAB.1	<i>Stereocaulon vesuvianum</i>	OTU10	slag	Czech Republic, Kladno	50.179026	14.142936
MH415305	MH415126		VancurovaCAB.2	<i>Stereocaulon vesuvianum</i>	OTU10	slag	Czech Republic, Kladno	50.179026	14.142936
MH415341	MH415102		VancurovaL1621	<i>Stereocaulon vesuvianum</i>	OTU11	lava	Spain, Canary Islands, La Palma	28.608889	-17.835556
MH415342	MH415103		VancurovaL1623	<i>Stereocaulon vesuvianum</i>	OTU11	lava	Spain, Canary Islands, La Palma	28.608056	-17.838333
MH415343	MH415104		VancurovaL1624	<i>Stereocaulon vesuvianum</i>	OTU11	lava	Spain, Canary Islands, La Palma	28.608056	-17.838333
MH415344	MH415105		VancurovaL1625	<i>Stereocaulon vesuvianum</i>	OTU11	lava	Spain, Canary Islands, La Palma	28.605833	-17.840278
MH415345	MH415106		VancurovaL1626	<i>Stereocaulon vesuvianum</i>	OTU11	lava	Spain, Canary Islands, La Palma	28.5975	-17.840556
MH415346	MH415107		VancurovaL1627	<i>Stereocaulon vesuvianum</i>	OTU11	volcanic rock	Spain, Canary Islands, La Palma	28.5975	-17.840556
MH415347	MH415108		VancurovaL1628	<i>Stereocaulon vesuvianum</i>	OTU11	volcanic rock	Spain, Canary Islands, La Palma	28.583333	-17.833333
MH415348	MH415109		VancurovaL1630	<i>Stereocaulon vesuvianum</i>	OTU11	volcanic rock	Spain, Canary Islands, La Palma	28.566667	-17.833333
MH415349	MH415110		VancurovaL1632	<i>Stereocaulon vesuvianum</i>	OTU11	volcanic rock	Spain, Canary Islands, La Palma	28.566667	-17.833333
MH415350	MH415111		VancurovaL1633	<i>Stereocaulon vesuvianum</i>	OTU11	lava	Spain, Canary Islands, La Palma	28.566667	-17.833333
MH415351	MH415112		VancurovaL1634	<i>Stereocaulon vesuvianum</i>	OTU11	lava	Spain, Canary Islands, La Palma	28.573333	-17.840556
MH415352	MH415113		VancurovaL1636	<i>Stereocaulon vesuvianum</i>	OTU11	volcanic rock	Spain, Canary Islands, La Palma	28.518611	-17.834722
MH415353	MH415114		VancurovaL1637	<i>Stereocaulon vesuvianum</i>	OTU11	volcanic rock	Spain, Canary Islands, La Palma	28.758889	-17.881111
MH415365	MH415126		VancurovaL952	<i>Stereocaulon vesuvianum</i>	OTU10	slag	Czech Republic, Kladno	50.179026	14.142936
MH415371	MH415132		VancurovaLV5.1	<i>Stereocaulon nanodes</i>	OTU40	sludge bed, textile	Czech Republic, Nové Hodějovice	48.95446	14.512725
MH415373	MH415133		VancurovaLV9.2	<i>Stereocaulon nanodes</i>	OTU40	sludge bed, textile	Czech Republic, Nové Hodějovice	48.95446	14.512725

algal ITS accession	fungal ITS accession	actin accession	sample ID	mycobiont morphospecies	mycobiont OTU	substrate	locality	GPS	
MH415400	MH415160		VancurovaO24	<i>Stereocaulon cf. gregarium</i>	OTU18		New Zealand, South Island	-41.831111	172.881111
MH415404	MH415164		VancurovaO29	<i>Stereocaulon sp.</i>	OTU57	stone	New Zealand, North Island	-43.448843	170.173866
MH415417	MH415177		VancurovaO65	<i>Stereocaulon cf. ramulosum</i>	OTU23	volcanic stone	Portugal, Madeira	32.776658	-17.08028
MH415420	MH415180		VancurovaO68	<i>Stereocaulon vesuvianum</i>	OTU11	shallow soil in rock crevices	Portugal, Madeira	32.739043	-16.933149
MH415421	MH415181		VancurovaO69	<i>Stereocaulon vesuvianum</i>	OTU11	volcanic rock/soil	Portugal, Madeira	32.765147	-16.92206
MH415440	MH415199		VancurovaOP1076.1	<i>Stereocaulon pileatum</i>	OTU3	siliceous rock in former qaurry	Czech Republic	49.566008	12.820167
MH415441			VancurovaOP1077.1	<i>Stereocaulon vesuvianum</i>		on industrial foam	Czech Republic, Dobřany	49.659041	13.297867
MH415442			VancurovaOP1077.2	<i>Stereocaulon vesuvianum</i>		on industrial foam	Czech Republic, Dobřany	49.659041	13.297867
MH415450	MH415201		VancurovaOP1118.2	<i>Stereocaulon nanodes</i>	OTU40	slag	Czech Republic, Kladno	50.179026	14.142936
MH415208	MH414976		RidkaT1	<i>Stereocaulon sp.</i>	OTU23	volcanic rock	Tanzania, Meru Mt.	-3.23437	36.769235
MH415209	MH414977		RidkaT2	<i>Stereocaulon vesuvianum</i>	OTU10	volcanic rock	Tanzania, Meru Mt.	-3.23437	36.769235
MH415211	MH414978		RidkaT4	<i>Stereocaulon sp.</i>	OTU23	volcanic rock	Tanzania, Kilimanjaro Mt.	-3.06127	37.31287

StC1

MH415243			VancurovaA35	<i>Stereocaulon</i>		slate	Georgia	42.503056	45.358889
MH415401	MH415161		VancurovaO25	<i>Stereocaulon gregarium</i>	OTU27	granit	New Zealand, South Island	-44.758056	168.012778
MH415402	MH415162		VancurovaO27	<i>Stereocaulon gregarium</i>	OTU27	granit	New Zealand, South Island	-44.758056	168.012778
MH415403	MH415163		VancurovaO28	<i>Stereocaulon sp.</i>	OTU57		New Zealand, North Island	-40.888937	175.422803

StC2

MH415215	MH414981		Vancurova1078	<i>Stereocaulon nanodes</i>	OTU40	soil	Czech Republic, Horní Slavkov	50.128119	12.813843
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other *Chloridium*

MH415227	MH414994		VancurovaA316	<i>Stereocaulon sp.</i>	OTU9	lava	Costa Rica, PN Volcan Arenal	10.461468	-84.728184
MH415228	MH414995		VancurovaA318	<i>Stereocaulon obesum</i>	OTU10	stone	Costa Rica, PN Braulio Carrillo, Volcan Barva	10.135842	-84.098455
MH415275			VancurovaA419	<i>Stereocaulon ramulosum</i>		stone	Guatemala	14.749758	-91.48022
MH415295	MH415055		VancurovaA503	<i>Stereocaulon ramulosum</i>	OTU26		Venezuela, Roraima Mt.	5.154994	-60.780957

algal ITS accession	fungal ITS accession	actin accession	sample ID	mycobiont morphospecies	mycobiont OTU	substrate	locality	GPS
<i>Vulcanochloris canariensis</i>								
KR952329	MH415071		VancurovaA98	<i>Stereocaulon vesuvianum</i>	OTU52	lava field	Spain, Canary Islands, La Palma	28.6528 -17.8512
KR952320	MH415101		VancurovaL1620	<i>Stereocaulon vesuvianum</i>	OTU52	lava stone	Spain, Canary Islands, La Palma	28.473056 -17.847222
<i>Vulcanochloris guanchorum</i>								
KR952330	MH414983		VancurovaA104	<i>Stereocaulon vesuvianum</i>	OTU52	lava field	Spain, Canary Islands, La Palma	28.604722 -17.895389
<i>Vulcanochloris symbiotica</i>								
KR952331	MH414984		VancurovaA105	<i>Stereocaulon vesuvianum</i>	OTU52	lava field	Spain, Canary Islands, La Palma	28.598806 -17.893389
KR952321	MH415063		VancurovaA72	<i>Stereocaulon vesuvianum</i>	OTU52	top of the volcano	Spain, Canary Islands, La Palma	28.4855 -17.849917
KR952322	MH415064		VancurovaA73	<i>Stereocaulon vesuvianum</i>	OTU52	top of the volcano	Spain, Canary Islands, La Palma	28.4855 -17.849917
KR952323	MH415065		VancurovaA74	<i>Stereocaulon vesuvianum</i>	OTU52	lava stone	Spain, Canary Islands, La Palma	28.487167 -17.849139
KR952324	MH415066		VancurovaA75	<i>Stereocaulon vesuvianum</i>	OTU52	lava stone	Spain, Canary Islands, La Palma	28.486511 -17.849786
KR952325	MH415067		VancurovaA77	<i>Stereocaulon vesuvianum</i>	OTU52	lava stone	Spain, Canary Islands, La Palma	28.477694 -17.850361
KR952326	MH415068		VancurovaA78	<i>Stereocaulon vesuvianum</i>	OTU52	lava	Spain, Canary Islands, La Palma	28.474722 -17.851028
KR952327	MH415069		VancurovaA80	<i>Stereocaulon vesuvianum</i>	OTU52	lava stone	Spain, Canary Islands, La Palma	28.464139 -17.845333
KR952328	MH415070		VancurovaA97	<i>Stereocaulon vesuvianum</i>	OTU52	rock on edge of lava field	Spain, Canary Islands, La Palma	28.653167 -17.851194
KR952317	MH415098		VancurovaL1616	<i>Stereocaulon vesuvianum</i>	OTU52	lava stone	Spain, Canary Islands, La Palma	28.481944 -17.849444
KR952318	MH415099		VancurovaL1617	<i>Stereocaulon vesuvianum</i>	OTU52	lava stone	Spain, Canary Islands, La Palma	28.481389 -17.845556
KR952319	MH415100		VancurovaL1618	<i>Stereocaulon vesuvianum</i>	OTU52	lava stone	Spain, Canary Islands, La Palma	28.481389 -17.845556

Table S2. Primers used in this study.

Name	Sequence		Reference
nr-SSU-1780-5'	5'-CTG CGG AAG GAT CAT TGA TTC-3'	algal ITS region, algal-specific	Piercey-Normore & DePriest 2001
ITS1-F-5'	5'- CTT GGT CAT TTA GAG GAA GTA A -3'	fungus ITS region, fungus-specific	Gardes & Bruns 1993
ITS4-3'	5'-TCC TCC GCT TAT TGA TAT GC-3'	algal and fungus ITS region, universal	White et al. 1990
a-nu-act1-0645-5'	5'-GAC AGA GCG TGG KTA CAG-3'	actin type I locus, algal specific	Nelsen & Gargas 2006
a-nu-act1-0818-3'	5'-TGA ACA GCA CCT CAG GGC A-3'	actin type I locus, algal specific	Nelsen & Gargas 2006
ActinF2 Astero-5'	5'-AGC GCG GGT ACA GCT TCA C-3'	actin type I locus, algal specific	Škaloud & Peksa, 2010
ActinR2 Astero-3'	5'-CAG CAC TTC AGG GCA GCG GAA-3'	actin type I locus, algal specific	Škaloud & Peksa, 2010
ActinF Astero-5'	5'-GGG TAC AGC TTC AC-3'	actin type I locus, algal specific	this study
ActinR Astero-3'	5'-TGA ACA GCA CTT CAG GGC A-3'	actin type I locus, algal specific	this study
ActinF3 Astero-5'	5'-AGC TTC ACC ACC ACT GCA G-3'	actin type I locus, algal specific	this study
ActinR3 Astero-3'	5'-AGC GGA AKC GCT CGC TGC C-3'	actin type I locus, algal specific	this study

Table S3. Details of the area of collection and GenBank accession numbers of free-living Chloroidium cultures (previously published and retrieved from GenBank).

ITS accession	sequence ID/ culture number	substrate	locality
<i>Chloroidium ellipsoideum</i>			
FM946015	SAG 2143	rough plaster	Germany, Rostock, Südstadt, Ernst-Häckel-Str.12-15
FM946012	SAG 3.95		
FM946013	H1949	tree bark	Czech Republic, Adršpach
FM946014	SAG 2140	pond	Japan, Kagamiyama, Higashi-hiroshima-City
FM946016	SAG 2061	plastic switchbox	Germany, Rostock, Südstadt, Max-Planck-Str.
FM946017	SAG 2111	roof tile	Germany, Göttingen, Nikolausberger Weg 18
FM946018	SAG 2142	plastic switchbox	Germany, Rostock, Südstadt, Max-Planck-Str.
<i>Chloroidium angustoeilipsoideum</i>			
FM946019	SAG 2115	silicone insulation	Germany, Göttingen, Nikolausberger Weg 18
FM946020	SAG 2144	rough plaster	Germany, Rostock, Südstadt, Brahestr. 7-11
FM946021	CCAP 211/108	tree bark	Germany, near Leipzig
StC2			
FR865666	CCAP 211/33	freshwater	Italy
<i>Chloroidium engadiensis</i>			
FM946011	SAG 812/1	soil	Switzerland, Unterengadin
<i>Chloroidium saccharophilum</i>			
FR865677	CCAP 211/58	soil	Antarktica, Mt. Erebus
FM946009	SAG 2149	water pond	Switzerland, Basel
FM946008	SAG 2120	roof tile	Germany, Schermbeck, Werderstrasse
FM946004	CCAP 211/42	freshwater	Italy
FM946002	CCAP 211/34	freshwater	Italy
FM946001	CCAP 211/32	freshwater	Italy
FR865669	CCAP 211/40	freshwater	Italy
FR865665	CCAP 211/32	freshwater	Italy
FM946000	SAG 211 9a	sap from wounded <i>Populus alba</i>	Germany
FM946010	SAG 2197	concrete	Russia, Irkutsk
FM946007	SAG 211-1c	freshwater	Sweden
FM946006	SAG 211-1d	culture apparatus (freshwater)	Germany
FM946005	SAG 211-1b	freshwater	USA, Madison
FM946003	CCAP 211/36	freshwater	Italy
FR865664	CCAP 211/31	freshwater	Italy
EU038292	Ce		
JQ315766	KMMCC192	freshwater	
JQ315769	KMMCC195	seawater	
KJ676132	UTEX2068	lagoon (seawater)	Assateague Island, Virginia, USA

Table S4. Substitution models selected for each partition of *Asterochloris*, *Chloroidium* and *Stereocaulon* (mycobiont) datasets using the Bayesian information criterion (BIC) as implemented in JModelTest2 (Guindon & Gascuel 2003, Darriba et al. 2012).

Partition	<i>Asterochloris</i> dataset	<i>Chloroidium</i> dataset	<i>Stereocaulon</i> mycobiont dataset
ITS1 rDNA	TIM2ef + Γ ($\alpha=0.7730$)	TIM2ef + Γ ($\alpha=0.4860$)	HKY + Γ ($\alpha=0.6740$)
5.8 S rDNA	JC	K80 + I	TIM1ef + I
ITS2 rDNA	TIM2ef + Γ ($\alpha=0.1790$)	TrNef + Γ ($\alpha=0.4580$)	TVM + I + Γ ($\alpha=1.486$)
intron 206 of actin type I gene	HKY + Γ ($\alpha=4.4390$)		
exon part of actin type I gene	TrNef + Γ ($\alpha=0.1760$)		
intron 248 of actin type I gene	K80 + Γ ($\alpha=3.3430$)		

Table S5. Presence/absence matrix of 12 substrate/habitat variables (substrates: soil, rock, lava, plastic and metal; habitat characteristics: mine, sludge bed, occurrence of moss, other plants or forest, closeness of road or river).

sample ID	soil	rock	lava	moss	other plants	forest	plastic	metal	mine	sludgebed	road	river
Peksa1011	0	1	0	0	0	0	0	0	1	0	0	0
Peksa1012	0	1	0	0	0	0	0	0	1	0	0	0
Peksa1013	0	1	0	0	0	0	0	0	1	0	0	0
Peksa1014	0	1	0	0	0	0	0	0	1	0	0	0
Peksa786	1	0	0	0	0	0	0	0	1	0	0	0
Peksa801	1	0	0	0	0	0	0	0	1	0	0	0
RidkaT1	0	1	1	0	0	0	0	0	0	0	0	0
RidkaT2	0	1	1	0	0	0	0	0	0	0	0	0
RidkaT4	0	1	1	0	0	0	0	0	0	0	0	0
Vancurova10	0	0	0	0	0	0	0	0	0	1	0	0
Vancurova1077	0	0	0	0	0	0	1	0	0	0	0	0
Vancurova1078	1	0	0	0	0	0	0	0	0	1	0	0
VancurovaA1	1	0	0	0	0	0	0	0	0	0	0	0
VancurovaA104	0	1	1	0	0	0	0	0	0	0	1	0
VancurovaA105	0	1	1	0	0	0	0	0	0	0	1	0
VancurovaA11	0	1	0	1	0	0	0	0	0	0	0	0
VancurovaA116	0	1	0	0	0	0	0	0	0	0	0	0
VancurovaA14	1	0	0	0	1	0	0	0	0	0	0	0
VancurovaA16	1	0	0	1	1	0	0	0	0	0	0	0
VancurovaA18	1	0	0	1	1	0	0	0	0	0	0	0
VancurovaA2	1	0	0	0	1	0	0	0	0	0	0	0
VancurovaA20	1	0	0	1	1	0	0	0	0	0	0	0
VancurovaA22	1	0	0	1	1	0	0	0	0	0	0	0
VancurovaA3	0	1	0	0	0	0	0	0	0	0	0	0
VancurovaA316	0	1	1	0	0	0	0	0	0	0	0	0
VancurovaA318	0	1	0	0	0	0	0	0	0	0	0	0
VancurovaA319	0	1	0	0	0	0	0	0	0	0	0	0
VancurovaA322	0	1	0	1	0	1	0	0	0	0	0	0
VancurovaA323	1	0	0	0	0	1	0	0	0	0	0	0
VancurovaA329	0	1	1	0	0	1	0	0	0	0	0	0
VancurovaA33	0	1	0	0	0	0	0	0	0	0	1	0
VancurovaA333	0	1	0	0	0	0	0	0	0	0	0	0
VancurovaA335	1	1	0	0	0	0	0	0	0	0	0	0
VancurovaA336	1	1	0	0	0	0	0	0	0	0	0	0
VancurovaA337	0	1	0	0	0	0	0	0	0	0	0	0
VancurovaA339	0	1	0	0	0	0	0	0	0	0	0	0
VancurovaA340	1	1	0	0	0	0	0	0	0	0	0	0
VancurovaA348	1	1	0	0	0	0	0	0	0	0	0	0
VancurovaA349	0	1	0	0	0	0	0	0	0	0	0	0
VancurovaA350	0	1	0	0	0	0	0	0	0	0	0	0
VancurovaA351	0	0	0	0	0	0	0	0	0	0	0	0
VancurovaA352	0	0	0	0	0	0	0	0	0	0	0	0
VancurovaA353	0	1	0	1	0	0	0	0	0	0	0	0
VancurovaA354	0	1	0	0	0	0	0	0	0	0	0	0
VancurovaA357	0	0	0	0	0	0	0	0	0	0	0	0
VancurovaA358	0	0	0	0	0	0	0	0	0	0	0	0
VancurovaA359	1	1	0	0	0	0	0	0	0	0	0	0
VancurovaA366	0	1	0	1	0	1	0	0	0	0	0	0
VancurovaA370	0	1	0	1	0	1	0	0	0	0	0	1

sample ID	soil	rock	lava	moss	other plants	forest	plastic	metal	mine	sludgebed	road	river
VancurovaA371	0	1	0	0	0	0	0	0	0	0	0	0
VancurovaA375	0	1	0	1	0	1	0	0	0	0	0	0
VancurovaA378	0	0	0	0	0	0	0	0	0	0	1	0
VancurovaA379	0	0	0	1	0	0	0	0	0	0	1	0
VancurovaA382	0	0	0	0	0	0	0	0	0	0	1	0
VancurovaA383	0	0	0	0	0	0	0	0	0	0	1	0
VancurovaA384	0	1	0	0	0	0	0	0	0	0	1	0
VancurovaA385	0	0	0	0	0	0	0	0	0	0	1	0
VancurovaA386	1	0	0	0	0	0	0	0	0	0	1	0
VancurovaA387	1	0	0	0	0	0	0	0	0	0	1	0
VancurovaA389	0	0	0	0	0	0	0	0	0	0	1	0
VancurovaA390	0	0	0	0	0	0	0	0	0	0	1	0
VancurovaA391	0	0	0	0	0	0	0	0	0	0	1	0
VancurovaA392	0	0	0	0	0	0	0	0	0	0	1	0
VancurovaA397	1	0	0	0	0	0	0	0	0	0	1	0
VancurovaA398	1	0	0	0	0	0	0	0	0	0	1	0
VancurovaA399	0	0	0	0	0	0	0	0	0	0	0	0
VancurovaA400	0	1	1	0	0	0	0	0	0	0	1	0
VancurovaA421.2	0	1	0	0	0	0	0	0	0	0	0	0
VancurovaA421_1	0	1	0	0	0	0	0	0	0	0	0	0
VancurovaA421_3	0	1	0	0	0	0	0	0	0	0	0	0
VancurovaA426	0	1	0	0	0	0	0	0	0	0	1	0
VancurovaA442	1	0	0	1	1	0	0	0	0	0	0	1
VancurovaA445	1	0	0	1	1	0	0	0	0	0	0	0
VancurovaA450	0	1	0	0	0	0	0	0	0	0	1	0
VancurovaA451	0	1	0	0	0	0	0	0	0	0	1	0
VancurovaA478	0	1	1	0	0	0	0	0	0	0	0	0
VancurovaA485	0	1	1	0	0	0	0	0	0	0	0	0
VancurovaA496	0	1	0	0	0	1	0	0	0	0	0	0
VancurovaA498	0	1	0	0	0	0	0	0	0	0	0	0
VancurovaA499	0	0	0	0	0	0	0	0	0	0	0	0
VancurovaA5	1	0	0	0	1	0	0	0	0	0	0	0
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VancurovaA77	0	1	1	0	0	0	0	0	0	0	0	0
VancurovaA78	0	1	1	0	0	0	0	0	0	0	0	0
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sample ID	soil	rock	lava	moss	other plants	forest	plastic	metal	mine	sludgebed	road	river
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VancurovaFB1	0	1	0	0	0	0	0	0	0	0	0	0
VancurovaJM1734	0	0	0	0	0	0	0	1	0	0	0	0
VancurovaKO25.1	1	1	0	0	0	0	0	0	0	0	0	0
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VancurovaL1633	0	1	1	0	0	0	0	0	0	0	0	0
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VancurovaL1636	0	1	1	0	0	1	0	0	0	0	0	0
VancurovaL1637	0	1	1	0	0	0	0	0	0	0	0	0

sample ID	soil	rock	lava	moss	other plants	forest	plastic	metal	mine	sludgebed	road	river
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VancurovaL1641	1	1	0	0	0	0	0	0	0	0	0	0
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VancurovaO28	0	0	0	0	1	1	0	0	0	0	0	0

sample ID	soil	rock	lava	moss	other plants	forest	plastic	metal	mine	sludgebed	road	river
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VancurovaO32	0	1	0	0	0	0	0	0	0	0	0	0
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VancurovaO35	0	1	0	0	1	0	0	0	0	0	0	0
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VancurovaO40	1	1	0	0	0	0	0	0	0	0	0	0
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VancurovaO51	1	1	0	0	0	0	0	0	0	0	0	0
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VancurovaO65	0	1	1	0	1	0	0	0	0	0	0	0
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VancurovaO67	1	1	0	0	0	0	0	0	0	0	1	0
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VancurovaO69	1	1	1	0	0	0	0	0	0	0	1	0
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VancurovaO73	0	1	1	0	1	0	0	0	0	0	1	0
VancurovaO74	0	1	1	0	1	0	0	0	0	0	1	0
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VancurovaO93	0	1	0	0	0	0	0	0	0	0	0	0
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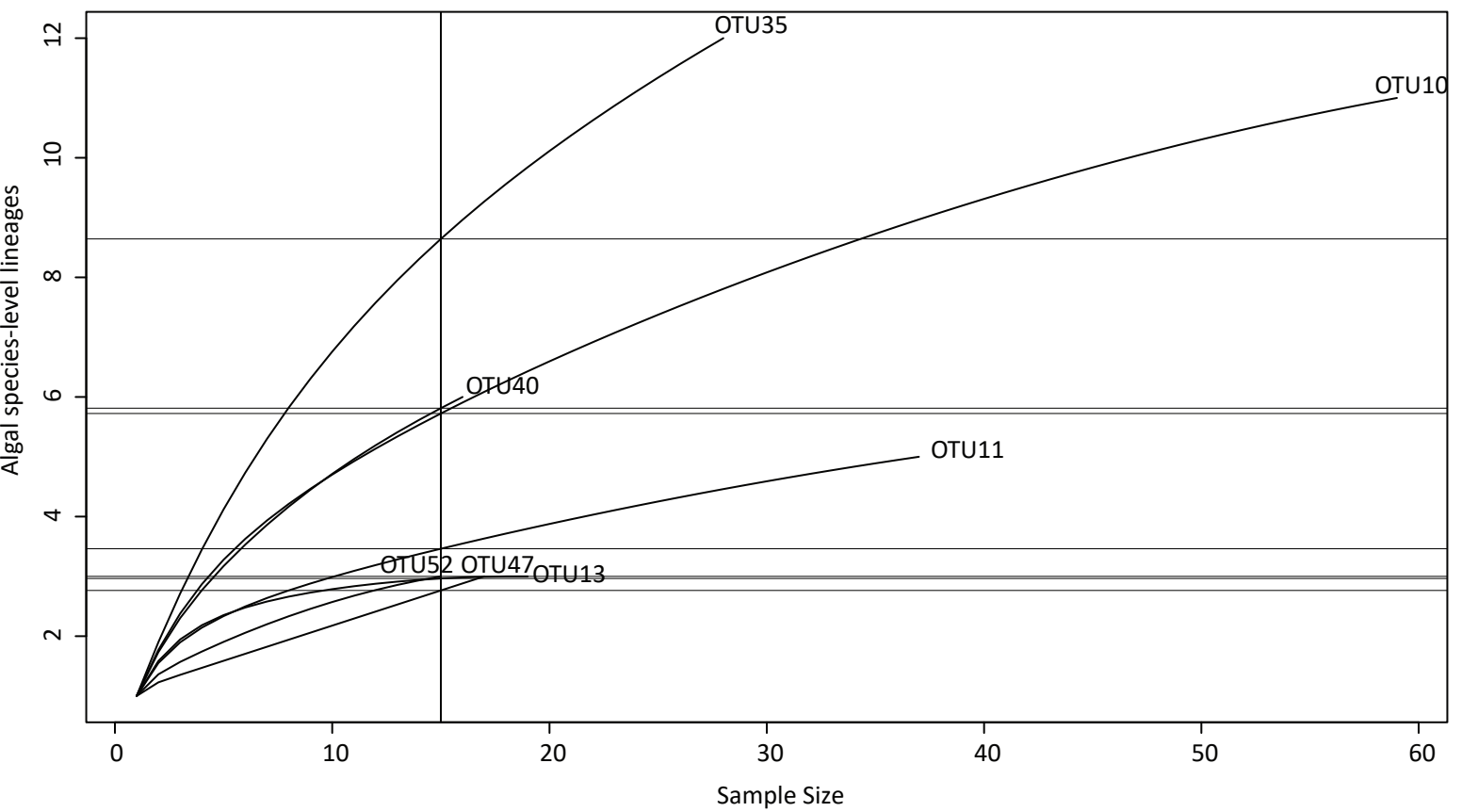
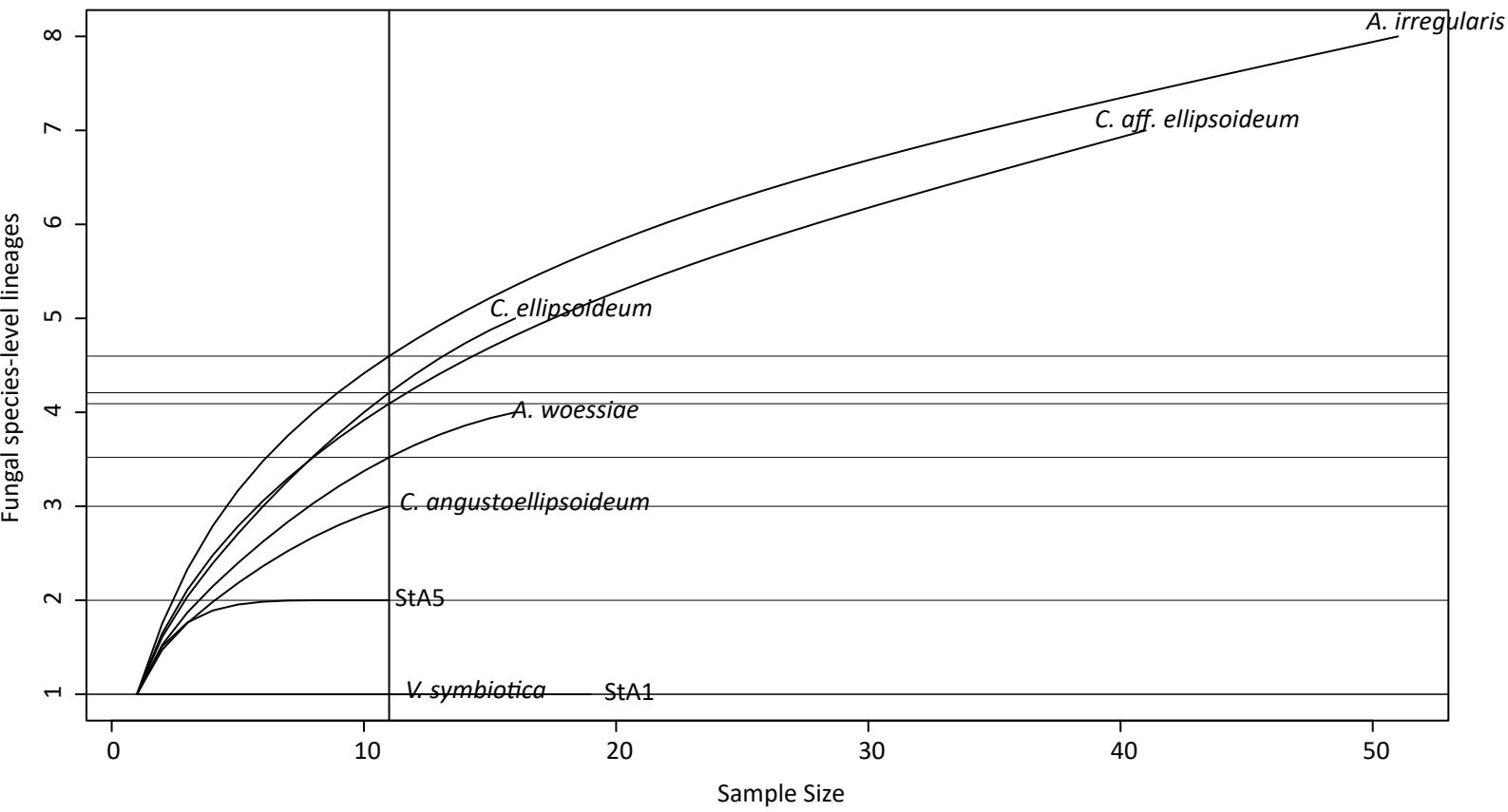


Figure S1. Rarefaction curves for 8 algal and 7 fungal most abundant species-level lineages. Vertical line is drawn at smallest sample size in the data set with horizontal lines for the rarefied number of species-level lineages of associated mycobionts/phycoionts.

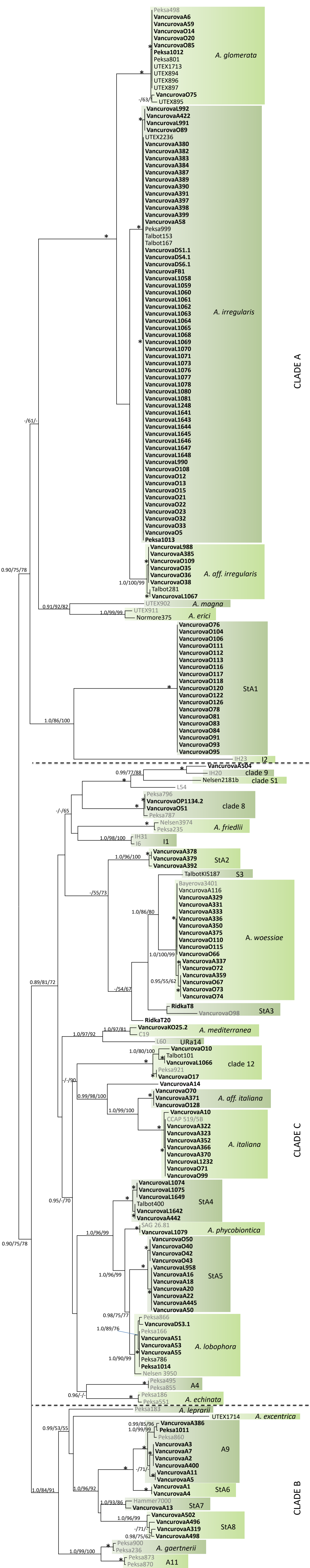


Figure S2. Phylogenetic hypothesis of *Asterochloris* resulting from the Bayesian analysis of combined ITS rDNA and actin type I sequences. Values at the nodes indicate the statistical supports of Bayesian posterior probability (left), maximum-likelihood bootstraps (middle) and maximum parsimony bootstraps (right). Fully supported branches (1.0/100/100) are marked with an asterisk. Scale bar shows the substitution of substitutions per site. Newly obtained sequences are marked in bold. Sequences of phycobionts associated with the lichen-forming fungal genus *Stereocaulon* are marked in black. Sequences of phycobionts of other lichens are marked in grey. Clade affiliations: clade 8, clade 9, clade A, clade B, clade C, clade D, clade E, clade F, clade G, clade H, clade I, clade J, clade K, clade L, clade M, clade N, clade O, clade P, clade Q, clade R, clade S, clade T, clade U, clade V, clade W, clade X, clade Y, clade Z. *A. aff. irregularis*, *A. aff. italiana* and *StA1* – *StA8* lineages were identified as new in present study.

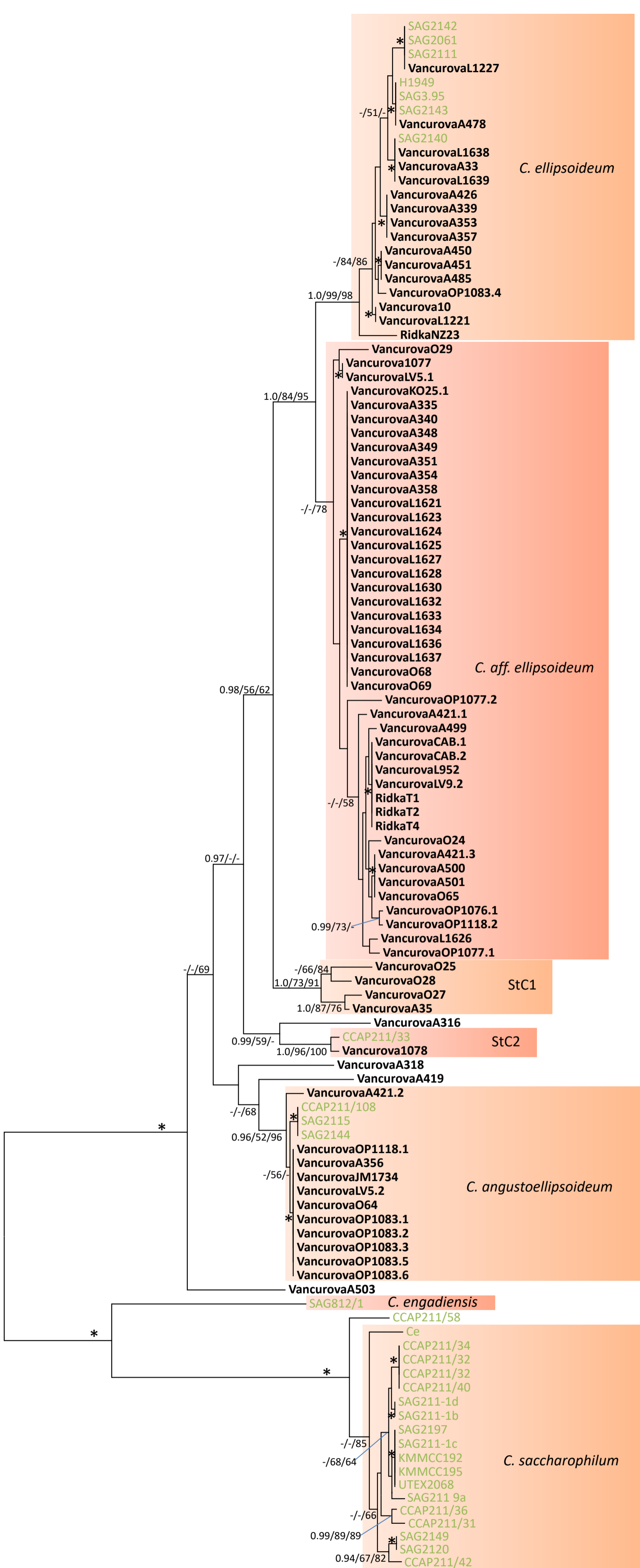


Figure S3. Phylogenetic hypothesis of *Chloroidium* resulting from Bayesian analysis of ITS rDNA. Values at the nodes indicate the statistical supports of Bayesian posterior probability (left), maximum-likelihood bootstrap (middle) and maximum parsimony bootstrap (right). Fully supported branches (1.0/100/100) are marked with an asterisk. Scale bar shows the estimated number of substitutions per site. Newly obtained sequences are marked in bold. Sequences of phycobionts associated with the lichen-forming fungal genus *Stereocaulon* are marked in black. Sequences of free-living algae are marked in green. *C. aff. ellipsoideum*, StC1 and StC2 lineages were identified as new in present study.

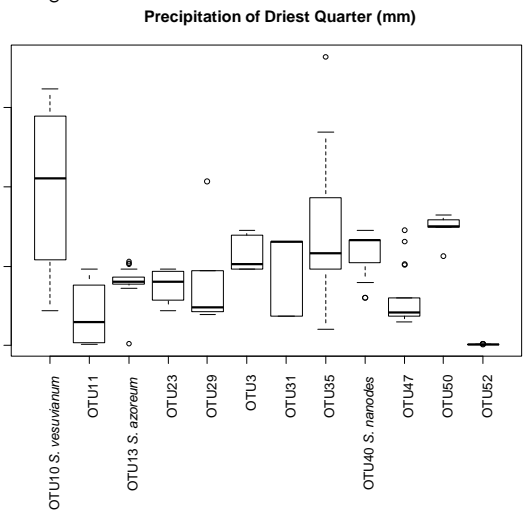
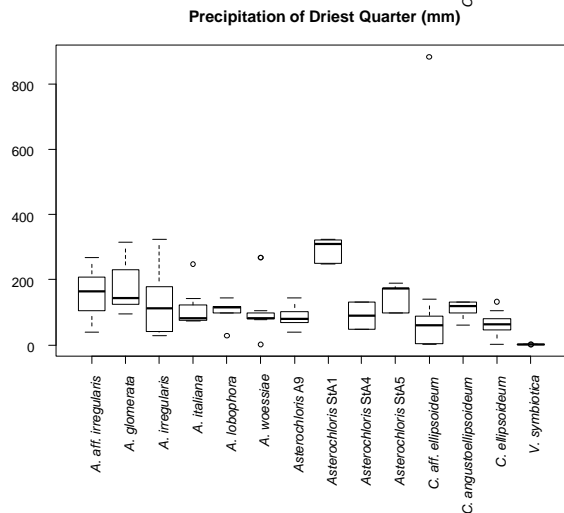
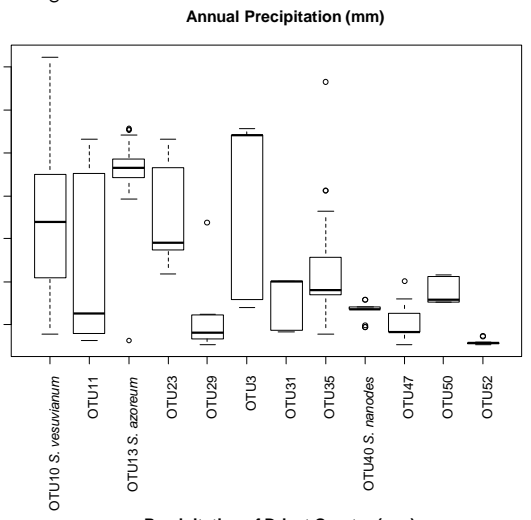
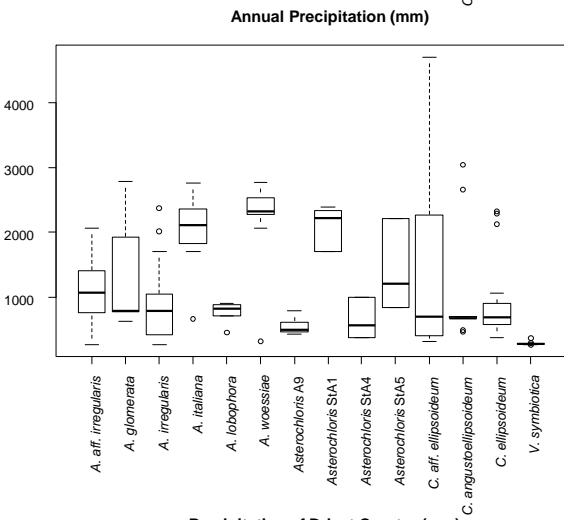
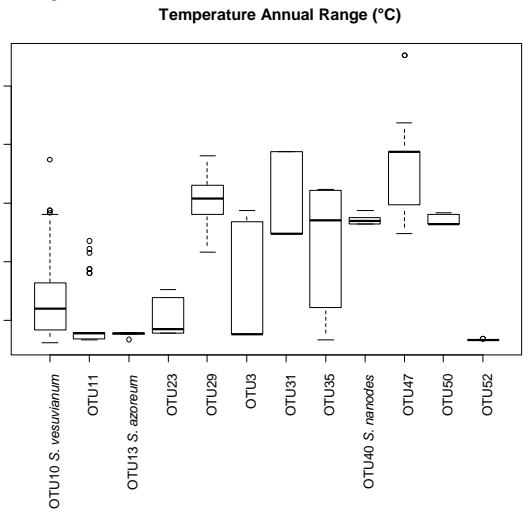
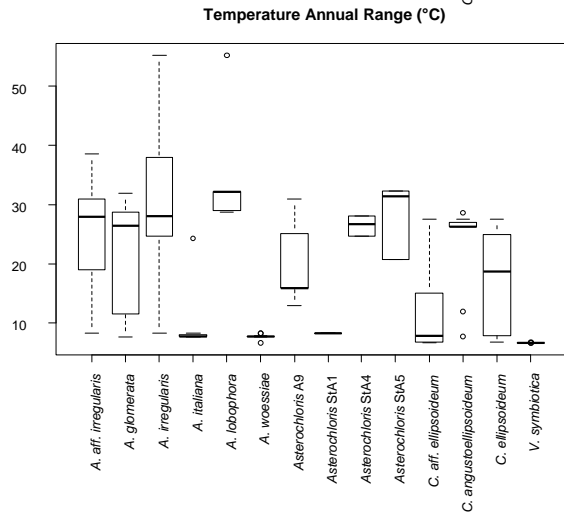
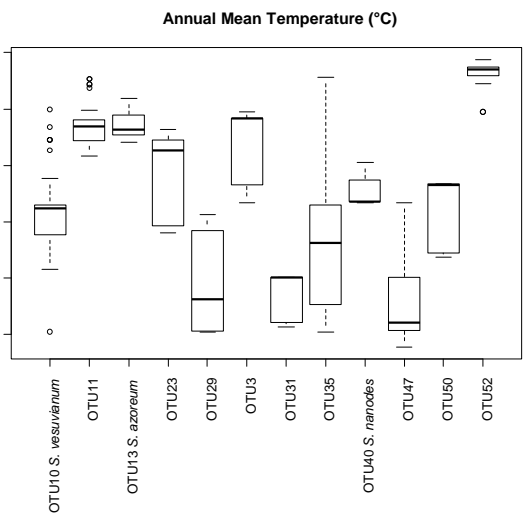
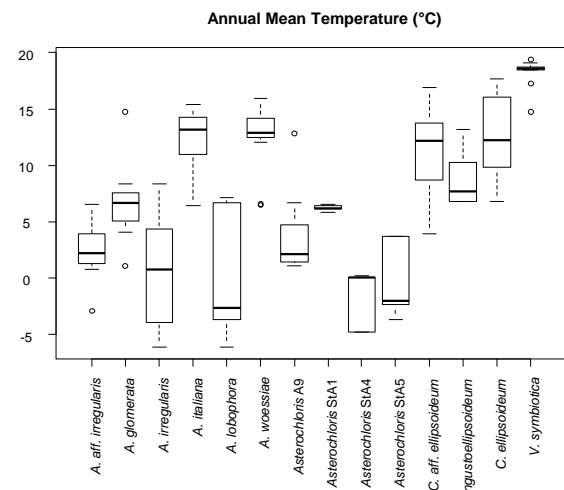


Figure S4. Differences in the distribution of 14 most abundant (≥ 5 specimens) phycobiont species-level lineages (on the left) associated with the lichen-forming fungal genus *Stereocaulon* and 12 most abundant (≥ 5 specimens) mycobiont species-level lineages of *Stereocaulon* (on the right) along the gradient of annual mean temperature, temperature annual range, annual precipitation, and precipitation of driest quarter.

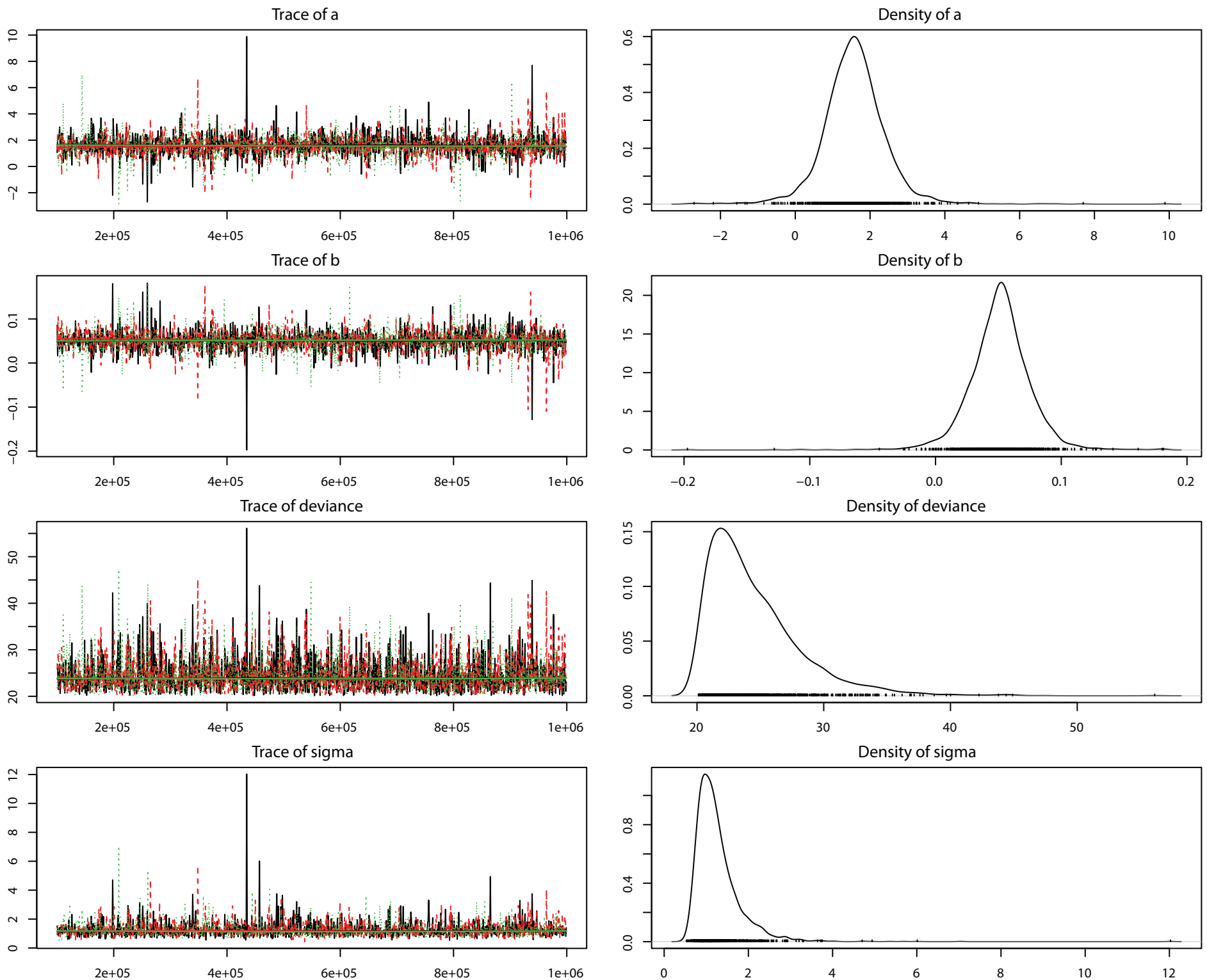


Figure S5. Trace and density plots of Markov Chain Monte Carlo samples for four parameters: intercept (a) and slope (b) or regression line, deviance and variance of the residuals (sigma). Slope of the regression line (density of b) was significantly different from 0 (95% confidence interval (CI) 0.025, 0.096).

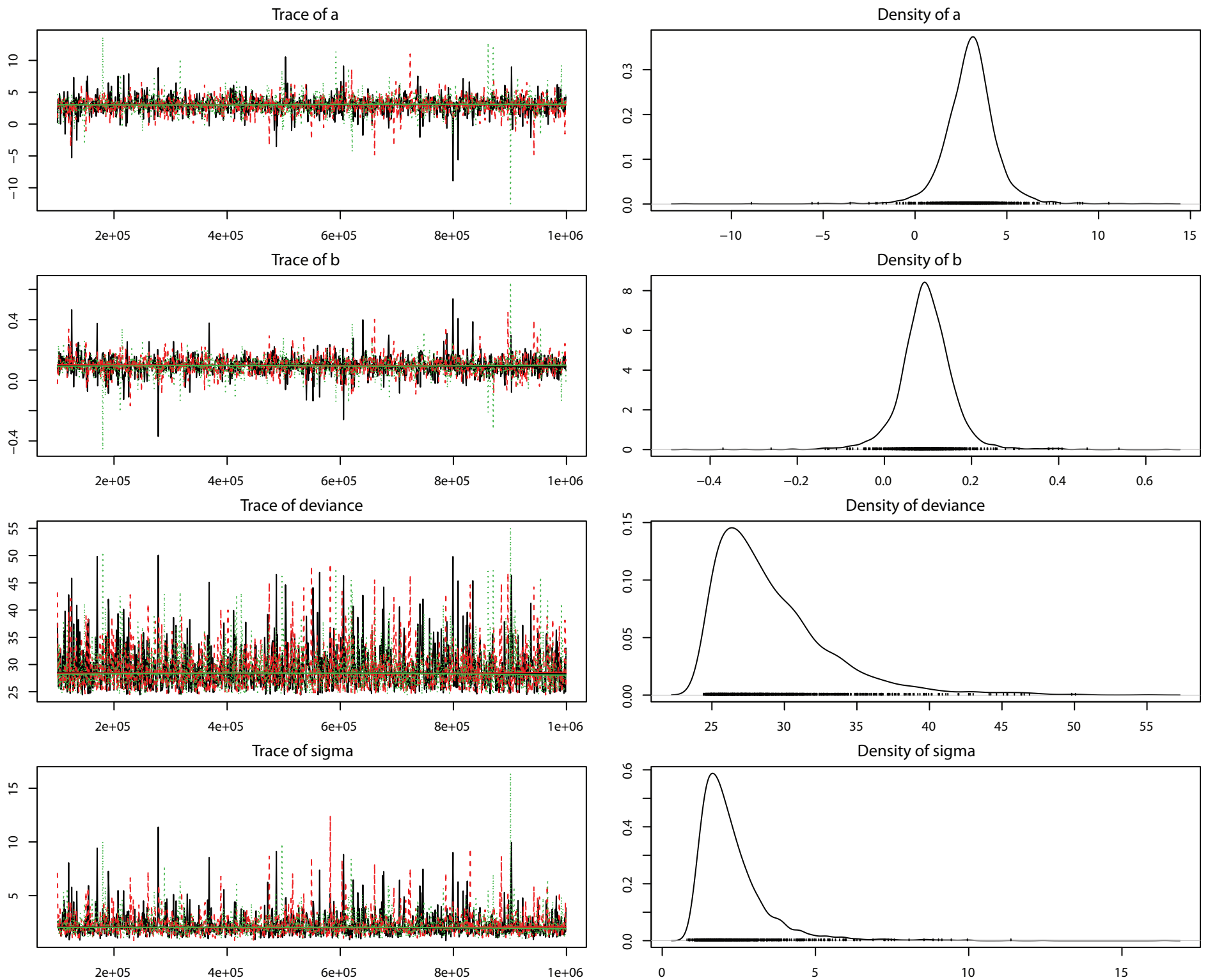


Figure S6. Trace and density plots of Markov Chain Monte Carlo samples for four parameters: intercept (a) and slope (b) or regression line, deviance and variance of the residuals (sigma). Slope of the regression line (density of b) was clearly shifted, but not significantly different from 0 (95% confidence interval (CI) -0.024, 0.213).