

# The lichens of the Golfo Dulce region

## Líquenes de la región de Golfo Dulce

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**Abstract:** A short historical survey of the study of lichens in Costa Rica and the Golfo Dulce region is provided, followed by an overview of the lichenological investigations currently undertaken in the region. A general characterisation of the lichen flora of the Golfo Dulce region with remarks on the occurrence of species within particular habitat types is presented, and the biogeographical relationships of the lichen flora is shortly discussed. Special attention is given to foliicolous lichens which account for the greatest proportion of the species. A list of all lichen species so far known to occur in the region, based on the literature as well as on own collections, is presented.

**Key words:** biodiversity, lichens, mycoflora of Costa Rica, Central America.

**Resumen:** Se entrega una breve revisión histórica del estudio de los líquenes en Costa Rica y la región de Golfo Dulce, seguida de una descripción de las investigaciones liquenológicas que actualmente se llevan a cabo en la región. Se presenta una caracterización general de la flora de líquenes de la región de Golfo Dulce con énfasis en la presencia de especies dentro de habitat particulares y se discute brevemente las relaciones biogeográficas de la flora de líquenes. Se otorga especial atención a los líquenes foliícolas que representan el mayor número de especies. Se incluye una lista de todas las especies de líquenes hasta ahora conocidas para la región, basada en la literatura como también en nuestras colecciones.

**Palabras clave:** biodiversidad, líquenes, micoflora de Costa Rica, América Central.

### History of lichen exploration in Costa Rica

The first lichen reported from Costa Rica was *Cora pavonia* in FRIES (1851), followed by a short list by NYLANDER (1877) of a few species collected by H. Polakowsky. The first comprehensive publications dealing with Costa Rican lichens are those by MÜLLER (1891, 1893) with treatments of c. 300 lichen species collected by H. Pittier and A. Tonduz with many of them described as new. Other extensive collections made by A. S. Ørsted in 1846-1848 have never been published as a unit. After MÜLLER's (loc.cit.) papers, interest in Costa Rican lichenology declined for many years until DODGE (1933) published a study on foliose and fruticose lichens. The next papers were those by DODGE (1936) and HEDRICK (1942) which report several species that have been collected during the 1934 Allan Hancock Expedition to the west coast of Costa Rica. SANTESSON (1952) in his pioneering work on foliicolous lichens included many collections from Costa Rica. Additional lichen records from Costa Rica have been found in publications by MÜLLER (1881, 1895), VAINIO (1894), HOWE (1914), DODGE (1929), HILLMANN (1930), MOTYKA (1936-38), DES ABBAYES (1939), and IMSHAUG

(1955). A summary of all previous lichen records from Costa Rica was provided by IMSHAUG (1956).

The first native Costa Rican to publish on lichens was GÓMEZ (1972) who treated Costa Rican basidiolichens. TIBELL (1982) revised the order Caliciales in Costa Rica, and KAPPELLE & SIPMAN (1992) reported foliose and fruticose lichens from oak forests in the Talamanca Mountain Range. Within the last two decades, interest in Costa Rican lichens has increased considerably. Much fieldwork has been carried out by various collectors resulting in the production of too many papers to be cited individually. Of particular importance is the extensive work of LÜCKING (1992, 1995, 1997, 1998, 1999 and others) and LÜCKING & VEZDA (1998) on foliicolous lichens. Many Costa Rican lichen samples are cited in modern monographs and revisions of certain genera (BRAKO 1991, TIBELL 1996, AHTI 2000, STAIGER 2002). In a recent series, BREUSS (2000, 2001, 2004, 2006) published lists of lichen collections mainly from south-western Costa Rica. A field guide with descriptions and colour photographs of selected lichens from Costa Rica was provided by UMAÑA & SIPMAN (2002). Recently, in the course of the TICOLICHEN project, several genus accounts (LÜCKING et al. 2006,





**Plate 1:** Lichen habitats: tropical rainforest (Esquinas forest), (a) interior of primary rainforest, (b) understory along a creek near Esquinas Rainforest Lodge, (c) interior of rainforest on ridge top, (d) canopy layer of rainforest, (e) interior of primary rainforest in a ravine, (f) margin of primary forest near field station "Tropenstation La Gamba". Photos: O. Breuss.



2007, NELSEN et al. 2006, among others) and a treatment of pyrenocarpous lichens (APTROOT et al. 2008) have been published.

## Lichenological research in the Golfo Dulce area

Until recently, the Golfo Dulce region received little attention, lichenologically. DODGE (1933) reported a few species from the Osa peninsula. LÜCKING (1992, 1995, 1997a,b, 1999a,b,c) examined extensive collections from the Osa peninsula and Golfito. BREUSS (2000, 2006) and BREUSS & NEUWIRTH (2007) focused on lichens from the Bosque Esquinas and its surroundings. BALOCH & GRUBE (2006) included collections from the Bosque Esquinas in their molecular studies on the Porinaceae. Several new taxa have been described from the Golfo Dulce region, namely *Calenia solorioides*, *Enterographa byssoidea*, *Ocellularia auratipruinosa*, *Anisomeridium flavovulcanus*, *Arthonia isidiata*, and, most recently, *Porina pilifera* and *Byssolecania pluriseptata*.

Lichen sampling in the Golfo Dulce region has been rather fragmentary and local. Epiphyllous lichens have been collected at several sites in the Golfo Dulce area and are rather well represented, whereas non-foliicolous lichens were mainly collected in the Bosque Esquinas region except for several macrolichen samples from the Osa peninsula and mentioned by DODGE (1933). LÜCKING's (loc. cit.) collections of foliicolous lichens are from a few sites on the Osa peninsula, from the Golfito Wildlife Refuge and from the vicinity of the Golfito airfield. The recent collecting work of BREUSS (2000, 2006) and BREUSS & NEUWIRTH (2007), which covers foliicolous as well as corticolous and lignicolous lichens, was undertaken during three one-week stays in 1999, 2002 and 2004 in the hillside forests of the Bosque Esquinas, including a riverine forest (Quebrada Chorro) and gallery woodland (Valle Bonito). Collecting work in a coastal forest has been done at one site only (San Josecito). Mangroves in tidal estuaries of the larger rivers have not yet been investigated for their lichen flora.

A part of the author's collection is still undetermined. There are a number of specimens which require critical study, and further results will be published in forthcoming papers. Continuation of the lichenological investigations in the study area is planned for the near future. In recent years, lichenologists from Graz University have carried out several lichenological expeditions to the Bosque Esquinas and their work focuses on the following fields: the colonisation of artificial leaves by foliicolous lichens in different rainforest plots (Martin Grube), phylogenetic relationships of tropical lichens

(Elisabeth Baloch), and the taxonomy of sterile crustose lichens (Barbara Emmerer, Josef Hafellner).

There is a need for further research; since the lichen flora in the Golfo Dulce area has only been explored in any depth in a few places, it is too early to attempt a detailed analysis of the local lichen flora. Only a rough and fragmental overview can therefore be given in the present contribution.

## Lichen flora of Costa Rica

Fungi form a species-rich group of organisms. The estimated number of known ascomycetes is 30.000-40.000, half of which are lichenised. Contrary to the ascomycetes, lichen-forming basidiomycetes are very few. At present, nearly 1400 lichen species are known from Costa Rica, according to the preliminary Internet checklist (UMAÑA TENORIO et al. 2002). As the knowledge of tropical lichens in general is very incomplete, the number of taxa will undoubtedly rise considerably with ongoing efforts of investigation, and the total number of Costa Rican lichen species may be estimated as twice that number. A critical catalogue of all lichen species so far reported from Costa Rica is in preparation and will probably be published in 2009 (BREUSS & NEUWIRTH, in prep.).

## Lichen flora of the Golfo Dulce area

### General characterisation

Lowland rainforest is the major habitat type in the Golfo Dulce area and the lichens, therefore, are predominantly crustose. The largest proportion of the known lichen flora is represented by foliicolous lichens, whereas corticolous crustose lichens are known to a lesser extent.

Macrolichens are scarce in the lowland rainforest with species richness rising significantly in more open secondary habitats. There, members of the Parmeliaceae constitute most of the foliose lichen flora, followed by species of the genera *Dirinaria*, *Leptogium*, *Parmeliella*, *Physcia* and *Pyxine*. Fruticose lichens such as *Cladonia* and *Usnea* species account for only a very small proportion of the lichen flora. A rich macrolichen flora is developed in anthropogenic vegetation: on fence posts and trees along roads and brooks, in pastureland and around villages, in riparian shrub vegetation and gardens.

The soil lichen flora is poorly developed in the wet tropics and usually confined to compacted soil in strongly disturbed secondary vegetation types. A luxuriant terricolous lichen growth in the investigated area was a large cover of *Baeomyces rufus* on compacted earth



**Plate 2:** Lichen habitats, (a) valley of Río Bonito, river banks and gallery woodland, (b) cultivated land and secondary forest near Río Bonito, (c) pasture and hillside forest near La Gamba, (d) roadside vegetation at field station "Tropenstation La Gamba". Photos: O. Breuss.

on a vertical road cutting at Fila Gamba. A small growth of *Cladonia subradiata* was found in the garden of the Esquinas Rainforest Lodge.

No lichens have yet been found growing on stone due to the scarcity of rocky areas. Coastal cliffs and riverine rocks may bear a sparse and inconspicuous lichen growth but have not yet been investigated.

### Biogeographical relationships

Nearly all lichen species occurring in the Golfo Dulce area are not confined to this region but have wider distributions. Most species are pantropical to pantropical-temperate or intercontinentally distributed, whereas about one third are wide neotropical or American. A few species have narrower geographical ranges. Only 23 species are potentially endemic to Costa Rica or Central America. Endemism is generally rare in the lichen flora of the neotropics.

Of the foliicolous lichens (see below), 112 are pantropical, some of which extend their range into subtropical or temperate regions (including *Byssoloma leucoblepharum*, *B. subdiscordans*, *Gyalectidium filicinum*, *Opegrapha filicina*, *Strigula nitidula*, and *S. smaragdula*).

There are 84 neotropical species (32%); of these, four (*Coccocarpia tenuissima*, *Malcolmiella amazonica*, *Mazosia praemorsa*, *M. tumidula*) are centred on the Amazon Basin, one species (*Porina pocsii*) is Central American, and eleven species (*Byssolecania pluriseptata*, *Calenia subdepressa*, *Dimerella minima*, *D. squirrensensis*, *Enterographa byssoidea*, *Fellhanera muhleii*, *Gyalideopsis actinoplacoides*, *Opegrapha alba*, *Paratracharia paradoxa*, *Porina pilifera*, and *Trichothelium longisporum*) are putatively endemic to Costa Rica. Some 26 epiphyllous species show a neotropical-African distribution pattern, and 22 species are amphi-Pacific (Neotropics and Eastern paleotropics), two of which have range extensions into the Valdivian (*Porina rubrosphaera*) or Hawaiian (*Tapellaria nana*) regions. Several species occur in all tropical regions and one extratropical region: *Arthonia cyanea* is pantropical-Valdivian, *Porina rubentior* is pantropical-Tethyan, and *Tapellaria phyllophila* is pantropical-Neozelandic-Tasmanian (LÜCKING 2003).

The non-foliicolous lichens have similar distribution patterns. About 91 species are pantropical (partly without Australia), 13 of which extend their distribution range into subtropical or temperate regions. Common pantropical species include *Bulbothrix goebelii*, *Coc-*



*cocarpia erythroxyli*, *C. pellita*, *Dirinaria picta*, *Glyphis citricosa*, *Leptogium azureum*, *L. phyllocarpum*, *Malcolmiella granifera*, *Megalospora tuberculosa*, *Ocellularia cavata*, *Parmotrema cristiferum*, *Porina mastoidea*, *Pyrenula anomala* and *Pyrrhospora russula*. One species is cosmopolitan in oceanic places (*Normandina pulchella*), and a further two (*Baeomyces rufus* and *Peltigera collina*) are widespread temperate to boreal. *Pertusaria tetrathalamia* is American. About 71 species are widespread throughout the neotropics, seven species (*Mycomicrothelia oleosa*, *Myriotrema barroense*, *Ocellularia landronii*, *O. subemersa*, *Polymeridium flavothecium*, *Pyrenula falsaria*, and *Thelotrema neei*) are Central American, and four species (*Anisomeridium flavovulcanus*, *Arthonia isidiata*, *Gyrotrema wirthii* and *Ocellularia auratipruinosa*) are supposedly endemic to Costa Rica. *Coccocarpia domingensis*, *Leiorreuma sericeum*, and *Stegobolus auberianus* are neotropical-Pacific. Eleven species have a neotropical-African distribution pattern. Amphipacific ranges (Neotropics and Eastern paleotropics) are shown in 28 species, a few of them with occurrences within the Pacific region.

### Foliicolous lichens

As pointed out above, the knowledge of tropical lichens is very incomplete. Among those groups which are being more intensely studied are the foliicolous lichens, i.e. those growing on living leaves of vascular plants. Because of the short-lived substrate this life form involves short life cycles – which implies rapid reproduction – in combination with small thalli. These adhere to the leaf surface by a thin layer of mucilage except for the species of *Strigula* that grow below the leaf cuticle. Dozens of species may occur on a single leaf. A survey of general aspects of the biology of foliicolous lichens is given by SANTESSON (1952) and LÜCKING (2001).

At present, about 800 species of foliicolous lichens are known world-wide (LÜCKING 2003). The great majority of them are confined to the tropics and most of them are obligately epiphyllous. SANTESSON's (1952) monograph laid the basis for the study of foliicolous lichens which has expanded steadily in recent years. Thus, the number of 482 species world-wide known in 1993 (FARKAS & SIPMAN 1993) has been enlarged by over 300 since then. Most research concentrates on regional diversity and taxonomy, and only a few authors take up ecological studies such as to host-substrate preferences, species associations, successional colonisation and interspecific competition in epiphyllous communities (see CONRAN 1997). Studies of the distribution ecology of foliicolous lichens in Costa Rica were undertaken by LÜCKING (1992b, 1998, 1999), and LÜCKING (1997d) pointed out the possible role of epiphyllous lichens as bioindicators.

Species diversity of foliicolous lichens is highest in undisturbed rainforests. Their optimal habitat appears to be the foliage of small woody plants, young trees and ferns in the transitional position from the shady understory to natural light gaps where light level is dim and humidity is high. There are fewer species higher up in the trees, and the outer canopy exhibits low species diversity (LÜCKING 1997c). Little is known about possible host preferences, but phorophyte specificity seems to be rare in foliicolous lichens. Colonisation of leaves by lichens is greatly influenced by surface features as smoothness or hairiness and surface relief.

Due to the fragmentary study of the phyllosphere at a world-wide scale, the distribution of many species is poorly known. The increasing knowledge of epiphyllous lichens also provides a better understanding of their distribution. Many species were found to have a wider range than indicated by former literature data; in fact, the vast majority seem to be pantropical. Types of distributions in foliicolous lichens in comparison with floristic regions based on vascular plants are outlined by LÜCKING (2003).

The foliicolous lichen flora of Costa Rica is well studied. With more than 400 species currently known, which corresponds to about half of the world's species number and three quarters of all species known from the neotropics, Costa Rica's foliicolous lichen flora is the best known in the world (LÜCKING 1997c). The highest species diversity of epiphyllous lichens in Costa Rica is found in the wet undisturbed primary lowland forests where single sites can support up to 280 species (LÜCKING 1997a).

The Golfo Dulce area has a rich epiphyllous lichen flora. The 245 presently known species comprise 58% of the species number known from Costa Rica. They belong to 18 families and 50 genera. Dominant families are the Gomphillaceae, Porinaceae, and Pilocarpaceae with 51, 49, and 46 species, respectively. The most well represented genera are *Porina* (33 species), *Strigula* (15 species), and *Trichothelium* (14 species).

### Rainforests

Large areas of the Golfo Dulce region are still covered by rainforest. The Golfo Dulce rainforests belong to the most luxuriant and species-rich forests in Central America, which is also true with respect to lichens. The main forest type in the region is the Tropical Wet Forest according to HOLDRIDGE (1967) which covers the lowlands of the Golfo Dulce area. It is a multi-layered forest with abundant stilt-rooted palms, dwarf palms and broad-leaved herbs dominating the shrub layer (WEISSENHOFER et al. 2001) which clothes the plains and hillsides. Due to forest clearing for planta-





**Plate 3:** Epiphyllous lichens, (a) *Porina limbulata*, (b) *Strigula schizospora*, (c) *Chroodiscus coccineus*, (d) *Porina pilifera*, (e) *Porina radiata*, (f) *Echinoplaca wilsoniorum*, (g) *Mazosia melanophthalma*. Photos: G. Neuwirth.

tions and pastures or timber exploitation on flat land, the flat forest types are preserved only in the Corcovado National Park and have vanished from other regions where rainforests are restricted to the hillsides, e.g. in Piedras Blancas National Park. The hills and ridges (filas) often have very steep slopes and deep ravines which are difficult to access. The fila ridges are the “driest” parts, the ravines the wettest. The rainforest on the highest hill-tops and ridges shows premontane affinities with dense groundlayer mainly of ferns and a rich epiphyte cover.

Down in the dense forest with a closed canopy layer, where light levels are low, crustose lichens over-

whelmingly dominate; few species are macrolichens (foliose and fruticose growth forms). Squamulose, leprose, and filamentous lichens are also rare. The dominant role of crustose lichens in lowland rainforests has been pointed out by several investigators (see KOMPOSCH & HAFELLNER 2002). One reason for the absence of macrolichens under these conditions may be physiological (ZOTZ 1999). Most macrolichens that occur near ground level within the forest are species with blue-green photobionts such as *Leptogium* and *Coccocarpia* species. The macrolichen flora becomes increasingly richer in situations where light intensities are higher than within the forest – on stream-side trees, in larger light gaps, on forest edges and in the canopy. It can part-



ly be observed on fallen canopy branches and is represented by common and widespread species especially of the family Parmeliaceae but is not characteristic for lowland rainforests.

Typical lichen crusts in shade on tree bases and lower trunks include several *Porina* species (*Porina dolichophora*, *P. epimelaena*, *P. exasperatula*, *P. mastoidea*, *P. rudiusscula*, *P. tijucana*), *Anisomeridium flavovulcanus*, *Pyrenula* spp., *Malcolmiella granifera*, *Myeloconis* spp. and members of the large family Thelotremaaceae. There is a high proportion of sterile, sorediate, isidiate or otherwise vegetatively reproducing species which are difficult to identify. The squamulose growth form is represented by *Eschatogonia prolifera* and *Phyllopsora* species. Filamentous lichens are *Dictyonema* and *Coenogonium* species. Besides unknown sterile crusts, several *Porina* species seem to be among the most shade-tolerant lichens that form extensive species-poor mosaics on buttresses, stilt-roots and woody lianas above the forest floor.

Characteristic foliicolous species on shady understory leaves are *Arthonia accolens*, *A. leptosperma*, *Dimerella squirrensis*, *Fellhanera fuscata*, *Gyalidea epiphylla*, *Phylloblastenia amazonica*, *Porina epiphylla*, *P. limbulata*, *P. mirabilis*, *P. rufula*, *Strigula phyllogena*, *Strigula platypoda*, and *Trichothelium epiphyllum*, whereas *Arthonia palmulacea*, *Badimia dimidiata*, *Chroodiscus coccineus*, *Eremothecella calamicola*, *Mazosia* species, *Opegrapha filicina*, *Phyllobathelium firmum*, *Porina fulvella*, *Porina subepiphylla*, *Strigula maculata*, *S. subtilissima*, and *Paratracharia paradoxa* prefer less damp and lighter spots in the forest. Epiphyllous associations in light gaps include *Actinoplaca strigulacea*, *Aspidothelium fugiens*, *Calenia depressa*, *Calopadia foliicola*, *C. fusca*, *Echinoplaca* species, *Gyalectidium filicinum*, *Gyalideopsis vulgaris*, *Strigula smaragdula*, *Tricharia urceolata*, and *T. vainioi*.

Much of the Golfo Dulce rainforest is pristine forest and supports special lichen communities. *Amazonomyces farkasiae*, *Arthonia orbygniae*, *Aulaxina microphana*, *Badimia galbinea*, *Byssoloma minutissimum*, *Caleniopsis laevigata*, *Fellhanera verrucifera*, *Gyalidea epiphylla*, *Mazosia longispora*, *M. rubropunctata*, *M. tenuissima*, *Paratracharia paradoxa*, *Porina radiata*, *P. guianensis*, *P. pseudo-fulvella*, and *Strigula macrocarpa* are examples of species which seem to be restricted to primary forests, whereas occurrences of *Asterothyrium* species, *Bullatina aspidota*, *Porina vezdae*, and *Strigula antillarum* indicate secondary forests. Most species found in the study area have a wide altitudinal distribution, but *Badimia galbinea*, *Bapalmuia palmularis*, *Byssolecania* species, *Cryptothecia filicina*, *Mazosia tumidula* and *Porina radiata* are largely confined to lowland forests.

## Secondary vegetation

Although the Golfo Dulce region is largely uninhabited, parts of the landscape have been affected by human activities. Land outside the national parks became fragmented, fenced, grazed and cultivated and locally shows different stages of recolonisation and successions. Disturbed forests and secondary vegetation shelter lichen communities which are very different from those in virgin forests. There is a decline in foliicolous lichens, a predominance of corticolous species, and a richer macrolichen flora in the more open vegetation. The close proximity of (nearly) undisturbed primary forest and secondary habits created by man affects biodiversity levels considerably. It is the interlinking of primary and secondary vegetation with transition features between forested and open areas and their contrasting plant communities that provides high numbers of lichen species within comparatively small areas.

The synanthropic lichen flora has been investigated in the surroundings of the village of La Gamba. Solitary trees along roads or in pastures have a rich growth of lichens. *Arthothelium galbineum*, *Glyphis cicatricosa*, *Leptogium phyllocarpum*, *Normandina pulchella*, *Parmeliella stylophora*, *Physcia atrostriata*, *P. krogiae*, and *P. lobulata* are among those lichens that have been found only in cultivated areas. Large thalli of *Parmotrema cristiferum*, *P. dilatatum* and *P. endosulphureum* colonise well-lit stems and branches. Fence posts support a rich cover of lignicolous lichen communities that are dominated by Graphidaceae. Lichens present on dead wood include *Carbacanthographis chionophora*, *Graphis chrysocharpa*, *G. dissempens*, *G. proserpens*, *G. rimulosa*, *G. striatula*, *G. vestitoides* and *Thalloloma anguinaeforme*. Most of these species are absent or rare in natural habitats.

## Species inventory

At present, 471 lichen taxa are known from the Golfo Dulce region. They are listed below with foliicolous and non-foliicolous lichens enumerated separately (species found on both leaves and bark or lignum are shown in both sections). The list is based on literature records and on (unpublished) collections by the author. Taxonomy of foliicolous lichens mostly follows LÜCKING et al. (2000). *Dimerella* is retained as a genus distinct from *Coenogonium*. To facilitate comparison of literature data, the most recent changes in generic delimitations, e.g. within the Gomphillaceae (LÜCKING et al. 2005), have not been considered. Taxonomy of Graphidaceae follows STAIGER (2002). Every species name is followed by abbreviations referring to the subregions of the area (BE, Go, Osa, Caño) and the literature references.





**Plate 4:** Corticolous lichens, (a) *Coccocarpia filiformis*, (b) *Sarcographa ramificans*, (c) *Graphis chrysocarpa*, (d) *Graphis vestitoides*, (e) *Platythecium allosporellum*, (f) *Sarcographa labyrinthica*. Photos: G. Neuwirth.



**Abbreviations:**

BE = Bosque Esquinas and La Gamba, Go = Golfo, Osa = Peninsula de Osa, Caño = Isla del Caño; Ap&al08 = APTROOT et al. 2008, BaGr06 = BALOCH & GRUBE 2006, Br00 = BREUSS 2000, Br06 = BREUSS 2006, BrNe07 = BREUSS & NEUWIRTH 2007, HaKa95 = HAFELLNER & KALB 1995, Lü95 = LÜCKING 1995, Lü97 = LÜCKING 1997, Lü99 = LÜCKING 1999, LüMa96 = LÜCKING & MATZER 1996, LüSér.97 = LÜCKING & SÉRUSIAUX 1997

**Foliicolous lichens**

- Actinoplaca strigulacea* MÜLL. ARG.: BE, Br06  
*Amazonomyces farkasiae* (LÜCKING) LÜCKING, SERUS. & THOR: BE, Osa, Lü95, BrNe07  
*Arthonia accolens* STIRT.: BE, Osa, Br06, Lü95  
*Arthonia aciniformis* STIRT.: BE, Br00, BrNe07, Lü95  
*Arthonia cinnabarinula* MÜLL. ARG.: BE, BrNe07  
*Arthonia cyanea* MÜLL. ARG.: BE, Go, Br06, Lü92, Lü95  
*Arthonia epidendri* (REHM) R. SANT.: BE, BrNe07  
*Arthonia intermedia* MATZER: Osa, MATZER 1996  
*Arthonia leptosperma* (MÜLL. ARG.) R. SANT.: BE, Osa, Br00, Br06, BrNe07, Lü95  
*Arthonia mira* R. SANT.: Go, Lü92  
*Arthonia orbignyae* (UPADHYAY) MATZER: BE, Osa, Br00, Lü95  
*Arthonia palmulacea* (MÜLL. ARG.) R. SANT.: BE, Go, Osa, Br06, BrNe07, Lü95,  
*Arthonia trilocularis* MÜLL. ARG.: BE, Go, Osa, BrNe07, Lü92, Lü95  
*Aspidothelium fugiens* (MÜLL. ARG.) R. SANT.: BE, Br06, BrNe07  
*Aspidothelium geminiparum* (MALME) R. SANT.: BE, BrNe07  
*Aspidothelium ornatum* LÜCKING: BE, Br06  
*Aspidothelium papillicarpum* LÜCKING: BE, Br06  
*Aspidothelium scutellarpum* LÜCKING: BE, BrNe07  
*Aspidothelium trichothelioides* SÉRUS. & VÉZDA: BE, Br06  
*Asterothyrium microsporium* R. SANT.: BE, BrNe07  
*Asterothyrium pittieri* MÜLL. ARG.: Go, Lü92  
*Asterothyrium rotuliforme* (MÜLL. ARG.) SÉRUS.: BE, BrNe07  
*Aulaxina intermedia* LÜCKING: BE, BrNe07  
*Aulaxina microphana* (VAIN.) R. SANT.: BE, BrNe07  
*Aulaxina minuta* R. SANT.: BE, Osa, Br06, BrNe07, Lü97  
*Aulaxina multiseptata* R. SANT.: BE, Br06  
*Aulaxina opegraphina* FÉE: BE, Go, Br06, Lü92  
*Aulaxina quadrangula* (STIRT.) R. SANT.: BE, Osa, Br06, BrNe07, Lü97  
*Aulaxina submuralis* KALB & VÉZDA: BE, BrNe07  
*Bacidina apiatica* (MÜLL. ARG.) VÉZDA: BE, BrNe07  
*Bacidina pallidocarpa* (MÜLL. ARG.) VÉZDA: BE, Br06  
*Badimia dimidiata* (BAB. ex LEIGHTON) VÉZDA: BE, Br00, Br06, BrNe07  
*Badimia galbinea* (KREMP.) VÉZDA: BE, Br00, Br06, BrNe07  
*Badimia pallidula* (KREMP.) VÉZDA: BE, Br00, Br06  
*Badimia tuckermanii* (R. SANT.) LÜCKING, LUMBSCH & ELIX: BE, BrNe07  
*Bapalmua costaricensis* LÜCKING & KALB: BE, BrNe07  
*Bapalmua palmularis* (MÜLL. ARG.) SÉRUS.: BE, Br06  
*Bullatina aspidota* (VAINIO) VÉZDA & POELT: BE, Go, Br06, Lü92  
*Byssolecania deplanata* (MÜLL. ARG.) R. SANT.: BE, Br06, BrNe07  
*Byssolecania fumosonigrans* (MÜLL. ARG.) R. SANT.: BE, Br06, BrNe07  
*Byssolecania hymenocarpa* (VAIN.) KALB et al.: BE, BrNe07  
*Byssolecania pluriseptata* BREUSS: BE, BrNe07  
*Byssolecania variabilis* VÉZDA, KALB & LÜCKING: BE, BrNe07  
*Byssolecania vezdae* KALB & LÜCKING: BE, BrNe07  
*Byssoloma aeruginascens* VÉZDA: Osa, ELIX & al. 1995  
*Byssoloma leucoblepharum* (NYL.) VAINIO: BE, Br00, Br06, BrNe07  
*Byssoloma lueckingii* SÉRUS.: Go, SÉRUSIAUX 1995  
*Byssoloma minutissimum* KALB & VÉZDA: BE, Br06, BrNe07  
*Byssoloma subdiscordans* (NYL.) P. JAMES: BE, Br06, BrNe07  
*Byssoloma tricholomum* (MONT.) ZAHLBR.: BE, BrNe07  
*Byssoloma vanderystii* SÉRUS.: BE, BrNe07  
*Calenia bullatinoides* LÜCKING: Go, LÜCKING et al. 2001  
*Calenia depressa* MÜLL. ARG.: BE, Br06, BrNe07  
*Calenia graphidea* VAIN.: BE, Osa, BrNe07, Lü97  
*Calenia lueckingii* HARTMANN: BE, BrNe07  
*Calenia phyllogena* (MÜLL. ARG.) R. SANT.: BE, Osa, Br06, BrNe07, Lü97  
*Calenia solerinoides* LÜCKING: Go, Lü91, Lü92  
*Calenia subdepressa* LÜCKING: BE, Osa, Br06, BrNe07, Lü97  
*Calenia thelotremella* VAIN.: Osa, Lü97  
*Calenia triseptata* ZAHLBR.: BE, Osa, BrNe07, Lü97  
*Caleniopsis laevigata* (MÜLL. ARG.) VÉZDA & POELT: BE, BrNe07  
*Calopadia foliicola* (FÉE) VÉZDA: BE, Osa, Br06, Lü99  
*Calopadia fusca* (MÜLL. ARG.) VÉZDA: BE, Caño, Go, Osa, Br06, BrNe07, Lü92, Lü99  
*Calopadia perpallida* (NYL.) VÉZDA: BE, Br00, BrNe07  
*Calopadia phyllogena* (MÜLL. ARG.) VÉZDA: BE, Osa, Br06, BrNe07, Lü99  
*Calopadia puiggarii* (MÜLL. ARG.) VÉZDA: BE, Caño, Br06, BrNe07, Lü99  
*Calopadia subcoerulescens* (ZAHLBR.) VÉZDA: BE, Br06, BrNe07  
*Caprettia neotropica* LÜCKING & SÉRUS.: Osa, SÉRUSIAUX & LÜCKING 2003  
*Chroodiscus australiensis* LUMBSCH & VÉZDA: BE, Br06  
*Chroodiscus coccineus* (LEIGHT.) MÜLL. ARG.: BE, Go, Osa, Br00, Br06, BrNe07, Lü92, Lü99b  
*Coccocarpia domingensis* VAIN.: BE, BrNe07  
*Coccocarpia epiphylla* (FÉE) KREMP.: BE, Br06  
*Coccocarpia stellata* TUCK.: BE, Br00, Br06  
*Coccocarpia tenuissima* MÜLL. ARG.: BE, BrNe07  
*Coenogonium ciliatum* KALB & LÜCKING: BE, BrNe07  
*Coenogonium implexum* NYL.: BE, Br00  
*Coenogonium moniliforme* TUCK.: Osa, Lü99c  
*Cryptothecia filicina* (ELLIS & EVERH.) LÜCKING et al.: BE, Osa, BrNe07, Lü95  
*Dictyonema phyllogenum* (MÜLL. ARG.) ZAHLBR. f. *phyllogenum*: BE, Br06, BrNe07  
*Dictyonema sericeum* (SW.) BERK. f. *phyllophilum* PARM.: BE, BrNe07  
*Dimerella dilucida* (Kremp.) R. SANT.: BE, Br06, BrNe07, Osa, Lü99c



- Dimerella epiphylla* (MÜLL. ARG.) MALME: BE, Go, Osa, Br06, BrNe07, Lü92, Lü99c
- Dimerella fallaciosa* (MÜLL. ARG.) VĚZDA: BE, Br06, BrNe07
- Dimerella flavicans* VĚZDA & FARKAS: BE, Br00
- Dimerella hypophylla* VĚZDA: BE, Osa, Br06, BrNe07, Lü99c
- Dimerella isidiifera* LÜCKING: Osa, Lü99c
- Dimerella lisowskii* VĚZDA: BE, BrNe07
- Dimerella minima* (MÜLL. ARG.) R. SANT.: BE, Br06, BrNe07, Osa, Lü99c
- Dimerella squirrensis* LÜCKING: BE, Go, Osa, Br06, BrNe07, Lü99c
- Dimerella subzonata* LÜCKING: BE, Osa, Br06, Lü99c
- Dimerella usambarensis* VĚZDA & FARKAS: BrNe07
- Echinoplaca bispora* KALB & VĚZDA: BE, Br06, BrNe07
- Echinoplaca diffluens* (MÜLL. ARG.) R. SANT.: BE, Br06, BrNe07
- Echinoplaca epiphylla* FÉE: BE, Go, Osa, Br06, BrNe07, Lü92, Lü97
- Echinoplaca furcata* SÉRUS.: Osa, Lü97
- Echinoplaca fusconitida* LÜCKING: BE, Br06, BrNe07
- Echinoplaca handelii* (Zahlbr.) LÜCKING: BE, Br06
- Echinoplaca hymenocaroides* (VAIN.) LÜCKING: BE, BrNe07
- Echinoplaca leucotrichoides* (VAIN.) R. SANT.: BE, Osa, Br06, BrNe07, Lü97
- Echinoplaca marginata* LÜCKING: BE, Osa, BrNe07, Lü97
- Echinoplaca pellicula* (MÜLL. ARG.) R. SANT.: BE, Go, Osa, Br06, BrNe07, Lü97
- Echinoplaca tricharioides* KALB & VĚZDA: BE, BrNe07
- Echinoplaca verrucifera* LÜCKING: BE, Caño, Osa, Br06, Lü97
- Echinoplaca wilsoniorum* LÜCKING: vicinity of field station La Gamba
- Enterographa angustissima* (VAIN.) R. SANT.: Go, Lü92
- Enterographa byssoidea* LÜCKING: BE, Go, Lü92, BrNe07
- Eremothecella calamicola* SYD.: BE, Osa, BrNe07, Lü95
- Fellhanera angustispora* LÜCKING: Osa, Lü97b
- Fellhanera fuscata* (MÜLL. ARG.) VĚZDA: Osa, Lü97b
- Fellhanera muhleii* LÜCKING: Osa, Lü97b
- Fellhanera rhapidophylli* (REHM) VĚZDA: BE, BrNe07
- Fellhanera rubida* (MÜLL. ARG.) LÜCKING: Osa, Lü97b
- Fellhanera stanhopeae* (MÜLL. ARG.) LÜCKING, LUMBSCH & ELIX: Osa, Lü97b
- Fellhanera subfuscata* LÜCKING: Osa, Lü97b
- Fellhanera subternella* (NYL.) VĚZDA: BE, Br06, BrNe07
- Fellhanera verrucifera* LÜCKING: Osa, Lü97b
- Gyalectidium ciliatum* LÜCKING, THOR & MATSUMOTO: BE, BrNe07
- Gyalectidium filicinum* MÜLL. ARG.: BE, Osa, BrNe07, Lü97
- Gyalidea epiphylla* VĚZDA: BE, Osa, Br06, Lü99b
- Gyalideopsis actinoplacoides* LÜCKING: BE, BrNe07
- Gyalideopsis rubescens* VĚZDA: BE, Go, BrNe07, Lü92
- Gyalideopsis verruculosa* VĚZDA & HAF.: BE, Br06
- Gyalideopsis vulgaris* (MÜLL. ARG.) LÜCKING: BE, Osa, Br06, BrNe07, Lü97
- Lasioloma arachnoideum* (KREMP.) R. SANT.: BE, Go, Osa, Br06, BrNe07, Lü92, Lü99
- Lichenopeltella setifera* MATZER: BE, BrNe07
- Loflammia epiphylla* (FÉE) LÜCKING & VĚZDA: BE, Br06
- Loflammia gabrielis* (MÜLL. ARG.) VĚZDA: Go, Osa, Lü99
- Lyromma nectandrae* BAT. & H. MAIA: Go, Lü92
- Macentina perminuta* VĚZDA: BE, BrNe07
- Malcolmiella amazonica* (REDINGER) KALB & LÜCKING: BE, BrNe07
- Mazosia bambusae* (VAINIO) R. SANT.: BE, Osa, Br06, BrNe07, LüMa96
- Mazosia dispersa* (HEDRICK) R. SANT.: BE, Go, Osa, Br06, BrNe07, Lü92, LüMa96
- Mazosia longispora* LÜCKING & MATZER: BE, BrNe07
- Mazosia melanophthalma* (MÜLL. ARG.) R. SANT.: BE, Go, Br06, BrNe07, LüMa96
- Mazosia paupercula* (MÜLL. ARG.) R. SANT.: BE, Br00
- Mazosia phyllosema* (NYL.) ZAHLBR.: BE, Go, Br00, Br06, BrNe07, Lü92
- Mazosia pilosa* KALB & VĚZDA: BE, Go, Osa, Br00, Br06, BrNe07, LüMa96
- Mazosia praemorsa* (STIRT.) R. SANT.: BE, Br06, BrNe07
- Mazosia pseudobambusae* KALB & VĚZDA: BE, Osa, BrNe07, LüMa96
- Mazosia rotula* (MONT.) A. MASSAL.: BE, Caño, Osa, Br00, Br06, BrNe07, LüMa96
- Mazosia rubropunctata* R. SANT.: Caño, LüMa96
- Mazosia tenuissima* LÜCKING & MATZER: BE, Osa, Br00, Br06, BrNe07, LüMa96
- Mazosia tumidula* (STIRT.) MÜLL. ARG.: BE, Osa, Br00, Br06, BrNe07, LüMa96
- Microtheliopsis uleana* MÜLL. ARG.: BE, BrNe07
- Musaespora kalbii* LÜCKING & SÉRUS.: Osa, LüSér97
- Opegrapha alba* LÜCKING: Go, Lü91, Lü92
- Opegrapha filicina* MONT.: BE, Caño, Go, Br06, BrNe07, Lü92, LüMa96
- Opegrapha lambinonii* SÉRUS.: Osa, LüMa96
- Opegrapha phylloporinae* MÜLL. ARG.: BE, BrNe07
- Opegrapha puiggarii* MÜLL. ARG.: Go, Lü92
- Opegrapha sipmanii* MATZER: Osa, MATZER 1996
- Opegrapha strigulae* R. SANT.: BE, BrNe07
- Paratricharia paradoxa* (LÜCKING) LÜCKING: BE, Br00, Br06, BrNe07
- Phyllobothelium firmum* (STIRT.) VĚZDA: BE, Br06, BrNe07
- Phyllobothelium leguminosae* (CAVALC. & A.A. SILVA) LÜCKING & SÉRUS.: BE, BrNe07
- Phylloblastia amazonica* KALB & VĚZDA: BE, Br06, BrNe07
- Porina alba* (R. SANT.) LÜCKING: BE, Osa, BALOCH & GRUBE 2006, Br06, BrNe07, LüVe98
- Porina andreana* LÜCKING & VEZDA: BE, Br06
- Porina atriceps* (VAIN.) VAIN.: BE, BrNe07
- Porina barvica* LÜCKING: BE, BrNe07
- Porina conspersa* MALME: BE, Br06
- Porina distans* VĚZDA & VIVANT: BE, Br06
- Porina epiphylla* (FÉE) FÉE: BE, Osa, BaGr06, Br06, BrNe07
- Porina fulvella* MÜLL. ARG.: BE, Go, Lü92, Br00, BE, BrNe07
- Porina fusca* LÜCKING: BE, BrNe07
- Porina andreana* LÜCKING & VĚZDA: BE, Br06
- Porina guianensis* LÜCKING & VĚZDA f. *guianensis*: BE, Br06
- Porina imitatrix* MÜLL. ARG.: BE, Br06
- Porina karnatakensis* MAKH., ADAW. & PATW.: BE, Osa, LüVe98, Br06, BrNe07
- Porina leptosperma* MÜLL. ARG.: BE, Br00, BrNe07
- Porina leptospermoides* MÜLL. ARG.: BE, Br06, BrNe07
- Porina limbulata* (KREMP.) VAINIO: BE, BaGr06, Br00, Br06, BrNe07

- Porina lucida* R. SANT.: BE, Osa, LüVe98, Br00, Br06, BaGr06, BrNe07
- Porina nitidula* MÜLL. ARG.: BE, BaGr06, BrNe07
- Porina octomera* (MÜLL. ARG.) F. SCHILL.: BE, BrNe07
- Porina ornata* VÉZDA: BE, BrNe07
- Porina papillifera* (STIRT.) F. SCHILL.: BE, BrNe07
- Porina pilifera* NEUWIRTH: BE, NEUWIRTH & PFALLER 2006, BrNe07
- Porina pocsii* VÉZDA: BE, Br06
- Porina pseudofulvella* SÉRUS.: BE, Br00, BrNe07
- Porina radiata* KALB, LÜCKING & VÉZDA: BE, Osa, LüVe98, BaGr06, Br00, Br06, BrNe07
- Porina repanda* (STIRT.) LÜCKING & R. SANT.: BE, Osa, HaKa95, BaGr06, Br00, BrNe07
- Porina rubentior* (STIRT.) MÜLL. ARG.: BE, BaGr06, Br00, Br06, BrNe07
- Porina rubescens* (LÜCKING) HAF. & KALB: Osa, HaKa95
- Porina rubrosphaera* R. SANT.: BE, BrNe07
- Porina rufula* (KREMP.) VAINIO: BE, Br00, Br06, BaGr06, BrNe07
- Porina subepiphylla* LÜCKING & VÉZDA: BE, Go, Osa, LüVe98, BaGr06, Br06, BrNe07
- Porina tetracerae* (AFZ.) MÜLL. ARG.: BE, Br06
- Porina tetramera* (MALME) R. SANT.: BE, Br06, BrNe07
- Porina vezdae* LÜCKING: BE, BrNe07
- Pseudocalopadia mira* LÜCKING: Osa, Lü99
- Sporopodium antonianum* ELIX, LUMBSCH & LÜCKING: Osa, ELIX et al. 1995, Lü99
- Sporopodium citrinum* (ZAHLEBR.) ELIX et al.: BE, Osa, Br00, Lü99
- Sporopodium leprieurii* MONT.: BE, Go, Osa, Br06, BrNe07, ELIX et al. 1995, Lü99
- Sporopodium phyllocaris* (MONT.) A. MASSAL.: Caño, Lü99
- Sporopodium xantholeucum* (MÜLL. ARG.) ZAHLEBR.: BE, Br00
- Strigula antillarum* (FÉE) MÜLL. ARG.: Go, Lü91, Lü92
- Strigula complanata* (FÉE) MONT.: BE, Br06, BrNe07
- Strigula concreta* (FÉE) R. SANT.: BE, Go, Lü92, BrNe07
- Strigula macrocarpa* VAINIO: BE, Br06, BrNe07
- Strigula maculata* (COOKE & MASSEE) R. SANT.: BE, Br06, BrNe07
- Strigula nemathora* MONT. var. *nemathora*: BE, Br06, BrNe07
- Strigula nemathora* MONT. var. *pulchella* (MÜLL. ARG.) R. SANT.: BE, BrNe07
- Strigula nitidula* MONT.: BE, Br00
- Strigula obducta* (MÜLL. ARG.) R.C. HARRIS: BE, BrNe07
- Strigula phaea* (TUCK.) R.C. HARRIS: Osa, Ap&al08
- Strigula phyllogena* (MÜLL. ARG.) R.C. HARRIS: BE, Br00, Br06, BrNe07
- Strigula platypoda* (MÜLL. ARG.) R.C. HARRIS: BE, Br06, BrNe07
- Strigula schizospora* R. SANT.: BE, BrNe07
- Strigula smaragdula* FR.: BE, Go, Lü92, Br06, BrNe07
- Strigula subelegans* VAINIO: BE, Br06, BrNe07
- Strigula subtilissima* (FÉE) MÜLL. ARG.: BE, Br06, BrNe07
- Strigula viridis* (LÜCKING) R.C. HARRIS: BE, BrNe07
- Tapellaria bilimbioides* R. SANT.: BE, BrNe07
- Tapellaria epiphylla* (MÜLL. ARG.) R. SANT.: BE, Osa, Lü99, Br00, Br06, BE, BrNe07
- Tapellaria malmei* R. SANT.: BE, Osa, Lü99, BrNe07
- Tapellaria nana* (FÉE) R. SANT.: BE, Br06
- Tapellaria nigrata* (MÜLL. ARG.) R. SANT.: BE, BrNe07
- Tapellaria phylophila* (STIRT.) R. SANT.: BE, Br06, BE, BrNe07
- Tapellaria puiggarii* (MÜLL. ARG.) R. SANT.: BE, BrNe07
- Tapellariopsis octomera* LÜCKING: Osa, Lü99
- Tricharia albostrigosa* R. SANT.: BE, Br00, Br06, BrNe07
- Tricharia amazonum* VAIN.: Osa, Lü97
- Tricharia carnea* (MÜLL. ARG.) R. SANT.: Osa, Lü97
- Tricharia couepiae* (BAT.) LÜCKING & SÉRUS.: Osa, Lü97
- Tricharia helminthospora* R. SANT.: BE, Osa, Lü97, BrNe07
- Tricharia heterella* (STIRT.) LÜCKING: BE, Osa, Lü97, Br06, BrNe07
- Tricharia hyalina* KALB & VÉZDA: BE, Osa, Lü97, BrNe07
- Tricharia planicarpa* LÜCKING: BE, BrNe07
- Tricharia santessoniana* KALB & VEZDA: BE, BrNe07
- Tricharia urceolata* (MÜLL. ARG.) R. SANT.: BE, Osa, Lü97, Br00, Br06, BrNe07
- Tricharia vainioi* R. SANT.: BE, Osa, Lü97, Br06, BrNe07
- Trichothelium alboatrum* VAIN.: BE, BrNe07
- Trichothelium annulatum* (KARST.) R. SANT.: Osa, Lü98
- Trichothelium bipindense* F. SCHILL.: BE, Osa, Lü98, Br00, Br06, BrNe07
- Trichothelium epiphyllum* MÜLL. ARG.: BE, Osa, Lü98, Br00, Br06, BaGr06, BrNe07
- Trichothelium juruense* (P. HENN.) F. SCHILL.: BE, Osa, Lü98, BrNe07
- Trichothelium longisporum* LÜCKING: BE, Osa, Lü98, Br06, BrNe07
- Trichothelium minus* VAIN.: BE, Go, Osa, Lü98, Br06, BrNe07
- Trichothelium minutum* (LÜCKING) LÜCKING: BE, Osa, Lü98, BrNe07
- Trichothelium mirum* LÜCKING: Osa, Lü98
- Trichothelium montanum* LÜCKING: BE, Osa, Lü98, BrNe07
- Trichothelium pallescens* (MÜLL. ARG.) F. SCHILL.: BE, Osa, Lü98, Br06, BrNe07
- Trichothelium pallidesetum* LÜCKING: BE, Br06
- Trichothelium sipmanii* R. LÜCKING s.str.: BE, Osa, Lü98, Br06
- Trichothelium sipmanii* R. LÜCKING f. *multiseptatum* LÜCKING: BE, Osa, Lü98, BrNe07
- Trichothelium ulei* (P. HENN.) HÖHNEL: Osa, Lü98
- Non-foliicolous lichens**
- Anisomeridium ambiguum* (ZAHLEBR.) R.C. HARRIS: Osa, Ap&al08
- Anisomeridium americanum* (A. MASSAL.) R.C. HARRIS: Caño, Ap&al08
- Anisomeridium flavovulcanus* KOMPOSCH: BE, Osa, KOMPOSCH 2005, BrNe07
- Anisomeridium infernale* (MONT.) R.C. HARRIS: BE, BrNe07
- Anthracothecium prasinum* (ESCHW.) R.C. HARRIS: Osa, Ap&al08
- Arthonia complanata* FÉE: BE, Br00, BrNe07
- Arthonia isidiata* GRUBE, LÜCKING & UMANA-TENORIO: Osa, Grube & al. 2004
- Astrothelium crassum* (FÉE) APTROOT: Osa, Ap&al08
- Astrothelium eustomum* (MONT.) MÜLL. ARG.: BE, Br06
- Astrothelium galbineum* BE, Osa, Br06, BrNe07, Ap&al08
- Astrothelium eustomum* (MONT.) MÜLL. ARG.: BE, Br06
- Astrothelium interjectum* R.C. HARRIS: BE, Br06



- Astrothelium variolosum* (ACH.) MÜLL. ARG.: BE, Br06  
*Bacidia lutescens* MALME: BE, BrNe07  
*Baeomyces rufus* (HUDSON) REBENT.: BE, BrNe07  
*Bathelium degenerans* (VAIN.) R.C. HARRIS: Osa, Ap&al08  
*Bathelium feei* (MEISSN.) APTROOT: Osa, Ap&al08  
*Biatora furfurosa* TUCK. ex NYL.: BE, BrNe07  
*Bulbothrix apophysata* (HALE & KUROK.) HALE: BE, Br06, BrNe07  
*Bulbothrix goebelii* (ZENKER) HALE: BE, BrNe07  
*Bulbothrix klementii* HALE: BE, BrNe07  
*Bulbothrix laevigatula* (NYL.) HALE: BE, BrNe07  
*Bulbothrix suffixa* (STIRTON) HALE: BE, Br06  
*Calopadia cf. chacoensis* (MALME) KALB & VĚZDA: BE, Br00  
*Calopadia foliicola* (FÉE) VĚZDA: BE, Osa, Br06, Lü99  
*Calopadia isidiosa* KALB & VĚZDA: BE, BrNe07  
*Calopadia lecanorella* (NYL.) KALB & VĚZDA: BE, Br06, BrNe07  
*Calopadia perpallida* (NYL.) VĚZDA: BE, Br00, BrNe07  
*Calopadia subcoeruleascens* (ZAHLEBR.) VĚZDA: BE, BrNe07  
*Carbacanthographis chionophora* (REDINGER) STAIGER & KALB: BE, Br06, BrNe07  
*Celothelium aciculiferum* (NYL.) VAIN.: BE, BrNe07  
*Cladonia subradiata* (VAIN.) SANDST.: area of the Esquinas Rainforest Lodge  
*Coccocarpia dissecta* SWINSC. & KROG: Osa, LÜCKING et al. 2007  
*Coccocarpia epiphylla* (FÉE) KREMP.: BE, Br06  
*Coccocarpia erythroxyli* (SPRENGEL) SWINSC. & KROG: BE, Osa, Br00, LÜCKING et al. 2007  
*Coccocarpia filiformis* L. ARVIDSS.: BE, BrNe07  
*Coccocarpia glauca* KREMP.: Osa, LÜCKING et al. 2007  
*Coccocarpia palmicola* (SPRENGEL) ARVIDSS. & GALLOWAY: BE, Osa, Br00, DODGE 1933, LÜCKING et al. 2007  
*Coccocarpia pellita* (ACH.) MÜLL. ARG.: BE, Osa, Br06, DODGE 1933  
*Coccocarpia stellata* TUCK.: BE, Br00, Br06  
*Coenogonium acrocephalum* MÜLL. ARG.: near Esquinas Rainforest Lodge, Fila Golfito  
*Coenogonium implexum* NYL.: BE, Br00  
*Coenogonium interplexum* NYL.: BE, Br06  
*Coenogonium leprieurii* (MONT.) NYL.: BE, BrNe07  
*Coenogonium linkii* EHRENB.: BE, Br06, BrNe07  
*Coenogonium subvirescens* (NYL.) NYL.: BE, Osa, DODGE 1933, BrNe07  
*Crocynia gossypina* (SW.) A. MASSAL.: BE, Br06, BrNe07  
*Crocynia pyxinoides* NYL.: BE, Br00  
*Dichosporidium nigrocinctum* (EHRENB.: FR.) THOR: BE, Br00  
*Dictyonema glabratum* (SPRENG.) D. HAWKSW.: BE, Br06  
*Dictyonema sericeum* (SW.) BERK.: BE, Br00, Br06  
*Diorygma confluens* (FÉE) KALB, STAIGER & ELIX: BE, Br00  
*Diorygma poitaei* (FÉE) KALB, STAIGER & ELIX: BE, Br06  
*Diorygma pruinosum* (ESCHW.) KALB, STAIGER & ELIX: BE, BrNe07  
*Diorygma reniforme* (FÉE) KALB, STAIGER & ELIX: BE, Br06, BrNe07  
*Dirimaria aegialita* (ACH.) MOORE: BE, BrNe07  
*Dirimaria picta* (SW.) CLEM. & SHEAR: BE, Br00, BrNe07  
*Dyplolabia afzelii* (ACH.) A. MASSAL.: BE, BrNe07  
*Echinoplaca bisporea* KALB & VĚZDA: BE, Br06, BrNe07  
*Echinoplaca similis* KALB & VĚZDA: BE, BrNe07  
*Eschatogonia prolifera* (MONT.) R. SANT.: BE, Br06, BrNe07  
*Fissurina cingalina* (NYL.) STAIGER: BE, BrNe07  
*Gassicurtia coccinea* FÉE: BE, Br06  
*Glyphis cicatricosa* ACH.: BE, Br06, BrNe07  
*Graphis acharii* FÉE: BE, Br06  
*Graphis analoga* NYL.: BE, BrNe07  
*Graphis anfractuosa* (ESCHW.) ESCHW.: BE, BrNe07  
*Graphis anguilliformis* TAYLOR: BE, Br06, BrNe07  
*Graphis antillarum* VAIN.: BE, BrNe07  
*Graphis cf. furcata* FÉE: BE, BrNe07  
*Graphis chrysocarpa* (RADDI) SPRENG.: BE, Br06, BrNe07, STAIGER 2002  
*Graphis dimidiata* VAINIO: BE, Br00, BrNe07  
*Graphis dissepens* NYL.: BE, BrNe07  
*Graphis duplicata* ACH.: BE, Br06  
*Graphis elegans* (SM.) ACH.: BE, BrNe07  
*Graphis elongatoradians* FINK: BE, BrNe07  
*Graphis flexibilis* KREMP.: BE, Br00, Br06  
*Graphis cf. haemographa* NYL.: BE, Br00  
*Graphis leptocarpa* FÉE: BE, BrNe07  
*Graphis longula* KREMP.: BE, Br06, BrNe07  
*Graphis paraserpens* LIZANO & LÜCKING: BE, BrNe07  
*Graphis plurispora* (REDINGER): BE, Br06  
*Graphis proserpens* VAIN.: BE, BrNe07  
*Graphis rimulosa* (MONT.) TREVISAN: BE, Br00, Br06, BrNe07  
*Graphis striatula* (ACH.) SPRENG.: BE, BrNe07  
*Graphis vestitoides* (FINK) STAIGER: BE, Br00, Br06, BrNe07  
*Gyalideopsis confluens* KALB & VĚZDA: BE, BrNe07  
*Gyalideopsis lambinonii* VĚZDA: BE, BrNe07  
*Gyalideopsis vainioi* KALB & VĚZDA: BE, BrNe07  
*Gyrotrema wirthii* RIVAS PLATA, LÜCKING & LUMBSCH: Osa, RIVAS PLATA et al. 2008  
*Haematomma leprarioides* (VAINIO) VAINIO: BE, Br06  
*Laurera subdisjuncta* (MÜLL. ARG.) R.C. HARRIS: Osa, Ap&al08  
*Leiorreuma exaltatum* (MONT. & V. D. BOSCH) STAIGER: BE, Br00, Br06, BrNe07  
*Leiorreuma hypomelaenum* (MÜLL. ARG.) STAIGER: BE, Br06  
*Leiorreuma lyellii* (SM.) STAIGER: BE, BrNe07  
*Leiorreuma sericeum* (ESCHW.) STAIGER: BE, BrNe07  
*Leptogium austroamericanum* (MALME) DODGE: BE, Br00, BrNe07  
*Leptogium azureum* (SW.) MONT. s.str.: BE, Osa, Br00, Br06, BrNe07, DODGE 1933  
*Leptogium caespitosum* (TAYLOR) SWINSCOW & KROG: BE, Br06  
*Leptogium coralloideum* (MEYEN & FLOT.) VAIN.: BE, BrNe07  
*Leptogium denticulatum* NYL.: BE, Osa, BrNe07, DODGE 1933  
*Leptogium foveolatum* NYL.: BE, Br06  
*Leptogium marginellum* (SW.) S.F. GRAY: BE, Br00, Br06, BrNe07  
*Leptogium phyllocarpum* (PERS.) MONT.: BE, Br06, BrNe07  
*Leptogium standleyi* DODGE: BE, Br06  
*Leptogium stipitatum* VAINIO: BE, Br06, BE, BrNe07  
*Leptogium tuckermanii* DODGE: BE, Br00  
*Leptogium ulvaceum* auct.: BE, Br00, Br06  
*Malcolmiella granifera* (ACH.) KALB & LÜCKING: BE, Br00, Br06, BrNe07  
*Malcolmiella psychotrioides* KALB & LÜCKING: BE, BrNe07  
*Megalospora tuberculosa* (FÉE) SIPMAN: BE, BrNe07

- Megalotremis biocellata* APTROOT: Osa, Ap&al08  
*Megalotremis nemorosa* (R.C. HARRIS) APTROOT: BE, Osa, Br06, Ap&al08  
*Megalotremis verrucosa* (MAKH. & PATW.) APTROOT: BE, Osa, BrNe07, Ap&al08  
*Musaespora gigas* (Z AHLBR.) R.C. HARRIS: Osa, Ap&al08  
*Mycocomrothelia hemisphaerica* (MÜLL. ARG.) D. HAWKSW.: Osa, Ap&al08  
*Mycomicrothelia oleosa* APTROOT: BE, BrNe07  
*Mycoporum eschweileri* (MÜLL. ARG.) R.C. HARRIS: Osa, Ap&al08  
*Myelocanis fecunda* P.M. MCCARTHY & ELIX: BE, Br06, BrNe07  
*Myelocanis guyanensis* P.M. MCCARTHY & ELIX: BE, Br06  
*Myriotrema album* FÉE: BE, Br00, Br06  
*Myriotrema barroense* (HALE) HALE: BE, BrNe07  
*Myriotrema glaucophaenum* (KREMP.) HALE: BE, Br06, BrNe07  
*Myriotrema myriocarpum* (FÉE) HALE: BE, Br06  
*Myriotrema pachystomum* (NYL.) HALE: BE, BrNe07  
*Myriotrema trypaneoides* (NYL.) HALE: BE, BrNe07  
*Nadvornikia hawaiiensis* (TUCK.) TIBELL: BE, Br06  
*Normandina pulchella* (BORRER) NYL.: BE, BrNe07  
*Ocellularia alborosella* (NYL.) R. SANT.: BE, Br00, Br06  
*Ocellularia auratipruinosa* BREUSS: BE, Br00, Br06  
*Ocellularia cavata* (ACH.) MÜLL. ARG.: BE, BrNe07  
*Ocellularia comparabilis* (KREMP.) MÜLL. ARG.: BE, Br06  
*Ocellularia crocea* (KREMP.) OVEREEM: BE, Br06  
*Ocellularia dactyliza* HALE: BE, BrNe07  
*Ocellularia interposita* (NYL.) HALE: BE, Br06  
*Ocellularia landronii* HALE: BE, BrNe07  
*Ocellularia perforata* (LEIGHTON) MÜLL. ARG.: BE, Br00, Br06  
*Ocellularia rhodostroma* (MONT.) Z AHLBR.: BE, Br00, Br06, BrNe07  
*Ocellularia subemersa* MÜLL. ARG.: BE, Br06  
*Ocellularia xanthostroma* (NYL.) Z AHLBR.: BE, Br06, BrNe07  
*Opegrapha curvula* REDINGER: BE, Br06  
*Parmeliella isidiopannosa* P.M. JØRG.: BE, BrNe07  
*Parmeliella pannosa* (Sw.) MÜLL. ARG.: BE, BrNe07  
*Parmeliella stylophora* (VAIN.) P.M. JØRG.: BE, Br06, BrNe07  
*Parmotrema cristiferum* (TAYLOR) HALE: BE, Br00, BrNe07  
*Parmotrema dilatatum* (VAINIO) HALE: BE, Br06, BrNe07  
*Parmotrema endosulphureum* (HILLM.) HALE: BE, Br00, Br06, BrNe07  
*Parmotrema flavescens* (KREMP.) HALE: BE, BrNe07  
*Parmotrema rubifaciens* (HALE) HALE: BE, Br06  
*Parmotrema sulphuratum* (NEES & FLOTOW) HALE: BE, Br00, Br06  
*Peltigera collina* (ACH.) SCHRAD.: BE, BrNe07  
*Pertusaria tetrathalamia* (FÉE) NYL.: BE, Br06  
*Phaeographis caesiodisca* STAIGER: BE, BrNe07  
*Phaeographis decipiens* (FÉE) MÜLL. ARG.: BE, Br06  
*Phaeographis haematites* (FÉE) MÜLL. ARG.: BE, Br00  
*Phaeographis intricans* (NYL.) STAIGER: BE, BrNe07  
*Phaeographis lindigiana* MÜLL. ARG.: BE, Br06  
*Phaeographis schizoloma* Müll. ARG.: BE, Br06  
*Phyllopsora buettneri* (MÜLL. ARG.) Z AHLbr. var. *glauca* (DE LESD.) BRAKO: BE, Br06  
*Phyllopsora confusa* SWINSCOW & KROG: BE, BrNe07  
*Phyllopsora corallina* (ESCHW.) MÜLL. ARG. var. *ochroxantha* (NYL.) BRAKO: BE, Br06  
*Phyllopsora furfuracea* (PERS.) Z AHLBR.: BE, BrNe07  
*Physcia atrostriata* MOBERG: BE, Br00, Br06, BrNe07  
*Physcia krogiae* MOBERG: BE, Br00  
*Physcia lobulata* MOBERG: BE, BrNe07  
*Physcia wrightii* TUCK.: BE, BrNe07  
*Physma byrsaeum* (ACH.) TUCK.: BE, BrNe07  
*Platythecium allosporellum* (NYL.) STAIGER: BE, BrNe07  
*Platythecium grammitis* (FÉE) STAIGER: BE, Br06  
*Polymeridium albidum* (MÜLL. ARG.) R.C. HARRIS: BE, BrNe07  
*Polymeridium contendens* (NYL.) R.C. HARRIS: BE, BrNe07  
*Polymeridium flavothecium* R.C. HARRIS: BE, Br06, BrNe07  
*Porina dolichophora* (NYL.) MÜLL. ARG.: BE, Br06, BrNe07  
*Porina eminentior* (NYL.) MCCARTHY: BE, BrNe07  
*Porina epimelaena* VAINIO ex REDINGER: BE, Br06, BrNe07  
*Porina exasperatula* VAINIO: BE, KOMPOSCH 2005  
*Porina mastoidea* (ACH.) MÜLL. ARG.: BE, Br06, BrNe07  
*Porina rudiusscula* (NYL.) MÜLL. ARG.: BE, Br06, BrNe07  
*Porina tijucana* VAINIO: BE, Br06, BrNe07  
*Pseudopyrenula diluta* (FÉE) MÜLL. ARG.: BE, BrNe07  
*Pseudopyrenula subnudata* MÜLL. ARG.: BE, Br00, Br06  
*Psorella leucophyllina* (NYL.) Z AHLBR.: BE, BrNe07  
*Pyrenula acutalis* R.C. HARRIS: BE, Br06  
*Pyrenula acutispora* HAF. & KALB: Osa, Ap&al08  
*Pyrenula anomala* (ACH.) VAIN.: BE, Osa, BrNe07, Ap&al08  
*Pyrenula aspistea* (ACH.) ACH.: BE, Osa, Br06, BrNe07, Ap&al08  
*Pyrenula cocoes* MÜLL. ARG.: BE, Br06  
*Pyrenula concatervans* (NYL.) R.C. HARRIS: Osa, Ap&al08  
*Pyrenula confinis* (NYL.) R.C. HARRIS: Osa, Ap&al08  
*Pyrenula cryptothelia* (MÜLL. ARG.) APTROOT & ETAYO: Osa, Ap&al08  
*Pyrenula dermatodes* (BORR.) SCHAER.: Osa, Ap&al08  
*Pyrenula dupicans* (NYL.) APTROOT: BE, Br06  
*Pyrenula cf. falsaria* (Z AHLBR.) R.C. HARRIS: BE, BrNe07  
*Pyrenula laetior* MÜLL. ARG.: BE, Osa, Br06, Ap&al08  
*Pyrenula leucostoma* ACH.: Osa, Ap&al08  
*Pyrenula lineatostroma* APTROOT: Osa, Ap&al08  
*Pyrenula mamillana* (ACH.) TREV.: BE, Osa, Br06, Ap&al08  
*Pyrenula massariospora* (STARB.) R.C. HARRIS: BE, Osa, BrNe07, Ap&al08  
*Pyrenula microcarpa* MÜLL. ARG.: BE, Br06  
*Pyrenula pyrenuloides* (MONT.) R.C. HARRIS: Caño, Ap&al08  
*Pyrenula quassiaeicola* FÉE: Osa, Ap&al08  
*Pyrenula septicollaris* (ESCHW.) R.C. HARRIS: BE, BrNe07  
*Pyrenula subcongruens* MÜLL. ARG.: Caño, Ap&al08  
*Pyrenula tenuisepta* R.C. HARRIS: Osa, Ap&al08  
*Pyrrhospora russula* (ACH.) HAF.: BE, Br06, BrNe07  
*Pyxine eschweileri* (TUCK.) VAIN.: BE, BrNe07  
*Sarcographa cinchonarum* FÉE: BE, BrNe07  
*Sarcographa heteroclita* (MONT.) Z AHLBR.: BE, Br06, BrNe07  
*Sarcographa labyrinthica* (ACH.) MÜLL. ARG.: BE, Br00, Br06, BrNe07  
*Sarcographa medusulina* (NYL.) MÜLL. ARG.: BE, Br06  
*Sarcographa ramificans* (KREMP.) STAIGER: BE, BrNe07  
*Sarcographa tricola* (ACH.) MÜLL. ARG.: BE, BrNe07  
*Sporopodium xantholeucum* (MÜLL. ARG.) Z AHLBR.: BE, Br00  
*Stegobolus auberianus* (MONT.) A. FRISCH & KALB: BE, Br06  
*Stegobolus wrightii* (TUCK.) A. FRISCH: BE, Br06, FRISCH & KALB 2006, BrNe07



*Tapellaria epiphylla* (MÜLL. ARG.) R. SANT.: BE, Br00  
*Thalloloma anguinaeforme* (VAIN.) STAIGER: BE, Br06  
*Thalloloma cinnabarinum* (FÉE) STAIGER: BE, Br06  
*Thalloloma hypoleptum* (NYL.) STAIGER: BE, STAIGER 2002  
*Thelotrema glaucopallens* NYL.: BE, Br06  
*Thelotrema neei* (HALE) HALE: BE, BrNe07  
*Tricharia fumosa* KALB & VÉZDA: BE, BrNe07  
*Trypethelium annulare* (FÉE) MONT.: BE, Br06  
*Trypethelium neogalbineum* R.C. HARRIS: Osa, Ap&al08  
*Trypethelium nitidiusculum* (NYL.) R.C. HARRIS: BE, Osa, Br06, Ap&al08  
*Trypethelium papulosum* (NYL.) MAKH. & PATW.: BE, Br06  
*Trypethelium subcatervarium* MALME: BE, Br06  
*Trypethelium tuberculosum* (VAIN.) R.C. HARRIS: Osa, Ap&al08  
*Trypethelium variolosum* ACH.: BE, BrNe07  
*Usnea brasiliensis* (ZAHLEBR.) MOT.: BE, BrNe07

## Discussion

A total of 469 species are known from the Golfo Dulce area, which represents 33% of the species so far accepted to occur in Costa Rica. Though very far from complete, the list demonstrates the remarkable nature of the investigated area and highlights the need for maintaining conservation efforts. The catalogue includes 110 genera and 471 infrageneric taxa, the richest genera being *Porina* (40 species), *Graphis* and *Pyrenula* (22 each), *Strigula* and *Trichothelium* (15 each), *Arthonia* and *Mazosia* (13 each). The largest proportion is held by foliicolous lichens (52%). As in other parts of the tropics, the most species-rich families are the Porinaceae with mainly epiphyllous species, the Thelotremataceae with mainly rainforest species, and the Graphidaceae with a higher diversity in open places. One reason for the high diversity is the interlinking of primary rainforest with secondary vegetation types. Given the extraordinary biodiversity of Costa Rica and the rather fragmentary collecting work in the study area, the real species number can be expected to be significantly higher. There are a great many species yet to be discovered by further field work, especially in the more remote areas of the region.

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