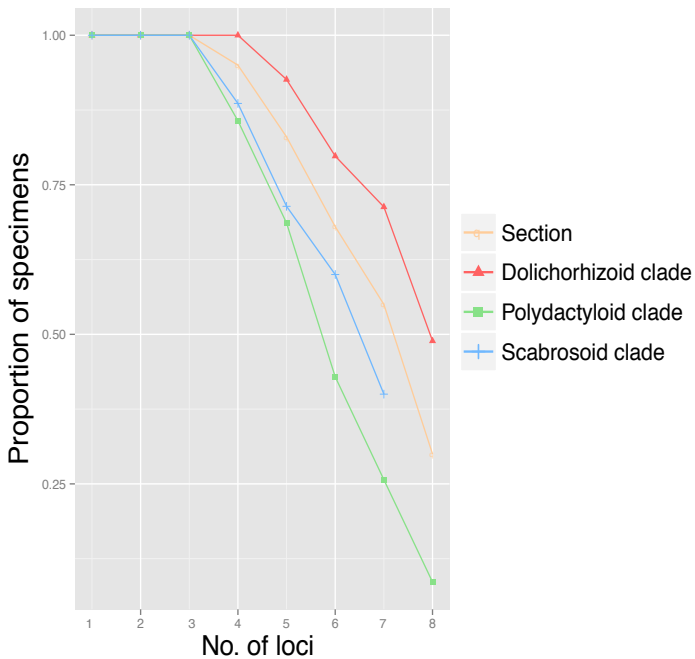
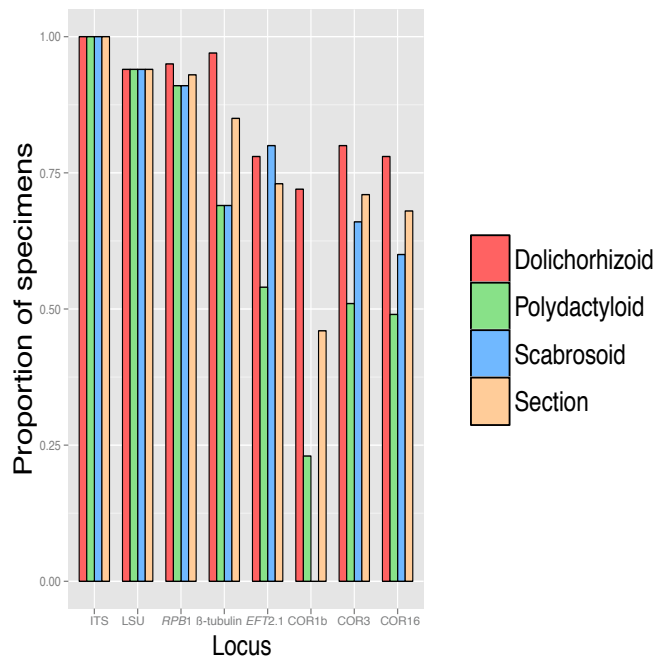


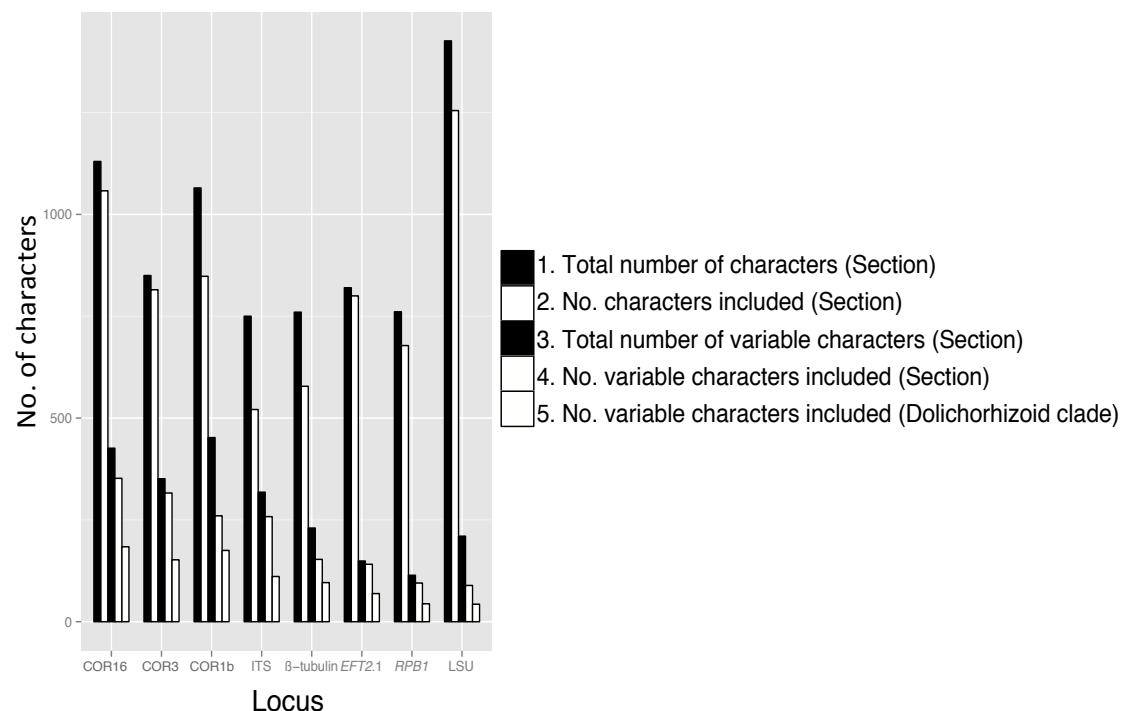
A



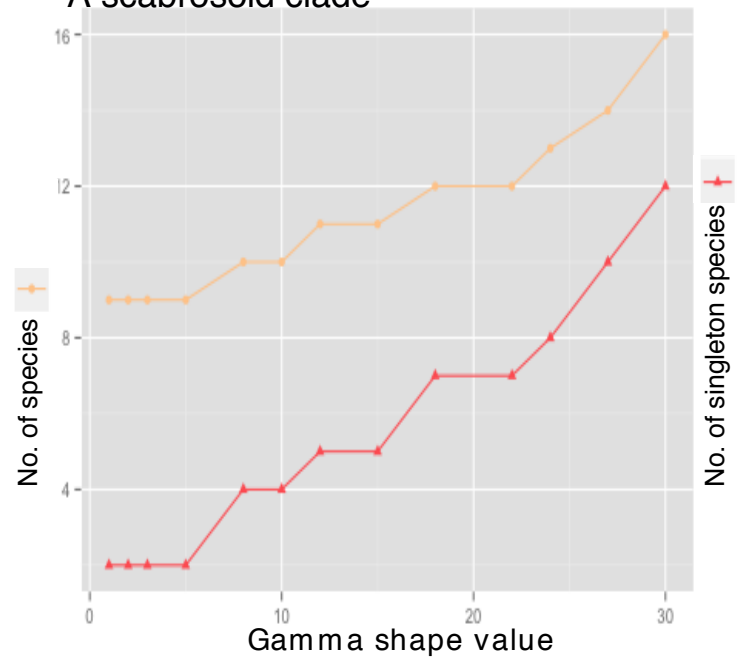
B



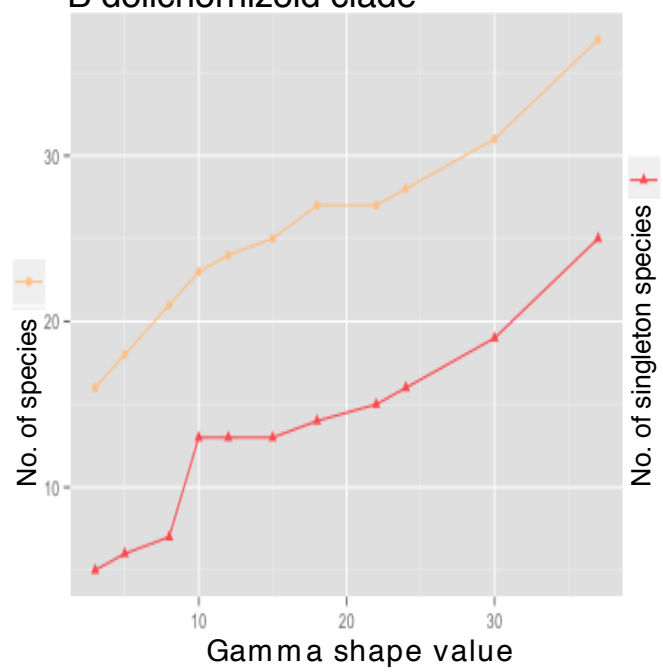
C



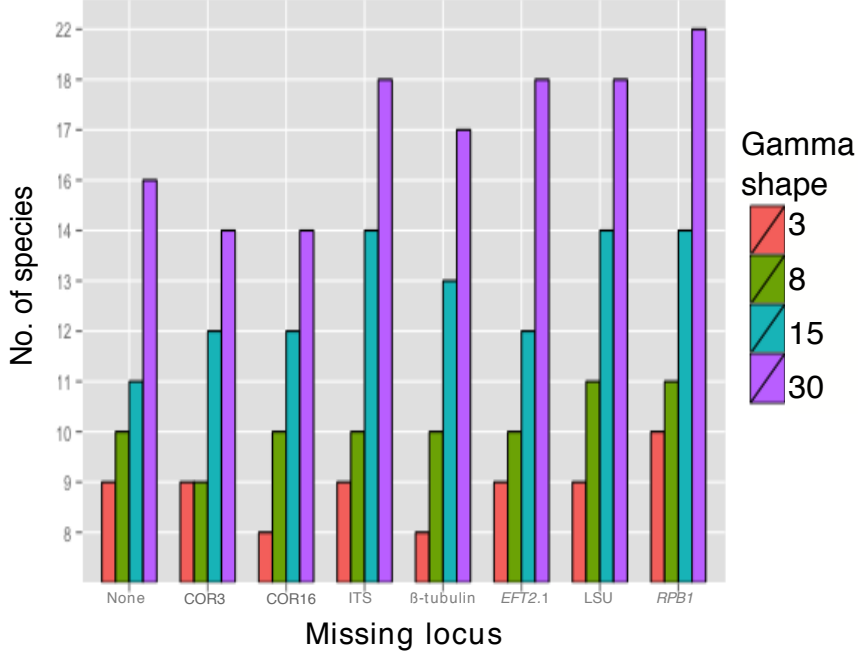
A scabrosoid clade



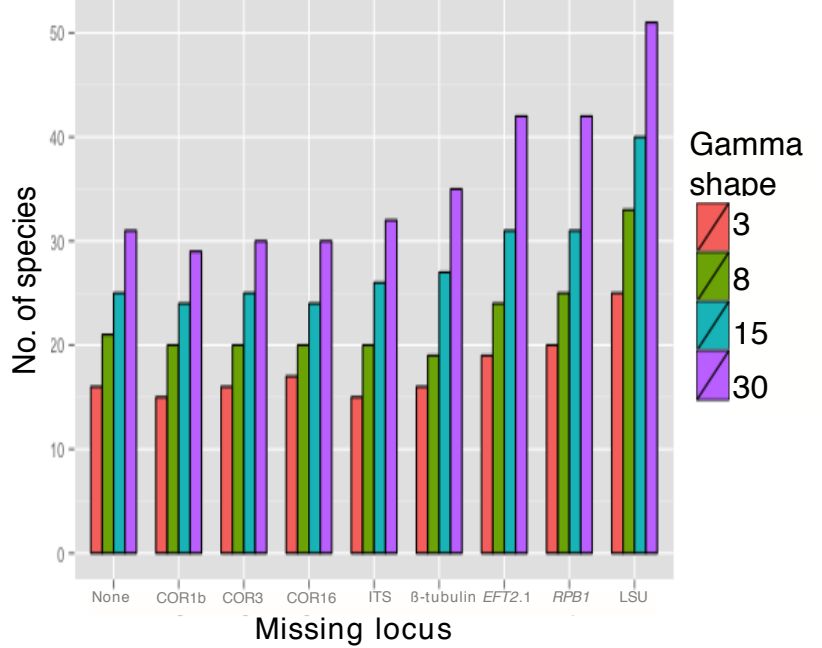
B dolichorhizoid clade



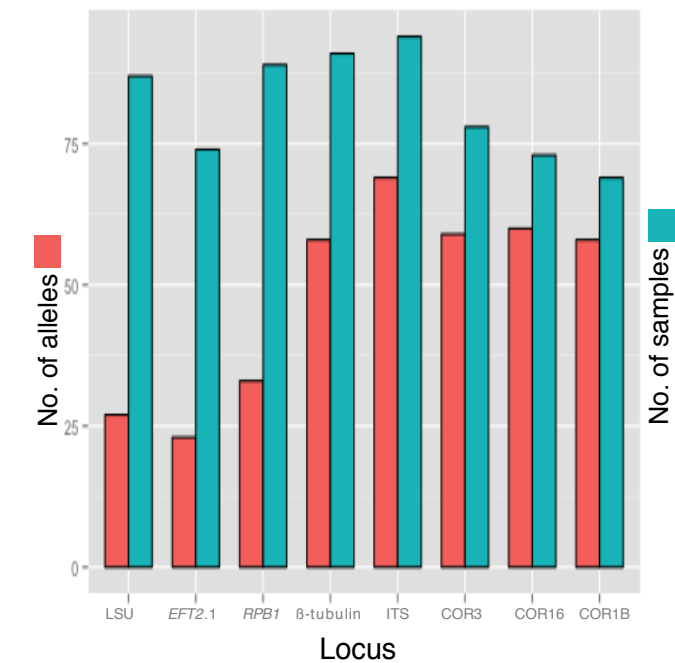
C scabrosoid clade



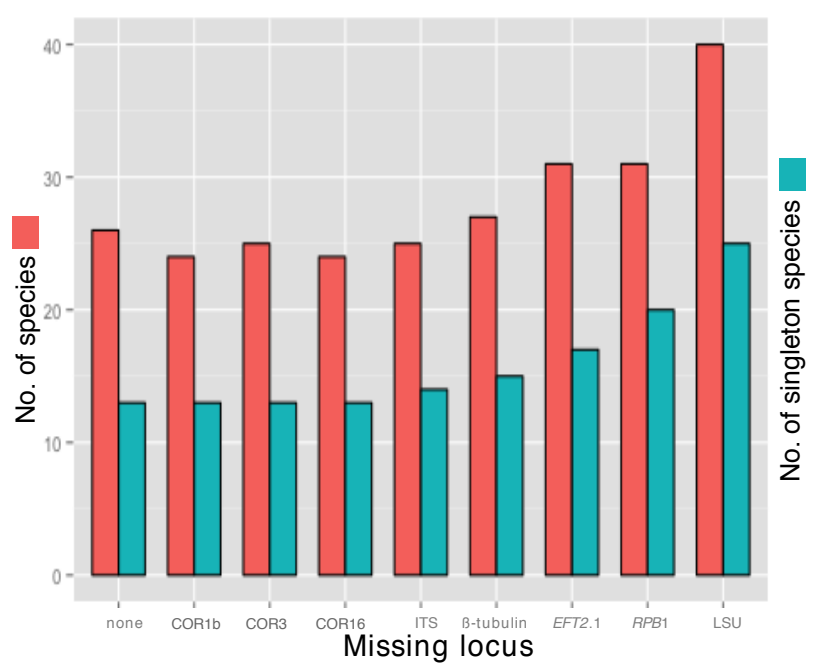
D dolichorhizoid clade

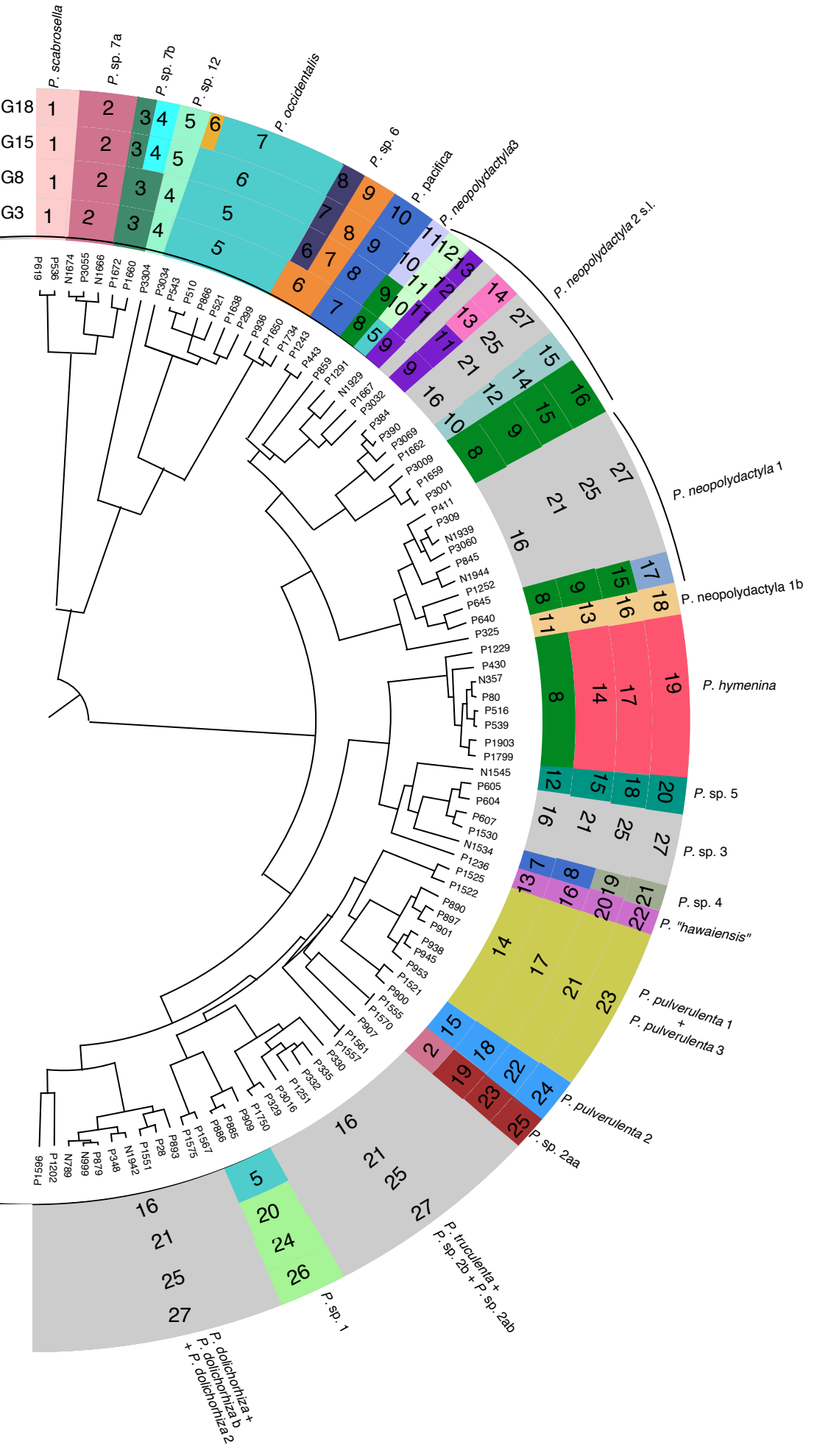


E dolichorhizoid clade

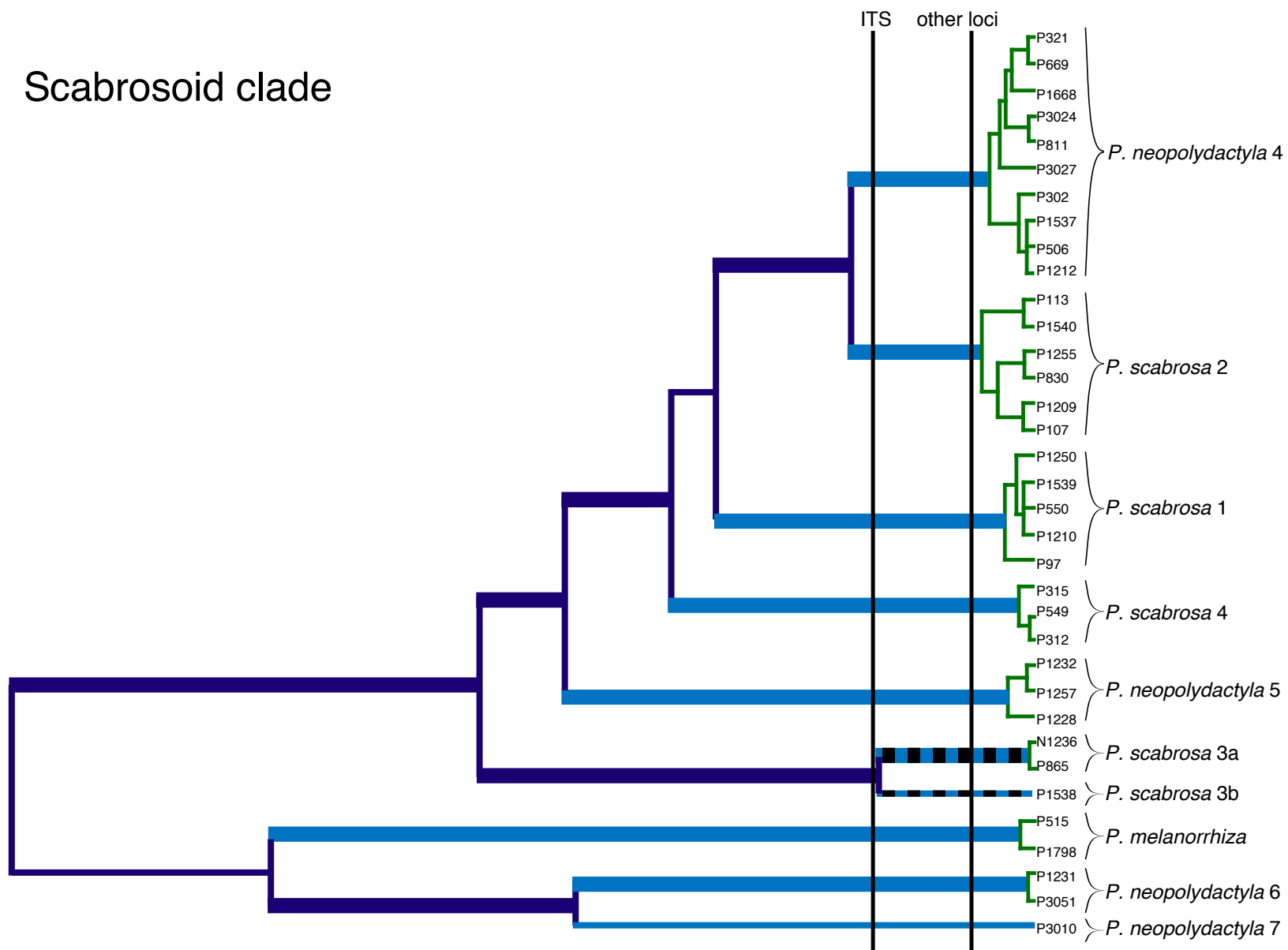


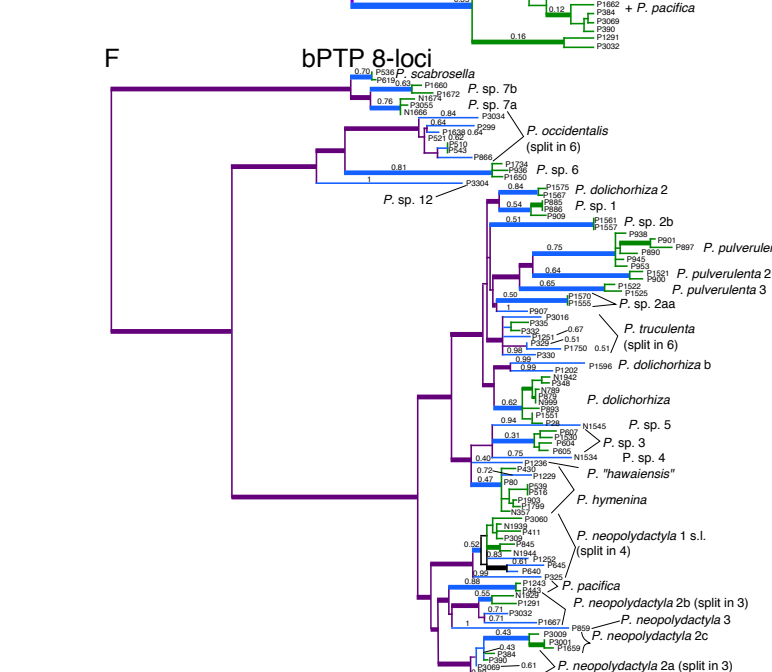
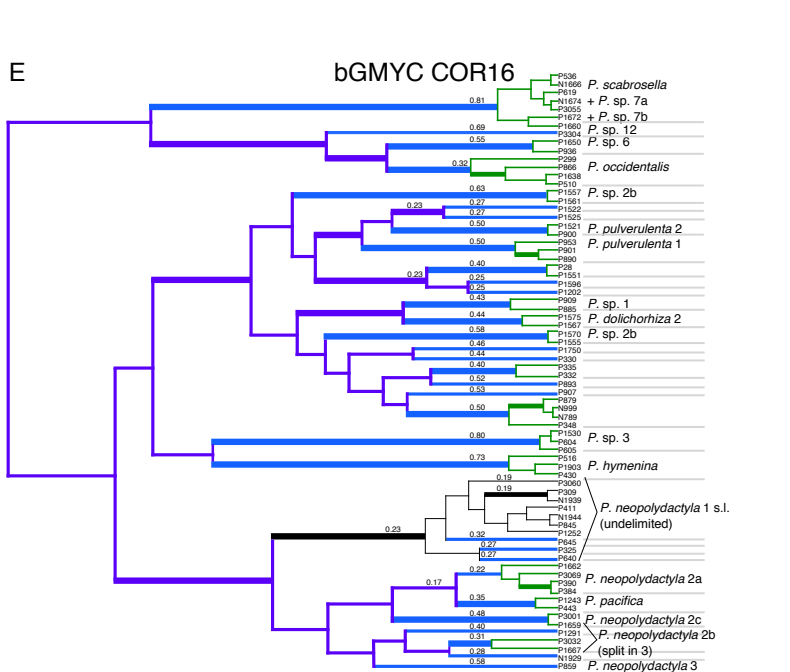
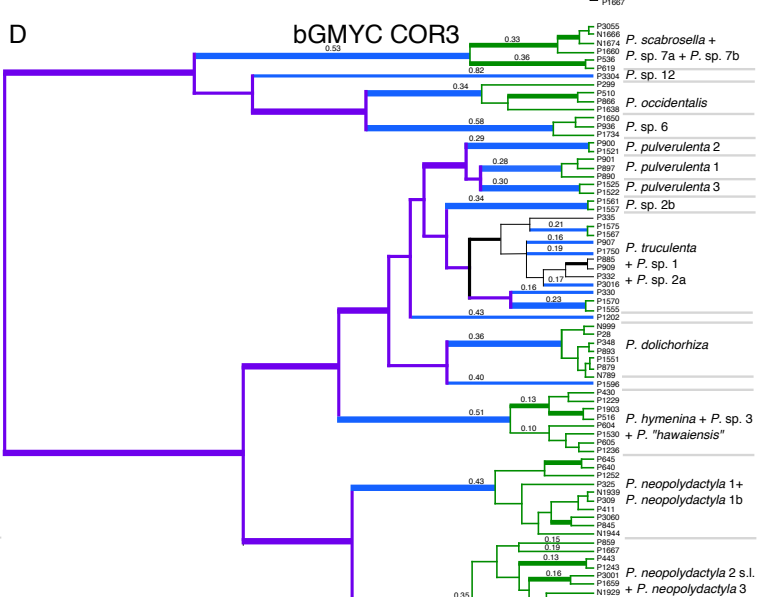
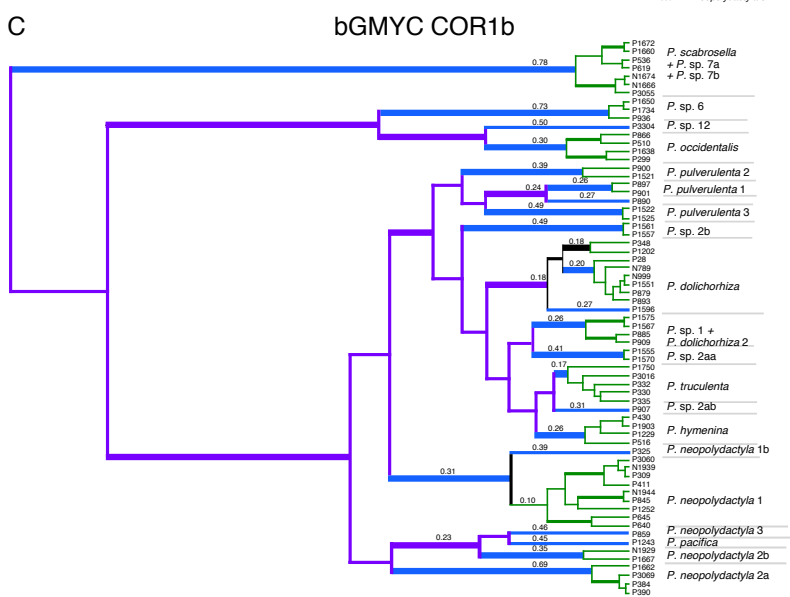
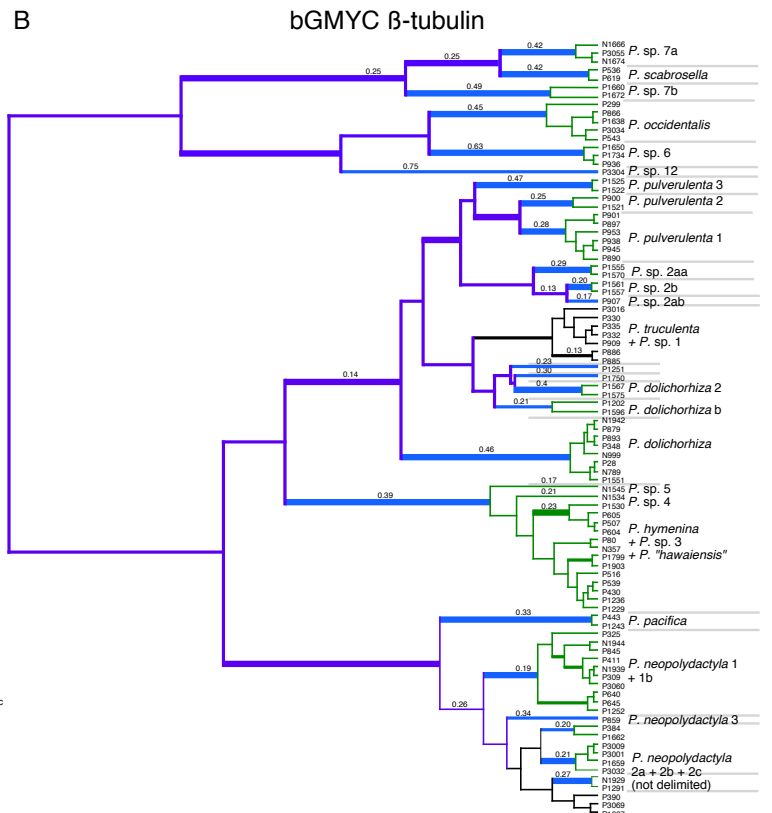
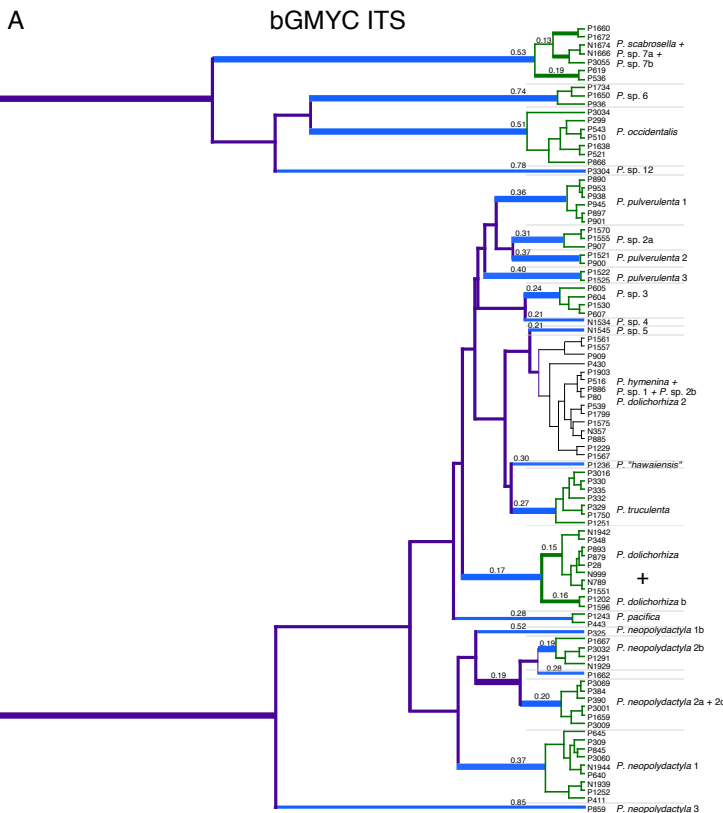
F dolichorhizoid clade





Scabrosoid clade





Supplementary Table S1. List of genomes used in this study, with their reference name(s), source and taxonomic class. All assemblies or reference names that have been used in different analyses are provided. * For two genomes (*Cladonia grayi* and *Xanthoria parietina*), a first set of analyses was performed on older assemblies, while subsequent analyses were performed on the most recent versions available. Sources: JGI: <http://genome.jgi.doe.gov/>; AspGD: <http://www.aspgd.org>. In the analyses column, Fig. 1 means that these genomes were used for the synteny analyses of COR3 and COR16 as depicted in Fig. 1, 9G corresponds to the nine genomes used to identify the 125 collinear regions, and 24G represents the 24 genomes in which the presence of these 125 syntenic blocks was assessed.

Species	Reference name	Source	Class	Analyses
<i>Acarospora strigata</i>	Acastr1; ASTR1	McDonald et al. 2013	Lecanoromycetes	Fig. 1, 9G
<i>Arthroderma benhamiae</i>	Artbe1	JGI	Eurotiomycetes	24G
<i>Aspergillus clavatus</i>	Aspcl1	JGI	Eurotiomycetes	24G
<i>Aspergillus flavus</i>	Aspfl1	JGI	Eurotiomycetes	24G
<i>Aspergillus fumigatus</i>	Aspfu1	JGI	Eurotiomycetes	24G
<i>Aspergillus fumigatus</i>	Aspfu_A1163_1	JGI	Eurotiomycetes	24G
<i>Aspergillus kawachii</i>	Aspka1_1	JGI	Eurotiomycetes	24G
<i>Aspergillus nidulans</i>	Aspnid1; AspGD	JGI; AspGD	Eurotiomycetes	Fig. 1, 9G
<i>Aspergillus niger</i>	Aspni_DSM_1	JGI	Eurotiomycetes	24G
<i>Aspergillus niger</i>	Aspni7	JGI	Eurotiomycetes	24G
<i>Aspergillus oryzae</i>	Aspor1	JGI	Eurotiomycetes	24G
<i>Aspergillus terreus</i>	Aspte1	JGI	Eurotiomycetes	24G
<i>Blastomyces dermatitidis</i>	Blade1	JGI	Eurotiomycetes	24G
<i>Cladonia grayi</i>	Clagr2*; Clagr3	JGI	Lecanoromycetes	Fig. 1, 9G
<i>Coccidioides immitis</i>	Cocim1	JGI	Eurotiomycetes	24G
<i>Dibaeis baeomyces</i>	Dibbae1; DBAEO1	McDonald et al. 2013	Lecanoromycetes	Fig. 1, 9G
<i>Endocarpon pallidulum</i>	Endpal1; EPALI	McDonald et al. 2013	Eurotiomycetes	Fig. 1, 9G
<i>Eurotium rubrum</i>	Eurhe1	JGI	Eurotiomycetes	24G
<i>Graphis scripta</i>	Grascr1; GSCRI1	McDonald et al. 2013	Lecanoromycetes	Fig. 1, 9G
<i>Histoplasma capsulatum</i>	Hisca1	JGI	Eurotiomycetes	24G
<i>Leptogium austroamericanum</i>	LEPT1	McDonald et al. 2013	Lecanoromycetes	Fig. 1
<i>Microsporium canis</i>	Micca1	JGI	Eurotiomycetes	24G
<i>Neosartorya fischeri</i>	Neofi1	JGI	Eurotiomycetes	24G
<i>Paracoccidioides brasiliensis</i>	Parbr1	JGI	Eurotiomycetes	24G
<i>Peltigera evansiana</i>	PEVA1	Unpublished	Lecanoromycetes	Fig. 1
<i>Peltula cylindrica</i>	PCYL1	McDonald et al. 2013	Lichinomycetes	Fig. 1
<i>Penicillium chrysogenum</i>	Pench1	JGI	Eurotiomycetes	Fig. 1, 9G
<i>Penicillium chrysogenum</i>	PenchWisc1_1	JGI	Eurotiomycetes	24G
<i>Penicillium digitatum</i>	Pendi1	JGI	Eurotiomycetes	24G
<i>Penicillium oxalicum</i>	Penox1	JGI	Eurotiomycetes	24G
<i>Penicillium thymicola</i>	Penth1	JGI	Eurotiomycetes	24G
<i>Phaeomoniella chlamydospora</i>	Phach1	JGI	Eurotiomycetes	24G
<i>Trichophyton rubrum</i>	Triru1	JGI	Eurotiomycetes	24G
<i>Umbilicaria muehlenbergii</i>	Umbili; UBIL	Park et al. 2014	Lecanoromycetes	Fig. 1, 9G
<i>Uncinocarpus reesii</i>	Uncre1	JGI	Eurotiomycetes	24G
<i>Xanthoria parietina</i>	Xanpa1*; Xanpa2	JGI	Lecanoromycetes	Fig. 1, 9G

Supplementary Table S2. Specimens used in this study with their reference numbers (DNA extraction number), consensus species assignment (based on this study), voucher information, and GenBank accession numbers. Newly generated sequences are shown in bold.

Clade & taxon	DNA no.	Voucher	ITS	β -tubulin	<i>RPB1</i>	<i>EFT2.1</i>	LSU	COR1b	COR3	COR16	<i>rbcLX</i>
DOLICORHIZOID CLADE											
<i>P. dolichorhiza</i>	N1942	Panama; B. Goffinet 753; CONN	KX897184	KX880095	KX880195	KX897459	KX869753	---	---	---	KX922891
<i>P. dolichorhiza</i>	N789	Madagascar; E. Sérusiaux s.n.; LG	MF908481	MF946748	MF946706	---	MF946785	MF947033	MF946923	MF946820	MF947103
<i>P. dolichorhiza</i>	N999	Reunion Island; N. Magain & E. Sérusiaux s.n.; LG	KX897180	KX880093	KX880193	KX897457	KX869751	MF947034	MF946924	MF946821	KX922887
<i>P. dolichorhiza</i>	P1551	Galapagos Islands; F. Bungartz 8368; CDS 41014	MF908482	MF946749	MF946707	MF946670	MF946786	MF947035	MF946925	MF946822	---
<i>P. dolichorhiza</i>	P1596	Brazil, Minas Gerais; J. Miadlikowska et al.; CGMS 34453	KX897187	KX880096	KX880196	KX897460	KX869754	MF947036	MF946926	MF946824	MF947104
<i>P. dolichorhiza</i>	P28	Costa Rica; J. Miadlikowska et al. 03.23.2003-P28.; DUKE	KX897181	KX880094	KX880194	KX897458	KX869752	MF947037	MF946927	MF946823	KX922888
<i>P. dolichorhiza</i>	P348	Mexico; M. A. Herrera-Campos 13382; MEXU	KX897182	KM005819	KM005937	KM005875	KM005745	MF947038	MF946928	MF946825	KX922889
<i>P. dolichorhiza</i>	P879	Rwanda; E. Sérusiaux PA7; LG	KX897183	MF946750	MF946708	MF946671	---	MF947039	MF946929	MF946824	KX922890
<i>P. dolichorhiza</i>	P893	Bolivia; M. Kukwa 9740; UGDA 17730	KX897179	KX880092	KX880192	KX897456	KX869750	MF947040	MF946930	MF946827	KX922886
<i>P. dolichorhiza 2</i>	P1567	Brazil, Minas Gerais; J. Miadlikowska et al.; CGMS 34530	KX897188	KX880097	KX880197	KX897461	KX86975	MF947042	MF946932	MF946828	KX922894
<i>P. dolichorhiza 2</i>	P1575	Brazil, Minas Gerais; J. Miadlikowska et al.; CGMS 34456	KX897189	MF946751	MF946709	MF946672	MF946787	MF947041	MF946931	MF946829	KX922895
<i>P. dolichorhiza b</i>	P1202	Mexico; M.A. Herrera-Campos 2658 MEXU	MF908483	MF946752	MF946710	MF946673	MF946788	MF947043	MF946933	MF946830	MF947105
<i>P. hawaiiensis</i>	P1236	USA, Hawaii; B. McCune 22196; OSU	KX897190	KX880098	---	---	KX869756	---	MF946934	---	KX922896
<i>P. hymenina</i>	N357	Spain, Tenerife; E. Sérusiaux s.n.; LG	KX897192	KX880100	KX880199	KX897463	KX869758	---	---	---	KX922898
<i>P. hymenina</i>	P1229	USA, Oregon; B. McCune 30448; OSU	KX897205	KX880103	KX880203	KX897467	KX869762	MF947044	MF946935	---	KX922911
<i>P. hymenina</i>	P1799	Portugal, Azores; P. Divakar 6915a; MAF	KX897207	KX880104	KX880204	KX897468	KX869763	---	---	---	---
<i>P. hymenina</i>	P1903	Portugal, Azores; P. Divakar 6916s; MAF	KX897208	KX880105	KX880205	MF946674	KX869764	MF947045	MF946936	MF946832	MF947106
<i>P. hymenina</i>	P430	Canada, Newfoundland; J. Lendemer 10397; H	KX897191	KX880099	KX880198	KX897462	KX869757	MF947046	MF946937	MF946831	KX922897
<i>P. hymenina</i>	P516	Portugal, Azores; E. Sérusiaux s.n.; LG	KX897196	MF946753	---	KX897464	KX869759	MF947047	MF946938	MF946833	KX922902

<i>P. hymenina</i>	P539	Norway; N. Magain s.n.; LG	KX897198	KX880101	KX880201	KX897465	KX869760	---	---	---	KX922904
<i>P. hymenina</i>	P80	Iceland; T. Ahti 69347; H	KX897200	KX880102	KX880202	KX897466	KX869761	---	---	---	KX922906
<i>P. neopolydactyla</i> 1	P3060	Canada, British Columbia; C. Bjork 16545; UBC	MF908484	MF946754	MF946711	MF946675	MF946789	MF947048	MF946939	MF946834	---
<i>P. neopolydactyla</i> 1	N1939	USA, Alabama; B. Goffinet 5209; DUKE	KX897224	KX880111	KX880217	KX897475	KX869776	MF947049	MF946940	MF946835	KX922926
<i>P. neopolydactyla</i> 1	N1944	USA, Alaska; B. Goffinet 9424; CONN	KX897219	KX880107	KX880213	KX897472	KX869772	MF947050	MF946941	MF946836	KX922921
<i>P. neopolydactyla</i> 1	P1252	USA, AZ; J. Hollinger 1781; UBC	KX897227	KX880114	KX880220	MF946676	KX869779	MF947052	MF946942	MF946837	KX922929
<i>P. neopolydactyla</i> 1	P309	Canada, Québec; J. Miadlikowska et al. 2011-P309; DUKE	KX897220	KX880108	KX880214	KX897473	KX869773	MF947051	MF946943	MF946838	KX922922
<i>P. neopolydactyla</i> 1	P411	Russia, Yakutia; T. Ahti 65064; H	KX897221	KX880109	KX880215	MF946677	KX869774	MF947053	MF946944	MF946839	KX922923
<i>P. neopolydactyla</i> 1	P640	USA, North Carolina; J. Miadlikowska et al. 2011-P640; DUKE	KX897225	KX880112	KX880218	KX897476	KX869777	MF947054	MF946945	MF946840	KX922927
<i>P. neopolydactyla</i> 1	P645	USA, North Carolina; J. Miadlikowska et al. 2011-P645; DUKE	KX897226	KX880113	KX880219	KX897477	KX869778	MF947055	MF946946	MF946841	KX922928
<i>P. neopolydactyla</i> 1	P845	Norway; N. Magain s.n.; LG	KX897223	KX880110	KX880216	KX897474	KX869775	MF947056	MF946947	MF946842	KX922925
<i>P. neopolydactyla</i> 1b	P325	Peru; E. Gaya 07.14.10-19; DUKE	KX897228	KX880115	KX880221	KX897478	KX869780	MF947057	MF946948	MF946843	KX922930
<i>P. neopolydactyla</i> 2a	P1662	Japan, Hokkaido; A. Frisch 10/Jp410; UPS 522008	KX897243	KX880120	KX880225	MF946678	KX869784	MF947058	MF946949	MF946844	---
<i>P. neopolydactyla</i> 2a	P384	Norway; N. Magain s.n.; LG	KX897237	KX880117	KX880223	KX897480	KX869782	MF947059	MF946950	MF946845	KX922939
<i>P. neopolydactyla</i> 2a	P390	Norway; N. Magain s.n.; LG	KX897246	KX880123	KX880227	KX897481	KX869787	MF947060	MF946951	MF946846	---
<i>P. neopolydactyla</i> 2a	P3069	T. Goward 06-329c; UBC	MF908485	MF946755	MF946712	MF946679	MF946790	MF947061	MF946952	MF946847	MF947107
<i>P. neopolydactyla</i> 2b	P1667	Japan, Kochi; G. Thor 21279; UPS 164500	KX897244	KX880121	KX880226	---	KX869785	MF947062	MF946953	MF946848	MF947108
<i>P. neopolydactyla</i> 2b	N1929	China, Yunnan; B. Goffinet 10120; CONN	KX897234	KX880116	KX880222	KX897479	KX869781	MF947063	MF946954	MF946849	KX922936
<i>P. neopolydactyla</i> 2b	P1291	China, Yunnan; J. Miadlikowska 2003-P1291; DUKE	KX897241	KX880118	---	---	---	---	MF946955	MF946850	MF947109
<i>P. neopolydactyla</i> 2b	P3032	Russia, Khabarovsk Territory; F. Lutzoni and J. Miadlikowska 06.29.2013-P3032.; DUKE	MF908486	MF946759	MF946714	MF946680	MF946791	---	MF946956	MF946851	MF947110
<i>P. neopolydactyla</i> 2c	P1659	Japan, Hokkaido; G. Thor 25720; UPS 519479	KX897242	KX880119	KX880224	MF946681	KX869783	---	MF946957	MF946852	MF947111
<i>P. neopolydactyla</i> 2c	P3001	Russia, Khabarovsk Territory; F. Lutzoni and J. Miadlikowska 2013-P3001; DUKE	MF908487	MF946757	MF946713	MF946683	MF946792	---	MF946958	MF946853	MF947112
<i>P. neopolydactyla</i> 2c	P3009	Russia, Sakhalin; S. Tchabanenko 3082; SAKH	MF908488	MF946756	MF946715	MF946682	---	---	---	---	MF947113

<i>P. neopolydactyla</i> 3	P859	Vietnam; Vo Thi Phi Giao G06-NL86B; B 600144665	KX897247	KX880124	KX880228	---	KX869788	MF947064	MF946959	MF946854	KX922943
<i>P. occidentalis</i>	P1638	USA, NC; Richard C. Harris 52559; NY	KX897275	MF946761	MF946716	---	MF946793	MF947065	MF946960	MF946855	KX922971
<i>P. occidentalis</i>	P299	Canada, Québec F. Lutzoni et al. s.n.; DUKE	KX897269	KX880133	KX880237	KX897489	KX869798	MF947066	MF946961	MF946856	KX922965
<i>P. occidentalis</i>	P3034	Russia, Khabarovsk Territory; F. Lutzoni and J. Miadlikowska 07.26.2013-P3034; DUKE	MF908489	MF946758	MF946717	MF946684	MF946794	---	---	---	MF947114
<i>P. occidentalis</i>	P510	Norway; N. Magain s.n.; LG	KX897276	---	KX880239	KX897491	KX869800	MF947067	MF946962	MF946857	---
<i>P. occidentalis</i>	P521	Norway; N. Magain s.n.; LG	KX897277	---	KX880240	KX897492	KX869801	---	---	---	---
<i>P. occidentalis</i>	P543	Norway; N. Magain s.n.; LG	KX897272	KX880134	KX880238	KX897490	KX869799	---	---	---	KX922968
<i>P. occidentalis</i>	P866	USA, Alaska; T. Ahti 63231; H	KX897278	KX880135	KX880241	KX897493	KX869802	MF947068	MF946963	MF946858	---
<i>P. pacifica</i>	P1243	Canada, BC; T. Goward 06-1522; UBC	KX897283	KX880136	KX880242	KX897494	KX869804	MF947069	MF946964	MF946860	KX922975
<i>P. pacifica</i>	P443	Canada, British Columbia; O. Vitikainen 13080; H	KX897284	KM005822	KM005938	---	KM005762	---	MF946965	MF946859	---
<i>P. pulverulenta</i> 1	P890	Bolivia; M. Kukwa 8536; UGDA 17702	KX897290	KX880137	KX880244	KX897497	KX869805	MF947070	MF946967	MF946861	KX922986
<i>P. pulverulenta</i> 1	P897	Mexico; M. A. Herrera-Campos 122; MEXU	KX897291	MF946762	MF946718	---	---	MF947071	MF946966	---	KX922987
<i>P. pulverulenta</i> 1	P901	Colombia; R. Lücking 33383; UDBC	KX897295	KX880138	KX880245	---	KX869806	MF947072	MF946968	MF946862	---
<i>P. pulverulenta</i> 1	P938	Colombia; R. Lücking 33321; UDBC	KX897296	KX880139	KX880246	---	KX869807	---	---	---	---
<i>P. pulverulenta</i> 1	P945	Colombia; R. Lücking 33691; UDBC	KX897297	KX880140	KX880247	KX897498	KX869808	---	---	---	---
<i>P. pulverulenta</i> 1	P953	Colombia; R. Lücking 33333; UDBC	MF908490	MF946763	MF946720	MF946685	MF946795	---	---	MF946865	---
<i>P. pulverulenta</i> 2	P1521	Colombia; R. Lücking 34028; UDBC	KX897298	KX880141	KX880248	KX897499	KX869809	MF947074	MF946972	MF946864	KX922991
<i>P. pulverulenta</i> 2	P900	Colombia; R. Lücking 33367; UDBC	KX897299	KX880142	KX880249	KX897500	KX869810	MF947073	MF946971	MF946863	KX922992
<i>P. pulverulenta</i> 3	P1522	Colombia; R. Lücking 34033; UDBC	KX897300	KX880144	KX880250	KX897501	KX869811	MF947075	MF946969	MF946866	KX922993
<i>P. pulverulenta</i> 3	P1525	Colombia; R. Lücking 199; UDBC 199	MF908491	MF946764	MF946719	MF946686	MF946796	MF947076	MF946970	MF946867	---
<i>P. scabrosella</i>	P536	Norway; N. Magain s.n.; LG	KX897332	KX880157	KX880263	KX897512	KX869824	MF947077	MF946974	MF946868	---
<i>P. scabrosella</i>	P619	Norway; N. Magain s.n.; LG	KX897330	MF946765	MF946721	---	MF946797	MF947078	MF946973	MF946869	KX923023
<i>P. truculenta</i>	P1251	Chile; J. Hollinger 1925; UBC	KX897398	KX880184	---	KX897533	KX869853	---	---	---	KX923087

<i>P. triculenta</i>	P1750	Kerguelen Islands; R.L. Poulsen 767; H	MF908492	MF946766	MF946722	---	---	MF947079	MF946978	MF946870	---
<i>P. triculenta</i>	P3016	Gough Island; M. Gremmen 99-348; H	MF908493	MF946760	MF946723	---	MF946798	MF947080	MF946977	---	---
<i>P. triculenta</i>	P329	Chile; P. Nelson 4362; CONC	KX897397	---	KX880289	KX897532	KX869852	---	---	---	KX923086
<i>P. triculenta</i>	P330	Chile; T. Wheeler 3826; CONC	KX897400	KX880186	KX880291	KX897535	KX869855	MF947082	MF946975	MF946871	KX923089
<i>P. triculenta</i>	P332	Chile; T. Wheeler 89; CONC	KX897396	KX880183	KX880288	---	KX869851	MF947081	MF946976	MF946872	KX923085
<i>P. triculenta</i>	P335	Chile; T. Wheeler 1093; CONC	KX897399	KX880185	KX880290	KX897534	KX869854	MF947083	MF946979	MF946873	KX923088
<i>P. sp. 1</i>	P885	Bolivia; M. Kukwa 9276; UGDA 17710	KX897335	KX880158	KX880264	KX897513	KX869825	MF947084	MF946980	MF946874	KX923028
<i>P. sp. 1</i>	P886	Bolivia; M. Kukwa 9327; UGDA 17713	KX897336	KX880159	KX880265	KX897514	KX869826	---	---	---	KX923029
<i>P. sp. 1</i>	P909	Colombia; R. Lücking 33339; UDBC	KX897337	KX880160	MF946724	---	KX869827	MF947085	MF946981	MF946875	---
<i>P. sp. 2a</i>	P1555	Brazil, Minas Gerais; J. Miadlikowska et al.; CGMS 34544	KX897338	KX880161	KX880266	KX897515	KX869828	MF947086	MF946982	MF946877	KX923030
<i>P. sp. 2a</i>	P1570	Brazil, Minas Gerais; J. Miadlikowska et al.; CGMS 34526	KX897339	MF946767	MF946725	MF946687	MF946799	MF947087	MF946983	MF946876	KX923031
<i>P. sp. 2a</i>	P907	Colombia; R. Lücking 33361; UDBC	KX897340	KX880162	KX880267	---	KX869829	MF947088	MF946984	MF946878	KX923032
<i>P. sp. 2b</i>	P1557	Brazil, Minas Gerais; J. Miadlikowska et al.; CGMS 34562	KX897342	KX880163	KX880268	KX897516	KX869830	MF947090	MF946985	MF946879	KX923034
<i>P. sp. 2b</i>	P1561	Brazil, Minas Gerais; J. Miadlikowska et al.; CGMS 34399	KX897341	MF946768	MF946726	MF946688	MF946800	MF947089	MF946986	MF946880	KX923033
<i>P. sp. 3</i>	P1530	New Zealand; D. Blanchon s.n.; DUKE	KX897351	KX880166	KX880271	KX897519	KX869833	---	MF946987	MF946883	---
<i>P. sp. 3</i>	P604	New Zealand; F. Högnabba 1538; H	KX897346	KX880164	KX880269	KX897517	KX869831	---	MF946988	MF946882	KX923038
<i>P. sp. 3</i>	P605	New Zealand; S. Stenroos 5815; H	KX897352	KX880167	KX880272	KX897520	KX869834	---	MF946989	MF946881	---
<i>P. sp. 3</i>	P607	New Zealand; S. Stenroos 5820; H	KX897348	KX880165	KX880270	KX897518	KX869832	---	---	---	KX923040
<i>P. sp. 4</i>	N1534	Papua New Guinea; E. Sérusiaux s.n.; LG	KX897353	KX880168	KX880273	---	KX869835	---	---	---	KX923043
<i>P. sp. 5</i>	N1545	Papua New Guinea; E. Sérusiaux s.n.; LG	KX897354	MF946769	KX880274	KX897521	KX869836	---	---	---	KX923044
<i>P. sp. 6</i>	P1650	Honduras; B. Allen 17790; NY	KX897357	KX880169	KX880275	---	KX869837	MF947091	MF946990	MF946885	KX923047
<i>P. sp. 6</i>	P1734	Peru; N. Magain s.n.; DUKE	KX897356	MF946770	MF946727	---	MF946801	MF947092	MF946991	---	KX923046
<i>P. sp. 6</i>	P936	Colombia; R. Lücking 33659; UDBC	KX897359	KX880170	KX880276	MF946689	KX869838	MF947093	MF946992	MF946884	KX923049

<i>P. sp. 7a</i>	N1666	Canada, British Columbia; T. Tonsberg 20741; BG 34876	KX897364	KX880171	KX880277	KX897522	KX869839	MF947094	MF946993	MF946886	---
<i>P. sp. 7a</i>	N1674	Canada, British Columbia; T. Tonsberg 20742; BG 34877	KX897361	MF946771	MF946728	---	---	MF947095	MF946994	MF946887	KX923051
<i>P. sp. 7a</i>	P3055	Canada, British Columbia; T. Goward 06-1371; UBC	MF908494	MF946772	MF946729	MF946690	MF946802	MF947096	MF946995	MF946888	MF947115
<i>P. sp. 7b</i>	P1660	Japan, Hokkaido; G. Thor 25408; UPS 519475	KX897365	KX880172	KX880278	MF946691	KX869840	MF947098	MF946996	MF946889	KX923054
<i>P. sp. 7b</i>	P1672	Japan, Hokkaido; G. Thor; UPS	KX897366	MF946773	MF946731	---	XXXX	MF947097	---	MF946890	KX923055
<i>P. sp. 12</i>	P3304	Japan; E. Sérusiaux s.n.; LG	MF908496	MF946774	MF946730	---	MF946803	MF947099	MF946997	MF946891	---

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<i>P. nana</i> 1	P1281	China, Yunnan; J. Miadlikowska 10.24.2002-P1281; DUKE	KX897212	---	KX880208	---	KX869767	MF947101	MF946998	---	KX922915
<i>P. nana</i> 1	P1290	China, Yunnan; J. Miadlikowska 10.24.2002-P1290; DUKE	KX897216	---	KX880211	---	KX869770	---	---	---	---
<i>P. nana</i> 1	P1665	China, Sichuan; N. Gustavsson 10; UPS 509502	KX897215	---	KX880210	---	KX869769	---	MF946999	---	KX922918
<i>P. nana</i> 1	P1666	Japan, Kochi; G. Thor 21255; UPS 383534	KX897213	---	KX880209	---	KX869768	---	MF947000	MF946892	KX922916
<i>P. nana</i> 2	P609	New Zealand; S. Stenroos 6037; H	KX897217	---	KX880212	KX897471	KX869771	---	---	MF946893	KX922919
<i>P. polydactylon</i> 1	N2069	Norway; J. Holtan-Hartwig 528; O	KX365447	KX365467	KX880243	---	KX365455	---	---	---	KX922976
<i>P. polydactylon</i> 1	P3021	Turkey; K. Yazici s.n.; H	KX365471	MF946775	KX365443	---	---	KX365488	KX373620	KX373631	---
<i>P. polydactylon</i> 1	P385	Norway; N. Magain s.n.; LG	KX365448	KM005820	KM005994	KM005876	KM005765	KX365489	KX373621	KX373632	KX922979
<i>P. polydactylon</i> 1	P388	Norway; N. Magain s.n.; LG	KX365449	KX365468	KX365461	KX897495	KX365456	---	---	---	KX922980
<i>P. polydactylon</i> 1	P856	Iran; A. A. Maassoumi 573; B 600114374	KX365446	KX365466	MF946732	---	KX365454	---	---	---	KX922985
<i>P. polydactylon</i> 2	P1234	USA, Montana; B. McCune 29108; OSU	KX365445	KX365465	KX365460	---	KX365453	---	---	KX373629	---
<i>P. polydactylon</i> 2	P71	USA, New Mexico; J. Hollinger 2462; DUKE	KX365444	KX365464	KX365459	KX897496	KX365452	KX365486	KX373618	KX373628	KX922982
<i>P. polydactylon</i> 2	P3015	USA, Michigan; F. Lutzoni and J. Miadlikowska 05.27.2013-P3015.; DUKE	KX365469	MF946776	KX365477	---	KX365473	---	---	---	MF947116
<i>P. polydactylon</i> 2	P3052	Canada, British Columbia; J. Hollinger 1505; UBC	KX365470	KX365476	KX365478	---	KX365474	KX365487	KX373619	KX373630	---
<i>P. sp. 8</i>	N1898	China, Yunnan; B. Goffinet 10063; CONN	KX897373	KX880174	KX880280	KX897524	KX869842	---	MF947001	MF946894	KX923062
<i>P. sp. 8</i>	N1900	China, Yunnan; B. Goffinet 10102; CONN	KX897374	MF946777	MF946733	MF946692	MF946804	---	MF947002	MF946895	KX923063
<i>P. sp. 8</i>	N1922	China, Yunnan; B. Goffinet 10072; CONN	KX897375	KX880175	KX880281	KX897525	KX869843	MF947100	MF947003	MF946896	KX923064
<i>P. sp. 8</i>	N1924	China, Yunnan; B. Goffinet 10095; CONN	KX897376	KX880176	KX880282	KX897526	KX869844	---	---	---	KX923065

<i>P. sp. 8</i>	N1928	China, Yunnan; B. Goffinet 10107; CONN	KX897377	KX880177	KX880283	KX897527	KX869845	---	MF947004	MF946897	KX923066
<i>P. sp. 8</i>	N1947	China, Yunnan; B. Goffinet 9978; CONN	KX897368	---	MF946734	MF946693	MF946805	---	---	MF946898	KX923057
<i>P. sp. 8</i>	P1237	Taiwan; A. Mikulin T71; Mikulin Private Coll.	KX897378	KX880178	KX880284	KX897528	KX869846	---	---	---	KX923067
<i>P. sp. 8</i>	P1272	China, Jilin; M. Sohrabi 16572; M. Sohrabi Private Coll.	KX897369	KX880173	KX880279	KX897523	KX869841	---	MF947006	MF946899	KX923058
<i>P. sp. 8</i>	P1278	China, Yunnan; J. Miadlikowska 10.24.2002-P1278.; DUKE	MF908499	MF946778	---	---	MF946806	---	---	---	---
<i>P. sp. 8</i>	P1610	USA, Vermont; W. Buck 53756; NY 01024735	MF908497	MF946779	MF946735	MF946694	MF946807	---	MF947005	MF946900	MF947117
<i>P. sp. 8</i>	N1748	South Korea, J. Santosh 080042; J. Santosh Private Coll.	KX897380	---	MF946736	---	MF946808	---	---	---	KX923069
<i>P. sp. 8</i>	P3013	Russia, Khabarovsk Territory; F. Lutzoni and J. Miadlikowska 07.28.2013-P3013.; DUKE	MF908498	MF946780	MF946737	MF946695	MF946809	---	---	MF946901	MF947118
<i>P. sp. 9</i>	N1899	China, Yunnan; B. Goffinet 10014; CONN	KX897390	---	KX880286	KX897530	KX869848	---	---	---	---
<i>P. sp. 9</i>	N1908	China, Yunnan; B. Goffinet 10040; CONN	KX897384	MF946781	MF946738	---	---	---	MF947008	---	KX923073
<i>P. sp. 9</i>	N1921	China, Yunnan; B. Goffinet 10064; CONN	KX897386	MF946782	MF946739	MF946696	MF946810	---	MF947007	---	KX923075
<i>P. sp. 9</i>	N1923	China, Yunnan; B. Goffinet 10073; CONN	KX897387	KX880179	KX880285	KX897529	KX869847	MF947102	MF947009	---	KX923076
<i>P. sp. 10</i>	P1652	Canada, Nova Scotia; NY	KX365450	---	KX365462	---	KX365457	---	---	---	KX923079
<i>P. sp. 10</i>	P3050	USA, North Carolina; J. Hollinger 670; UBC	KX365472	---	KX365479	MF946697	KX365475	---	KX373622	KX373633	MF947119
<i>P. sp. 10</i>	P450	USA, Pennsylvania; J. Lendemer 16792; NY	KX365451	---	KX365463	KX897531	KX365458	KX365490	KX373623	KX373634	KX923080
<i>P. sp. 11</i>	N1532	Papua New Guinea; E. Sérusiaux s.n.; LG	KX897391	KX880180	KX880287	---	KX869849	---	---	---	KX923081
<i>P. sp. 11</i>	N1533	Papua New Guinea; E. Sérusiaux s.n.; LG	KX897392	KX880181	---	---	KX869850	---	---	---	KX923082

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<i>P. melanorrhiza</i>	P1798	Portugal, Azores; P. Divakar 6918b; MAF	KX897211	KX880106	KX880207	KX897470	KX869766	---	MF947010	MF946902	---
<i>P. melanorrhiza</i>	P515	Portugal, Azores; E. Sérusiaux s.n.; LG	KX897210	---	KX880206	KX897469	KX869765	---	---	---	KX922914
<i>P. neopolydactyla</i> 4	P1212	Norway; N. Magain s.n.; LG	KX897256	---	KX880232	KX897485	KX869792	---	---	---	KX922952
<i>P. neopolydactyla</i> 4	P1537	Russia, Krasnoyarsk Territory; F. Lutzoni and J. Miadlikowska 06.2012-P1537; DUKE	MF908500	---	MF946740	MF946698	MF946811	---	MF947011	MF946903	---
<i>P. neopolydactyla</i> 4	P1668	Japan, Hokkaido; G. Thor 24306; UPS 519471	KX897250	KX880125	KX880229	KX897482	KX869789	---	MF947012	MF946904	KX922946
<i>P. neopolydactyla</i> 4	P302	Canada, Québec F. Lutzoni et al. 2011-P302.; DUKE	KX897252	KX880126	KX880230	KX897483	KX869790	---	MF947013	MF946905	KX922948
<i>P. neopolydactyla</i> 4	P3024	Canada, Québec R. Darnajoux P3024.; DUKE	MF908501	---	MF946741	MF946699	MF946812	---	---	---	MF947120

<i>P. neopolydactyla</i> 4	P3027	Canada, Québec R. Darnajoux P3027; DUKE	MF908502	---	MF946742	MF946700	MF946813	---	MF947014	MF946906	---
<i>P. neopolydactyla</i> 4	P321	Canada, Québec F. Lutzoni et al. 2011-P321; DUKE	KX897253	KX880127	KX880231	KX897484	KX869791	---	---	---	KX922949
<i>P. neopolydactyla</i> 4	P506	Norway; N. Magain s.n.; LG	KX897257	KX880128	KX880233	KX897486	KX869793	---	MF947015	MF946907	KX922953
<i>P. neopolydactyla</i> 4	P669	Norway; N. Magain s.n.; LG	KX897258	---	MF946743	MF946701	---	---	---	---	KX922954
<i>P. neopolydactyla</i> 4	P811	Norway; N. Magain s.n.; LG	KX897255	---	MF946744	---	MF946814	---	---	---	KX922951
<i>P. neopolydactyla</i> 5	P1228	USA, Oregon; B. McCune 30018; OSU	KX897259	KX880129	KX880234	KX897487	KX869794	---	MF947016	MF946908	KX922955
<i>P. neopolydactyla</i> 5	P1232	USA, Oregon; B. McCune 26873; OSU	KX897260	KX880130	---	---	KX869795	---	---	---	KX922956
<i>P. neopolydactyla</i> 5	P1257	USA, Oregon; J. Hollinger 1385; UBC	KX897261	KX880131	KX880235	KX897488	KX869796	---	---	---	KX922957
<i>P. neopolydactyla</i> 6	P1231	USA, Oregon; B. McCune 24160; OSU	KX897264	KX880132	KX880236	---	KX869797	---	MF947017	MF946909	KX922960
<i>P. neopolydactyla</i> 6	P3051	USA, Oregon; J. Hollinger 1386; UBC	MF908503	---	---	---	MF946815	---	MF947018	MF946911	MF947121
<i>P. neopolydactyla</i> 7	P3010	Russia, Sakhalin; S. Tchabanenko 3072; SAKH	MF908504	MF946783	MF946745	MF946702	MF946816	---	MF947019	MF946910	MF947122
<i>P. scabrosa</i> 1	P1210	Norway; N. Magain s.n.; LG	KX897301	KX880145	KX880251	---	KX869812	---	---	---	KX922994
<i>P. scabrosa</i> 1	P1250	Canada, Alberta; J. Hollinger 1066; UBC	KX897302	KX880146	KX880252	KX897502	KX869813	---	MF947020	MF946912	KX922995
<i>P. scabrosa</i> 1	P1539	Russia, Krasnoyarsk Territory; F. Lutzoni and J. Miadlikowska 06.2012-P1539; DUKE	KX897303	---	MF946747	MF946703	MF946817	---	MF947021	MF946913	KX922996
<i>P. scabrosa</i> 1	P550	Norway; N. Magain s.n.; LG	KX897308	KX880148	KX880254	KX897504	KX869815	---	MF947023	MF946915	---
<i>P. scabrosa</i> 1	P97	Canada, Québec; F. Lutzoni et al. 2011-P97; DUKE	KX897307	KX880147	KX880253	KX897503	KX869814	---	MF947022	MF946914	KX923000
<i>P. scabrosa</i> 2	P107	Canada, Québec; F. Lutzoni et al. 2011-P107; DUKE	KX897310	KM005791	KM005933	KM005872	KM005769	---	MF947024	MF946916	KX923003
<i>P. scabrosa</i> 2	P113	Canada, Québec; F. Lutzoni et al. 2011-P113; DUKE	KX897311	KX880149	KX880255	KX897505	KX869816	---	---	---	KX923004
<i>P. scabrosa</i> 2	P1209	Norway; N. Magain s.n.; LG	KX897312	KX880150	KX880256	KX897506	KX869817	---	MF947025	MF946917	KX923005
<i>P. scabrosa</i> 2	P1255	Canada, BC; C. Bjork 16230; UBC	KX897313	KX880151	KX880257	KX897507	KX869818	---	MF947026	MF946918	KX923006
<i>P. scabrosa</i> 2	P1540	Russia, Krasnoyarsk Territory; F. Lutzoni and J. Miadlikowska 06.24.2012-P1540; DUKE	KX897314	---	MF946746	---	MF946818	---	MF947027	MF946919	KX923007
<i>P. scabrosa</i> 2	P830	Norway; N. Magain s.n.; LG	KX897318	MF946784	---	MF946704	---	---	---	---	KX923011
<i>P. scabrosa</i> 3a	N1236	Greenland; E. Sérusiaux s.n.; LG	KX897320	KX880153	KX880259	KX897509	KX869820	---	MF947029	MF946922	KX923013
<i>P. scabrosa</i> 3a	P865	Russia, Yakutia; T. Ahti 65068; H	KX897319	KX880152	KX880258	KX897508	KX869819	---	MF947030	MF946920	KX923012
<i>P. scabrosa</i> 3b	P1538	Russia, Krasnoyarsk Territory; J. Miadlikowska et al. s.n.; DUKE	KX897322	---	XXXX	MF946705	MF946819	---	MF947028	MF946921	KX923015

<i>P. scabrosa</i> 4	P312	Canada, Québec F. Lutzoni et al. 2011-P312.; DUKE	KX897323	KX880154	KX880260	KX897510	KX869821	---	MF947031	---	KX923016
<i>P. scabrosa</i> 4	P315	Canada, Québec F. Lutzoni et al. 2011-P315; DUKE	KX897324	KX880155	KX880261	---	KX869822	---	---	---	KX923017
<i>P. scabrosa</i> 4	P549	Norway; N. Magain s.n.; LG	KX897327	KX880156	KX880262	KX897511	KX869823	---	MF947032	---	KX923020

Supplementary Table S3: Datasets and performed phylogenetic analyses including information about the partitioning method, the resulting data subsets and the nucleotide substitution models applied (when applicable).

Dataset	Analysis	Partitioning method/criterion	No. of subsets	Subset	Model
Section; 8-locus	RAxML; Mr Bayes, BEAST	PartitionFinder, BIC	5	1: ITS 1 + ITS 2, β -tubulin non-coding, COR1b	N/A; TrN + G
				2: 5.8S, β -tubulin 1 st codon position, β -tubulin 2 nd codon positions, <i>RPBI</i> 2 nd codon position	N/A; JC + I
				3: <i>EFT2.1</i> 3 rd codon position, <i>EFT2.1</i> non-coding, <i>RPBI</i> 3 rd codon position, β -tubulin 3 rd codon position, COR3	N/A; HKY + G
				4: <i>EFT2.1</i> 1 st codon position, <i>EFT2.1</i> 2 nd codon position, <i>RPBI</i> 1 st codon position, <i>RPBI</i> non-coding, LSU	N/A; TrN + I + G
				5: COR16	N/A; K80+G
Section; 8-locus	*BEAST	Locus	8	1: ITS	GTR+G
				2: LSU	GTR+I+G
				3: β -tubulin	HKY+G
				4: <i>EFT2.1</i>	K80+G
				5: <i>RPBI</i>	SYM+G
				6: COR1b	HKY+G
				7: COR3	HKY+G
				8: COR16	K80+G
Section; ITS	RAxML	Coding/Non-coding	2	1: ITS1 + ITS2	N/A
				2: 5.8S	N/A

Section; β -tubulin	RAxML	Codon position/ Non-coding	4	1: 1 st codon position 2: 2 nd codon position 3: 3 rd codon position 4: non-coding	N/A N/A N/A N/A
Section; <i>EFT2.1</i>	RAxML	Codon position/ Non-coding	4	1: 1 st codon position 2: 2 nd codon position 3: 3 rd codon position 4: non-coding	N/A N/A N/A N/A
Section; <i>RPB1</i>	RAxML	Codon position/ Non-coding	4	1: 1 st codon position 2: 2 nd codon position 3: 3 rd codon position 4: non-coding	N/A N/A N/A N/A
Section; nrLSU	RAxML	Locus	1	1: LSU	N/A
Section; COR1	RAxML	Locus	1	1: COR1b	N/A
Section; COR3	RAxML	Locus	1	1: COR3	N/A
Section; COR16	RAxML	Locus	1	1: COR16	N/A
Dolichorhizoid; 8-locus	RAxML; Mr Bayes, BEAST	PartitionFinder, BIC	4	1: COR1b, COR16, COR3, ITS1 + ITS 2, β - tubulin 3 rd codon position 2: LSU, β -tubulin 1 st codon position, β -tubulin 2 nd codon position, <i>EFT2.1</i> 1 st codon position, <i>RPB1</i> 1 st codon position 3: 5.8S, <i>EFT2.1</i> 2 nd codon position, <i>RPB1</i> 2 nd codon position, <i>RPB1</i> non-coding 4: <i>EFT2.1</i> 3 rd codon position, <i>EFT2.1</i> non- coding, <i>RPB1</i> 3 rd codon position	N/A; HKY + G N/A; HKY + I N/A; F81 N/A; K80

Dolichorhizoid; 8-locus	*BEAST	Locus	8	1: ITS 2: LSU 3: β -tubulin 4: <i>EFT2.1</i> 5: <i>RPB1</i> 6: COR1 7: COR3 8: COR16	HKY+G GTR+G K80+G K80 GTR HKY+G HKY K80+G
Dolichorhizoid; ITS	RAxML; BEAST	Coding/Non-coding	2	1: ITS1+ITS2 2: 5.8S	N/A; HKY+G N/A; JC
Dolichorhizoid; β -tubulin	RAxML; BEAST	Codon position/ Non-coding	4	1: 1 st codon position 2: 2 nd codon position 3: 3 rd codon position 4: non-coding	N/A; F81 N/A; JC N/A; F81 N/A; K80
Dolichorhizoid; <i>EFT2.1</i>	RAxML; BEAST	Codon position/ Non-coding	4	1: 1 st codon position 2: 2 nd codon position 3: 3 rd codon position 4: non-coding	N/A; F81 N/A; F81 N/A; HKY N/A; JC
Dolichorhizoid; <i>RPB1</i>	RAxML; BEAST	Codon position/ Non-coding	4	1: 1 st codon position 2: 2 nd codon position 3: 3 rd codon position 4: non-coding	N/A; F81 N/A; F81 N/A; HKY N/A; JC
Dolichorhizoid; nrLSU	RAxML; BEAST	Locus	1	1: LSU	N/A; GTR+G

Dolichorhizoid; COR1	RAxML; BEAST	Locus	1	1: COR1	N/A; HKY+G
Dolichorhizoid; COR3	RAxML; BEAST	Locus	1	1: COR3	N/A; HKY
Dolichorhizoid; COR16	RAxML; BEAST	Locus	1	1: COR16	N/A; K80+G
Scabrosoid; 7-locus	RAxML; MrBayes, BEAST	PartitionFinder, BIC	6	1: COR3, ITS1 + ITS2, β -tubulin non-coding, <i>EFT2.1</i> non-coding 2: β -tubulin 1 st codon position, <i>RPB1</i> 1 st codon positions, <i>EFT2.1</i> 1 st codon position 3: 5.8S, β -tubulin 2 nd codon position 4: COR16, β -tubulin 3 rd codon position, <i>EFT2.1</i> 3 rd codon positions, <i>RPB1</i> 3 rd codon position 5: <i>EFT2.1</i> 2 nd codon position, <i>RPB1</i> 2 nd codon position 6: LSU, <i>RPB1</i> non-coding	N/A; HKY+G N/A; F81 N/A; JC N/A; K80+G N/A; F81 N/A; K80+I
Scabrosoid; 7-locus	*BEAST	Locus	7	1: ITS 2: LSU 3: β -tubulin 4: <i>EFT2.1</i> 5: <i>RPB1</i> 6: COR3 7: COR16	HKY+G HKY+I+G K80+G K80 HKY HKY K80
Scabrosoid; ITS	BEAST	Locus	1	1: ITS	HKY+G
Scabrosoid; ITS	RAxML	Coding/Non- coding	2	1: ITS1 + ITS2 2: 5.8S	N/A N/A
Scabrosoid; β -tubulin	RAxML	Codon position/ Non-coding	4	1: 1 st codon position	N/A

				2: 2 nd codon position	N/A
				3: 3 rd codon position	N/A
				4: non-coding	N/A
Scabrosoid; β -tubulin	BEAST	Locus	1	1: β -tubulin	K80+G
Scabrosoid; <i>EFT2.1</i>	RAxML	Codon position/ Non-coding	4	1: 1 st codon position	N/A
				2: 2 nd codon position	N/A
				3: 3 rd codon position	N/A
				4: non-coding	N/A
Scabrosoid; <i>EFT2.1</i>	BEAST	Locus	1	1: <i>EFT2.1</i>	K80
Scabrosoid; <i>RPBI</i>	RAxML	Codon position/ Non-coding	4	1: 1 st codon position	N/A
				2: 2 nd codon position	N/A
				3: 3 rd codon position	N/A
				4: non-coding	N/A
Scabrosoid; <i>RPBI</i>	BEAST	Locus	1	1: <i>RPBI</i>	HKY
Scabrosoid; nrLSU	RAxML; BEAST	Locus	1	1: LSU	N/A; HKY+I+G
Scabrosoid; COR3	RAxML; BEAST	Locus	1	1: COR3	N/A; HKY
Scabrosoid; COR16	RAxML; BEAST	Locus	1	1: COR16	N/A; K80