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> Amanda Barreto XAVIER-LEITE, Bruno Tomio GOTO, Marcela Eugenia da Silva CÁCERES & Robert LÜCKING

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Laboratoire de Botanique, Phytochimie et Mycologie / UMR -CNRS 5175 CEFE, Faculté de Pharmacie, 15, avenue Charles-Flahault, Université Montpellier I, BP 14491, 34093 Montpellier Cedex 5 (France)

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Naritsada THONGKLANG

Center of Excellence in Fungal Research, Mae Fah Luang University, 333 M. 1 T.Tasud Muang District, Chiang Rai 57100 (Thailand) Xiang-Hua WANG

CAS Key Laboratory for Plant Diversity and Biogeography of East Asia, Kunming Institute of Botany, Chinese Academy of Sciences, Lanhei Road 132, Kunming 650201, P. R. (China)

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Reclassification of species in the lichenized family Gomphillaceae Walt. Watson ex Hafellner (Ascomycota: Graphidales) using morphology-based phylogenetic binning

Amanda Barreto XAVIER-LEITE

Programa de Pós-Graduação em Sistemática e Evolução, CB, Universidade Federal do Rio Grande do Norte, Campus Universitário, 59072-970, Natal, Rio Grandedo Norte (Brazil) amandabxleite@hotmail.com

Bruno Tomio GOTO

Departamento de Botânica e Zoologia, CB, Universidade Federal do Rio Grande do Norte, Campus Universitário, 59072-970, Natal, Rio Grande do Norte (Brazil) brunogoto@hotmail.com

Marcela Eugenia da Silva CÁCERES

Departamento de Biociências, Universidade Federal de Sergipe, Avenida Vereador Olimpio Grande, s/n, Bairro Centro, CEP 49500-000, Itabaiana, Sergipe (Brazil) mscaceres@hotmail.com

Robert LÜCKING

Botanischer Garten und Botanisches Museum Berlin, Freie Universität Berlin, Königin-Luise-Strasse 6-8, 14195 Berlin (Germany) r.luecking@bo.berlin

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ABSTRACT

Results of phylogenetic analyses are often not translated into formal classifications, because only a portion of the taxa have been sequenced, making the placement of the remaining taxa unclear. This is the case for Gomphillaceae Walt. Watson ex Hafellner, which currently includes 422 accepted lichenized and 18 lichenicolous or fungicolous species, with only 27% having sequence data available. A separate, expanded phylogeny of the family recognized at least 19 further genus-level lineages, in addition to the 27 genera thus far distinguished, for a total of 46, making it necessary to reassess generic placement of a large number of non-sequenced species and to test the stability of the newly proposed classification. In the present study we applied the phenotype-based phylogenetic binning approach to address this problem. We selected 310 taxa, leaving out most species of Gyalidea Lettau ex Vězda and part of Gyalideopsis Vezda and Gyalectidium Müll. Arg., because the phylogenetic framework was either not yet well established (Gyalidea, Gyalideopsis) or the genus was well-defined phenotypically (Gyalectidium). Of the 310 selected species, 72 had sequence data available and served as reference taxa. The binning analysis for the 238 remaining taxa for which no molecular data were available placed 157 taxa (66%) with absolute support (100%) into a single node in the reference tree. Further 35 taxa appeared on two or more alternative nodes but had at least 90% support for one of these nodes. Another 24 taxa had between 70% and 89% support for a given node, resulting in a total of 216 out of 238 taxa (91%) with a supported placement in the tree. Of these, 181 were placed within one of the 46 genus-level lineages, whereas 35 clustered with unnamed nodes, indicating further, potentially KEY WORDS Foliicolous lichens, phenotype data, molecular data, phylogenetic binning, maximum likelihood. unrecognized genera. These mostly included non-foliicolous species of *Gyalideopsis* and relatives for which no sequenced taxa were in the molecular reference tree. Three further species of *Gyalideopsis* were placed with the outgroup. Most of the placements obtained through phylogenetic binning were consistent with anticipated placements from earlier studies. Only for a small portion of the taxa (about 10%), the binning results were in conflict with their current or previously predicted placement.

RÉSUMÉ

Reclassification des lichens de la famille Gomphillaceae Walt. Watson ex Hafellner (Ascomycota : Graphidales) à l'aide du regroupement phylogénétique basé sur la morphologie.

Les résultats de l'analyse phylogénétique ne sont souvent pas traduits en classifications formelles, car seule une partie des taxons a été séquencée, ce qui rend le placement des taxons restants peu clair. C'est le cas pour les Gomphillaceae Walt. Watson ex Hafellner, qui comprennent actuellement 422 espèces lichénisées et 18 espèces lichénicoles ou fongicoles acceptées, avec seulement 27% ayant des données de séquence disponibles. Une mise à jour de la phylogénie chez cette famille a permis la reconnaissance d'au moins 19 lignées supplémentaires ou nouvelles au niveau du genre, en plus des 27 genres connus jusqu'à présent, ce qui a rendu nécessaire de réévaluer le placement générique de nombreuses espèces non séquencées et de tester la stabilité des nouvelles lignées résultantes. Dans la présente étude, nous avons donc appliqué l'approche de regroupement phylogénétique à cette famille. Nous avons sélectionné un sous-ensemble de 310 espèces, en laissant de côté la plupart des espèces de Gyalidea Lettau ex Vèzda et une partie de Gyalideopsis Vězda et Gyalectidium Müll. Arg., soit parce que le cadre phylogénétique n'était pas encore bien établi pour ces genres (Gyalidea, Gyalideopsis), soit parce que le genre était par ailleurs bien défini et monophylétique (Gyalectidium). Sur les 310 espèces sélectionnées, 72 disposaient de données de séquence et servaient de taxons de référence. L'analyse de regroupement sur les 238 taxons restants et pour lesquels aucune donnée moléculaire n'était disponible a placé 157 taxons (66%) avec un support absolu (100%) dans un seul nœud de l'arbre de référence. Trente-cinq autres taxons sont apparus sur deux nœuds alternatifs ou plus, mais avaient au moins 90% de support pour un nœud; 24 autres taxons avaient entre 70 % et 89 % de support pour un nœud donné. Ainsi, 216 taxons sur 238 (91 %) avaient un support pour un nœud donné. Cependant, pour 35 d'entre eux, le placement des nœuds se trouvait dans une partie non résolue de l'arbre, indiquant des genres potentiellement non reconnus, comprenant principalement des espèces non foliicoles de Gyalideopsis et des taxons apparentés pour lesquels aucune séquence ne se trouvait dans l'arbre de référence. Trois autres espèces de Gyalideopsis ont été placées avec l'exogroupe. La plupart des taxons restants pouvaient être placés dans un genre donné en toute confiance, y compris les 19 genres nouvellement reconnus, et la plupart des placements obtenus par regroupement phylogénétique étaient cohérents avec les placements prévus, y compris des études antérieures. Pour une petite partie des taxons seulement (environ 10%), les résultats du regroupement étaient en conflit avec leur placement actuel ou prédit précédemment.

MOTS CLÉS Lichens folicoles, données phénotypiques, données moléculaires, binning phylogénétique, plausibilité maximum.

INTRODUCTION

Molecular phylogeny has revolutionized our understanding of relationships between taxa and their classification within the fungi, at all levels from phylum down to species. Since fungi have only a limited set of systematically useful phenotype characters available, molecular data are of particular importance to correctly delimit and classify taxa (James *et al.* 2006; Hibbett *et al.* 2007; McLaughlin *et al.* 2009; Rivas Plata *et al.* 2011, 2012a; Moncada *et al.* 2014; Dal-Forno *et al.* 2016; Spatafora *et al.* 2016; Ahrendt *et al.* 2018; Tedersoo *et al.* 2018; Galindo *et al.* 2021; Wijayawardene *et al.* 2022). Yet, traditionally, the classification of fungi and other organisms has been based on the paradigm that taxa should be recognized on the basis of phenotypic characters. Molecular methods were then used to test and re-investigate the phylogenetic relationships between phenotypically defined lineages (Grube *et al.* 2004; Lutzoni *et al.* 2004; Parnmen *et al.* 2012; Rivas Plata *et al.* 2012b).

Although sequencing methods have become relatively inexpensive and broadly available, often only a fraction of all taxa in a group have molecular data available, usually because fresh material is needed and many species have restricted distributions and/or are rare. Therefore, results of phylogenetic analyses are often not translated into formal classifications, because the placement of non-sequenced taxa remains unclear. Examples are widespread among fungi and a prominent example of tropical lichens is the Graphidaceae, in which about 20% of the known species have been sequenced and, in some genera, such as *Graphis* Adans. and its recent segregate *Allographa* Chevall., only about 10% (Lücking *et al.* 2009; Rivas Plata *et al.* 2011; Lücking & Kalb 2018). Thus, with the profound changes in classification in this family (Rivas Plata *et al.* 2012a; Parnmen *et al.* 2012; Lücking *et al.* 2015), the remaining species have to be placed within a new classification framework based on phenotype data alone.

An approach to overcome this problem is phenotype-based phylogenetic binning, a set of algorithms that provide a quantitative and testable mean to place taxa based on phenotype data within a phylogenetic framework of taxa for which both molecular and phenotype data are available (Berger et al. 2011a, b). This method was originally developed to place fossils into a phylogenetic tree but can equally be applied to extant taxa. Phylogenetic binning includes three key components: 1) building a phylogenetic framework (reference tree) using only taxa with molecular data available; 2) mapping phenotype characters onto the phylogeny for these taxa and computing character weights based on their distribution over the tree (homoplastic and uninformative characters are downweighed); and 3) invoking the Evolutionary Placement Algorithm (EPA) for all taxa lacking molecular data. This approach places ('bins') each taxon individually into the tree based on its weighted phenotype characters; it also features bootstrapping to evaluate consistency of the placement (Berger et al. 2011a). This method provides predictive, testable taxon placements and can quickly process a large number of taxa, since computational time only increases linearly. Besides providing predictive classifications for taxa lacking molecular data, a specific use of this method consists in the placement of types into a phylogenetic framework in order to fix the name of clades when no molecular data can be obtained from types (Lücking et al. 2015). The method can also be used as an identification tool (Lücking et al. 2023).

Thus far, phylogenetic binning has been mostly used with lichen fungi, such as Graphidaceae (Berger *et al.* 2011b; Rivas Plata *et al.* 2012b; Parnmen *et al.* 2012; Lücking *et al.* 2015; Lücking & Kalb 2018; Perlmutter *et al.* 2020). The method has also been employed for other organisms, including plants and sponges (Koch *et al.* 2012; Fang *et al.* 2013; Springer *et al.* 2015; Dohrmann *et al.* 2017; Testo *et al.* 2018).

Here, we apply the binning approach to the lichenized family Gomphillaceae, which currently includes 440 accepted species, among them 18 lichenicolous and fungicolous taxa (Lendemer 2017; Lücking et al. 2017; Diederich et al. 2018; Herrera-Campos et al. 2019; Gutteres et al. 2020; Roux et al. 2022). Lichenized members of this family are mostly found on leaves in wet tropical forests, but several lineages, particularly in the genus Gyalideopsis s.lat., also occur on other substrata and extend into temperate regions (Vězda & Poelt 1987; Kalb & Vězda 1988; Lücking 1997, 2008; Lücking et al. 2007; Lendemer 2017). Until recently, only 25 species (6%) had sequence data available, a proportion that was increased to 111 (25%), including several putatively new taxa, through a much expanded taxon sampling (Xavier-Leite et al. 2022). This latter study recognized at least 19 new genus-level lineages (Xavier-Leite et al. 2022, 2023), in addition to the 27 genera thus far distinguished (Etayo 2017; Lücking et al. 2017; Diederich et al. 2018; Gutteres et al. 2020), making it necessary to reassess generic placement of many additional species, particularly in the highly polyphyletic genera Aderkomyces Bat., Calenia Müll. Arg., Echinoplaca Fée, Gyalideopsis Vézda, and Tricharia Fée.

MATERIAL AND METHODS

Phenotype data

We relied on the phenotype data matrix first assembled by Lücking et al. (2005). This matrix originally contained 209 characters tailored for Gomphillaceae, but was extended here to 223 to allow the inclusion of the taxa previously placed in Asterothyriaceae and Solorinellaceae, namely the genera Asterothyrium Müll. Arg., Gyalidea Lettau ex Vězda (including Solorinella Anzi), Linhartia Sacc. & P. Syd., Phyllogyalidea Lücking, and Psorotheciopsis Rehm (Vězda 1973; Vězda & Poelt 1987; Lücking 1997, 1999, 2008; Aptroot & Lücking 2002; Henssen & Lücking 2002; Lücking et al. 2004, 2005). The mentioned genera were recently reclassified in Gomphillaceae (Lücking et al. 2017) and were also nested in that family in the most recent phylogenetic analysis (Xavier-Leite et al. 2022). In addition, some characters were accommodated to include the outgroup taxon, the genus Coenogonium Ehrenb. (Appendix 1).

While the recently published phylogenetic analysis used Fissurina Fée (in the sister group Graphidaceae) as outgroup (Xavier-Leite et al. 2022), in the binning analysis we opted for Coenogonium, an outgroup for both Gomphillaceae and Graphidaceae, which provides a better model for the assessment of ancestral apothecial types in these two families. The 223 characters were divided into five groups: 1) ecology (14 characters); 2) thallus morphology and anatomy (46); 3) apothecial morphology and anatomy (86); 4) hyphophore morphology and anatomy (67 characters); and 5) pycnidial morphology and anatomy (10). The matrix contained a total of 310 ingroup taxa, about 75% of the accepted species of Gomphillaceae, plus three Coenogonium outgroup species (Appendix 2). Most species of Gyalidea and about one third of the species of Gyalideopsis were excluded, since the molecular sampling for these taxa was insufficient to provide reliable binning results. We also included only a part of the genus Gyalectidium Müll. Arg., since this genus is phenotypically very distinctive, characterized by unique hyphophores and very uniform apothecial anatomy, and resulted monophyletic in both molecular and cladistic analyses (Ferraro et al. 2001; Lücking et al. 2004, 2005; Xavier-Leite et al. 2022).

MOLECULAR REFERENCE TREE

For the molecular reference tree, we first ran the same data set as Xavier-Leite *et al.* (2022), based on two molecular markers, the mitochondrial small subunit (mtSSU) and the nuclear large subunit (nuLSU) rDNA (see their supplementary table S1 for GenBank accession numbers), but with three *Coenogonium* species as outgroup (accession numbers AF279387, AF465442, AY300834, AY300884, AY584698, AY584699). We then used a subset of the data, representing one terminal per species, including 72 ingroup species and three outgroup taxa (Appendix 3). To compute the reference tree for the phylogenetic binning, the aligned dataset was subjected to maximum likelihood (ML) tree search using RAxML 8.2.0 (Stamatakis 2006, 2014; Stamatakis *et al.* 2008), employing the universal GTR-gamma model with ten slow

ML searches. To avoid topological artifacts of sampling bias relative to the complete data set, the topology was constrained under RAxML using the topology obtained by Xavier-Leite *et al.* (2022) for the full data set.

PHYLOGENETIC BINNING

With 75 taxa in the molecular reference tree and 313 in the full phenotype matrix, our goal was to bin 238 taxa based on their phenotype characters into the reference tree. In the first step of the binning method, the molecular reference tree and the matrix of 223 phenotype characters for the 75 sequenced taxa were used to compute a maximum likelihood weight vector in RAxML 7.2.6 (Berger et al. 2011a, b) that reflected the distribution of the phenotypic character states over the reference tree. Subsequently, applying the weight vector, the 238 non-sequenced query taxa were placed into the reference tree using the Evolutionary Placement Algorithm (EPA) implemented in RAxML 7.2.6 (Stamatakis et al. 2005, 2008; Stamatakis 2006; Berger et al. 2011a, b). Potential alternative placements were tested through non-parametric bootstrapping using 100 replicates. The classification tree was visualized in FigTree 1.4.0 (http://tree.bio.ed.ac.uk/software/figtree/); to make output tree file compatible with that program, it needed to be formatted by replacing the string ":1.0[" with "[" and the string "]" with "]:1.0". Also, query name strings with placements having the same bootstrap support and hence representing duplicate names were edited by adding the letters a, b, c, etc., to generate unique name strings for each terminal. The resulting classification table was converted from a space-delimited text into a tab-delimited spreadsheet format to summarize the results.

RESULTS

The molecular reference tree included 35 genus-level lineages, out of the 46 now recognized based on our previous phylogenetic study (Xavier-Leite et al. 2022, 2023; Fig. 1). Of these, 19 represented previously recognized and 16 newly recognized genera. The binning analysis for the 238 taxa for which no molecular data were available placed 157 taxa (66%) with absolute support (100%) into a single node in the reference tree (Table 1; Fig. 2; Appendices 4; 5). Further 35 taxa appeared on two or more alternative nodes but had at least 90% support for one of these nodes; another 24 taxa had between 70% and 89% support for a given node. Thus, 216 out of 238 taxa (91%) had at least basic support for a given node. For 35 of these species, the node placement was in an unresolved portion of the tree, mostly including non-foliicolous species of Gyalideopsis and relatives for which no sequenced taxon was in the reference tree; three further species of Gyalideopsis were placed with the outgroup, suggesting that the reference data set included no closely related taxa for these species. The remaining species were binned into one of the 35 genera in the reference tree. For 22 species (9%), the placement remained unresolved (Table 1; Fig. 2).

Most placements obtained by phylogenetic binning were consistent with anticipated placements from earlier studies, but for a small portion of the taxa (about 10%), the binning results were conflicting with their current or predicted placement (Table 1; Appendix 4). Most of these represented the genus Gyalideopsis, the largest genus in the family with over 100 species but for which only few sequenced reference taxa were available and for which a revised genus concept remains unclear. Others included presumably non-sequenced clades, such as Aplanocalenia inconspicua (Müll. Arg.) Lücking, Sérus. & Vězda, Ferraroa hyalina (Lücking) Lücking, Sérus. & Vězda, Hippocrepidea nigra Sérus., and Paratricharia paradoxa (Lücking) Lücking, which clustered with Calenia s.lat., Batistomyces Xavier-Leite, M.Cáceres & Lücking, Gyalectidium, and Caleniella Xavier-Leite, M.Cáceres & Lücking, respectively (Table 1). A surprising result was the binning of Aderkomyces couepiae Bat., the type of that genus, with the type of Arthotheliopsis Vain., A. hymenocarpoides Vain., and not with the clade presumed to represent the genus Aderkomyces, represented by the sequenced species A. papilliferus (Lücking) Lücking, Sérus. & Vězda and two undescribed species (Table 1; Appendix 4). About 50 taxa, roughly one fourth of the taxon sampling, were placed in one of the 16 newly recognized genera included in the reference tree, based on our broader phylogenetic analysis (Xavier-Leite et al. 2022). These have been formally recombined into the new genera in a parallel paper (Xavier-Leite *et al.* 2023).

DISCUSSION

Gomphillaceae is a highly diverse family of lichenized fungi, with a potentially high number of yet unrecognized, partially cryptic species (Xavier-Leite et al. 2022). Even considering the large set of 223 phenotype characters scored here for this family (based on Lücking et al. 2005), Gomphillaceae is not well understood in terms of its internal classification and the usefulness of phenotype characters to delimit genera and species. Studies on this family continue to discover new species and genera on a regular basis (Lücking et al. 2007; Lücking 2008; Menezes et al. 2013; Lücking et al. 2017; Etayo 2017; Lendemer 2017; Xavier-Leite et al. 2018; Herrera-Campos et al. 2019; Gutteres et al. 2020; Roux et al. 2022). For better-sampled species complexes, the most recent molecular phylogeny (Xavier-Leite et al. 2022) is an indication of the taxonomic diversity in the family, revealing a great deal of hidden diversity in presumably known taxa, such as Gyalectidium filicinum Müll. Arg. and Microxyphiomyces (Tricharia) vainioi (R.Sant.) Xavier-Leite, M.Cáceres & Lücking.

This situation is comparable with Graphidaceae, which traditionally comprised 12 genera in two families and now contains over 80 genera and well over 2000 species (Rivas Plata *et al.* 2012a; Lücking *et al.* 2017; Miranda-González *et al.* 2020), with over 3500 predicted (Lücking *et al.* 2014). Since genera should represent clades (i.e., monophyletic groups), but as rank-based units are abstract entities, the



Fig. 1. — The molecular reference tree (maximum likelihood tree) showing 35 genus-level lineages of Gomphillaceae Walt. Watson ex Hafellner and the relationships among genera. The molecular phylogenetic analysis resulted in 13 new genera and three newly reinstated genera for the family (marked in blue).

TABLE 1. — Result of the phylogenetic binning for the 238 query taxa in relation to the 75 reference taxa. Taxa are listed in alphabetical order and for each taxon, all alternative node placements are given, in descending order of support. Node identifications (**ID**) are listed for each node and the final genus placement is indicated for each species; genus placement is necessarily consistent with Node ID for placements with low support. In cases where the placement was not resolved or conflict was detected, we adopted a conservative genus placement (**indicated in brackets**). The table is also available in spreadsheet format (Appendix 4).

Taxon	Node	Support	Node ID	Genus placement
Actinoplaca strigulacea	190	[ref]	Actinoplaca	Actinoplaca
Aderkomyces albostrigosus	13	[ref]	Spinomyces	Spinomyces
Aderkomyces albostrigosus f. aggregatus	14	[ref]	Spinomyces	Spinomyces
Aderkomyces armatus	l118	100	Gyalideopsis applanata clade	[Aderkomyces]
Aderkomyces carneoalbus	111	[ref]	Roselviria	Roselviria
Aderkomyces couepiae	1125	100	Arthotheliopsis	[Aderkomyces]
Aderkomyces cretaceus	11	100	unresolved	[Aderkomyces]
Aderkomyces cubanus	1	100	unresolved	[Aderkomyces]
Aderkomyces deslooveri	12	100	Spinomyces	Spinomyces
Aderkomyces dilatatus	1/1	100	Aderkomyces s.str.	Aderkomyces
Aderkomyces fumosus	11	100	unresolved	[Aderkomyces]
Aderkomyces guatemalensis	12	96	Spinomyces	Spinomyces
Aderkomyces gualemaiensis	1104	4 [rof]		Spiriorityces
Aderkomyces lebulicarpus	1134	[[e]] 50	Posolviria	Posolviria
Aderkomyces lobulicarpus	19	34	Roselviria	Roselviria
Aderkomyces lobulicarpus	1106	16	Tricharia	Roselviria
Aderkomyces microcarpus	12	100	Spinomyces	Spinomyces
Aderkomyces microtrichus	1101	99	Calenia-Echinoplaca grade	[Calenia]
Aderkomyces microtrichus	1141	1	Echinoplaca	[Calenia]
Aderkomyces papilliferus	171	[ref]	Aderkomvces s.str.	Aderkomvces
Aderkomyces planus	1134	100	Psathyromyces	Psathyromyces
Aderkomyces pruinosus	1133	[ref]	Psathyromyces	Psathyromyces
Aderkomyces purulhensis	110	[ref]	Roselviria	Roselviria
Aderkomyces ramiferus	11	100	unresolved	[Aderkomyces]
Aderkomyces subalbostrigosus	1118	99	Gyalideopsis applanata clade	[Gyalideopsis]
Aderkomyces subalbostrigosus	153	1	Microxyphiomyces	[Gyalideopsis]
Aderkomyces subplanus	11	100	unresolved	[Aderkomyces]
Aderkomyces verruciferus	1126	53	Verruciplaca	[Aderkomyces]
Aderkomyces verruciferus	1127	29	Verruciplaca	[Aderkomyces]
Aderkomyces verruciferus	1132	8	Psathyromyces	[Aderkomyces]
Aderkomyces verruciferus	12	8	Spinomyces	[Aderkomyces]
Aderkomyces verruciferus	1118	2	Gyalideopsis applanata clade	[Aderkomyces]
Aderkomyces verrucosus	12	100	Spinomyces	Spinomyces
Artnotnellopsis nymenocarpoides	1125	100	Arthotheliopsis	Arthotheliopsis
Arthotheliopsis planicarpus	1120	100	Arthotheliopsis	Arthotheliopsis
Arthotheliopsis tricharioidas	1125	[rof]	Arthotholiopsis	Arthotheliopsis
Asterothyrium anomalum	125	100	Asterothyrium	Asterothyrium
Asterothyrium argenteum	120	100	Asterothyrium	Asterothyrium
Asterothyrium aspidospermatis	126	82	Asterothyrium	Asterothyrium
Asterothyrium aspidospermatis	131	18	Psorotheciopsis	Asterothvrium
Asterothvrium atromarginatum	127	100	Asterothvrium	Asterothvrium
Asterothyrium aulaxinoides	125	99	Asterothyrium	Asterothyrium
Asterothyrium aulaxinoides	124	1	Asterothyrium	Asterothyrium
Asterothyrium bisporum	126	100	Asterothyrium	Asterothyrium
Asterothyrium chroodisciforme	125	100	Asterothyrium	Asterothyrium
Asterothyrium decipiens	124	100	Asterothyrium	Asterothyrium
Asterothyrium filiforme	131	100	Psorotheciopsis	[Asterothyrium]
Asterothyrium gigantosporum	125	100	Asterothyrium	Asterothyrium
Asterothyrium gyalideoides	120	100	Linhartia	[Asterothyrium]
Asterothyrium hedbergii	124	100	Asterothyrium	Asterothyrium
Asterothyrium leptosporum	122	100	Asterothyrium	Asterothyrium
Asterothyrium leucophthalmum	122	[ref]	Asterothyrium	Asterothyrium
Asterothyrium longisporum	125	[ret]	Asterothyrium	Asterothyrium
Asterothyrium monosporum	127	[rei]	Asterothyrium	Asterothyrium
Asterothyrium monosporum	120	17	Asterothyrium	Asterothyrium
Asterothyrium octomerum	120	100	Asterothyrium	Asterothyrium
Asterothyrium pallidum	126	52	Asterothyrium	Asterothyrium
Asterothyrium pallidum	125	48	Asterothyrium	Asterothvrium
Asterothyrium pernambucense	126	100	Asterothvrium	Asterothvrium
Asterothvrium pittieri	125	100	Asterothvrium	Asterothvrium
Asterothyrium rondoniense	125	100	Asterothyrium	Asterothyrium
Asterothyrium rostratum	127	58	Asterothyrium	Asterothyrium
Asterothyrium rostratum	126	42	Asterothyrium	Asterothyrium
Asterothyrium rotuliforme	126	[ref]	Asterothyrium	Asterothyrium

Taxon	Node	Support	Node ID	Genus placement
Asterothvrium segmentatum	119	81	Asterothvrium-Linhartia	[Asterothvrium]
Asterothyrium segmentatum	126	19	Asterothyrium	[Asterothyrium]
Asterothyrium septemseptatum	126	100	Asterothyrium	Asterothyrium
Asterothyrium subargenteum	127	100	Asterothyrium	Asterothyrium
Asterothyrium tetrasporum	125	99	Asterothyrium	Asterothyrium
Asterothyrium tetrasporum	124	1	Asterothyrium	Asterothyrium
Asterothyrium umbilicatum	131	100	Psorotheciopsis	[Asterothyrium]
Asterothyrium uniseptatum	125	100	Asterothyrium	Asterothyrium
Asterothyrium vezdae	126	100	Asterothyrium	Asterothyrium
Aulaxina aggregata	145	78	Aulaxina	Aulaxina
		100	Adelphomyces	Aulaxina
Aulaxina conticola	144	100	Aulaxina	Aulaxina
Aulaxina eninhulla	145	100	Διμαχίηα	Aulaxina
Aulaxina opprijna Aulaxina intermedia	140	[ref]	Aulaxina	Aulaxina
Aulaxina microphana	144	99	Aulaxina	Aulaxina
Aulaxina microphana	142	1	Aulaxina	Aulaxina
Aulaxina minuta	141	ſrefl	Aulaxinella	Aulaxinella
Aulaxina multiseptata	144	100	Aulaxina	Aulaxina
Aulaxina opegraphina	145	[ref]	Aulaxina	Aulaxina
Aulaxina quadrangula	147	[ref]	Aulaxina	Aulaxina
Aulaxina submuralis	150	[ref]	Aulaxina	Aulaxina
Aulaxina uniseptata	141	100	Aulaxinella	Aulaxinella
Aulaxina unispora	145	100	Aulaxina	Aulaxina
Bullatina aspidota	175	[ref]	Bullatina	Bullatina
Calenia africana	186	100	Calenia-Echinoplaca grade	[Calenia]
Calenia applanata	190	100	Actinoplaca	[Aplanocalenia]
Calenia areolata	179	100	Calenia-Echinoplaca grade	[Calenia]
Calenia bullatinoides	188	[ret]	Calenia-Echinoplaca grade	[Calenia]
Calenia depressa	196	[ret]	Calenia-Echinoplaca grade	
	1/0	100	Calenia-Echinoplaca grade	
	100	99 1	Calenia-Echinoplaca grade	
Calenia echinoplacoldes	173	90	Calenia-Echinoplaca grade	
Calenia flava	197	5	Calenia-Echinoplaca grade	[Calenia]
Calenia flava	196	4	Calenia-Echinoplaca grade	[Calenia]
Calenia flava	179	1	Calenia-Echinoplaca grade	[Calenia]
Calenia fumosa	186	100	Calenia-Echinoplaca grade	[Calenia]
Calenia graphidea	184	[ref]	Calenia-Echinoplaca grade	[Calenia]
Calenia inconspicua	177	43	Calenia-Echinoplaca grade	Aplanocalenia
Calenia inconspicua	116	32	Monocalenia	Aplanocalenia
Calenia inconspicua	118	16	Monocalenia	Aplanocalenia
	190	9	Actinopiaca	Aplanocalenia
	190	49		[Calenia]
Calenia leptocarpa	180	40	Calenia-Echinoplaca grade	[Calenia]
Calenia leptocarpa	198	2	Calenia-Echinoplaca grade	[Calenia]
Calenia lobulata	173	_ [ref]	Calenia-Echinoplaca grade	[Calenia]
Calenia lueckingii	182	[ref]	Calenia-Echinoplaca grade	[Calenia]
Calenia maculans	139	100	Caleniella	Caleniella
Calenia microcarpa	158	100	Gyalectidium	Gyalectidium
Calenia minuta	189	86	Calenia-Echinoplaca grade	[Calenia]
Calenia minuta	188	11	Calenia-Echinoplaca grade	[Calenia]
Calenia minuta	191	3	Vezdamyces	[Calenia]
Calenia monospora	118	[ref]	Monocalenia	Monocalenia
Calenia obtecta	176	100	Calenia-Echinoplaca grade	[Calenia]
Calenia philippinensis	179	100	Calenia-Echinoplaca grade	[Calenia]
Calenia phyllogena	197	[ret]	Calenia-Echinoplaca grade	
	173	100	Calenia-Echinoplaca grade	
	179	100	Monocolonia	[Calenia] Monocolonia
Calenia rolandiana	128	14	unresolved	Monocalenia
Calenia solorinoides	117	[ref]	Pseudocalenia	Pseudocalenia
Calenia subdepressa	186	53	Calenia-Echinoplaca grade	[Calenia]
Calenia subdepressa	179	47	Calenia-Echinoplaca grade	[Calenia]
Calenia submuralis	179	lrefl	Calenia-Echinoplaca grade	[Calenia]
Calenia thelotremella	179	97	Calenia-Echinoplaca grade	[Calenia]
Calenia thelotremella	197	3	Calenia-Echinoplaca grade	[Calenia]
Calenia triseptata	139	[ref]	Caleniella	Caleniella
Calenia viridis	118	100	Monocalenia	Monocalenia

Taxon	Node	Support	Node ID	Genus placement
Caleniopsis laevigata	143	[ref]	Caleniopsis	Caleniopsis
Caleniopsis tetramera	143	100	Caleniopsis	Caleniopsis
Coenogonium leprieurii	l146	[ref]	outgroup	[outgroup]
Coenogonium luteum	l143	[ref]	outgroup	[outgroup]
Coenogonium pineti	l145	[ref]	outgroup	[outgroup]
Diploschistella athalloides	114	50	Santricharia	[Diploschistella]
Diploschistella athalloides	132	50	Gyalidea	[Diploschistella]
Diploschistella lithophila	114	57	Santricharia	[Diploschistella]
Diploschistella lithophila	11	41	unresolved	[Diploschistella]
Diploschistella lithophila	132	2	Gyalidea	[DIPIOSCIIISTEIIA] [Diploschistelle]
Diploschistella solonnenaeronnis	132	96	Antrootidea	[Diploschistella]
Diploschistella trapperi	132	3	Gvalidea	[Diploschistella]
Diploschistella trapperi	1118	1	Gvalideopsis applanata clade	[Diploschistella]
Diploschistella urceolata	11	100	unresolved	[Diploschistella]
Echinoplaca amapensis	1102	100	Aptrootidea	Aptrootidea
Echinoplaca atrofusca	144	86	Aulaxina	[Áptrootidea]
Echinoplaca atrofusca	I102	14	Aptrootidea	Aptrootidea
Echinoplaca atromuralis	1102	100	Aptrootidea	Aptrootidea
Echinoplaca bispora	1121	100	Gomphillus	[Gyalideopsis]
Echinoplaca campanulata	1141	[ref]	Echinoplaca	Echinoplaca
Echinoplaca diffluens	199	[ref]	Calenia-Echinoplaca grade	[Echinoplaca]
Echinoplaca epiphylla	1140	[ref]	Echinoplaca	Echinoplaca
Echinoplaca epipnylloides	1//	98	Calenia-Echinoplaca grade	[Calenia]
Echinoplaca epiphylioldes	1140	∠ 100	Vorruciplaca	[Calenia] Sinmanidaa
Echinoplaca furcata subsp. peotropica	1129	[rof]	Verruciplaca	Sipmanidea
Echinoplaca fusconitida	1137	100	Rezerronlaca	Bezerroplaca
Echinoplaca gemmifera	190	100	Actinoplaca	Actinoplaca
Echinoplaca handelii	1140	94	Echinoplaca	Echinoplaca
Echinoplaca handelii	177	6	Calenia-Echinoplaca grade	Echinoplaca
Echinoplaca hispida	177	100	Calenia-Echinoplaca grade	[Calenia]
Echinoplaca incrustatociliata	1137	91	Bezerroplaca	Bezerroplaca
Echinoplaca incrustatociliata	1138	6	Sporocybomyces	Bezerroplaca
Echinoplaca incrustatociliata	1136	3	Calenia-Echinoplaca grade	Bezerroplaca
Echinoplaca intercedens	1101	[ref]	Calenia-Echinoplaca grade	[Calenia]
Echinoplaca leucomuralis	1138	100	Sporocybomyces	Sporocybomyces
Echinoplaca leucotricholdes	1138	[ref]	Sporocybornyces	Sporocybornyces
Echinoplaca lucernilera Echinoplaca macgrogorii	1137	100	Sparacyhomycos	Sparacyborrycos
Echinoplaca madagascariensis	1101	98	Calenia-Echinoplaca grade	[Calenia]
Echinoplaca madagascariensis	190	2	Actinoplaca	[Calenia]
Echinoplaca marginata	1102	[ref]	Aptrootidea	Aptrootidea
Echinoplaca melanothrix	1136	70	Calenia-Echinoplaca grade	[Echinoplaca]
Echinoplaca melanothrix	1135	25	Calenia-Echinoplaca grade	[Echinoplaca]
Echinoplaca melanothrix	l140	4	Echinoplaca	[Echinoplaca]
Echinoplaca melanothrix	1139	1	Echinoplaca	[Echinoplaca]
Echinoplaca pachyparaphysata	1137	100	Bezerroplaca	Bezerroplaca
Echinoplaca pellicula	177	[ref]	Calenia-Echinoplaca grade	[Calenia]
Echinoplaca purpurea	1136	68	Calenia-Echinoplaca grade	[Echinoplaca]
Echinoplaca purpurea	1135	32	Calenia-Echinoplaca grade	[Echinoplaca]
Echinoplaca similis	1140	98	Comphillup	[ECNINOPIACA] [Echinoplaca]
Echinoplaca stroimonnii	1121	∠ 100	Bozorropiaca	[ECIIIIOpiaca] Pozorropiaca
Echinoplaca subsimilis	1107	100	Gomphillus	[Gyalideonsis]
Echinoplaca tetranla	186	[ref]	Calenia-Echinoplaca grade	[Calenia]
Echinoplaca triseptata	1102	100	Aptrootidea	Aptrootidea
Echinoplaca verrucifera	1131	[ref]	Verruciplaca	Sipmanidea
Echinoplaca verrucifera f. calcarea	1130	[ref]	Verruciplaca	Sipmanidea
Echinoplaca vezdana	199	100	Calenia-Echinoplaca grade	[Échinoplaca]
Echinoplaca wilsonii	144	100	Aulaxina	Aptrootidea
Epilithia cristata	1125	76	Arthotheliopsis	[Ġyalideopsis]
Epilithia cristata	1141	14	Echinoplaca	[Gyalideopsis]
Epilithia cristata	132	10	Gyalidea	[Gyalideopsis]
Gomphillus americanus	1122	100	Gomphillus	Gomphillus
Gomphillus calycioides	1123	[ret]	Gomphillus	Gomphillus
Gompnillus opniosporus	1122	[reī]	Gomphillus	Gomphillus
Gyalectiolum areolatum	100	100	Gyalectidium	Gyalectidium Gyalectidium
Gyalectidium aurolii	168	100	Gvalectidium	Gvalectidium
ayaroonann auronn	100	.00	ayaloolialam	ayaroonanan

Gyalectolium Oyalectolium Oyalectolium Oyalectolium Gyalectolium Gyalectolium Gyalectolium Gyalectolium Gyalectolium Gyalectolium HS 100 Gyalectolium	Taxon	Node	Support	Node ID	Genus placement
Galectidium actatum IBB 100 Gyalectidium Gyalectidium Gyalectidium Galectidium caucasicum IIII [ref] Gyalectidium Gyalectidium Gyalectidium Galectidium caucasicum IIII [ref] Gyalectidium Gyalectidium Gyalectidium Galectidium conchiferum IBS 100 Gyalectidium Gyalectidium Gyalectidium Gyalectidium conchiferum IBS 22 Gyalectidium Gy	Gyalectidium australe	161	100	Gyalectidium	Gyalectidium
Gyalectidium cassicum 1167 [ref] Gyalectidium Gyalectidium Gyalectidium Galectidium cassicum 1161 100 Gyalectidium Gyalectid	Gyalectidium barbatum	168	100	Gyalectidium	Gyalectidium
Gyalectidium Gyalectidium Gyalectidium Gyalectidium Gyalectidium Gyalectidium Field Gyalectidium Gyalectidium Gyalectidium Gyalectidium Field </td <td>Gyalectidium catenulatum</td> <td>1167</td> <td>[ref]</td> <td>Gyalectidium</td> <td>Gyalectidium</td>	Gyalectidium catenulatum	1167	[ref]	Gyalectidium	Gyalectidium
Gyalectidium cohchum Bit 100 Gyalectidium Gyalectidium Gyalectidium Gyalectidium conchlerum B7 64 Gyalectidium Gyalectidium<	Gyalectidium caucasicum	1161	[ref]	Gyalectidium	Gyalectidium
Gyalecticium conchrierum IB5 100 Gyalecticium Gyalecticium Gyalecticium Graiesticium conchrierum IBS 32 Graiesticium Gyalecticium Gyalecticium Graiesticium conchrierum IBS 32 Graiesticium Gyalecticium	Gyalectidium ciliatum	161	100	Gyalectidium	Gyalectidium
Gyalectidium conchiferum Ib7 64 Gyalectidium Gyalectidium Gyalectidium Gyalectidium conchiferum IB8 4 Gyalectidium Gyalectid	Gyalectidium colchicum	165	100	Gyalectidium	Gyalectidium
Gyalectidium conchiferum IBS 3.2 Gyalectidium Gyalectidium Gyalectidium controla IB2 9.6 Calenia, E-chinoplaca grade [Calenia] Gyalectidium controla IB2 9.6 Calenia, E-chinoplaca grade [Calenia] Gyalectidium controla IB2 0.6 Gyalectidium Gyalectidium Gyalectidium controla IB3 IG Gyalectidium Gyalectidium Gyalectidium finitum- IB3 IG Gyalectidium Gyalectidium Gyalectidium finitum- IB3 IOO Gyalectidium Gyalectidium Gyalectidium finitum- IB3 IOO Gyalectidium Gyalectidium Gyalectidium finitum- IB4 IOO Gyalectidium Gyalectidium Gyalectidium finitum- IB5 IOO <	Gyalectidium conchiferum	167	64	Gyalectidium	Gyalectidium
Gyalectidium conchiferum IB8 4 Gyalectidium Gyalectidium Gyalectidium Gyalectidium corticola 173 2 Calenia E-chinoplaca grade [Calenia] Gyalectidium denticulatum 1165 100 Gyalectidium Gyalectidium Gyalectidium denticulatum 1165 100 Gyalectidium Gyalectidium Gyalectidium 1168 100 Gyalectidium Gyalectidium Gyalectidium discinum 163 100 Gyalectidium Gyalectidium Gyalectidium discinum 163 100 Gyalectidium Gyalectidium Gyalectidium discutum 163 100 Gyalectidium Gyalectidium Gyalectidium discutum 168 100 Gyalectidium Gyalectidium Gyalectidium maracae 165 100 Gyalectidium Gyalectidium Gyalectidium maracae 161 12 Gyalectidium Gyalectidium Gyalectidium minus 168 100 Gyalectidium Gyalectidium Gyalectidium moruguineense 161 1	Gyalectidium conchiferum	165	32	Gyalectidium	Gyalectidium
Gyalectidum corticola IB2 BB Calenia -Echnoplaca grade [Calenia] Gyalectidum corticola IT3 2 Calenia -Echnoplaca grade [Calenia] Gyalectidum deritoulatum It65 [Ie1] Gyalectidum Gyalectidum Gyalectidum Gyalectidum filterum It63 [Ie1] Gyalectidum Gyalectidum Gyalectidum Gyalectidum filterum-lobatum It63 [Ie1] Gyalectidum Gyalectidum Gyalectidum Gyalectidum filterum-lobatum It63 [Ie1] Gyalectidum Gyalectidum Gyalectidum Gyalectidum filterum-lobatum It63 [Ie1] Gyalectidum Gyalectidum Gyalectidum Gyalectidum filterum It65 100 Gyalectidum Gyalectidum Gyalectidum Gyalectidum marcaa It63 100 Gyalectidum Gyalectidum Gyalectidum Gyalectidum marcaa It63 100 Gyalectidum Gyalectidum Gyalectidum Gyalectidum marcaa It63 100 Gyalectidum Gyalectidum Gyalectidum	Gyalectidium conchiferum	168	4	Gyalectidium	Gyalectidium
Gyalectolium corticola 173 2 Claima-t-Chrinopica grade [Canal] Gyalectolium skuchal 165 [ref] Gyalectolium Gyalectolium Gyalectolium Gyalectolium Instacturum 165 100 Gyalectolium Gyalectolium Gyalectolium Gyalectolium Instacturum 163 100 Gyalectolium Gyalectolium Gyalectolium Gyalectolium Instacturum 161 100 Gyalectolium Gyalectolium Gyalectolium Gyalectolium Answiskanum 161 100 Gyalectolium Gyalectolium Gyalectolium Gyalectolium Answiskanum 163 100 Gyalectolium Gyalectolium Gyalectolium Gyalectolium Ansracea 165 100 Gyalectolium Gyalectolium Gyalectolium Gyalectolium marcea 161 120 Gyalectolium Gyalectolium Gyalectolium Gyalectolium moroguneense 161 100 Gyalectolium Gyalectolium Gyalectolium Gyalectolium moroguneense 161 100 Gyalectolium Gyalectolium<	Gyalectidium corticola	182	98	Calenia-Echinoplaca grade	[Calenia]
Gyalectidium Graft Gyalectidium Gyalectidium Gyalectidium Gyalectidium Gyalectidium Gyalectidium Gyalectidium Gyalectidium Gy	Gyalectidium corticola	1/3	2	Calenia-Echinoplaca grade	[Calenia]
Gyalectidium Box DUD Gyalectidium Gyalectidium Gyalectidium Gyalectidium Biskuthum Biskuthum Biskuthum Gyalectidium		1165	[ret]	Gyalectidium	Gyalectidium
Gyalectidium Close Gyalectidium Gyalectidium Gyalectidium Gyalectidium Hintonum H63 100 Gyalectidium Gyalectidium Gyalectidium Hintonum H65 100 Gyalectidium Gyalectidium Gyalectidium Hintonum H65 100 Gyalectidium Gyalectidium Gyalectidium Hintonum H66 100 Gyalectidium Gyalectidium Gyalectidium Hintonum H66 100 Gyalectidium Gyalectidium Gyalectidium Hintonum H66 100 Gyalectidium Gyalectidium Gyalectidium Hintonum H65 100 Gyalectidium Gyalectidium Gyalectidium Hintonum H65 100	Gyalectidium eskuchel	100	100	Gyalectidium	Gyalectidium
Gyalectidium Instructure Instructure Gyalectidium Gyalectidium Gyalectidium Gyalectidium Gyalectidium Gyalectidium Gyalectidium Gyalectidium <td>Gyalectidium filiainum</td> <td>100</td> <td>100</td> <td>Gyalectidium</td> <td>Gyalectidium</td>	Gyalectidium filiainum	100	100	Gyalectidium	Gyalectidium
Oralecticulum 100 Opalecticulum Opalecticulum Opalecticulum Spalecticulum Opalecticulum Opalecticulum Opalecticulum	Gyalectidium filicinum lobatum	1103	100	Gyalectidium	Gyalectidium
Opelectidium inscrum 163 100 Opelectidium Opelectidium Opelectidium gehavisukanum 161 100 Gradectidium Opelectidium Opelectidium gehavisukanum 165 100 Gradectidium Opelectidium Opelectidium imperfectum 165 100 Gradectidium Opelectidium Opelectidium markace 165 100 Gradectidium Opelectidium Opelectidium morbanace 163 100 Gradectidium Opelectidium Opelectidium morbanace 161 12 Opelectidium Opelectidium Opelectidium norbanace 161 12 Opelectidium Opelectidium Opelectidium norbanace 161 100 Opelectidium Opelectidium Opelectidium pellicun 165 100 Opelectidium Opelectidium Opelectidium norbanace 165 100 Opelectidium Opelectidium Opelectidium pellicun Opelectidium Opelectidium Opelectidium Opelectidium norbanace 165 100 Opelectidium	Gyalectidium flabellatum	161	100	Gyalectidium	Gyalectidium
Grabetchium gatawisukanum 161 100 Grabetchium Grabetchium Grabetchium Grabetchium Grabetchium Imperfectum 165 100 Grabetchium Grabetchium Grabetchium Grabetchium Grabetchium Imperfectum 165 100 Grabetchium Grabetchium Grabetchium Grabetchium Grabetchium Imperfectum 168 100 Grabetchium Grabetchium Grabetchium Grabetchium Imperfectum 168 88 Grabetchium Grabetchium Grabetchium Impurs 168 88 Grabetchium Grabetchium Grabetchium Impurs 161 12 Grabetchium Grabetchium Grabetchium Impurs 165 100 Grabetchium Grabetchium Grabetchium Indiatum 165	Gyalectidium fuscum	168	100	Gvalectidium	Gvalectidium
Gyalectidium imperfectuum 168 [refl] Gyalectidium Gyalecctidium </td <td>Gyalectidium gabavisukanum</td> <td>161</td> <td>100</td> <td>Gvalectidium</td> <td>Gvalectidium</td>	Gyalectidium gabavisukanum	161	100	Gvalectidium	Gvalectidium
Gyalectidium Kenyanum ISS 100 Gyalectidium Gyalectidium <thgyalidecpsis< th=""> Gyalectidium</thgyalidecpsis<>	Gvalectidium imperfectum	1168	[ref]	Gvalectidium	Gvalectidium
Gyalectidium marcaae IES 100 Gyalectidium Gyalectidium Gyalectidium Gyalectidium marcaae IES 100 Gyalectidium Gyalectidium Gyalectidium minus IES 100 Gyalectidium Gyalectidium Gyalectidium pairnicola IES 100 Gyalectidium Gyalectidium Gyalectidium quinticola IES 100 Gyalectidium Gyalectidium Gyalectidium quinticola IES 100 Gyalectidium Gyalectidium Gyalectidium varculosum IES 100 Gyalectidium Gyalectidium Gyalectidium varculosum IES 100 Gyalectidium Gyalectidium Gyaledeposis attrenu IES 100 Gyalectidium Gyalectidium Gyaledeposis attrenu IES 100 <t< td=""><td>Gvalectidium kenvanum</td><td>165</td><td>100</td><td>Gvalectidium</td><td>Gvalectidium</td></t<>	Gvalectidium kenvanum	165	100	Gvalectidium	Gvalectidium
Gyalectidium maracae I65 100 Gyalectidium Gyalectidium <thgyalectidium< th=""> Gyalecitidium</thgyalectidium<>	Gyalectidium laciniatum	165	100	Gyalectidium	Gyalectidium
Gyalectidium membranaceum I68 100 Gyalectidium Gyalectidium Gyalectidium Gyalectidium minus I61 12 Gyalectidium	Gyalectidium maracae	165	100	Gyalectidium	Gyalectidium
Gyalectidium minus I68 88 Gyalectidium Gyalectidium Gyalectidium Gyalectidium novoguineense I61 100 Gyalectidium Gyalectidium Gyalectidium Gyalectidium pallicum I65 100 Gyalectidium Gyalectidium Gyalectidium Gyalectidium puntiloi I60 100 Gyalectidium Gyalectidium Gyalectidium Gyalectidium autilatum I65 100 Gyalectidium Gyalectidium Gyalectidium aphriae I65 100 Gyalectidium Gyalectidium Gyaledopsis actinoplacoides I118 I00 Gyalectidium Gyalectidium Gyaledopsis applanata I11 100 unresolved Gyalideopsis	Gyalectidium membranaceum	168	100	Gyalectidium	Gyalectidium
Gyalectidium minus I61 12 Gyalectidium Gyalectidium Gyalectidium Gyalectidium palticum I65 100 Gyalectidium Gyalectidium <td>Gyalectidium minus</td> <td>168</td> <td>88</td> <td>Gyalectidium</td> <td>Gyalectidium</td>	Gyalectidium minus	168	88	Gyalectidium	Gyalectidium
Gyalecticilum novoguineense I61 100 Gyalecticilum Gyalecticilum Gyalecticilum Gyalecticilum palmicola I60 100 Gyalecticilum Gyalecticilum Gyalecticilum Gyalecticilum palmicola I60 100 Gyalecticilum Gyalecticilum Gyalecticilum Gyalecticilum radiatum I65 100 Gyalecticilum Gyalecticilum Gyalecticilum ulloae I65 100 Gyalecticilum Gyalecticilum Gyalecticilum variau I65 100 Gyalecticilum Gyalecticilum Gyalecticilum variau I65 100 Gyalecticilum Gyalecticilum Gyalecticilum variau I64 Irefl Gyalidea Gyalidea Gyalideopsis actinoplacoides I118 100 Gralideopsis applanata Gyalideopsis Gyalideopsis aduporunosa I11 100 ruresolved Gyalideopsis Gyalideopsis applanata I14 100 ruresolved Gyalideopsis Gyalideopsis bispora I107 3 Tricharia Gyalideopsis	Gyalectidium minus	161	12	Gyalectidium	Gyalectidium
Gyalecticium pallicum I65 100 Gyalecticium Gyalecticium Gyalecticium palmicola I60 100 Gyalecticium Gyalecticium Gyalecticium palmicola I60 100 Gyalecticium Gyalecticium Gyalecticium setiferum I65 100 Gyalecticium Gyalecticium Gyalecticium setiferum I65 100 Gyalecticium Gyalecticium Gyalecticium vertuculosum I65 100 Gyalecticium Gyalecticium Gyalecticium vertuculosum I65 100 Gyalecticium Gyalecticium Gyaleda hyalinescens I33 [ref] Gyalidea Gyalidea Gyalideopsis actinoplacoides I118 100 Gyalideopsis applanata clade Gyalideopsis Gyalideopsis albopunosa I11 100 unresolved [Gyalideopsis] Gyalideopsis alponunosa I11 100 unresolved [Gyalideopsis] Gyalideopsis alponunosa I11 100 unresolved [Gyalideopsis] Gyalideopsis bispora I1 100	Gyalectidium novoguineense	161	100	Gyalectidium	Gyalectidium
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Operational Section 13 77 Rubortocha (Gyalideopsis) Gyalideopsis kubili 11 100 unresolved (Gyalideopsis) Gyalideopsis kubili 11 100 unresolved (Gyalideopsis) Gyalideopsis kubili 111 100 unresolved (Gyalideopsis) Gyalideopsis kubili 114 100 unresolved (Gyalideopsis) Gyalideopsis kubilita 110 100 unresolved (Gyalideopsis) Gyalideopsis mexicana 112 19 Gornalita (Gyalideopsis) Gyalideopsis mexicana 112 19 Gornalita (Gyalideopsis) Gyalideopsis mexicana 113 1 unresolved (Gyalideopsis) Gyalideopsis mexicana 113 1 unresolved (Gyalideopsis) Gyalideopsis montana 116 100 Trichana (Gyalideopsis) Gyalideopsis montana 113 70 Adataryces (Gyalideopsis) Gyalideopsis montana 113 10 unresolved (Gyalideopsis)	Taxon	Node	Support	Node ID	Genus placement
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Gyalideopsis stipitataI0100Jameselia[Gyalideopsis]Gyalideopsis stipitataI1198unresolved[Gyalideopsis]Gyalideopsis stipitataI1122Tricharia[Gyalideopsis]Gyalideopsis stipitataI122Tricharia[Gyalideopsis]Gyalideopsis subantarcticaI32100Gyalidea[Gyalideopsis]Gyalideopsis triseptataI5699Microxyphiomyces[Gyalideopsis]Gyalideopsis vainioiI10680Tricharia[Gyalideopsis]Gyalideopsis vainioiI10680Tricharia[Gyalideopsis]Gyalideopsis vainioiI1215Gomphillus[Gyalideopsis]Gyalideopsis veruculosaI5256Microxyphiomyces[Gyalideopsis]Gyalideopsis veruculosaI10742Tricharia[Gyalideopsis]Gyalideopsis veruculosaI11100unresolved[Gyalideopsis]Gyalideopsis veruculosaI132Rubrotricha[Gyalideopsis]Gyalideopsis vulgarisI92[ref]VezdamycesVezdamycesGyalideopsis vulgaris f. albopruinosaI93[ref]Vezdamyces[Gyalideopsis]Gyalideopsis williamsiiI11223Tricharia[Gyalideopsis]Gyalideopsis williamsiiI1167Roselviria[Gyalideopsis]Gyalideopsis wirthiiI1167Roselviria[Gyalideopsis]Gyalideopsis wirthiiI1176unresolved[Gyalideopsis]Gyalideops	Gyalideopsis rubra	114	3	Santricharia	[Gyalideopsis]
Gyalideopsis stipitataI198Unresolved[Gyalideopsis]Gyalideopsis stipitata11122Tricharia[Gyalideopsis]Gyalideopsis subantarctica132100Gyalidea[Gyalideopsis]Gyalideopsis subantarctica15699Microxyphiomyces[Gyalideopsis]Gyalideopsis triseptata11151Adelphomyces[Gyalideopsis]Gyalideopsis vainioi110680Tricharia[Gyalideopsis]Gyalideopsis vainioi11215Gomphillus[Gyalideopsis]Gyalideopsis vainioi11215Gomphillus[Gyalideopsis]Gyalideopsis verruculosa15256Microxyphiomyces[Gyalideopsis]Gyalideopsis verruculosa110742Tricharia[Gyalideopsis]Gyalideopsis verruculosa1132Rubrotricha[Gyalideopsis]Gyalideopsis veruculosa111100unresolved[Gyalideopsis]Gyalideopsis vulgaris192[ref]VezdamycesVezdamycesGyalideopsis willamsii11176unresolved[Gyalideopsis]Gyalideopsis williamsii11123Tricharia[Gyalideopsis]Gyalideopsis wirthii11167Roselviria[Gyalideopsis]Gyalideopsis wirthii1120unresolved[Gyalideopsis]Gyalideopsis wirthii1120unresolved[Gyalideopsis]Gyalideopsis wirthii1120unresolved[Gyalideopsis](Gyalideopsis wirthii	Gyalideopsis rubrotusca	10	100	Jamesiella	[Gyalideopsis]
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Gyalideopsis striseptata152100Gyalidea[Gyalideopsis]Gyalideopsis triseptata15699Microxyphiomyces[Gyalideopsis]Gyalideopsis triseptata11151Adelphomyces[Gyalideopsis]Gyalideopsis vainioi110680Tricharia[Gyalideopsis]Gyalideopsis vainioi1115unresolved[Gyalideopsis]Gyalideopsis vainioi11215Gomphillus[Gyalideopsis]Gyalideopsis veruculosa15256Microxyphiomyces[Gyalideopsis]Gyalideopsis veruculosa110742Tricharia[Gyalideopsis]Gyalideopsis veruculosa1132Rubrotricha[Gyalideopsis]Gyalideopsis vezdae11100unresolved[Gyalideopsis]Gyalideopsis vulgaris f. albopruinosa192[ref]VezdamycesVezdamycesGyalideopsis williamsii1176unresolved[Gyalideopsis]Gyalideopsis williamsii11167Roselviria[Gyalideopsis]Gyalideopsis withii1120unresolved[Gyalideopsis]Gyalideopsis withii1120unresolved[Gyalideopsis]Gyalideopsis withii1121Roselviria[Gyalideopsis]Gyalideopsis withii1121Roselviria[Gyalideopsis]Gyalideopsis withii1121Roselviria[Gyalideopsis]Gyalideopsis withii12Roselviria[Gyalideopsis]Gyalideopsis withii141	Gyalideopsis stipitata	1112	2	Iricharia	[Gyalideopsis]
Gyalideopsis triseptata15699Introvyprinomyces[Gyalideopsis]Gyalideopsis triseptata11151Adelphomyces[Gyalideopsis]Gyalideopsis vainioi110680Tricharia[Gyalideopsis]Gyalideopsis vainioi1115unresolved[Gyalideopsis]Gyalideopsis vainioi11215Gomphillus[Gyalideopsis]Gyalideopsis verruculosa15256Microxyphiomyces[Gyalideopsis]Gyalideopsis verruculosa110742Tricharia[Gyalideopsis]Gyalideopsis verruculosa1132Rubrotricha[Gyalideopsis]Gyalideopsis verdae11100unresolved[Gyalideopsis]Gyalideopsis vulgaris192[ref]VezdamycesVezdamycesGyalideopsis williamsii1176unresolved[Gyalideopsis]Gyalideopsis williamsii11167Roselviria[Gyalideopsis]Gyalideopsis williamsii1167Roselviria[Gyalideopsis]Gyalideopsis wirthii1120unresolved[Gyalideopsis]Gyalideopsis wirthii1120unresolved[Gyalideopsis]Gyalideopsis wirthii141Spinomyces[Gyalideopsis]Gyalideopsis wirthii141Spinomyces[Gyalideopsis]Gyalideopsis wirthii141Spinomyces[Gyalideopsis]Gyalideopsis wirthii141Spinomyces[Gyalideopsis]Gyalideopsis wirthii141 <td>Gyalideopsis subarnarctica</td> <td>132</td> <td>100</td> <td>Gyalluea Mierovy phiemy eeo</td> <td>[Gyalideopsis]</td>	Gyalideopsis subarnarctica	132	100	Gyalluea Mierovy phiemy eeo	[Gyalideopsis]
Gyalideopsis vinseptata11151Adeipholyces[Gyalideopsis]Gyalideopsis vainioi110680Tricharia[Gyalideopsis]Gyalideopsis vainioi1115unresolved[Gyalideopsis]Gyalideopsis vainioi11215Gomphillus[Gyalideopsis]Gyalideopsis verruculosa15256Microxyphiomyces[Gyalideopsis]Gyalideopsis verruculosa110742Tricharia[Gyalideopsis]Gyalideopsis verruculosa1132Rubrotricha[Gyalideopsis]Gyalideopsis verdae11100unresolved[Gyalideopsis]Gyalideopsis vezdae11100unresolved[Gyalideopsis]Gyalideopsis vulgaris f. albopruinosa193[ref]VezdamycesVezdamycesGyalideopsis williamsii11176unresolved[Gyalideopsis]Gyalideopsis williamsii111223Tricharia[Gyalideopsis]Gyalideopsis williamsii11167Roselviria[Gyalideopsis]Gyalideopsis withii1120unresolved[Gyalideopsis]Gyalideopsis withii1120unresolved[Gyalideopsis]Gyalideopsis withii1120unresolved[Gyalideopsis]Gyalideopsis withii141Spinomyces[Gyalideopsis]Gyalideopsis withii141Spinomyces[Gyalideopsis]Gyalideopsis withii141Spinomyces[Gyalideopsis]Gyalideopsis withii141 <td>Gyalideopsis triseptata</td> <td>130</td> <td>99</td> <td>Adalahamyaaa</td> <td>[Gyalideopsis]</td>	Gyalideopsis triseptata	130	99	Adalahamyaaa	[Gyalideopsis]
Gyalideopsis valition110030Interfaila[Gyalideopsis]Gyalideopsis valition1115unresolved[Gyalideopsis]Gyalideopsis valition11215Gomphillus[Gyalideopsis]Gyalideopsis verruculosa15256Microxyphiomyces[Gyalideopsis]Gyalideopsis verruculosa110742Tricharia[Gyalideopsis]Gyalideopsis verruculosa1132Rubrotricha[Gyalideopsis]Gyalideopsis verdae11100unresolved[Gyalideopsis]Gyalideopsis vulgaris192[ref]VezdamycesVezdamycesGyalideopsis williamsii1176unresolved[Gyalideopsis]Gyalideopsis williamsii111223Tricharia[Gyalideopsis]Gyalideopsis williamsii11167Roselviria[Gyalideopsis]Gyalideopsis wirthii1120unresolved[Gyalideopsis]Gyalideopsis wirthii1120unresolved[Gyalideopsis]Gyalideopsis wirthii141Spinomyces[Gyalideopsis]Gyalideopsis wirthii141Spinomyces[Gyalideopsis]Gyalideopsis wirthii141Spinomyces[Gyalideopsis]Gyalideopsis wirthii141Spinomyces[Gyalideopsis]Gyalideopsis wirthii141Spinomyces[Gyalideopsis]Hippocrepidea nigra160100Gyalectidium[Hippocrepidea]	Gyalideopsis uiseplala	1115	90	Triobaria	[Gyalideopsis]
Gyalideopsis valinoiI1I5Gimestived[Gyalideopsis]Gyalideopsis valinoi11215Gomphillus[Gyalideopsis]Gyalideopsis verruculosa15256Microxyphiomyces[Gyalideopsis]Gyalideopsis verruculosa110742Tricharia[Gyalideopsis]Gyalideopsis verruculosa1132Rubrotricha[Gyalideopsis]Gyalideopsis verruculosa111100unresolved[Gyalideopsis]Gyalideopsis verlace11100unresolved[Gyalideopsis]Gyalideopsis vulgaris192[ref]VezdamycesVezdamycesGyalideopsis vulgaris f. albopruinosa193[ref]VezdamycesVezdamycesGyalideopsis williamsii11176unresolved[Gyalideopsis]Gyalideopsis williamsii11176unresolved[Gyalideopsis]Gyalideopsis williamsii11167Roselviria[Gyalideopsis]Gyalideopsis wirthii1120unresolved[Gyalideopsis]Gyalideopsis wirthii1120unresolved[Gyalideopsis]Gyalideopsis wirthii1912Roselviria[Gyalideopsis]Gyalideopsis wirthii141Spinomyces[Gyalideopsis]Gyalideopsis wirthii141Spinomyces[Gyalideopsis]Gyalideopsis wirthii141Spinomyces[Gyalideopsis]Hippocrepidea nigra160100Gyalectidium[Hippocrepidea]	Gyalideopsis vainioi	1100	00 15	uprosolvod	[Gyalideopsis]
Gyalideopsis varinoir112.15Gornprinitis[Gyalideopsis]Gyalideopsis verruculosa15256Microxyphiomyces[Gyalideopsis]Gyalideopsis verruculosa110742Tricharia[Gyalideopsis]Gyalideopsis verruculosa1132Rubrotricha[Gyalideopsis]Gyalideopsis verruculosa11100unresolved[Gyalideopsis]Gyalideopsis verdae11100unresolved[Gyalideopsis]Gyalideopsis vulgaris192[ref]VezdamycesVezdamycesGyalideopsis vulgaris f. albopruinosa193[ref]VezdamycesVezdamycesGyalideopsis williamsii1176unresolved[Gyalideopsis]Gyalideopsis williamsii111223Tricharia[Gyalideopsis]Gyalideopsis williamsii141Spinomyces[Gyalideopsis]Gyalideopsis wirthii1167Roselviria[Gyalideopsis]Gyalideopsis wirthii1120unresolved[Gyalideopsis]Gyalideopsis wirthii141Spinomyces[Gyalideopsis]Gyalideopsis wirthii1912Roselviria[Gyalideopsis]Gyalideopsis wirthii141Spinomyces[Gyalideopsis]Gyalideopsis wirthii141Spinomyces[Gyalideopsis]Gyalideopsis wirthii141Spinomyces[Gyalideopsis]Hippocrepidea nigra160100Gyalectidium[Hippocrepidea]	Gyalideopsis vainioi	1101	5	Comphillus	[Gyalideopsis]
GyalideopsisVerificultionIS2S0Introdyplantingets[Gyalideopsis]GyalideopsisVerificultion[Gyalideopsis][Gyalideopsis]GyalideopsisVerificultion[Gyalideopsis]Gyalideopsis[Gyalideopsis][Gyalideopsis]Gyalideopsis[Gyalideopsis][Gyalideopsis]Gyalideopsis[Gyalideopsis][Gyalideopsis]Gyal	Gyalideopsis variioi Gyalideopsis verruculosa	152	56	Microxyphiomyces	[Gyalideopsis]
Gyalideopsis verificulosa110142Incritiana[Gyalideopsis]Gyalideopsis verruculosa1132Rubrotricha[Gyalideopsis]Gyalideopsis verdae11100unresolved[Gyalideopsis]Gyalideopsis vulgaris192[ref]VezdamycesVezdamycesGyalideopsis vulgaris f. albopruinosa193[ref]VezdamycesVezdamycesGyalideopsis williamsii1176unresolved[Gyalideopsis]Gyalideopsis williamsii111223Tricharia[Gyalideopsis]Gyalideopsis williamsii141Spinomyces[Gyalideopsis]Gyalideopsis wirthii11167Roselviria[Gyalideopsis]Gyalideopsis wirthii1120unresolved[Gyalideopsis]Gyalideopsis wirthii1120unresolved[Gyalideopsis]Gyalideopsis wirthii141Spinomyces[Gyalideopsis]Gyalideopsis wirthii141Spinomyces[Gyalideopsis]Gyalideopsis wirthii141Spinomyces[Gyalideopsis]Gyalideopsis wirthii141Spinomyces[Gyalideopsis]Hippocrepidea nigra160100Gyalectidium[Hippocrepidea]	Gyalideopsis vertuculosa	1107	42	Tricharia	[Gyalideopsis]
Gyalideopsis verdae11100unresolved[Gyalideopsis]Gyalideopsis verdae11100unresolved[Gyalideopsis]Gyalideopsis vulgaris192[ref]VezdamycesVezdamycesGyalideopsis vulgaris f. albopruinosa193[ref]VezdamycesVezdamycesGyalideopsis vulgaris f. albopruinosa1176unresolved[Gyalideopsis]Gyalideopsis williamsii1176unresolved[Gyalideopsis]Gyalideopsis williamsii111223Tricharia[Gyalideopsis]Gyalideopsis williamsii141Spinomyces[Gyalideopsis]Gyalideopsis wirthii1167Roselviria[Gyalideopsis]Gyalideopsis wirthii1120unresolved[Gyalideopsis]Gyalideopsis wirthii1120unresolved[Gyalideopsis]Gyalideopsis wirthii141Spinomyces[Gyalideopsis]Gyalideopsis wirthii141Spinomyces[Gyalideopsis]Gyalideopsis wirthii141Spinomyces[Gyalideopsis]Hippocrepidea nigra160100Gyalectidium[Hippocrepidea]	Gyalideopsis verruculosa	113	+∠ 2	Rubrotricha	[Gyalideopsis]
Gyalideopsis vulgarisIn <t< td=""><td>Gyalideopsis verdee</td><td>11</td><td>100</td><td>unresolved</td><td>[Gyalideopsis]</td></t<>	Gyalideopsis verdee	11	100	unresolved	[Gyalideopsis]
Gyalideopsis vulgaris f. albopruinosa193[ref]VezdamycesVezdamycesGyalideopsis vulgaris f. albopruinosa1176unresolved[Gyalideopsis]Gyalideopsis williamsii1176unresolved[Gyalideopsis]Gyalideopsis williamsii111223Tricharia[Gyalideopsis]Gyalideopsis williamsii141Spinomyces[Gyalideopsis]Gyalideopsis withii1167Roselviria[Gyalideopsis]Gyalideopsis withii1120unresolved[Gyalideopsis]Gyalideopsis withii1912Roselviria[Gyalideopsis]Gyalideopsis withii141Spinomyces[Gyalideopsis]Gyalideopsis withii141Spinomyces[Gyalideopsis]Hippocrepidea nigra160100Gyalectidium[Hippocrepidea]	Gyalideopsis vulgaris	192	[ref]	Vezdamyces	Vezdamyces
Gyalideopsis williamsiiI176unresolved[Gyalideopsis]Gyalideopsis williamsiiI11223Tricharia[Gyalideopsis]Gyalideopsis williamsiiI11223Tricharia[Gyalideopsis]Gyalideopsis williamsiiI41Spinomyces[Gyalideopsis]Gyalideopsis wirthiiI1167Roselviria[Gyalideopsis]Gyalideopsis wirthiiI120unresolved[Gyalideopsis]Gyalideopsis wirthiiI120unresolved[Gyalideopsis]Gyalideopsis wirthiiI912Roselviria[Gyalideopsis]Gyalideopsis wirthiiI41Spinomyces[Gyalideopsis]Hippocrepidea nigraI60100Gyalectidium[Hippocrepidea]	Gvalideopsis vulgaris f albopruinosa	193	[ref]	Vezdamyces	Vezdamyces
Gyalideopsis williamsii11223Tricharia[Gyalideopsis]Gyalideopsis williamsiiI1223Tricharia[Gyalideopsis]Gyalideopsis williamsiiI41Spinomyces[Gyalideopsis]Gyalideopsis wirthiiI1167Roselviria[Gyalideopsis]Gyalideopsis wirthiiI120unresolved[Gyalideopsis]Gyalideopsis wirthiiI120unresolved[Gyalideopsis]Gyalideopsis wirthiiI912Roselviria[Gyalideopsis]Gyalideopsis wirthiiI41Spinomyces[Gyalideopsis]Hippocrepidea nigraI60100Gyalectidium[Hippocrepidea]	Gvalideopsis williamsii	11	76	unresolved	[Gvalideopsis]
Gyalideopsis williamsiiIA1Spinomyces[Gyalideopsis]Gyalideopsis wirthiiI167Roselviria[Gyalideopsis]Gyalideopsis wirthiiI120unresolved[Gyalideopsis]Gyalideopsis wirthiiI912Roselviria[Gyalideopsis]Gyalideopsis wirthiiI912Roselviria[Gyalideopsis]Gyalideopsis wirthiiI41Spinomyces[Gyalideopsis]Hippocrepidea nigraI60100Gyalectidium[Hippocrepidea]	Gvalideopsis williamsii	1112	23	Tricharia	[Gvalideopsis]
GyalideopsisInFor BoundaryEnvironmentGyalideopsisI167Roselviria[Gyalideopsis]GyalideopsisI120unresolved[Gyalideopsis]GyalideopsisI120unresolved[Gyalideopsis]GyalideopsisI112Roselviria[Gyalideopsis]GyalideopsisI912Roselviria[Gyalideopsis]GyalideopsisI41Spinomyces[Gyalideopsis]Hippocrepidea nigraI60100Gyalectidium[Hippocrepidea]	Gvalideopsis williamsii	14	1	Spinomyces	[Gvalideopsis]
Gyalideopsis wirthii1120unresolved[Gyalideopsis]Gyalideopsis wirthii1912Roselviria[Gyalideopsis]Gyalideopsis wirthii141Spinomyces[Gyalideopsis]Hippocrepidea nigra160100Gyalectidium[Hippocrepidea]	Gvalideopsis wirthii	111	67	Roselviria	[Gvalideopsis]
Gyalideopsis wirthii1912Roselviria[Gyalideopsis]Gyalideopsis wirthii141Spinomyces[Gyalideopsis]Hippocrepidea nigra160100Gyalectidium[Hippocrepidea]	Gvalideopsis wirthii	11	20	unresolved	[Gvalideopsis]
Gyalideopsis wirthiiI41Spinomyces[Gyalideopsis]Hippocrepidea nigraI60100Gyalectidium[Hippocrepidea]	Gvalideopsis wirthii	19	12	Roselviria	[Gvalideopsis]
Hippocrepidea nigra I60 100 Gyalectidium [Hippocrepidea]	Gyalideopsis wirthii	14	1	Spinomyces	[Gyalideopsis]
	Hippocrepidea nigra	160	100	Gyalectidium	[Hippocrepidea]

Taxon	Node	Support	Node ID	Genus placement
Jamesiella anastomosans	10	[ref]	Jamesiella	Jamesiella
Jamesiella perlucida	11	100	unresolved	[Jamesiella]
Jamesiella scotica	11	90	unresolved	[Jamesiella]
Jamesiella scotica	1142	10	outgroup	[Jamesiella]
Linhartia albomaculans	131	100	Psorotheciopsis	Psorotheciopsis
Linhartia guajalitensis	120	100	Linhartia	Linhartia
Linnartia gyalideoides	120	100 [rof]	Linhartia	Linhartia
Linhartia patellarioldes	120	[rei]		
Linhartia philippinensis Linhartia variasentata	120	100	Linhartia	Linhartia Linhartia
Lithogyalideonsis aterrima	132	100	Gvalidea	[] ithogvalideopsis]
Lithogyalideopsis poeltii	128	58	unresolved	[Lithogvalideopsis]
Lithogyalideopsis poeltii	1106	42	Tricharia	[Lithogyalideopsis]
Lithogyalideopsis vivantii	132	98	Gyalidea	[Lithogyalideopsis]
Lithogyalideopsis vivantii	139	2	Caleniella	[Lithogyalideopsis]
Lithogyalideopsis zeylandica	132	79	Gyalidea	[Lithogyalideopsis]
Lithogyalideopsis zeylandica	114	21	Santricharia	[Lithogyalideopsis]
Microlychnus epicorticis	1121	100	Gomphillus	[Gyalideopsis]
Microspatna glauca	11	100	unresolved	[Gyalldeopsis]
Paratricharia paradoxa	139	99		[Paratricharia]
Phallomyces palmae	140	00	Autothelionsis	Aderkomyces
Phallomyces palmae	157	1	Microxyphiomyces	Aderkomyces
Psathvromvces rosacearum	1134	100	Psathvromvces	Psathvromvces
Psorotheciopsis premneella	131	ſrefl	Psorotheciopsis	Psorotheciopsis
Rolueckia aggregata	137	[ref]	Rolueckia	Rolueckia
Rolueckia conspersa	136	[ref]	Rolueckia	Rolueckia
Rubrotricha helminthospora	113	100	Rubrotricha	Rubrotricha
Rubrotricha subhelminthospora	113	[ref]	Rubrotricha	Rubrotricha
Sporocybomyces pulcher	1138	100	Sporocybomyces	Sporocybomyces
Iricharia amazonum	1111	[ref]	Tricharia	Tricharia
Tricharia atrocarpa Tricharia auloviniformia	1106	100	Iricharia	Iricharia [Tricharia]
Tricharia aulaxiniformis	1115	3/	Adelpholnyces	[IIICIIdIId] [Tricharia]
Tricharia aulaximioinis	1106	99	Tricharia	Tricharia
Tricharia aulaxinoides	1112	1	Tricharia	Tricharia
Tricharia bambusae	1106	100	Tricharia	Tricharia
Tricharia carnea	1109	[ref]	Tricharia	Tricharia
Tricharia cuneata	155	63	Microxyphiomyces	Microxyphiomyces
Tricharia cuneata	157	17	Microxyphiomyces	Microxyphiomyces
Tricharia cuneata	152	11	Microxyphiomyces	Microxyphiomyces
Tricharia cuneata	153	9	Microxyphiomyces	Microxyphiomyces
Iricharia demoulinii	156	99	Microxyphiomyces	Microxyphiomyces
Tricharia demouiinii Tricharia alagana	107	1	Microxyphiomyces	Microxyphiomyces
Tricharia elegans	156	18	Microxyphiomyces	Microxyphiomyces
Tricharia elegans	152	5	Microxyphiomyces	Microxyphiomyces
Tricharia elegans	153	2	Microxyphiomyces	Microxyphiomyces
Tricharia elegans (hyphophores)	155	87	Microxyphiomyces	Microxyphiomyces
Tricharia elegans (hyphophores)	152	7	Microxyphiomyces	Microxyphiomyces
Tricharia elegans (hyphophores)	153	5	Microxyphiomyces	Microxyphiomyces
Tricharia elegans (hyphophores)	157	1	Microxyphiomyces	Microxyphiomyces
Tricharia farinosa	114	[ref]	Santricharia	Santricharia
Tricharia hyalina	1116	[ref]	Batistomyces	Batistomyces
Tricharia Kashiwadanii Tricharia kashiwadanii	170	70		Nicroxypniomyces
Tricharia lancicarna	154	SU	Microxyphiomyces	Microxyphiomyces
Tricharia Iongispora	1112	[ref]	Tricharia	Tricharia
Tricharia novoquineense	1115	100	Adelphomyces	[Tricharia]
Tricharia pallida	1116	76	Batistomyces	Batistomyces
Tricharia pallida	19	24	Roselviria	Batistomyces
Tricharia paraguayensis	I106	[ref]	Tricharia	Tricharia
Tricharia pseudosantessonii	1116	89	Batistomyces	Batistomyces
Tricharia pseudosantessonii	114	10	Santricharia	Batistomyces
Tricharia pseudosantessonii	1103	1	Tricharia	Batistomyces
Iricharia santessoniana	156	/4	Microxyphiomyces	Nicroxyphiomyces
Iricnaria santessoniana	1110	20	Batistomyces	IVIICTOXYPNIOMYCES
menaria santessonii Tricharia similis	100	luu	Nicroxyphiomyces	Nicroxyphiomyces
Tricharia sublancicaroa	1106	[i c i] 62	Tricharia	Tricharia
	1100	02	monuna	monunu

Taxon	Node	Support	Node ID	Genus placement
Tricharia sublancicarpa	154	34	Microxyphiomyces	Tricharia
Tricharia sublancicarpa	1105	3	Tricharia	Tricharia
Tricharia sublancicarpa	1107	1	Tricharia	Tricharia
Tricharia substipitata	l112	99	Tricharia	Tricharia
Tricharia substipitata	19	1	Roselviria	Tricharia
Tricharia testacea	1121	72	Gomphillus	[Gyalideopsis]
Tricharia testacea	l134	22	Psathyromyces	[Gyalideopsis]
Tricharia testacea	1132	6	Psathyromyces	[Gyalideopsis]
Tricharia triseptata	156	100	Microxyphiomyces	Microxyphiomyces
Tricharia umbrosa	1106	100	Tricharia	Tricharia
Tricharia urceolata	1107	[ref]	Tricharia	Tricharia
Tricharia vainioi	157	[ref]	Microxyphiomyces	Microxyphiomyces
Tricharia variratae	156	100	Microxyphiomyces	Microxyphiomyces
Tricharia vezdae	l1	100	unresolved	[Gyalideopsis]

Table 1. - Continuation.

number of genera distinguished in a group is subjective and should be based on practicability, guidelines, and community agreement. One possible guideline is the species-to-genus ratio. In lichen fungi it is currently about 20:1 (Lücking et al. 2017; Lücking 2019), comparable to the ratio found in vascular plants but higher than in most animal groups, where it may be as low as 5:1 (Resh & McElravy 1993; Lenat & Resh 2001; Krug et al. 2008; Lücking 2019). In Graphidaceae, the current ratio is about 28:1 (Rivas Plata et al. 2012a; Rivas Plata et al. 2013; Lücking et al. 2017), which suggests that Graphidaceae are comparatively undersplit at the genus level. With the 46 genera now recognized in Gomphillaceae (Etayo 2017; Lücking et al. 2017; Xavier-Leite et al. 2022, 2023), the current ratio for this family would be about 10:1, indicating oversplitting compared to lichen fungi overall. However, Gomphillaceae are much understudied; the recent phylogenetic analysis indicated considerable levels of cryptic speciation even in seemingly well-characterized taxa, such as Gyalectidium and Tricharia s.lat. (Xavier-Leite et al. 2022). As a consequence, the true species richness is likely much higher than the currently recognized 440 species. Lücking et al. (2014) predicted at least 700 species for this group, but given the level of previously unrecognized cryptic speciation, this prediction is likely conservative and the true number might be well over 800. Thus, the species: genus ratio in the family may approach roughly 20:1 with further species discoveries, the average for lichen fungi in general.

As with Graphidaceae, in Gomphillaceae the challenge with changing classifications based on molecular data, especially in groups were presumed key characters evolved multiple times independently, is the best possible phenotypic circumscription of these genera and the placement of species that lack molecular data. The binning approach provides a solution to this dilemma. However, while phenotype-based phylogenetic binning provides objective and testable predictions for the taxonomic placement of species for which no molecular data is available, it is also dependent on the underlying data and parameters. In the present case, the binning results were largely consistent with expectations, but a portion of the taxa either remained unresolved or was binned into unexpected clades. This was largely caused by the limited taxon sampling in the molecular reference tree, with a strong focus on foliicolous taxa and very few non-foliicolous taxa sequenced, which represent around a quarter of the family. Species of the genus Gyalideopsis s.lat. did not perform well with this approach, and due to the very limited sampling of the entirely non-foliicolous genus Gyalidea, species of this genus were not binned. The binning approach helps to single out key taxa that need to be targeted for additional sequencing in order to further improve our understanding of the classification of a group such as Gomphillaceae, in this case particularly the two aforementioned genera. On the other hand, we were able to assign about 50 species to 16 of the 19 newly recognized genus level clades distinguished in the previous molecular analysis (Xavier-Leite et al. 2022), which also aided in the correct circumscription of these new genera (Xavier-Leite et al. 2023).

Thus far, the binning approach has mostly been used in lichen fungi, particularly Gomphillaceae, Graphidaceae, and Roccellaceae (Berger et al. 2011b; Rivas Plata et al. 2012b; Parnmen et al. 2012; Lücking et al. 2015; Lücking & Kalb 2018; Perlmutter et al. 2020), but also in some animal and plant groups (Koch et al. 2012; Fang et al. 2013; Springer et al. 2015; Dohrmann et al. 2017; Testo et al. 2018). Most analyses were done in Graphidaceae, which helped to considerably improve predictive classifications, e.g. in the genera Graphis versus Allographa and in the highly complex tribe Ocellularieae (Berger et al. 2011b; Rivas Plata et al. 2012b; Lücking et al. 2015; Lücking & Kalb 2018). The situation in Gomphillaceae is comparable, with numerous distinctive groups that could be recognized as genera based on molecular and morphological data, but also with unresolved lineages and a large number of unsequenced species (Xavier-Leite et al. 2022). Binning cannot only be used to place species in re-defined genera, but also to assess diagnostic characters. For instance, Parnmen et al. (2012) used this method to apply quantitative statistics (multiple response permutation procedure, MRPP) to groups defined through the binning approach, in order to evaluate the highest level of phenotype discrimination among re-defined genera in Graphidaceae.



Fig. 2. — Result of the phenotype-based phylogenetic binning using taxa in the molecular reference and taxa based on their phenotype characters. The analysis includes node numbers on each branch and bootstrap support values from the binning approach for each query taxon after the query name. For full tree, see Appendix 5.

This approach will also be useful for Gomphillaceae when more species have been sequenced.

A case study to resolve a taxonomic and nomenclatural problem by evaluating the placement of the type species through binning in Graphidaceae was *Leptotrema* Mont. & Bosch. Lücking *et al.* (2015) found that the type species belonged in the genus *Myriotrema* Fée, whereas the most common species, *L. wightii* (Taylor) Müll. Arg., was unrelated and a new genus was established under the name *Sanguinotrema* Lücking. A somewhat similar situation was found in Gomphillaceae, where Lücking *et al.* (2005) previously separated two genera, *Aderkomyces* and *Arthotheliopsis*, for a group of rather similar species. The expanded phylogenetic analysis (Xavier-Leite *et al.* 2022) showed that two distant clades may correspond to these two genera, but the type of *Aderkomyces*, *A. couepiae*, which so far has not been sequenced, binned with *Arthotheliopsis* based on its phenotype, possibly requiring the description of a new genus for the other clade if this placement is confirmed by molecular data. Overall, our study is a further example of the usefulness of the phylogenetic binning tool in highly diverse and complex taxonomic groups for which it is difficult to obtain sequence data at a broad taxonomic level. It also revealed the shortcomings of this approach in cases of molecularly unsampled lineages, with the need to obtain additional sequence data for the principally non-foliicolous taxa in the genera *Gyalidea* and *Gyalideopsis s.lat*.

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REFERENCES

- AHRENDT S. R., QUANDT C. A., CIOBANU D., CLUM A., SALA-MOV A., ANDREOPOULOS B., CHENG J. F., WOYKE T., PELIN A., HENRISSAT B., REYNOLDS N. K., BENNY G. L., SMITH M. E., JAMES T. Y. & GRIGORIEV I. V. 2018. — Leveraging single-cell genomics to expand the fungal tree of life. *Nature Microbiology* 3: 1417-1428. https://doi.org/10.1038/s41564-018-0261-0
- APTROOT A. & LÜCKING R. 2002. Proposal to conserve *Gyalidea* (lichenized fungi: Asterothyriaceae, Ostropales) against an additional name, *Solorinella*. *Taxon* 51: 65. https://doi. org/10.2307/1554877
- BERGER S. A., KROMPASS D. & STAMATAKIS A. 2011a. Performance, accuracy and web-server for evolutionary placement of short sequence reads under maximum-likelihood. *Systematic Biology* 60: 291-302. https://doi.org/10.1093/sysbio/syr010
- BERGER S. A., STAMATAKIS A. & LÜCKING A. 2011b. Morphologybased phylogenetic binning of the lichen genera *Allographa* and *Graphis* (Ascomycota: Graphidaceae) using molecular site weight calibration. *Taxon* 60:1450-1457. https://doi.org/10.1002/ tax.605020
- DAL-FORNO M., LÜCKING R., BUNGARTZ F., YÁNEZ-AYABACA A., MARCELLI M. P., SPELMANN A. A., COCA L. F., CHAVES J. L., APTROOT A., SIPMAN H. J. M., SIKAROODI M., GILLEVET M. & LAWREY J. D. 2016. — From one to six: unrecognized species diversity in the genus *Acantholichen* (lichenized Basidiomycota: Hygrophoraceae). *Mycologia* 108 (1): 38-55. https://doi. org/10.3852/15-060
- DIEDERICH P., LAWREY J. D. & ERTZ D. 2018. The 2018 classification and checklist of lichenicolous fungi, with 2000 nonlichenized, obligately lichenicolous taxa. *The Bryologist* 121 (3): 340-425. https://doi.org/10.1639/0007-2745-121.3.340
- DOHRMANN M., KELLEY C., KELLY M., PISERA A., HOOPER J. N. & REISWIG H. M. 2017. — An integrative systematic framework helps to reconstruct skeletal evolution of glass sponges (Porifera, Hexactinellida). *Frontiers in Zoology* 14 (1): 18. https://doi. org/10.1186/s12983-017-0191-3
- ETAYO J. 2017. Hongos Liquenícolas de Ecuador. Opera Lilloana 50: 1-535.

- FANG H., OATES M. E., PETHICA R. B., GREENWOOD J. M., SARDAR A. J., RACKHAM O. J., DONOGHUE P. C., STAMATA-KIS A., DE LIMA MORAIS D. A. & GOUGH J. 2013. — A dailyupdated tree of (sequenced) life as a reference for genome research. *Scientific Reports* 3: 2015. https://doi.org/10.1038/srep02015
- FERRARO L. I., LÜCKING R. & SÉRUSIAUX E. 2001. A world monograph of the lichen genus *Gyalectidium* (Gomphillaceae). *Botanical Journal of the Linnean Society* 137 (3): 311-345. https:// doi.org/10.1111/j.1095-8339.2001.tb01126.x
- GALINDO L. J., LÓPEZ-GARCÍA P., TORRUELLA G., KARPOV S. & MOREIRA D. 2021. — Phylogenomics of a new fungal phylum reveals multiple waves of reductive evolution across *Holomycota*. *Nature Communications* 12 (1): 4973. https://doi.org/10.1038/ s41467-021-25308-w
- GRUBE M., BALOCH E. & LUMBSCH H. T. 2004. The phylogeny of Porinaceae (Ostropomycetidae) suggests a neotenic origin of perithecia in Lecanoromycetes. *Mycological Research* 108: 1111-1118. https://doi.org/10.1017/S0953756204000826
- GUTTERES D. C., DOS SANTOS M. D. M., DA SILVA R. A. F., SOUZA E. S. C., SOARES W. R. O., PINHO D. B. & DIANESE J. C. 2020. — *Cladosterigma*: an enigmatic fungus, previously considered a basidiomycete, now revealed as an ascomycete member of the Gomphillaceae. *Mycologia* 112: 829-846. https://doi.org/10 .1080/00275514.2020.1781501
- HENSSEN A. & LÜCKING R. 2002. Morphology, anatomy, and ontogeny in the Asterothyriaceae (Ascomycetes: Ostropales), a greatly misunderstood group of lichenized fungi. *Annales Botanici Fennici* 39: 273-299.
- HERRERA-CAMPOS M. A., BARCENAS-PEÑA A., MIRANDA-GONZÁLEZ R., MEJÍA M. A., GONZÁLEZ J. A. B., COLÍN P. M., TÉLLEZ N. S. & LÜCKING R. 2019. — New lichenized Arthoniales and Ostropales from Mexican seasonally dry tropical forest. *The Bryologist* 122: 62-83. https://doi.org/10.1639/0007-2745-122.1.062
- HIBBETT D. S., BINDER M., BISCHOFF J. F., BLACKWELL M., CANNON P. F., ERIKSSON O. E., HUHNDORF S., JAMES T., KIRK P. M., LÜCKING R., LUMBSCH H. T., LUTZONI F., MATHENY P. B., MC LAUGHLIN D. J., POWELL M. J., RED-HEAD S., SCHOCH C. L., SPATAFORA J. W., STALPERS J. A., VIL-GALYS R., AIME M. C., APTROOT A., BAUER R., BEGEROW D., BENNY G. L., CASTLEBURY L. A., CROUS P. W., DAI Y. C., GAMS W., GEISER D. M., GRIFFITH G. W., GUEIDAN C., HAWK-SWORTH D. L., HESTMARK G., HOSAKA K., HUMBER R. A., HYDE K. D., IRONSIDE J. E., KOLJALG U., KURTZMAN C. P., LARSSON K. H., LICHTWARDT R., LONGCORE J., MIADLIKOWSKA J., MILLER A., MONCALVO J. M., MOZLEY-STANDRIDGE S., OBER-WINKLER F., PARMASTO E., REEB V., ROGERS J. D., ROUX C., Ryvarden L., Sampaio J. P., Schussler A., Sugiyama J., Thorn R. G., Tibell L., Untereiner W. A., Walker C., WANG Z., WEIR A., WEISS M., WHITE M. M., WINKA K., YAO Y. J. & ZHANG N. 2007. — A higher-level phylogenetic classification of the Fungi. Mycological Research 111: 509-547. https://doi.org/10.1016/j.mycres.2007.03.004
- JAMES T. Y., KAUFF F., SCHOCH C. L., MATHENY P. B., HOFSTETTER V., COX C. J., CELIO G., GUEIDAN C., FRAKER E., MIADLIKOWSKA J., LUMBSCH H. T., RAUHUT A., REEB V., ARNOLD A. E., AMTOFT A., STAJICH J. E., HOSAKA K., SUNG G. H., JOHNSON D., O'ROURKE B., CROCKETT M., BINDER M., CURTIS J. M., SLOT J. C., WANG Z., WILSON A. W., SCHUSSLER A., LONGCORE J. E., O' DONNELL K., MOZLEY-STANDRIDGE S., PORTER D., LETCHER P. M., POWELL M. J., TAYLOR J. W., WHITE M. M., GRIFFITH G. W., DAVIES D. R., HUMBER R. A., MORTON J. B., SUGIYAMA J., ROSSMAN A. Y., ROGERS J. D., PFISTER D. H., HEWITT D., HANSEN K., HAMBLETON S., SHOEMAKER R. A., KOHLMEYER J., VOLKMANN-KOHLMEYER B., SPOTTS R. A., SERDANI M., CROUS P. W., HUGHES K. W., MATSUURA K., LANGER E., LANGER G., UNTEREINER W. A., LUCKING R., BUDEL B., GEISER D. M., APTROOT A., DIEDERICH P., SCHMITT I.,

SCHULTZ M., YAHR R., HIBBETT D. S., LUTZONI F., MC LAUGH-LIN D. J., SPATAFORA J. W. & VILGALYS R. 2006. — Reconstructing the early evolution of Fungi using a six-gene phylogeny. *Nature* 443: 818-822. https://doi.org/10.1038/nature05110

- KALB K. & VĚZDA A. 1988. Neue oder bemerkenswerte Arten der Flechtenfamilie Gomphillaceae in der Neotropis. *Bibliotheca Lichenologica* 29: 1-80.
- KOCH M. A., KIEFER M., GERMAN D. A., AL-SHEHBAZ I. A., FRAN-ZKE A., MUMMENHOFF K. & SCHMICKL R. 2012. — BrassiBase: Tools and biological resources to study characters and traits in the Brassicaceae – version 1.1. *Taxon* 61 (5): 1001-1009. https:// doi.org/10.1002/tax.615007
- KRUG A. Z., JABLONSKI D. & VALENTINE J. W. 2008. Speciesgenus ratios reflect a global history of diversification and range expansion in marine bivalves. *Proceedings of the Royal Society B* 275: 1117-1123. https://doi.org/10.1098/rspb.2007.1729
- LENAT D. R. & RESH V. H. 2001. Taxonomy and stream ecology The benefits of genus- and species-level identifications. *Journal* of the North American Benthological Society 20 (2): 287-298.
- LENDEMER J. C. 2017. Revision of *Gyalideopsis ozarkensis* and *G. subaequatoriana* (Gomphillaceae; lichenized Ascomycetes), leads to the description of an overlooked new species. *The Bryologist* 120: 274-286. https://doi.org/10.1639/0007-2745-120.3.274
- LÜCKING R. 1997. Estado actual de las investigaciones sobre líquenes foliícolas en la región Neotrópica, con un análisis biogeográfico preliminar. *Tropical Bryology* 13: 87-114.
- LÜCKING R. 1999. Addiciones y correcciones al conocimiento de la líquenoflora foliícola de Costa Rica. La familia Asterothyriaceae y el género *Chroodiscus* (Thelotremataceae), con un análisis filogenético. *Cryptogamie, Mycologie* 20: 193-224.
- LÜCKING R. 2008. Foliicolous Lichenized Fungi. Flora Neotropica Monograph 103: 1-866.
- LÜCKING R. 2019. Stop the abuse of time! A critical review of temporal banding for rank-based classifications in Fungi (including lichens) and other organisms. *Critical Review in Plant Sciences* 38: 199-253. https://doi.org/10.1080/073526 89.2019.1650517
- LÜCKING R. & KALB K. 2018. Formal instatement of *Allographa* (Graphidaceae): how to deal with a hyperdiverse genus complex with cryptic differentiation and paucity of molecular data. *Herzogia* 31: 535-561. https://doi.org/10.13158/heia.31.1.2018.535
- LÜCKING R., STUART B. & LUMBSCH H. T. 2004. Phylogenetic relationships of Gomphillaceae and Asterothyriaceae – evidence from a combined Bayesian analysis of nuclear and mitochondrial sequences. *Mycologia* 96: 283-294. https://doi. org/10.2307/3762064
- LÜCKING R., SÉRUSIAUX E. & VĚZDA A. 2005. Phylogeny and systematics of the lichen family Gomphillaceae (Ostropales) inferred from cladistic analysis of phenotype data. *The Lichenologist* 37 (2): 123-170. https://doi.org/10.1017/S0024282905014660
- LÜCKING R., BUCK W. R. & RIVAS PLATA E. 2007. The lichen family Gomphillaceae (Ostropales) in eastern North America, with notes on hyphophore development in *Gomphillus* and *Gyalideop*sis. The Bryologist 110: 622-672. https://doi.org/10.1639/0007-2745(2007)110[622:TLFGOI]2.0.CO;2
- LÜCKING R., ARCHER A. W. & APTROOT A. 2009. A world-wide key to the genus *Graphis* (Ostropales: Graphidaceae). *The Lichenolo*gist 41: 363-452. https://doi.org/10.1017/S0024282909008305
- LÜCKING R., JOHNSTON M. K., APTROOT A., KRAICHAK E., LEN-DEMER J. C., BOONPRAGOB K., CÁCERES M. E. S., ERTZ D., FERRARO L. I., JIA Z.-F., KALB K., MANGOLD A., MANOCH L., MER-CADO-DÍAZ J. A., MONCADA B., MONGKOLSUK P., PAPONG K., PARNMEN S., PELÁEZ R. N., POENGSUNGNOEN V., RIVAS PLATA E., SAIPUNKAEW W., SIPMAN H. J. M., SUTJARITTURAKAN J., VAN DEN BROECK D., VON KONRAT M., WEERAKOON G. & LUMB-SCH H. T. 2014. — One hundred and seventy-five new species of Graphidaceae: closing the gap or a drop in the bucket? *Phytotaxa* 189: 7-38. https://doi.org/10.11646/phytotaxa.189.1.4

- LÜCKING R., MANGOLD A., RIVAS PLATA E., PARNMEN S., KRAI-CHAK E. & LUMBSCH H. T. 2015. — Morphology-based phylogenetic binning to assess a taxonomic challenge: a case study in Graphidaceae (Ascomycota) requires a new generic name for the widespread *Leptotrema wightii*. *Botanical Journal of the Linnean Society* 179 (3): 436-443. https://doi.org/10.1111/boj.12327
- LÜCKING R., HODKINSON B. P. & LEAVITT S. D. 2017. The 2016 classification of lichenized fungi in the Ascomycota and Basidiomycota – Approaching one thousand genera. *The Bryologist* 119: 361-416. https://doi.org/10.1639/0007-2745-119.4.361
- LÜCKING R., MONCADA B. & DAL FORNO M. 2023. PhyloKey: a novel method to rapidly and reliably identify species in complex, species-rich genera, and an opportunity for 'non-molecular museomics'. *The Lichenologist* 55 (5): 181-192. https://doi. org/10.1017/S0024282923000415
- LUTZONI F., KAUFF F., COX C., MC LAUGHLIN D., CELIO G., DENT-INGER B., PADAMSEE M., HIBBETT D., JAMES T. Y., BALOCH E., GRUBE M., REEB V., HOFSTETTER V., SCHOCH C., ARNOLD A. E., MIADLIKOWSKA J., SPATAFORA J., JOHNSON D., HAMBLETON S., CROCKETT M., SHOEMAKER R., SUNG G.-H., LÜCKING R., LUMBSCH H. T., O' DONNELL K., BINDER M., DIEDERICH P., ERTZ D., GUEIDAN C., HANSEN K., HARRIS R. C., HOSAKA K., LIM Y. W., MATHENY B., NISHIDA H., PFISTER D., ROGERS J., ROSSMAN A., SCHMITT I., SIPMAN H., STONE J., SUGIYAMA J., YAHR R. & VILGALYS R. 2004. — Assembling the fungal tree of life: Progress, classification, and evolution of subcellular traits. *American Journal of Botany* 91: 1446-1480. https://doi. org/10.3732/ajb.91.10.1446
- MCLAUGHLIN D. J., HIBBETT D. S., LUTZONI F., SPATAFORA J. W. & VILGALYS R. 2009. The search for the fungal tree of life. *Trends in Microbiology* 17: 488-497. https://doi.org/10.1016/j. tim.2009.08.001
- MENEZES A. A., XAVIER-LEITE A. B., APTROOT A. & CACERES M. E. S. 2013. — New lichen species from the Caatinga in Chapada do Araripe, northeastern Brazil. *The Bryologist* 116 (3): 302-305.
- MIRANDA-GONZÁLEZ R., LÜCKING R., BARCENAS-PEÑA A. & HERRERA-CAMPOS M. A. 2020. — The new genus *Jocatoa* (Lecanoromycetes: Graphidaceae) and new insights into subfamily Redonographoideae. *The Bryologist* 123: 127-143. https://doi. org/10.1639/0007-2745-123.2.127
- MONCADA B., LÜCKING R. & SUÁREZ A. 2014. Molecular phylogeny of the genus *Sticta* (lichenized Ascomycota: Lobariaceae) in Colombia. *Fungal Diversity* 64: 205-231. https://doi. org/10.1017/S0024282912000825
- PARNMEN S., LÜCKING R. & LUMBSCH H. T. 2012. Phylogenetic classification at generic level in the absence of distinct phylogenetic patterns of phenotypical variation: a case study in Graphidaceae (Ascomycota). *PLoS ONE* 7: 1-13.https://doi. org/10.1371/journal.pone.0051392
- PERLMUTTER G. B., RIVAS PLATA E., LA GRECA S., APTROOT A., LÜCKING R., TEHLER A. & ERTZ D. 2020. — *Biatora akompsa* is revealed as a disjunct North American species of *Pentagenella* (Opegraphaceae) through molecular phylogenetic analysis and phenotype-based binning. *The Bryologist* 123: 502-516. https:// doi.org/10.1639/0007-2745-123.3.502
- RESH V. H. & MCELRAVY E. P. 1993. Contemporary quantitative approaches to biomonitoring uring benthic macroinvertebrates, *in* ROSENBERG D. M. & RESH V. H. (eds), *Fresh-Water Biomonitoring and Benthic Macroinvertebrates*. Chapman and Hall, New York: 159-194.
- RIVAS PLATA E., HERNÁNDEZ J. E., LÜCKING R., STAIGER B., KALB K. & CACERES M. E. S. 2011. — *Graphis* is two genera – A remarkable case of parallel evolution in lichenized Ascomycota. *Taxon* 60: 99-107.
- RIVAS PLATA E., LÜCKING R. & LUMBSCH H. T. 2012a. A new classification for the Family Graphidaceae *s. lat.* (Ascomycota: Lecanoromycetes: Ostropales). *Fungal Diversity* 52: 107-121. https://doi.org/10.1007/s13225-011-0135-8

- RIVAS PLATA E., LÜCKING R. & LUMBSCH H. T. 2012b. Molecular phylogeny and systematics of the *Ocellularia* clade (Ascomycota: Ostropales: Graphidaceae). *Taxon* 61: 1161-1179. https://doi. org/10.1002/tax.616001
- RIVAS PLATA E., PARNMEN S., STAIGER B., MANGOLD A., FRISCH A., WEERAKOON J., HERNÁNDEZ M. J. E., CÁCERES M. E. S., KALB K., SIPMAN H. J. M., COMMON R. S., NELSEN M. P., LÜCKING R. & LUMBSCH H. T. 2013. — A molecular phylogeny of Graphidaceae (Ascomycota: Lecanoromycetes: Ostropales) including 428 species. *MycoKeys* 6: 55-94. https://doi.org/10.3897/mycoKeys.6.3482
- ROUX C., PINAULT P. & ÉRTZ D. 2022. Corticifraga ramalinae P. Pinault, Ertz et Cl. Roux sp. nov., champignon lichénicole non lichénisé (Ascomycota, Gomphillaceae). Bulletin de la Société linnéenne de Provence 73: 29-35.
- SPATAFORA J. W., CHANG Y., BENNY G. L., LAZARUS K., SMITH M. E., BERBEE M. L., BONITO G., CORRADI N., GRIGORIEV I., GRY-GANSKYI A. & JAMES T. Y. 2016. — A phylum-level phylogenetic classification of zygomycete fungi based on genome-scale data. *Mycologia* 108: 1028-1046. https://doi.org/10.3852/16-042
- SPRINGER M. S., SIGNORE A. V., PAIJMANS J. L. A., VÉLEZ-JUARBE J., DOMNING D. P., BAUER C. E., HE K., CRERAR L., CAMPOS P. F., MURPHY W. J., MEREDITH R. W., GATESY J., WILLERSLEV E., MACPHEE R. D. E., HOFREITER M. & CAMPBELL K. L. 2015. — Interordinal gene capture, the phylogenetic position of Steller's sea cow based on molecular and morphological data, and the macroevolutionary history of *Sirenia. Molecular Phylogenetics and Evolution* 91: 178-193. https://doi.org/10.1016/j.ympev.2015.05.022
- STAMATAKIS A. 2006. RAXML-VI-HPC: maximum likelihood-based phylogenetic analyses with thousands of taxa and mixed models. *Bioinformatics* 22 (21): 2688-2690. https://doi. org/10.1093/bioinformatics/btl446
- STAMATAKIS A. 2014. RAxML version 8: a tool for phylogenetic analysis and post-analysis of large phylogenies. *Bioinformatics* 30 (9): 1312-1313. https://doi.org/10.1093/bioinformatics/btu033
- STAMATAKIS A., LUDWIG T. & MEIER H. 2005. RAxML-III: a fast program for maximum likelihood-based inference of large phylogenetic trees. *Bioinformatics* 21 (4): 456-463. https://doi. org/10.1093/bioinformatics/bti191
- STAMATAKIS A., HOOVER P. & ROUGEMONT J. 2008. A rapid bootstrap algorithm for the RAxML web servers. *Systematic Biology* 57 (5): 758-771. https://doi.org/10.1080/10635150802429642
- TEDERSOO L., SÁNCHEZ-RAMÍREZ S., KOLJALG U., BAHRAM M., DÖRING M., SCHIGEL D., MAY T., RYBERG M. & ABARENKOV K. 2018. — High-level classification of the Fungi and a tool for

evolutionary ecological analyses. *Fungal Diversity* 90: 135-159. https://doi.org/10.1007/s13225-018-0401-0

- TESTO W., OLLGAARD B., FIELD A., ALMEIDA T., KESSLER M. & BARRINGTON D. 2018. — Phylogenetic systematics, morphological evolution, and natural groups in neotropical *Phlegmariurus* (Lycopodiaceae). *Molecular Phylogenetics and Evolution* 125: 1-13. https://doi.org/10.1016/j.ympev.2018.03.016
- VĚZDA A. 1973. Foliicole Flechten aus der Republik Guinea (W. Afrika). I. Acta Musei Silesiae, Opava 22: 67-90.
- VĚZDA A. & POELT J. 1987. Flechtensystematische Studien. XII. Die Familie Gomphillaceae und ihre Gliederung. *Folia Geobotanica et Phytotaxonomica, Praha* 22: 179-198.
- WIJAYAWARDENE N. N., HYDE K. D., DAI D. Q., SÁNCHEZ-GARCÍA M., GOTO B. T., SAXENA R. K., ERDOĞDU M., SELÇUK F., RAJESH-KUMAR K. C., APTROOT A., BŁASZKOWSKI J., BOONYUEN N., DA SILVA G. A., DE SOUZA F. A., DONG W., ERTZ D., HAELE-WATERS D., JONES E. B. G., KARUNARATHNA S. C., KIRK P. M., Kukwa M., Kumla J., Leontyev D. V., Lumbsch H. T., Maha-RACHCHIKUMBURA S. S. N., MARGUNO F., MARTÍNEZ-RODríguez P., Mešić A., Monteiro J. S., Oehl F., Pawłowska J., PEM D., PFLIEGLER W. P., PHILLIPS A. J. L., POŠTA A., HE M. Q., LI J. X., RAZA M., SRUTHI O. P., SUETRONG S., SUWANNARACH N., Tedersoo L., Thiyagaraja V., Tibpromma S., Tkalčec Z., TOKAREV Y. S., WANASINGHE D. N., WIJESUNDARA D. S. A., WIMALASEANA S. D. M. K., MADRID H., ZHANG G. Q., GAO Y., SÁNCHEZ-CASTRO I., TANG L. Z., STADLER M., YURKOV A. & THINES M. 2022. — Outline of Fungi and fungus-like taxa – 2021. Mycosphere 13: 53-453. https://doi.org/10.5943/mycosphere/13/1/2
- XAVIER-LEITE A. B., CACERES M. E. S., GOTO B. T. & LÜCKING R. 2018. — The genus *Gyalideopsis* (lichenized Ascomycota: Gomphillaceae) in Brazil: updated checklist, key to species, and two novel taxa with unique hyphophores. *The Bryologist* 121 (1): 32-40. https://doi.org/10.1639/0007-2745-121.1.032
- XAVIER-LEITE A. B., CACERES M. E. S., APTROOT A. MONCADA B., LÜCKING R. & GOTO B. T. 2022. — Phylogenetic revision of the lichenized family Gomphillaceae (Ascomycota: Graphidales) suggests post-K–Pg boundary diversification and phylogenetic signal in asexual reproductive structures. *Molecular Phylogenetics and Evolution* 168: 107380. https://doi.org/10.1016/j. ympev.2021.107380
- XAVIER-LEITE A. B., GOTO B. T., LÜCKING R. & CACERES M. E. S. 2023. — New genera in the lichenized family Gomphillaceae (Ascomycota: Graphidales) focusing on neotropical taxa. *Mycological Progress* 22: 88. https://doi.org/10.1007/s11557-023-01933-1

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APPENDICES

APPENDIX 1. — Characters and character state definitions used in the morphology-based phylogenetic binning analysis, based on Lücking *et al.* (2005) and modified. All characters are binarily coded (**abs**, absent; **pre**, present). The numbers correspond to those used by Lücking *et al.* (2005) and in the present data matrix (see Appendix 4); added characters are marked with **asterisks** at their place of insertion. https://doi.org/10.5852/cryptogamie-mycologie2024v45a8_s1

APPENDIX 2. — Character matrix for the 310 studied taxa of Gomphillaceae Walt. Watson ex Hafellner and the three outgroup species of *Coenogonium* Ehrenb. For character and character state definitions see Appendix 1. https://doi.org/10.5852/cryptogamie-mycologie2024v45a8_s2

APPENDIX 3. — Molecular alignment of the mtSSU and nuLSU markers for the 75 reference taxa (including three outgroup species of *Coenogonium* Ehrenb.) in Fasta format. https://doi.org/10.5852/cryptogamie-mycologie2024v45a8_s3

APPENDIX 4. — Results of the phenotype-based phylogenetic binning analysis for the query taxa. https://doi.org/10.5852/cryptogamie-mycologie2024v45a8_s4

APPENDIX 5. — Labelled classification tree resulting from phenotype-based phylogenetic binning analysis for the query taxa. https://doi.org/10.5852/cryptogamie-mycologie2024v45a8_s5