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AZOREAN BRYOPHYTES: A PRELIMINARY REVIEW OF RARITY PATTERNS

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ABSTRACT

Bryophytes are not exempt of rarity and threat, although their small size, mute colours and difficult field identification may mask their true conservation status. Actually, it is known that a quarter of all European bryophytes are under actual or potential threat. The first Red Data Book for European Bryophytes was produced in 1995, largely based on national red lists and on the work of a vast team of bryologists who assessed the conservation status of each European species. The red listing of bryophytes has undoubtedly contributed to increase the awareness of planners to this group of organisms, and several efforts have been made, through Europe, to preserve sites based on their bryological interest. Accordingly, a specific Red List for the Azorean Bryophytes may help regional managers to identify particularly endangered species, thus allowing for the creation of measures to improve their preservation. In this paper we have used an adaptation of the works of Deborah Rabinowitz (1981), who created a typology to access different forms of rarity, using three variables: Geographical Distribution, Abundance and Habitat Specificity. All the 480 species and subspecies known to occur in the Azores were surveyed; of these, 215 species lacked sufficient data to be analyzed (data deficient), 121 were not considered rare and 144 (1 hornworts, 56 liverworts and 87 mosses) were considered rare, at least in one of the three parameters considered. The benefits and limitations of the methodology are briefly discussed. Several practical suggestions are proposed in order to enhance the conservation of selected bryophyte species.

RESUMO

Os briófitos podem ser tão raros e estar tão ameaçados como os demais organismos do planeta, apesar de o seu pequeno tamanho, cores discretas e difícil identificação no campo poderem mascarar o seu verdadeiro estatuto de conservação. De facto, é reconhecido que cerca de um quarto de todos os briófitos da Europa estão efectiva ou potencialmente ameaçados. O primeiro "Livro Vermelho dos Briófitos da Europa" foi produzido em 1995, amplamente baseado em listas vermelhas nacionais e no trabalho de uma vasta equipa de briólogos que avaliaram o estatuto de conservação para as espécies Europeias. A classificação de briófitos em listas vermelhas tem contribuído para aumentar a sensibilidade dos gestores para este grupo de organismos e alguns esforços têm sido desenvolvidos na Europa, para preservar locais tendo como característica o seu interesse briológico. Consequentemente, uma lista vermelha para os briófitos dos Açores pode auxiliar os gestores regionais a identificar espécies particularmente ameaçadas, tornando-se o primeiro passo para assegurar a sua protecção. Neste artigo usamos uma adaptação dos trabalhos de Deborah Rabinowitz (1981), que criou uma tipologia para desocultar e avaliar várias formas de raridade, utilizando três variáveis: Distribuição Geográfica, Abundância e Especificidade do Habitat. Todas as 480 espécies e subespécies dos Açores foram investigadas: 215 *taxa* não tinham informação suficiente para ser analisados (deficientes em dados), 121 não foram consideradas raros e 144 briófitos (1 antocerota, 56 hepáticas e 87 musgos) foram considerados raros pelo menos num dos parâmetros considerados. Os benefícios e limitações desta metodologia são brevemente discutidos. São propostas algumas sugestões práticas para melhorar a estratégia de conservação dos briófitos seleccionados.

INTRODUCTION

One of the most interesting characteristics of the Azores is their extraordinary wealth of bryophytes (480 species and subspecies, Gabriel *et al.*, 2010), comparable to the diversity present in other Macaronesian archipelagos (González-Mancebo *et al.*, 2008; Sérgio *et al.*, 2008), a feature unparalleled in other groups of Azorean organisms (Izquierdo *et al.*, 2004; Borges *et al.*, 2008, 2010a). In addition, Azorean islands host a high proportion of European bryophyte species (Homem & Gabriel,

2008) and also many endemic species of vascular plants, molluscs and arthropods (Borges *et al.*, 2010b), many of which are in danger as a consequence of historical human occupation and land-use changes (Borges *et al.*, 2000, 2009; Cardoso *et al.*, 2010; Martín *et al.*, 2010; Triantis *et al.*, 2010). In fact, the conservation of island biota was always considered a true priority since most of the recorded extinctions have occurred in islands (Sax & Gaines, 2008).

In spite of more than four centuries of Human occupation, the Azores and other Macaronesian archipelagos, still possess natural habitats (Borges *et al.*, 2009; Gaspar *et al.*, 2011), and these islands are some of the very few places in Europe where the 'biodiversity crisis' is particularly critical and a proper conservation strategy may effectively contribute to preserve unique pristine communities. Presently, about a fifth of the Azorean islands area is under some legal protection status (Monteiro & Furtado, 2010), and a few remnants of native forests have persisted since the Portuguese occupation in the early 15th century, although grasslands and exotic plantation forests dominate the islands these days (Borges *et al.*, 2009).

Most ecological studies in islands, and in particular in the Azores, are limited in their time span and a detailed understanding of the long-term responses of island bryophyte communities to global change drivers is not known. Bryophytes have long been considered indicator groups for habitat change, as their lack of roots makes them totally dependent on the atmospheric (or aquatic) inputs of nutrients (eg. Frego, 2007; Gignac, 2010). Besides, bryophytes are a characteristic part of the Azorean native forests, covering all kinds of substrata, including leaves of vascular species, with luxuriant communities (Homem & Gabriel, 2008), and are generally considered remnants of the subtropical flora that endured the Quaternary glaciations (but see Aigoin *et al.*, 2009, who recently questioned the relictual origin of Macaronesian bryophytes). Thus, assessing the conservation status for bryophytes may couple with policies for native habitats protection.

A red list ranks *taxa* according to their threat level and extinction risk, and assessments for the red list compile current knowledge of conservation status and threats to individual species (ex. Knapp & Monterrosa Salomón, 2010). Few vascular plants and even fewer bryophytes (only 101 of the ca. 18000 species!) have been formally assessed using the IUCN system (IUCN, 2010). However, one of the targets of the Global Strategy for Plant Conservation is "a preliminary assessment of the conservation status of all known plant species, at national, regional and international levels" (UNEP, 2002). There are various approaches to achieve this goal, including the use of expert's opinions (ex. Sérgio *et al*., 1992; Schumacker, 2001; Sjögren, 1995), the use of herbarium labels information (ex. Krupnick *et al*., 2008), the creation of specific software to create red lists accommodating the IUCN criteria (ex. RAMAS, 2007), but lately it has been advised that a thorough use of all available information, including georeferenced herbarium specimens and other parameters such as population size and local abundance, would be a good way forward to stimulate conservation (ex. Brummitt *et al*., 2008). In practice, not many species have been studied in any of these ways and the information necessary to do so is impressive. Nevertheless, the need to better understand the rarity of species is pressing and simple methods of ranking should at least be essayed for all groups of organisms.

The pioneer work of Deborah Rabinowitz (1981, 1986) has enlightened the rarity concept, acknowledging that

> "*There are many ways in which a species can become rare and this path has profound evolutionary and ecological consequences*" (Rabinowitz, 1981: 205).

To define rarity, she used a three dimensional system including distribution, abundance and habitat specificity. Each one of these dimensions was further subdivided into two qualitative categories (wide or narrow, large or small, generalist or specialist, respectively), resulting in an eight cells table, from which, only one cell includes common species, those with wide distributions, large populations and generalist. All other combinations suffer from at least one form of rarity. Knowing the rarity status of species is critical to evaluate both their extinction proneness and their roles in the ecosystems (Gaston, 1994, 2010).

One of the most useful resources to study biodiversity in the Azores is the regional species database, ATLANTIS, where grid-based spatial incidence information, allied to temporal data, has been gathered for several groups of organisms (lichens, bryophytes, vascular plants, marine invertebrates, terrestrial molluscs, arthropods and vertebrates) (Borges *et al*., 2010c; Martín *et al*., 2010). Parallel to this work, the biological and ecological features of bryophytes have also been noted by RG and co-workers. The information thus gathered may therefore serve as a starting point for an assessment of the rarity of bryophytes, using Rabinowitz' approach (considering range, abundance and distribution). Such a characterization has been applied to vascular plant species (ex. Rabinowitz *et al*., 1986; McIntyre, 1992), vertebrates (ex. Kattan, 1992; Goerck, 1997), insects (ex. Fattorini, 2011) and was essayed for European liverworts (Weibull & Söderström, 1995).

In this study we used all the information available to Azorean bryophytes, as inserted in ATLANTIS database, supplemented with literature and herbaria ecological features, to analyze the rarity patterns of the species and provide a preliminary conservation assessment, at the regional level, of this important indicator group. It is expected that it may be the basis of an Azorean Red List for Azorean bryophytes.

METHODS

Study Area

The nine islands composing the archipelago of the Azores, are situated in the North Atlantic Ocean, extending along a west-northwest to east-southeast orientation (between 36° 30′ - 40° North latitudes and 24° 30′ - 31° 30′ West longitudes). The joined area of the islands is 2,323 km^2 (larger island, São Miguel, 745 km^2; smaller island, Corvo, 17 km^2) (Forjaz, 2004). The archipelago's highest altitude is reached in Pico Island, at 2,350 m, but the second highest island (São Miguel) is just 1,105 m altitude. The Azores were uninhabited when Portuguese navigators arrived in the early 15th century, and the earlier descriptions of the islands portray them as intensely forested (Frutuoso, 1963). Nowadays the Azorean population includes about 241,800 people, at a density of 104 inhabitants per square kilometre (Forjaz, 2004). It is estimated that laurel forests occupied about 85% of the present area of Azores; unfortunately, most of this natural habitat has been disturbed, remaining only around 6,000 ha (Fernández-Palacios *et al*., 2011; Gaspar *et al*., 2011).

Data Sources

A tentative categorization of rarity was essayed for all the 480 bryophyte species and subspecies included in the most recent check-list of the Azorean Islands (Gabriel *et al*., 2010). The analyzed data came from literature and herbarium records. The first step included a thorough analysis and interpretation of the available literature, dating back to the 19th century (167 sources; see Appendix 1); this list includes books, chapters and papers as well as some grey literature such as academic thesis, letters and fieldwork reports (see Borges *et al*., 2010c for details). Secondly, the collection of bryophytes deposited at the University of the Azores was also examined. All information was fed to the ATLANTIS database (Borges, 2005). This database includes 29,323 species citations coming from literature (most of them, ca. 80%, with recognizable locations and indication of date of collection) and 11,237 citations coming from herbarium records (most of them placed at the bryophyte collection of the University of the Azores). One of the authors (RG) has further compiled information on fruiting, ecology and substrate preferences for each bryophyte record; in some occasions the habitat type was inferred from other published sources or direct knowledge of local experts. Although gaps of information are inevitable, and have indeed been demonstrated (see Aranda *et al*., 2010), this database is deemed to be as complete as possible and a good starting point to analyze rarity issues. A webpage, the Azorean Biodiversity Portal (http://www.azoresbioportal.angra.uac.pt/), with data on the taxonomy, detailed distribution of the species on the Azorean Islands (grid of 500 m x 500 m), European conservation status and some pictures and common names (whenever possible) has been available to the general public since 2008 (Borges *et al.*, 2010c).

Rarity dimensions

Geographical distribution

Due to the high dispersal ability characteristic of the group (see revision in Rydin, 2008), bryophytes occurring in the Azores were considered to have a narrow geographical distribution when their presence was known only from the Macaronesian Islands (i.e. Macaronesian endemic species and subspecies) and a wide distribution, whenever they also occurred elsewhere. This data was obtained from the recent checklist for Azorean bryophytes (Gabriel *et al.*, 2010).

Abundance

Abundance was the most difficult parameter to quantify, as it refers to the size of the populations, which is not immediate in bryophyte studies (Hallingbäck *et al.*, 1998; Hallingbäck, 2007). Different authors have used different approaches to estimate abundance, such as the examination of museum specimens (see Fattorini, 2011 for arthropods), and others have not considered this parameter for bryophytes (ex. Söderström & Séneca, 2008; Vanderpoorten & Hallingback, 2008). In order to reach an estimation of abundance for bryophytes, we have taken advantage of a recurrent pattern in ecological communities, i.e. the positive intraspecific or interspecifc relationship between mean local abundance and regional distribution (Gaston, 1994, 1996), which assumes that

> "*Within a taxonomic assemblage, locally abundant species tend to be widespread and locally rare species tend to be restricted in their distribution.*" (Gaston, 1996: 211).

The key issue here is the use of the small-scale distribution as a proxy of abundance. The importance of scaling, rarity and risk, has been highlighted by Hartley & Kunin (2003), working with two plant species (*Dianthus armeria* L. and *Silene otites* (L.) Wibel) at a distribution resolution of 1-km in Great Britain. Bearing this in mind, and using the ATLANTIS database, we have calculated for each species the number of geographical cells (500 m x 500 m) allocated with the highest precision values (precision 1 – very precise locations, usually point UTM data; 2 – localities never exceeding 25 km^2) in all Azorean Islands (see Borges *et al.*, 2010c), and subsequently divided that value by the total number of 500 m^2 cells of the archipelago (10044 cells), thus reaching an estimate of the area of occupancy (AOO) for each bryophyte. This ratio of relative area of occupancy was then considered a predictor of the local abundance for each species. All the species were ranked by this index, and those which fell below the median value were considered of low abundance while the others were considered as abundant.

Ecological tolerance

Habitat specificity was used as a proxy of ecological tolerance. RG's species database on ecological traits was categorized in 12 different habitat types (Coastal habitats, Mesic areas, Native forests, Semi-natural grasslands, Mountainous areas, Aquatic habitats, Peat bogs, Urban habitats, Parks and Gardens, Intensive pastures, Exotic forest plantations and Cave entrances). Table 1 includes a summary description of each of the habitats considered.

The islands survey is not equitable (Table 2); for example, if the number of records per km^2 is considered, Corvo, Terceira and Graciosa are the best inspected of the Azorean Islands while São Miguel is the worst. Likewise, the percentage of records to which it was not possible to assign a habitat varied according to the islands (highest in Faial and São Jorge and lowest in Terceira and Corvo) but, in average it did not reach one tenth (9.7%) of the 34976 records considered.

To appreciate the ecological range of a species, all the records where this was possible, were allocated to one of the 12 habitat types. Then, the number of records present in one habitat was divided by the total number of locations of that habitat (normalizing the records per habitat). Finally, for those species that had 12 or more described occurrences, the Lloyds Index of Patchiness (L) was applied: $L = S_x^2 - x / x^2 + 1$ (Basset, 1999), where S_x^2 and x are respectively the variance and mean of the samples in the 12 different habitat types. A specialist species in the present context is a species that showed preference for a particular habitat, the value of the index increasing for more specialized species. According to the interpretation of different authors (eg. Basset, 1999; Gabriel & Bates, 2005) those species with an L value larger or equal to three, were considered

TABLE 1. Brief description of the habitats considered in this paper and an indication of the number of independent locations where bryophytes were collected in the Azores.

Habitat types	Description	Number of locations
Coastal habitats	Coastal habitats are situated at the lowest altitudes, near the sea, mostly up to an altitude of 50 m, which may be higher, depending on the Island.	124
Mesic areas	Mesic areas occur above the coastal habitats and receive intermediate amounts of precipitation. These areas are presently dominated by fields (mostly corn fields), intensive pastures and exotic plantations.	204
Native forests	Native forests are the remnants of the former dominant ecosystem types, found by the first settlers. They include evergreen tree species such as *Laurus azorica, Erica azorica, Ilex perado* subsp. *azorica* and *Juniperus brevifolia.*	522
Semi-natural grasslands	These are open areas, mostly located among native forest fragments, including several herbaceous plant species.	42
Mountainous areas	This habitat (high mountain) is restricted to Pico Island, above 1200 m altitude.	57
Aquatic habitats	This habitat includes lagoon margins, temporary and permanent rivulets, cascades and other interior waters habitats.	212
Peat bogs	Large, open areas dominated by *Sphagnum* spp.	115
Urban habitats	Habitats that may be found in cities and villages, including buildings and other human constructions.	70
Parks and Gardens	Areas covered with exotic species, organized to appreciate nature.	48
Intensive pastures	Areas dominated by *Holcus*, *Bromus* or *Lolium* species, used by grazing cattle.	129
Exotic plantation forests	Areas dominated by *Eucalyptus* spp., *Cryptomeria japonica* or *Pittosporum undulatum.*	163
Cave entrances	Specific habitat, including all the rocky walls of caves (lava tubes) and volcano entrances (pits and pit caves), where light penetrates.	81

with restricted habitat requirements. Before proceeding to the calculus of L, the number of occurrences in a given habitat was normalized for the number of total occurrences in that habitat. For instance, while there were 522 locations inside native for-

TABLE 2. General characteristics of the Azorean Islands, including the total number of bryophyte' records made in the archipelago and the absolute and relative frequencies of records to which no habitat could be attributed. ([1]. Forjaz, 2004).

Azorean Island	Area[1]	Highest point[1]	Inhabitants[1]	Number of records	Records without habitat information	
	(km^2)	(m)	(Censos 2001)	(N_T)	(N_H)	(%)
Santa Maria	97	587	5578	942	98	10,4
São Miguel	745	1105	131609	3897	224	5,7
Terceira	400	1021	55833	13104	433	3,3
Graciosa	61	405	4780	1576	32	2,0
São Jorge	244	1053	9674	4054	744	18,4
Pico	445	2350	14806	6501	780	12,0
Faial	173	1043	15063	2076	404	19,5
Flores	141	911	3995	1551	126	8,1
Corvo	17	720	425	1275	103	8,1

ests, there were only 163 locations placed in exotic plantation forests.

Vulnerability index

Species considered rare on distribution, abundance and ecological tolerance, tend to be the most prone to extinction (Kattan, 1992; Manne & Pimm, 2001). The consequent application of the three criteria, with their binomial measurements: Distribution (large/small), Abundance (common/rare) and Ecological tolerance (wide/narrow), led to the following categorization: 1. Species that are not rare; 2. Scarce species (rare in abundance); 3. Species with narrow ecological tolerance; 4. Restricted species (species rare by geographical range); 5. Scarce species with narrow ecological tolerance; 6. Scarce and restricted species; 7. Restricted species with narrow ecological range and 8. Restricted and scarce species with narrow ecological range. Similar categories may be appreciated for other groups such as vertebrates (ex. Kattan,

1992) and arthropods (Fattorini, 2011) and also for bryophytes Söderström (1995).

RESULTS

Of the 480 species referred to the Azores, only 265 (55.2%) could be analyzed following the combination of criteria used (Appendix 2). From the evaluated species, about half (121; 45.7%) were not considered rare (1. Species that are not rare) but six of the seven types of rarity proposed by Rabinowitz (1981) were found within the Azorean bryophytes' dataset (absolute and relative frequencies of the eight categories may be seen in Figure 1). If one considers single categories of rarity by themselves, less than half (112; 42.3%) of the evaluated species presented narrow ecological tolerance, more than one fifth (56; 21.1%) were considered scarce and only 17 evaluated species (6.8%) had restricted distributions.

The results of the Chi-square test show that the hypothesis of overall independence of the three factors may be rejected (X^2=47.36; df=2; $p < 0.05$), indicating that these factors are not independent. Separate analysis of the 2 x 2 tables also indicated that all measures were not independent ($p<0.05$).

Twenty four species, nine liverworts and 15 mosses, previously classified in the European Red List of Bryophytes (ECCB, 1995; Dierssen, 2001), four of which (*Acanthocoleus aberrans, Jamesoniella rubricaulis, Fissidens azoricus* and *Neckera cephalonica*) also suggested by Sjögren (1995) to become protected species in the Azores, could not be evaluated in this analysis. All of these 24 species are scarce (rare by abundance) and none had the necessary number of collections to allow a full assessment of their ecological tolerance. Among them there are five restricted species, two Azorean endemics (*Fissidens azoricus* and *Trematodon perssoniorum*) and three Macaronesian endemics (*Leucodon canariensis, Neckera cephalonica* and *Tortula bogosica*). *Trematodon perssoniorum* which, so far, was only found in São Miguel Island seems to prefer aquatic habitats, and was collected mostly around Lagoa das Furnas and Ribeira Quente (seven records at different times), while *Riccia ligula* was only recorded in intensive pastures (six records) and *Jamesoniella rubricaulis* was only collected above 1000 m (five records).

DISCUSSION

Only about half (265) of all Azorean bryophytes species and subspecies (480) could be classified using the three rarity categories proposed by Rabinowitz (1981). In itself, this exposes a serious lack of information, regarding mostly abundance and ecological tolerance, which thwarts the design of a comprehensive conservation policy for bryophytes. Without appropriate knowledge of the biology of the species, it is not possible to understand why a bryophyte is rare or threatened and it is very difficult to propose measures that would induce its recovery.

The data presented in Figure 1 and Appendix 2, shows that most of the analyzed bryophytes that may be considered rare have wide range distributions (247 species), which is not surprising, considering that bryophytes successfully disperse by spores. Actually some authors such as Medina, Draper & Lara (2011), have argued that due to their high dispersal ability, bryophytes would tend to ubiquity. The hypothesis "*Everything is everywhere, but the environment selects*" (EiE) has generally been accepted by microbiologists (ex. O'Malley, 2007) and is being considered for larger organisms with microscopic dispersing stages (e.g. spores), such as ferns or bryophytes (ex. Fontaneto, 2011). An indirect evidence of this wide distribution ability is the low endemism value found among Azorean bryophytes (n=7; 1,5%), much lower those found among native vascular species or arthropods (Borges *et al*., 2010b). Moreover, according to the study of Söderström & Séneca (2008), the liverwort flora of Europe and Macaronesia consists of mainly widespread species, and, unlike what happens with vascular species, the rarest species occur in oceanic areas (and not in the Mediterranean region).

Eight of the 17 Macaronesian and Azorean endemic bryophytes evaluated, exhibited restricted distributions (Appendix 2, "vulnerability index 4"), while not appearing to be scarce or restricted in their habitat requirements. Interestingly enough, all of these eight species have been reported to the three geographical groups of islands and are presently known of six (*Breutelia azorica*) or more, of the nine Azorean islands (other seven species). Although the

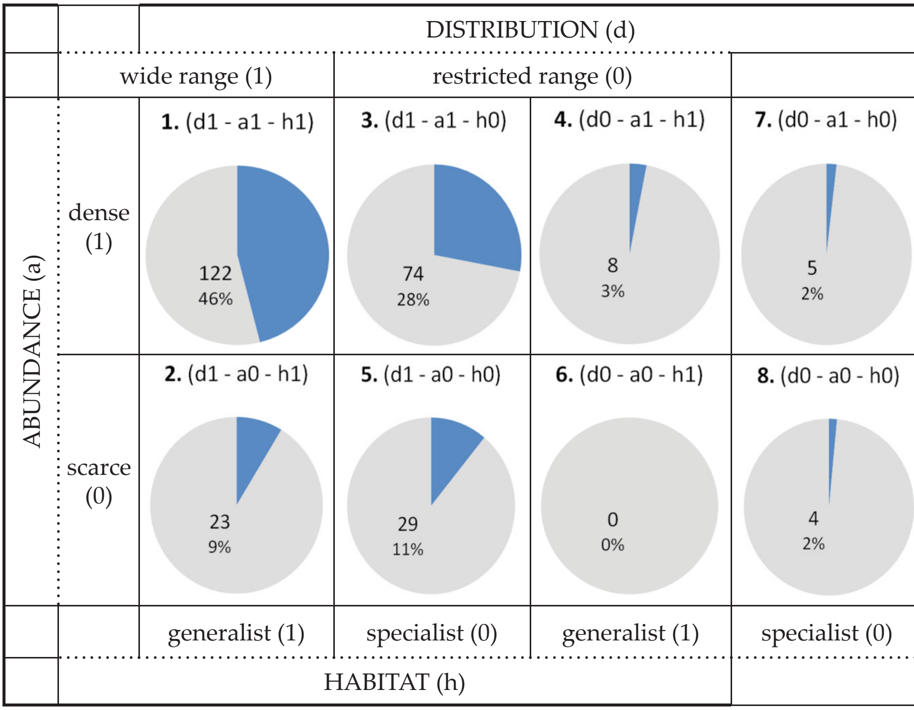

FIGURE 1. Distribution of rarity types within the evaluated bryophyte species (n=265) in the Azores. Numbers indicate number of species per category; dark areas of pie charts indicate the percent of the dataset each rarity type represents. 1, Species that are not rare; 2, Scarce species (rare by abundance); 3, Species with narrow ecological tolerance; 4, Restricted species (rare by range); 5, Scarce species with narrow ecological tolerance; 6, Restricted and scarce species; 7, Restricted species with narrow ecological range; 8, Restricted and scarce species with narrow ecological tolerance.

Chi-square tests indicated a significant association among distribution, rarity and abundance, endemism is not always associated with narrow ecological tolerance or with scarcity; species such as *Andoa berthelotiana* and *Leucodon treleasei* have been abundantly collected in different types of habitats and all islands of the Azores (eg. González-Mancebo *et al*., 2009). If these species evolved in Macaronesia (neoendemics), or survived only in Macaronesia (paleoendemics), they should indeed be well adapted to the Azorean ecosystems. Notwithstanding, *Echinodium renauldii*, which was recently confirmed as a true endemic species (Stech *et al*., 2008), is considered vulnerable by the IUCN (BSG, 2010), on account of its decreasing population trend and occurrence in less than ten localities in five islands of the Azores; this view is shared by Sjögren (1995). Fortunately, the number of places where this species has been collected is now known to be higher (more than 40 locations) and its presence was confirmed in two more islands (Corvo and Terceira) since 1995.

Almost half (n=112; 42,3%) of all the analyzed bryophytes were considered specialists in their habitat requirements, as referred by their high Lloyd index values, achieved when a high proportion of the total number of collections are grouped into one, or mostly two, habitats. Man-made habitats, such as exotic forests, grasslands or urban habitats do not seem to harbour specialist bryophyte species. This in itself has sobering implications for conservation, because of the historical decrease and fragmentation of native habitats (Triantis *et al*., 2010; Gaspar *et al*., 2011).

Forty liverworts and 24 mosses, more than half (!) of the specialist bryophyte species evaluated in this study (n=112) and about a quarter of all evaluated species show preference for natural forests (n=64; 24.2%). This is not surprising in view of what we know about the original plant cover of the islands – a dense forest ecosystem (ex. Frutuoso, 1963) that is lavishly covered with bryophytes in all occurring substrata. In spite of its obvious decrease in area (Silveira, 2007), the diversity and luxuriance of the communities that may be observed in the remaining native forest fragments (ex. Gabriel & Bates, 2005; Homem, 2005) is still staggering; thus, it is understandable, that this is the single most important habitat for bryophyte conservation in the Azores. Recently it was also demonstrated that Azorean native forests are a unique habitat for the conservation of most endemic arthropods (Triantis *et al*., 2010), and a high proportion of those species are now under threat of extinction due to its reduction. Bryophytes depending on native fragments are probably under the same pressures and would greatly benefit from an increase in the areas devoted to natural forests and from a careful control of the quality of remaining fragments, such as the removal of invasive species.

Peat bogs are structurally very different from forests, in their openness and permanent access to water and eleven species were considered specialists from this habitat, taking advantage of these special conditions. Obviously, *Sphagnum* and *Polytrichum* species (the green and brown makers of peatlands) are prone to be found in these habitats, but the persistent presence of the rare *Isopterygium tenerum* in Furnas do Enxofre (Terceira Island), should also be noted.

Surprisingly, or not (see Gabriel *et al*., 2006; Jennings, 2009), caves (lava tube and pit caves entrances) are an equally interesting habitat for the specialist group of bryophytes. Beyond *Asterella africana*, that has been collected specifically in such habitats, two other liverworts and eight mosses find refuge in these harsh environments, where competition from vascular species is certainly lower. Besides the 11 species that have mostly been collected at cave entrances, some species such as *Plagiochila longispina*, *Cyclodictyon laetevirens*, *Plagiothecium nemorale*, *Tetrastichium virens* and others, may be found both in native forest and cave entrances. This ability to colonize cave rocks is likely to expand their altitudinal range, as many of the lowest altitude records were from cave entrances. It is clear that caves are acting as refugia for some of these species. Due to the particular way abundance was inferred from the data, this is the least independent rarity dimension studied. The main issue is the lack of standardized data from where to take sound information (but see Gabriel & Bates, 2005 and Homem, 2005). However as showed by Couto (2010), standardized data on abundance obtained for several sites, was well correlated with distribution at the scale of Terceira Island. Bearing this in mind, additional efforts to get standardized information for different habitats and islands should be made. A relatively high number of the evaluated species (n=56; 21.1%), showed low abundance values, and were thus considered scarse. Scarse species include representatives from the three taxonomic groups (hornworts, liverworts and mosses); some examples include species that have been collected in a few places and were considered specialists such as *Asterella africana* (cave entrances), *Leptoscyphus azoricus* (native forests) or *Isopterygium tenerum* (peat bogs) but also species such as *Cephalozia lunulifolia, Fissidens coacervatus* or *Campylopus brevipilus*.

It is important to recognize that among the species that could not be evaluated are Azorean rare bryophytes seem to be found mostly in three important habitats: native forests, peat bogs and cave entrances. While a commendatory effort has been made in order to create natural parks in all islands including most native forests fragments, no such effort has been made to encompass lava tubes (Pereira *et al*., 2011), which are largely under private land and require adequate legislation to protect them, and peat bogs are presently very disturbed habitats.

About a third (n=43, 26 liverworts and 17 mosses; 30.1%) of all conservation dependent bryophytes (n=143) exist in five or more Island Parks. These Parks (one for each Island) have recently been created in the Azores and incorporate areas using different levels of protection, generally following IUCN criteria for protected areas (ex. Dudley, 2008). Nevertheless, there is a quarter of all conservation concern species (n=35 species, 22 liverworts and 13 mosses; 24.5%), including *Acrobolbus wilsonii, Adelanthus decipiens, Aphanolejeunea madeirensis, Leptoscyphus azoricus, Pallavicinia lyellii, Campylopus shawii* or *Cyclodictyon laetevirens* that exist in less than five Island Parks. While some of these species have a restricted range in the archipelago, occurring also in few islands (ex. *Kurzia pauciflora, Cheilolejeunea cedercreutzii*), others, such as *Plagiochila punctata* (7 Islands – 3 Island Parks), *Calypogeia azorica* (6 – 3), *Cyclodictyon laetevirens* (6 – 3), *Pallavicinia lyellii* (6 – 2) or *Trichocolea tomentella* (4 – 1) are not adequately protected by the current design of the Island Parks.

This work illustrates that even among relatively well studied groups of organisms – bryophytes, in a very confined region – the Azores, where a continuing collection, identification and reporting effort has been made through time, it was not possible to have a clear picture of the general rarity patterns of all species, and only about half of the reported taxa (n=265; 55.2%)

could be assessed using a simple method of categorization. This hinders conservation efforts, as only a fraction of knowledge is available to managers and decision makers, while enlightening the way forward. It is clear that better floristic knowledge and expertise on bryophytes is necessary in the Azores, if we are to preserve the wealth of species and the natural communities where they occur. As Knapp & Monterrosa Salomón have stated: *"[this] method is not a substitute for a quantitative conservation assessment…"* (2010: 527), however it is a way of setting priorities for further study or monitoring. Some suggestions follow:

1. The 143 species selected at least by one of Rabinowitz's dimension of rarity should be followed and all efforts should be made to adequately conserve their habitats.

2. The 24 species previously selected by IUCN criteria (ECCB, 1995; Dierssen, 2001), that could not be evaluated in this study for lack of collection records, should be very carefully prospected in the field and their evolution monitored, especially the four species that were also mentioned by the experts Erik Sjögren (1995) and / or René Schumacker (2001): *Acanthocoleus aberrans*, *Jamesoniella rubricaulis*, *Fissidens azoricus* and *Neckera cephalonica*.

3. One liverwort (*Aphanolejeunea madeirensis*) and three mosses (*Fissidens coacervatus*, *Sphagnum nitidulum*, *Thamnobryum rudolphianum*) have come out as restricted, scarce and with a narrow ecological tolerance, which means they were considered rare in the three dimensions considered. While it is obvious that their conservation in the Azores should be carefully planned, the taxonomic status of *S. nitidulum* and *F. coacervatus*, should be clarified.

4. Island Parks are acting as "safe areas" for a number of bryophyte species however, other conservation concern species would benefit from a reshape, sometimes quite straightforward, of those protected areas.

5. Some species that are not routinely included in red lists have nonetheless come up as rare in one or two

dimensions, an aspect already discussed for mosses by Sjögren (2006). This enlightens the scale problem of conservation: it is important to acknowledge that regional, as well as global, conservation plans should be enforced.

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APPENDIX 1. List of references used in this bryophyte survey.

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APPENDIX 2. Data on Azorean bryophyte species and subspecies as classified in the Rabinowitz (1981) rarity criteria used in this work. (Mean altitude includes all the records; dd, data deficient; na, not applicable; es, SJÖGREN, 1995; rs, Schumacker, 2001; Old IUCN Criteria: based on ECCB, 1995 and Dierssen, 2001).

Species	Endemic grouping	Groups of Islands	Number of Islands	Presence in Island Parks	Number of 500 x 500 m cells	Lloyd index (>11 records)	Habitat with highest number of records	Minimum altitude (m)	Mean altitude (m)	Maximum altitude (m)	Records <1976	Records >1975	Old IUCN criteria	Experts' opinion	Vulnerability Index
HORNWORTS															
***Anthoceros caucasicus* Steph.**		3	9	6	146	1,8	ExFor (18)	200	520,5	825	14	45	r		1. Species that are not rare
***Anthoceros punctatus* L.**		3	9	7	447	1,3	NaFor (24)	100	372,3	700	49	51			1. Species that are not rare
***Phaeoceros carolinianus* (Michx.) Prosk.**		1	4	1	3	dd	na (1)	350	350,0	350	0	4			
***Phaeoceros laevis* (L.) Prosk.**		3	8	5	70	0,6	NaFor (6)	175	440,0	700	3	12			2. Scarce species (rare by abundance)
***Phymatoceros bulbiculosus* (Brot.) Stotler, W. T. Doyle *et* Crand.-Stotl.**		3	4	1	67	dd	na (2)	dd	dd	dd	4	3			
LIVERWORTS															
***Acanthocoleus aberrans* (Lindenb. *et* Gottsche) Kruijt**		1	3	2	20	dd	NaFor (4)	500	690,0	750	4	1	r	es; rs	
***Acrobolbus wilsonii* Nees**		2	4	3	117	6,1	NaFor (47)	500	864,3	1050	20	32	v	es; rs	3. Species with narrow ecological tolerance
***Adelanthus decipiens* (Hook.) Mitt.**		3	6	4	179	6,4	NaFor (92)	500	856,8	1500	34	65		es	3. Species with narrow ecological tolerance
***Anastrophyllum minutum* (Schreb.) R. M. Schust.**		3	8	5	137	1,6	NaFor (26)	250	692,7	2300	15	33			1. Species that are not rare
***Aneura pinguis* (L.) Dumort.**		3	5	4	92	dd	NaFor (5)	500	616,7	850	6	5			
***Aphanolejeunea azorica* (V. Allorge *et* Ast) Pócs et Bernecker**		3	9	7	198	2,0	NaFor (76)	150	592,9	1050	75	65	v		1. Species that are not rare
***Aphanolejeunea madeirensis* (Schiffn.) Grolle**	MAC	2	5	4	83	4,6	NaFor (36)	250	658,8	925	36	6	r	rs	8. Restricted and scarce species with narrow ecological tolerance
***Aphanolejeunea microscopica* (Taylor) A. Evans**		3	8	6	624	4,2	NaFor (570)	50	701,8	1100	468	185			3. Species with narrow ecological tolerance
***Aphanolejeunea sintenisii* Steph.**		3	9	8	390	2,4	NaFor (180)	150	549,8	975	85	195	v		1. Species that are not rare
***Asterella africana* (Mont.) A. Evans**		3	7	5	79	7,9	Caves (21)	10	387,8	875	13	25	v	rs	5. Scarce species with narrow ecological tolerance

Species	Endemic grouping	Groups of Islands	Number of Islands	Presence in Island Parks	Number of 500 x 500 m cells	Lloyd index (>11 records)	Habitat with highest number of records	Minimum altitude (m)	Mean altitude (m)	Maximum altitude (m)	Records <1976	Records >1975	Old IUCN criteria	Experts' opinion	Vulnerability Index
Barbilophozia attenuata **(Mart.) Loeske**		2	6	5	195	2,8	NaFor (42)	400	656,1	1000	19	33			1. Species that are not rare
Bazzania azorica **H. Buch *et* H. Perss.**	AZ	3	6	6	376	7,8	NaFor (320)	350	766,4	1050	112	232	r	rs	7. Restricted species with narrow ecological range
Blepharostoma trichophyllum **(L.) Dumort.**		3	9	5	167	2,0	NaFor (35)	150	700,0	1050	12	40			1. Species that are not rare
Calypogeia arguta **Nees *et* Mont.**		3	9	8	245	2,8	NaFor (57)	100	501,3	975	35	102			1. Species that are not rare
Calypogeia azorica **Bischl.**	MAC	3	6	3	116	3,3	NaFor (21)	150	555,2	750	8	26	r	es; rs	7. Restricted species with narrow ecological range
Calypogeia fissa **(L.) Raddi**		3	9	9	455	3,3	NaFor (181)	200	601,8	1050	65	279			3. Species with narrow ecological tolerance
Calypogeia integristipula **Steph.**		3	4	4	16	dd	NaFor (8)	800	808,3	825	11	1			
Calypogeia muelleriana **(Schiffn.) Müll. Frib.**		3	8	7	468	3,1	NaFor (242)	150	667,5	1050	105	228			3. Species with narrow ecological tolerance
Calypogeia neesiana **(C. Massal. *et* Carestia) Müll. Frib.**		3	5	3	64	3,9	NaFor (22)	500	636,5	825	15	13			5. Scarce species with narrow ecological tolerance
Calypogeia sphagnicola **(Arnell *et* J. Perss.) Warnst. et Loeske**		3	6	2	15	3,0	NaFor (13)	650	750,0	925	12	4		rs	5. Scarce species with narrow ecological tolerance
Calypogeia suecica **(Arnell *et* J. Perss.) Müll. Frib.**		3	4	3	58	1,7	ExFor (6)	350	425,0	550	7	9			2. Scarce species (rare by abundance)
Cephalozia bicuspidata **(L.) Dumort.**		3	8	8	334	1,9	NaFor (87)	225	637,0	1075	49	91			1. Species that are not rare
Cephalozia connivens **(Dicks.) Lindb.**		2	3	2	50	dd	NaFor (4)	800	893,8	925	2	4			
Cephalozia crassifolia **(Lindenb. *et* Gottsche) Fulford**		3	6	6	333	5,5	NaFor (211)	250	693,8	1000	73	178	v		3. Species with narrow ecological tolerance
Cephalozia lunulifolia **(Dumort.) Dumort.**		2	5	4	65	5,2	NaFor (8)	625	805,0	1025	9	3			5. Scarce species with narrow ecological tolerance
Cephaloziella baumgartneri **Schiffn.**		1	2		10	dd	Mesic (3)	dd	dd	dd	3	2			
Cephaloziella calyculata **(Durieu et Mont.) Müll. Frib.**		1	1	1	3	dd	na (1)	dd	dd	dd	0	1	r		
Cephaloziella dentata **(Raddi) Steph.**		2	2	1	9	dd	NaFor (3)	500	539,3	650	0	7			
Cephaloziella divaricata **(Sm.) Schiffn.**		3	3	3	76	dd	Mesic (6)	225	475,0	600	6	4			
Cephaloziella hampeana **(Nees) Schiffn.**		1	2	1	3	dd	na (2)	550	575,0	600	0	3			

Species	Endemic grouping	Groups of Islands	Number of Islands	Presence in Island Parks	Number of 500 x 500 m cells	Lloyd index (>11 records)	Habitat with highest number of records	Minimum altitude (m)	Mean altitude (m)	Maximum altitude (m)	Records <1976	Records >1975	Old IUCN criteria	Experts' opinion	Vulnerability Index
Cephaloziella rubella (Nees) Warnst.		1	1	1	4	dd	na (2)	550	550,0	550	0	2			
Cephaloziella turneri (Hook.) Müll. Frib.		1	2	1	6	dd	na (2)	dd	dd	dd	2	0			
Cheilolejeunea cedercreutzii (H. Buch *et* H. Perss.) Grolle	MAC	2	4	4	105	3,0	NaFor (31)	250	786,0	1050	19	17	v	es; rs	7. Restricted species with narrow ecological range
Chiloscyphus coadunatus (Sw.) J. J. Engel *et* R. M. Schust.		3	9	5	255	2,3	NaFor (30)	100	452,7	900	17	46			1. Species that are not rare
Chiloscyphus fragrans (Moris *et* De Not.) J. J. Engel *et* R. M. Schust.		3	8	7	546	2,0	NaFor (132)	25	594,2	1000	120	81			1. Species that are not rare
Chiloscyphus minor (Nees) J. J. Engel *et* R. M. Schust.		2	3		1	dd	na (2)	175	418,8	700	8	0			
Chiloscyphus pallescens (Ehrh. ex Hoffm.) Dumort.		3	5		dd	dd	NaFor (4)	350	633,3	850	4	3			
Chiloscyphus polyanthos (L.) Corda		3	7	5	274	2,6	NaFor (14)	200	622,2	925	24	7			1. Species that are not rare
Chiloscyphus profundus (Nees) J. J. Engel *et* R. M. Schust.		3	8	5	102	2,9	NaFor (18)	10	485,6	875	27	17			1. Species that are not rare
Cladopodiella francisci (Hook.) Jörg.		2	2	2	19	dd	na (2)	400	508,3	575	2	3		rs	
Cololejeunea minutissima (Sm.) Schiffn.		3	9	9	586	2,0	NaFor (368)	10	566,6	1050	358	262			1. Species that are not rare
Colura calyptrifolia (Hook.) Dumort.		3	8	6	473	2,8	NaFor (221)	300	724,8	1100	165	115	rt		1. Species that are not rare
Conocephalum conicum (L.) Dumort.		3	9	9	426	6,2	Caves (130)	50	530,4	1400	91	210			3. Species with narrow ecological tolerance
Conocephalum salebrosum Szweykowski, Buczkowska *et* Odrzykoski		1	1		dd	dd	na (1)	dd	dd	dd	1	2			
Corsinia coriandrina (Spreng.) Lindb.		3	7	4	212	2,7	Mesic (16)	10	63,3	250	25	10			1. Species that are not rare
Diplophyllum albicans (L.) Dumort.		3	8	8	338	2,3	NaFor (106)	250	682,7	2300	64	107			1. Species that are not rare
Drepanolejeunea hamatifolia (Hook.) Schiffn.		3	8	8	524	4,0	NaFor (562)	10	706,9	1300	484	344			3. Species with narrow ecological tolerance
Dumortiera hirsuta (Sw.) Nees subsp. *hirsuta*		3	8	8	534	4,4	Caves (78)	10	522,0	1025	80	147	r		3. Species with narrow ecological tolerance
Exormotheca pustulosa Mitt.		3	5		124	2,7	Mesic (6)	25	100,0	175	9	5	r	rs	1. Species that are not rare

Species	**Endemic grouping**	**Groups of Islands**	**Number of Islands**	**Presence in Island Parks**	**Number of 500 x 500 m cells**	**Lloyd index (>11 records)**	**Habitat with highest number of records**	**Minimum altitude (m)**	**Mean altitude (m)**	**Maximum altitude (m)**	**Records <1976**	**Records >1975**	**Old IUCN criteria**	**Experts' opinion**	**Vulnerability Index**
Fossombronia angulosa **(Dicks.) Raddi**		3	9	8	235	1,2	NaFor (12)	150	376,4	700	29	27			1. Species that are not rare
Fossombronia caespitiformis **De Not. *ex* Rabenh. subsp. *caespitiformis***		2	4	3	82	1,8	Mesic; NaFor (4)	200	385,0	650	10	5			2. Scarce species (rare by abundance)
Fossombronia caespitiformis **De Not. ex Rabenh. subsp. *multispira* (Schiffn.) J. R. Bray et D. C. Cargill**		2	6	3	dd	dd	Mesic; Urban (3)	100	100,0	100	4	7			
Fossombronia echinata **Macvicar**		1	1		2	dd	na (1)	150	150,0	150	0	1	k		
Fossombronia pusilla **(L.) Nees**		2	4	2	20	dd	na (2)	400	400,0	400	2	2			
Frullania azorica **Sim-Sim *et al.***	IB-MAC	3	9	9	688	2,1	Coast (60)	10	154,4	800	59	164			1. Species that are not rare
Frullania fragilifolia **(Taylor) Gottsche *et al.***		1	3		dd	dd	NaFor (4)	dd	dd	dd	0	8			
Frullania microphylla **(Gottsche) Pearson**	EUR	3	9	9	777	1,8	NaFor (227)	10	493,4	1100	381	307			1. Species that are not rare
Frullania tamarisci **(L.) Dumort.**		3	9	9	1016	2,1	NaFor (606)	10	588,2	1225	366	729			1. Species that are not rare
Frullania teneriffae **(F. Weber) Nees**		3	9	7	509	1,7	NaFor (243)	10	670,8	1350	283	228			1. Species that are not rare
Geocalyx graveolens **(Schrad.) Nees**		3	7	6	188	4,9	NaFor (77)	475	675,0	1000	19	68			3. Species with narrow ecological tolerance
Gongylanthus ericetorum **(Raddi) Nees**		3	7	5	199	3,2	Mesic (22)	25	350,0	700	28	12			3. Species with narrow ecological tolerance
Gymnocolea inflata **(Huds.) Dumort.**		2	2	2	43	1,8	NaFor (8)	300	837,5	950	0	13		rs	2. Scarce species (rare by abundance)
Harpalejeunea molleri **(Steph.) Grolle**		3	9	9	638	1,5	NaFor (114)	10	474,2	1075	94	143			1. Species that are not rare
Herbertus dicranus **(Taylor *ex* Gottsche *et al.*) Trevis.**		1	1	1	79	dd	na (1)	1925	1925,0	1925	1	0			
Herbertus sendtneri **(Nees) Lindb.**		3	7	7	271	3,7	NaFor (94)	425	826,8	1500	39	76	r		3. Species with narrow ecological tolerance
Heteroscyphus denticulatus **(Mitt.) Schiffn.**	MAC	3	8	7	369	2,6	NaFor (21)	75	384,4	900	13	34	r	rs	4. Restricted species (rare by range)
Hygrobiella laxifolia **(Hook.) Spruce**		1	3		dd	dd	na (1)	525	525,0	525	0	1			

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***Jamesoniella rubricaulis* (Nees) Grolle**		2	2	1	52	dd	Mount (5)	1000	1133,3	1200	2	4	k	es	
Jubula hutchinsiae* (Hook.) Dumort. subsp. *hutchinsiae		3	7	7	594	4,2	NaFor (184)	75	604,7	1925	90	228			3. Species with narrow ecological tolerance
***Jungermannia atrovirens* Dumort.**		3	7	4	82	dd	NaFor (3)	50	410,0	650	4	6			
***Jungermannia callithrix* Lindenb. *et* Gottsche**		3	8	8	437	2,0	NaFor (30)	175	528,1	950	17	55			1. Species that are not rare
***Jungermannia gracillima* Sm.**		3	8	5	73	1,6	Aquat (12)	350	615,4	975	12	21			2. Scarce species (rare by abundance)
***Jungermannia hyalina* Lyell**		3	8	2	18	1,4	NaFor (17)	300	500,0	700	22	17			2. Scarce species (rare by abundance)
***Jungermannia pumila* With.**		2	4	2	122	1,3	NaFor (5)	dd	dd	dd	5	9			1. Species that are not rare
***Kurzia pauciflora* (Dicks.) Grolle**		3	4	4	106	7,1	NaFor (17)	550	690,0	925	11	17			3. Species with narrow ecological tolerance
***Lejeunea eckloniana* Lindenb.**		3	9	8	321	2,3	NaFor (37)	25	386,6	925	30	77		es	1. Species that are not rare
***Lejeunea flava* (Sw.) Nees subsp. *moorei* (Lindb.) R. M. Schust.**		3	8	7	269	1,8	NaFor (99)	50	511,4	950	57	123	(r)		1. Species that are not rare
***Lejeunea hibernica* Bischl. *et al.* *ex* Grolle**	EUR	3	4	4	181	2,4	NaFor (11)	75	586,1	800	6	9	r	es	1. Species that are not rare
***Lejeunea lamacerina* (Steph.) Schiffn.**		3	9	9	847	1,9	NaFor (547)	10	535,3	1050	481	721			1. Species that are not rare
***Lejeunea patens* Lindb.**		3	9	7	565	2,2	NaFor (156)	150	785,6	1500	113	95			1. Species that are not rare
***Lepidozia cupressina* (Sw.) Lindenb. subsp. *pinnata* (Hook.) Pócs**		3	6	6	375	5,7	NaFor (227)	525	756,1	1100	91	161			3. Species with narrow ecological tolerance
***Lepidozia pearsonii* Spruce**		1	1	1	2	dd	na (2)	975	975,0	975	0	2			
***Lepidozia reptans* (L.) Dumort.**		3	7	7	428	3,7	NaFor (130)	400	690,0	1050	60	94			3. Species with narrow ecological tolerance
***Lepidozia stuhlmannii* Steph.**		1	3	1	34	dd	NaFor (8)	650	812,5	1000	0	10			
***Leptoscyphus azoricus* (H. Buch *et* H. Perss.) Grolle**	EUR	3	5	4	80	6,2	NaFor (56)	550	797,6	1050	20	39	v	es; rs	5. Scarce species with narrow ecological tolerance
***Leptoscyphus cuneifolius* (Hook.) Mitt.**		1	3	3	20	dd	NaFor (5)	400	662,5	1000	4	8		es	
***Lophozia bicrenata* (Schmidel *ex* Hoffm.) Dumort.**		2	5	2	31	dd	na (2)	150	843,8	2000	3	2			

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Lophozia incisa **(Schrad.) Dumort. subsp.** ***incisa***		3	7	5	97	3,1	NaFor (8)	550	685,7	800	11	3			3. Species with narrow ecological tolerance
Lophozia longiflora **(Nees) Schiffn.**		2	5	2	7	dd	NaFor (4)	550	656,3	850	0	5			
Lophozia ventricosa **(Dicks.) Dumort. aggr.**		2	5	5	90	1,9	NaFor (20)	350	702,1	1050	25	4			1. Species that are not rare
Lunularia cruciata **(L.) Lindb.**		3	9	5	137	1,7	Mesic (11)	100	347,7	950	20	24			1. Species that are not rare
Mannia androgyna **(L.) A. Evans**		3	6	4	231	3,5	Urban (8)	25	62,5	100	18	6			3. Species with narrow ecological tolerance
Marchantia paleacea **Bertol.**		3	8	7	249	1,4	NaFor (15)	75	458,3	875	43	16	k		1. Species that are not rare
Marchantia polymorpha **L.**		2	3			dd	na (2)	650	650,0	650	5	0			
Marchantia polymorpha **L. subsp.** ***monti-vagans*** **Bischl.** ***et*** **Boisselier**		1	1	1	47	dd	na (2)	dd	dd	dd	0	5			
Marchantia polymorpha **L. subsp.** ***rudera-lis*** **Bischl.** ***et*** **Boisselier**		2	4		dd	dd	na (2)	dd	dd	dd	1	1			
Marchesinia mackaii **(Hook.) Gray**		3	9	9	812	1,8	NaFor (93)	10	386,3	825	147	173			1. Species that are not rare
Marsupella adusta **(Nees emend. Limpr.) Spruce**		2	3	2	10	dd	Mount (3)	625	1906,3	2350	6	0	k		
Marsupella emarginata **(Ehrh.) Dumort.**		3	8	7	179	1,8	NaFor (19)	50	601,9	1600	20	28			1. Species that are not rare
Marsupella funckii **(F. Weber** ***et*** **D. Mohr) Dumort.**		3	7	4	55	0,5	NaFor (9)	500	612,5	675	6	9			2. Scarce species (rare by abundance)
Marsupella profunda **Lindb.**		1	1	1	4	dd	na (1)	dd	dd	dd	0	1	v		
Marsupella sparsifolia **(Lindb.) Dumort.**		1	3	2	6	dd	NaFor (3)	825	862,5	900	1	2			
Marsupella sphacelata **(Gieseke** ***ex*** **Lindenb.) Dumort.**		2	3	3	10	dd	NaFor (5)	700	775,0	850	7	1			
Metzgeria furcata **(L.) Dumort.**		3	8	7	527	2,4	NaFor (163)	225	623,6	1050	225	83			1. Species that are not rare
Metzgeria leptoneura **Spruce**		3	6	6	309	3,6	NaFor (99)	450	732,4	1000	74	41			3. Species with narrow ecological tolerance
Microlejeunea ulicina **(Taylor) A. Evans**		3	7	7	206	1,4	NaFor (13)	100	342,0	950	19	25			1. Species that are not rare
Mnioloma fuscum **(Lehm.) R. M. Schust.**		3	6	5	198	8,7	NaFor (124)	475	801,1	1075	47	86	r	es	3. Species with narrow ecological tolerance

Species	Endemic grouping	Groups of Islands	Number of Islands	Presence in Island Parks	Number of 500 x 500 m cells	Lloyd index (>11 records)	Habitat with highest number of records	Minimum altitude (m)	Mean altitude (m)	Maximum altitude (m)	Records <1976	Records >1975	Old IUCN criteria	Experts' opinion	Vulnerability Index
***Mylia taylorii* (Hook.) Gray**		2	2	1	4	dd	na (1)	775	775,0	775	1	1			
***Nardia geoscyphus* (De Not.) Lindb.**		3	7	4	68	1,7	NaFor (7)	325	614,3	925	5	13			2. Scarce species (rare by abundance)
***Nardia scalaris* Gray**		3	9	9	415	1,7	NaFor (67)	150	563,2	1000	49	138			1. Species that are not rare
***Nowellia curvifolia* (Dicks.) Mitt.**		3	6	5	318	4,5	NaFor (145)	250	721,7	1075	81	84			3. Species with narrow ecological tolerance
***Odontoschisma denudatum* (Mart.) Dumort.**		3	6	4	154	3,3	NaFor (28)	300	659,2	1000	19	17			3. Species with narrow ecological tolerance
***Odontoschisma prostratum* (Sw.) Trevis.**		3	8	8	485	3,0	NaFor (154)	225	608,9	1025	88	175			3. Species with narrow ecological tolerance
***Pallavicinia lyellii* (Hook.) Carruth.**		3	6	2	197	6,6	NaFor (46)	450	733,0	1100	8	41	v	es	3. Species with narrow ecological tolerance
***Pellia epiphylla* (L.) Corda s.l.**		3	7	5	218	4,6	NaFor (125)	50	650,8	1000	52	193			3. Species with narrow ecological tolerance
***Plagiochasma rupestre* (J. R. Forst. *et* G. Forst.) Steph.**		2	4	1	2	dd	na (2)	dd	dd	dd	5	1			
***Plagiochila bifaria* (Sw.) Lindenb.**		3	9	9	729	4,2	NaFor (569)	100	676,2	1500	179	586			3. Species with narrow ecological tolerance
***Plagiochila exigua* (Taylor) Taylor**		3	9	7	351	3,5	NaFor (185)	225	739,5	1100	100	117			3. Species with narrow ecological tolerance
***Plagiochila longispina* Lindenb. *et* Gottsche**		3	9	7	114	4,0	NaFor (20)	300	635,5	975	17	24	v	es	3. Species with narrow ecological tolerance
***Plagiochila papillifolia* Steph.**		1	1		dd	dd	na (2)	800	800,0	800	0	2			
***Plagiochila punctata* (Taylor) Taylor**		3	7	3	122	6,9	NaFor (7)	525	847,5	1050	7	5			3. Species with narrow ecological tolerance
***Plagiochila retrorsa* Gottsche**		1	2	1	1	dd	na (1)	650	650,0	650	0	3			
***Porella canariensis* (F. Weber) Bryhn**		3	9	9	456	1,2	NaFor (53)	10	406,2	950	57	100	t		1. Species that are not rare
***Porella obtusata* (Taylor) Trevis.**		3	8	5	130	2,6	NaFor (60)	25	501,5	1000	7	101			1. Species that are not rare
Radula aquilegia* (Hook. F. *et* Taylor) Gottsche *et al.		3	7	7	537	2,7	NaFor (263)	150	692,8	1075	134	203			1. Species that are not rare
***Radula carringtonii* J. B. Jack**		3	9	9	673	1,4	NaFor (170)	25	499,5	1500	104	264	r		1. Species that are not rare

Species	**Endemic grouping**	**Groups of Islands**	**Number of Islands**	**Presence in Island Parks**	**Number of 500 x 500 m cells**	**Lloyd index (>11 records)**	**Habitat with highest number of records**	**Minimum altitude (m)**	**Mean altitude (m)**	**Maximum altitude (m)**	**Records <1976**	**Records >1975**	**Old IUCN criteria**	**Experts' opinion**	**Vulnerability Index**
Radula complanata **(L.) Dumort.**		3	6	3	110	1,8	Mesic (6)	25	450,0	825	29	4			1. Species that are not rare
Radula holtii **Spruce**	EUR	3	8	7	190	1,7	NaFor (52)	75	558,4	1050	56	31	r	es	1. Species that are not rare
Radula lindenbergiana **Gottsche** *ex* **C. Hartman**		3	8	7	413	2,5	Parks (16)	25	303,1	925	57	41			1. Species that are not rare
Radula nudicaulis **Steph.**		2	5	3	79	3,9	NaFor (25)	550	795,6	1500	10	18	r	es	5. Scarce species with narrow ecological tolerance
Radula wichurae **Steph.**	MAC	3	9	9	282	1,8	NaFor (42)	10	267,4	950	38	154	v	rs	4. Restricted species (rare by range)
Reboulia hemisphaerica **(L.) Raddi** *s.l.*		3	9	7	295	1,7	Mesic (24)	50	370,8	925	33	41			1. Species that are not rare
Riccardia chamedryfolia **(With.) Grolle**		3	8	8	443	4,2	NaFor (76)	150	606,3	1000	61	109			3. Species with narrow ecological tolerance
Riccardia latifrons **(Lindb.) Lindb.**		3	9	7	274	2,1	NaFor (28)	100	478,2	900	29	26			1. Species that are not rare
Riccardia multifida **(L.) Gray**		3	8	8	338	1,9	NaFor (51)	175	615,3	1000	38	58			1. Species that are not rare
Riccardia palmata **(Hedw.) Carruth.**		3	6	5	73	3,3	NaFor (15)	450	727,5	950	11	9			5. Scarce species with narrow ecological tolerance
Riccia beyrichiana **Hampe** *ex* **Lehm.** *et* **Lindenb.**		1	1	1	44	dd	na (1)	dd	dd	dd	0	2			
Riccia bifurca **Hoffm.**		2	2	2	48	dd	na (1)	525	525,0	525	1	4			
Riccia crozalsii **Levier**		3	6	4	167	1,8	Mesic (6)	25	178,6	475	4	12			1. Species that are not rare
Riccia crystallina **L. emend. Raddi**		2	2		24	dd	na (2)	dd	dd	dd	2	0			
Riccia glauca **L.**		2	3	2	57	dd	Mesic (3)	dd	dd	dd	2	5			
Riccia huebeneriana **Lindenb.**		1	1	1	2	dd	Aquat (3)	550	550,0	550	0	3	r		
Riccia ligula **Steph.**		1	1		1	dd	InPas (6)	325	325,0	325	0	6	r		
Riccia nigrella **DC.**		3	6	4	224	2,9	Mesic (7)	475	500,0	550	12	8			1. Species that are not rare
Riccia sorocarpa **Bischl.**		2	5	1	37	dd	Mesic (4)	325	375,0	475	3	8			
Riccia subbifurca **Warnst.** *ex* **Croz.**		1	1	1	1	dd	na (2)	525	525,0	525	0	2			
Riccia trabutiana **Steph.**		1	1		dd	dd	na (1)	dd	dd	dd	0	1	r		
Riccia warnstorfii **Limpr.** *ex* **Warnst.**		2	2	1	29	dd	na (1)	dd	dd	dd	2	1			

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Saccogyna viticulosa **(L.) Dumort.**	EUR	3	9	9	778	2,0	NaFor (317)	10	598,6	1050	142	364			1. Species that are not rare
Scapania compacta **(A. Roth.) Dumort.**		2	4	3	15	2,1	NaFor (3)	200	697,2	975	5	9			2. Scarce species (rare by abundance)
Scapania curta **(Mart.) Dumort.**		2	6	4	41	2,5	NaFor (14)	475	769,0	1075	19	4			2. Scarce species (rare by abundance)
Scapania gracilis **Lindb.**		3	8	8	555	3,5	NaFor (290)	125	739,0	1500	110	244			3. Species with narrow ecological tolerance
Scapania nemorea **(L.) Grolle**		3	6	3	166	1,9	NaFor (31)	400	653,8	1000	19	39			1. Species that are not rare
Scapania paludosa **(Müll. Frib.) Müll. Frib.**		1	1		dd	dd	na (2)	dd	dd	dd	2	0			
Scapania scandica **(Arnell et H. Buch) Macvicar**		1	1	1	1	dd	na (1)	2350	2350,0	2350	1	0			
Scapania undulata **(L.) Dumort.**		3	8	7	336	2,6	NaFor (69)	250	696,4	1100	63	47			1. Species that are not rare
Southbya tophacea **(Spruce) Spruce**		2	2		dd	dd	na (1)	500	500,0	500	0	1			
Sphaerocarpos texanus **Austin**		1	1		1	dd	na (1)	dd	dd	dd	0	1			
Targionia hypophylla **L.**		3	9	6	236	2,3	Mesic (19)	50	318,8	950	29	14			1. Species that are not rare
Targionia lorbeeriana **Müll. Frib.**		1	1		dd	dd	na (1)	dd	dd	dd	0	1			
Telaranea azorica **(H. Buch *et* H. Perss.) Pócs *ex* Schumacker *et* Váña**	MAC	3	6	5	265	6,9	NaFor (105)	250	784,1	1075	69	46	v	es; rs	7. Restricted species with narrow ecological range
Telaranea europaea **Engel *et* Merr.**		3	9	9	404	3,0	NaFor (271)	150	645,9	1025	101	265	r		3. Species with narrow ecological tolerance
Trichocolea tomentella **(Ehrh.) Dumort.**		2	4	1	133	3,8	NaFor (17)	550	712,5	1000	18	6			3. Species with narrow ecological tolerance
Tylimanthus laxus **(Lehm. *et* Lindenb.) Spruce**		3	6	6	245	1,9	NaFor (48)	10	706,6	1500	31	55	v	es; rs	1. Species that are not rare
MOSSES															
Aloina ambigua **(Bruch *et* Schimp.) Limpr.**		1	2		21	dd	Mesic (6)	dd	dd	dd	7	1			
Aloina rigida **(Hedw.) Limpr.**		1	1		12	dd	na (1)	dd	dd	dd	0	1			
Alophosia azorica **(Renauld *et* Cardot) Cardot**	MAC	3	7	5	363	1,3	NaFor (60)	100	576,2	1000	31	93	r		4. Restricted species (rare by range)

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***Amblystegium confervoides* (Brid.) Schimp.**		2	2		dd	dd	Caves (3)	50	150,0	250	0	3			
***Amblystegium serpens* (Hedw.) Schimp.**		3	3	1	38	dd	na (1)	50	75,0	125	5	1			
***Amphidium mougeotii* (Bruch *et* Schimp.) Schimp.**		2	5	3	41	dd	NaFor (5)	250	942,9	2350	5	4			
***Andoa berthelotiana* (Mont.) Ochyra**	MAC	3	9	9	1068	1,6	NaFor (233)	10	498,6	1550	203	461	r		4. Restricted species (rare by range)
***Andreaea rupestris* Hedw.**		1	2	1	39	dd	Mount (5)	1500	1612,5	1750	5	0			
***Anoectangium aestivum* (Hedw.) Mitt.**		1	1	1	44	dd	na (1)	dd	dd	dd	2	0			
***Anomobryum julaceum* (P. Gaerth., B. Mey. et Scherb.) Schimp.**		3	8	8	291	1,3	NaFor (19)	10	447,9	950	25	42			1. Species that are not rare
***Archidium alternifolium* (Hedw.) Schimp.**		3	4	1	107	dd	na (2)	300	450,0	600	5	3			
***Atrichum angustatum* (Brid.) Bruch *et* Schimp.**		3	8	6	236	1,1	Mesic (11)	150	468,3	900	18	30			1. Species that are not rare
***Atrichum tenellum* (Röhl.) Bruch *et* Schimp.**		1	1	1	1	dd	Aquat (3)	550	550,0	550	0	3			
***Atrichum undulatum* (Hedw.) P. Beauv.**		3	8	4	176	1,3	NaFor (31)	300	556,8	800	26	45			1. Species that are not rare
***Aulacomnium palustre* (Hedw.) Schwägr.**		2	3	1	16	dd	NaFor (5)	700	850,0	950	6	2		es	
***Barbula convoluta* Hedw.**		2	3	2	26	dd	na (1)	50	50,0	50	1	1			
***Barbula unguiculata* Hedw.**		3	9	6	189	1,9	Mesic (7)	50	267,5	575	7	16			1. Species that are not rare
***Bartramia pomiformis* Hedw.**		1	1	1	4	dd	na (2)	dd	dd	dd	1	0			
***Bartramia stricta* Brid.**		3	6	3	117	3,1	Coast (7)	25	240,6	800	12	4			3. Species with narrow ecological tolerance
***Blindia acuta* (Hedw.) Bruch et Schimp.**		3	5	5	92	1,6	NaFor (15)	450	725,0	950	14	7			1. Species that are not rare
***Brachymenium notarisii* (Mitt.) A. J. Shaw**		3	4	3	27	dd	na (2)	150	325,0	500	4	2	r		
***Brachytheciastrum velutinum* (Hedw.) Ignatov *et* Huttunen**		3	8	4	49	2,5	ExFor (10)	25	450,0	1500	10	17			2. Scarce species (rare by abundance)
***Brachythecium albicans* (Hedw.) Schimp.**		2	3	1	2	dd	na (2)	200	416,7	525	1	2			
***Brachythecium mildeanum* (Schimp.) Milde**		2	3	2	32	dd	NaFor (4)	50	528,1	875	10	0			

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Brachythecium rivulare **Schimp.**		3	8	5	102	2,3	NaFor (7)	275	430,6	650	8	11			1. Species that are not rare
Brachythecium rutabulum **(Hedw.) Schimp.**		3	8	5	125	2,0	InPas (14)	125	419,2	975	9	39			1. Species that are not rare
Brachythecium salebrosum **(Hoffm. *ex* F. Weber *et* D. Mohr) Schimp.**		3	9	6	202	1,7	ExFor (5)	100	209,4	350	10	6			1. Species that are not rare
Breutelia azorica **(Mitt.) Cardot**	AZ	3	6	5	220	1,7	NaFor (54)	250	719,1	1200	62	30	r		4. Restricted species (rare by range)
Bryoerythrophyllum inaequalifolium **(Taylor) R. H. Zander**		1	2	1	40	dd	na (2)	dd	dd	dd	0	2	r		
Bryoxiphium norvegicum **(Brid.) Mitt.**		1	1	1	1	dd	na (1)	325	325,0	325	0	1			
Bryum argenteum **Hedw.**		3	8	3	153	2,9	Mesic (9)	50	215,0	525	18	14			1. Species that are not rare
Bryum canariense **Brid.**		3	8	7	251	1,9	Mesic (15)	10	161,4	575	21	20			1. Species that are not rare
Bryum creberrimum **Taylor**		3	4		dd	dd	na (0)	dd	dd	dd	0	0			
Bryum gemmiparum **De Not.**		2	3	1	5	dd	na (1)	dd	dd	dd	2	0			
Bryum kunzei **Hornsch.**		1	1		dd	dd	na (2)	dd	dd	dd	2	0			
Bryum mildeanum **Jur.**		3	4	3	68	dd	Aquat (4)	150	150,0	150	5	1			
Bryum radiculosum **Brid.**		2	3	1	8	dd	na (2)	dd	dd	dd	2	2			
Bryum ruderale **Crundw. *et* Nyholm**		2	3	2	103	dd	na (2)	dd	dd	dd	0	4			
Bryum sauteri **Bruch *et* Schimp.**		1	2	1	15	dd	na (1)	dd	dd	dd	0	2			
Bryum subapiculatum **Hampe**		2	2	2	10	dd	na (1)	200	200,0	200	1	2			
Bryum tenuisetum **Limpr.**		2	2		22	dd	na (1)	10	10,0	10	0	2	k		
Bryum torquescens **Bruch *et* Schimp.**		3	7	5	75	1,9	Mesic (10)	10	268,6	600	8	18			2. Scarce species (rare by abundance)
Calliergonella cuspidata **(Hedw.) Loeske**		3	6	3	239	3,4	InPas (24)	225	536,3	800	24	32			3. Species with narrow ecological tolerance
Campylopus atrovirens **De Not.**		2	3		dd	dd	na (1)	dd	dd	dd	0	1			
Campylopus brevipilus **Bruch *et* Schimp.**		3	8	6	59	4,8	PeBog (9)	250	511,8	900	4	23			5. Scarce species with narrow ecological tolerance

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Campylopus cygneus (Hedw.) Brid.		3	8	8	430	2,3	NaFor (90)	200	682,7	1200	63	117	k		1. Species that are not rare
Campylopus flaccidus Renauld *et* Cardot		2	2	1	1	dd	na ()						k		
Campylopus flexuosus (Hedw.) Brid.		3	9	8	277	1,6	NaFor (47)	250	615,4	1000	57	64			1. Species that are not rare
Campylopus fragilis (Brid.) Bruch *et* Schimp.		3	9	8	344	1,5	NaFor (19)	150	573,8	900	24	34			1. Species that are not rare
Campylopus incrassatus Müll. Hal.		3	6	2	25	dd	PeBog (4)	550	771,4	1200	0	8			
Campylopus introflexus (Hedw.) Brid.		3	9	1	40	dd	na (2)	325	400,0	475	1	7			
Campylopus pilifer Brid.	i	3	9	9	1112	1,3	Mesic (51)	10	411,2	1500	144	148			1. Species that are not rare
Campylopus pyriformis (Schultz) Brid.		3	8	7	148	2,4	NaFor (37)	10	578,4	1025	12	96			1. Species that are not rare
Campylopus shawii Wilson		3	6	4	133	3,9	NaFor (33)	525	788,0	1500	15	40	r		3. Species with narrow ecological tolerance
Campylopus subulatus Schimp. *ex* J. Milde		1	1	1	1	dd	na (1)	775	775,0	775	0	1			
Ceratodon purpureus (Hedw.) Brid. subsp. *purpureus*		3	9	6	249	1,2	ExFor (11)	10	484,7	1450	27	30			1. Species that are not rare
Ceratodon purpureus (Hedw.) Brid. subsp. *stenocarpus* (Bruch. *et* Schimp. *ex* Müll. Hal.) Dixon		1	1	1	1	dd	na (1)	875	875,0	875	0	1			
Cheilothela chloropus (Brid.) Lindb.		1	1	1	7	dd	na (1)	dd	dd	dd	2	0			
Cirriphyllum piliferum (Hedw.) Grout.		3	9	2	12	dd	na (2)	625	680,0	800	1	5			
Cryphaea heteromalla (Hedw.) D. Mohr		1	1	1	1	dd	na (1)	dd	dd	dd	1	0		es	
Ctenidium molluscum (Hedw.) Warnst.		2	2	1	49	dd	Aquat (4)	200	237,5	325	6	1			
Cyclodictyon laetevirens (Hook. *et* Taylor) Mitt.		2	6	3	205	6,5	NaFor (85)	350	636,8	1000	25	114	r	es	3. Species with narrow ecological tolerance
Cynodontium bruntonii (Sm.) Bruch *et* Schimp.		1	1		dd	dd	na (0)	dd	dd	dd	0	0			
Daltonia stenophylla Mitt.		2	5	5	166	3,0	NaFor (42)	550	804,5	1000	25	27	v	es	3. Species with narrow ecological tolerance
Dialytrichia mucronata (Brid.) Broth.		2	2		11	dd	na (1)	dd	dd	dd	1	0			
Dicranella heteromalla (Hedw.) Schimp.		3	7	4	94	2,3	ExFor (10)	150	513,6	900	15	12			1. Species that are not rare

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Dicranella howei **Renauld** *et* **Cardot**		2	2	1	1	dd	na (2)	550	550,0	550	0	3			
Dicranella schreberiana **(Hedw.) Dixon**		1	2	1	10	dd	na (1)	400	475,0	550	0	2			
Dicranella subulata **(Hedw.) Schimp.**		1	1		dd	dd	na (0)	dd	dd	dd	1	0			
Dicranella varia **(Hedw.) Schimp.**		3	4	2	110	dd	na (2)	700	787,5	875	11	0			
Dicranoweisia cirrata **(Hedw.) Lindb.** *ex* **Milde**		1	2	1	7	dd	na (1)	175	175,0	175	1	1			
Dicranoweisia crispula **(Hedw.) Lindb. ex Milde**		2	3	1	5	dd	Mount (4)	200	920,0	2350	4	7			
Dicranum bonjeanii **De Not.**		2	3	3	42	dd	NaFor (6)	550	740,0	900	5	2			
Dicranum canariense **Hampe** *ex* **Müll. Hal.**		2	3	3	66	3,9	NaFor (15)	525	662,5	925	1	20			5. Scarce species with narrow ecological tolerance
Dicranum flagellare **Hedw.**		1	3	2	28	dd	NaFor (3)	575	650,0	800	1	3			
Dicranum majus **Sm.**		1	1	1	15	dd	NaFor (4)	675	687,5	700	0	4			
Dicranum scoparium **Hedw.**		3	6	4	83	5,6	NaFor (12)	500	860,7	1450	11	7			5. Scarce species with narrow ecological tolerance
Dicranum scottianum **Turn.**		3	8	8	436	4,4	NaFor (256)	175	703,1	1925	119	173			3. Species with narrow ecological tolerance
Didymodon acutus **(Brid.) Saito**		2	2	1	2	dd	na (1)	900	900,0	900	0	1			
Didymodon insulanus **(De Not.) Hill**		3	4	2	51	dd	Mesic (3)	200	212,5	225	7	2			
Didymodon luridus **Hornsch.**		2	6	1	92	dd	Mesic (4)	50	268,8	575	2	9			
Didymodon rigidulus **Hedw.**		1	1		1	dd	na (1)	500	500,0	500	0	1			
Didymodon tophaceus **(Brid.) Lisa**		3	6	5	192	3,6	Urban (6)	150	225,0	375	12	5			3. Species with narrow ecological tolerance
Didymodon vinealis **(Brid.) R. H. Zander**		2	5	4	127	2,3	Mesic (6)	75	433,3	875	12	3			1. Species that are not rare
Diphyscium foliosum **(Hedw.) D. Mohr**		3	9	8	257	1,3	NaFor (35)	300	617,6	1500	37	50			1. Species that are not rare
Ditrichum pallidum **(Hedw.) Hampe**		2	3	2	35	dd	na (1)	dd	dd	dd	1	3			
Ditrichum punctulatum **Mitt.**		1	1	1	2	dd	na (1)	1200	1200,0	1200	0	1			

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Ditrichum subulatum **Hampe**		2	3	2	3	dd	na (2)	900	900,0	900	2	1			
Echinodium renauldii **(Cardot) Broth.**	AZ	3	7	6	168	2,3	NaFor (15)	75	426,3	1250	18	32	v	es	4. Restricted species (rare by range)
Entosthodon attenuatus **(Dicks.) Bryhn**		3	8	7	419	1,3	NaFor (27)	150	570,0	950	45	38			1. Species that are not rare
Entosthodon muhlenbergii **(Turner) Fife**		1	2	1	7	dd	na (2)	dd	dd	dd	2	0			
Entosthodon obtusus **(Hedw.) Lindb.**		3	7	6	172	1,0	NaFor (11)	275	675,0	950	17	8			1. Species that are not rare
Entosthodon pulchellus **(H.Philib.) Brugués**		2	2	1	56	dd	Urban (3)	dd	dd	dd	3	0			
Ephemerum cohaerens **(Hedw.) Hampe**		1	1	1	1	dd	na (1)	dd	dd	dd	0	1	e		
Epipterygium tozeri **(Grev.) Lindb.**		3	9	7	466	3,2	Caves (32)	25	336,9	1000	22	88			3. Species with narrow ecological tolerance
Eucladium verticillatum **(Brid.) Bruch et Schimp.**		3	4	4	122	2,7	Aquat (6)	375	487,5	650	12	3			1. Species that are not rare
Eurhynchium striatum **(Hedw.) Schimp.**		1	2	1	105	2,8	Aquat; ExFor (4)	300	341,7	400	10	6			1. Species that are not rare
Fissidens adianthoides **Hedw.**		1	2	1	13	dd	NaFor (6)	250	491,7	675	2	7			
Fissidens asplenioides **Hedw.**		3	9	9	613	1,6	NaFor (91)	10	492,4	1000	115	225	r		1. Species that are not rare
Fissidens azoricus **(P. de la Varde) Bizot**	AZ	1	1		4	dd	na (2)	325	375,0	400	1	2	k	es	
Fissidens bryoides **Hedw. *s.l.***		3	9	6	382	2,3	Aquat (16)	25	407,9	950	28	54			1. Species that are not rare
Fissidens coacervatus **Brugg.-Nann.**	MAC	2	5	2	23	3,1	ExFor (11)	25	234,6	575	0	34	t		8. Restricted and scarce species with narrow ecological tolerance
Fissidens crassipes **Wilson *ex* Bruch et Schimp. subsp. *crassipes***		3	6	1	45	dd	na (2)	275	275,0	275	0	2			
Fissidens crassipes **Wilson *ex* Bruch et Schimp. subsp. *warnstorfii* (M.Fleisch.) Brugg.-Nann.**		3	4	3	103	5,2	Aquat (11)	250	316,7	400	12	2			3. Species with narrow ecological tolerance
Fissidens crispus **Mont.**		3	4	2	44	dd	na (1)	dd	dd	dd	1	2			
Fissidens curvatus **Hornsch.**		1	1	1	7	dd	na (1)	dd	dd	dd	1	0	k		
Fissidens dubius **P. Beauv.**		3	6	3	92	dd	NaFor (5)	400	537,5	675	4	4			

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***Fissidens monguillonii* Thér.**		1	1		dd	dd	na (1)	dd	dd	dd	1	0	r		
***Fissidens pusillus* (Wilson) Milde**		2	2		1	dd	na (1)	100	100,0	100	0	2			
***Fissidens rivularis* Bruch *et* Schimp.**		3	7	1	94	3,9	Aquat (6)	500	685,7	800	9	11			3. Species with narrow ecological tolerance
***Fissidens serratus* Müll. Hal.**		2	4	3	28	dd	na (2)	650	650,0	650	4	1			
***Fissidens serrulatus* Brid.**		3	9	9	566	4,5	NaFor (153)	75	557,5	1000	122	262			3. Species with narrow ecological tolerance
***Fissidens sublinaefolius* (P. de la Varde) Brugg.-Nann.**	MAC	3	6	4	163	4,9	Aquat (24)	800	800,0	800	37	1	r		7. Restricted species with narrow ecological range
***Fissidens taxifolius* Hedw. subsp. *pallidicaulis* (Mitt.) Mönk.**		3	9	3	537	1,2	NaFor (23)	25	391,7	950	66	58			1. Species that are not rare
Fissidens taxifolius* Hedw. subsp. *taxifolius		3	8	6	84	4,6	Caves (48)	50	297,5	1000	6	119			3. Species with narrow ecological tolerance
***Fissidens viridulus* (Sw. *ex* anon.) Wahlenb.**		3	8	5	122	4,6	Caves (20)	25	318,5	600	12	32			3. Species with narrow ecological tolerance
***Fontinalis antipyretica* Hedw.**		3	3	1	27	dd	Aquat (9)	550	550,0	550	8	3			
***Funaria hygrometrica* Hedw.**		2	2	2	107	1,6	Mesic (6)	325	360,0	500	10	6			1. Species that are not rare
***Glyphomitrium daviesii* (Dicks.) Brid.**		2	2	1	10	dd	na (2)	200	200,0	200	3	0	r		
***Grimmia elongata* Kaulf.**		1	1	1	40	dd	na (1)	1500	1500,0	1500	1	0			
***Grimmia hartmanii* Schimp.**		1	1		dd	dd	na (1)	dd	dd	dd	0	1			
***Grimmia incurva* Schwägr.**		1	1	1	15	dd	na (1)	2000	2000,0	2000	1	0			
***Grimmia laevigata* (Brid.) Brid.**		1	2		9	dd	na (2)	50	87,5	125	0	3			
***Grimmia lisae* De Not.**		3	9	7	570	1,8	Mesic (61)	10	249,5	800	61	95			1. Species that are not rare
***Grimmia montana* Bruch et Schimp.**		1	1		1	dd	na ()					1			
***Grimmia pulvinata* (Hedw.) Sm.**		3	4		13	dd	na (2)	25	25,0	25	2	2			
***Gymnostomum calcareum* Nees *et* Hornsch.**		3	6	5	177	7,1	Urban (6)	675	675,0	675	8	5			3. Species with narrow ecological tolerance
***Gymnostomum viridulum* Brid.**		1	1	1	25	dd	na (1)	dd	dd	dd	0	2			

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Gyroweisia tenuis (Hedw.) Schimp.		1	1		16	dd	na (1)	300	300,0	300	0	1			
Herzogiella striatella (Brid.) Iwats.		1	2		2	dd	na (1)	150	175,0	200	0	2			
Heterocladium flaccidum (Schimp.) A.J.E. Sm.		2	2	1	11	12,2	Caves (24)	275	435,4	600	1	24			5. Scarce species with narrow ecological tolerance
Heterocladium heteropterum (Brid.) Schimp.		3	9	9	437	3,6	NaFor (61)	100	564,0	1450	65	152			3. Species with narrow ecological tolerance
Heterocladium wulfsbergii I. Hagen		3	7	6	142	3,7	NaFor (21)	100	618,1	1925	8	40			3. Species with narrow ecological tolerance
Homalia lusitanica Schimp.		1	1	1	35	dd	Aquat (5)	100	166,7	300	4	3		es	
Homalia webbiana (Mont.) Düll		3	5	3	31	3,4	Aquat (12)	50	207,8	300	6	17	r	es	5. Scarce species with narrow ecological tolerance
Homalothecium sericeum (Hedw.) Schimp.		2	3	1	31	dd	na (1)	100	150,0	200	3	0			
Hookeria lucens (Hedw.) Sm.		3	4	2	32	dd	NaFor (7)	625	793,8	975	3	4			
Hygroamblystegium fluviatile (Hedw.) Loeske		1	1		dd	dd	na (1)	50	50,0	50	0	1			
Hygroamblystegium humile (P. Beauv.) Vanderp., Goffinet *et* Hedenäs		1	1	1	11	dd	na (1)	650	650,0	650	2	1			
Hygroamblystegium tenax (Hedw.) Jenn.		2	2		1	dd	na (2)	600	750,0	900	4	0			
Hygroamblystegium varium (Hedw.) Mönk.		3	4	3	68	dd	NaFor (5)	125	491,7	600	3	6			
Hygrohypnum luridum (Hedw.) Jenn.		2	2	1	32	dd	na (1)	dd	dd	dd	0	3			
Hylocomium splendens (Hedw.) Schimp.		3	5	3	218	2,2	NaFor (19)	75	831,3	1500	30	9			1. Species that are not rare
Hyocomium armoricum (Brid.) Wijk *et* Marg.		1	4	2	52	2,4	NaFor (22)	200	640,4	700	30	15		es	2. Scarce species (rare by abundance)
Hypnum andoi Smith		2	4	1	54	dd	na (2)	225	593,8	875	1	4			
Hypnum cupressiforme Hedw.		3	9	8	382	1,3	Mesic (61)	10	363,6	950	104	189			1. Species that are not rare
Hypnum imponens Hedw.		3	4	4	50	dd	na (2)	550	730,0	1025	7	2			
Hypnum jutlandicum Holmen *et* E. Warncke		3	9	5	145	1,7	NaFor (9)	150	475,0	850	12	20			1. Species that are not rare

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Hypnum uncinulatum **Jur.**	EUR	3	9	9	696	2,0	NaFor (452)	10	624,7	1500	326	487	rt		1. Species that are not rare
Imbribryum alpinum **(Huds. *ex* With.) N. Pedersen**		3	8	5	47	0,7	NaFor (7)	450	771,9	1550	6	8			2. Scarce species (rare by abundance)
Isopterygium tenerum **(Sw.) Mitt.**		2	4	4	64	7,1	PeBog (12)	300	583,9	675	3	14	e		5. Scarce species with narrow ecological tolerance
Isothecium alopecuroides **(Dubois) Isov.**		2	2	1	1	dd	na (1)	dd	dd	dd	1	0			
Isothecium myosuroides **Brid.**		3	7	4	137	4,1	NaFor (7)	275	810,4	1500	11	7			3. Species with narrow ecological tolerance
Isothecium prolixum **(Mitt.) Stech, Sim-Sim, Tangney *et* D.Quandt**	MAC	3	9	8	612	2,6	NaFor (265)	200	681,7	1925	134	225	r		4. Restricted species (rare by range)
Kiaeria blyttii **(Bruch *et* Schimp.) Broth.**		1	1	1	15	dd	na (1)	2000	2000,0	2000	1	0			
Kindbergia praelonga **(Hedw.) Ochyra**		3	9	9	581	2,6	InPas (107)	10	455,0	1050	160	340			1. Species that are not rare
Leptobarbula berica **(De Not.) Schimp.**		2	3	2	122	dd	Urban (4)	475	475,0	475	2	4			
Leptobryum pyriforme **(Hedw.) Wilson**		1	1	1	39	dd	PeBog (3)	dd	dd	dd	5	0			
Leptodictyum riparium **(Hedw.) Warnst.**		2	2	2	65	dd	Aquat; Parks (3)	dd	dd	dd	6	2			
Leptophascum leptophyllum **(Müll. Hal.) J. Guerra *et* J. M. Cano**	i	3	6	2	140	dd	Mesic (4)	dd	dd	dd	0	7			
Leucobryum albidum **(P. Beauv.) Lindb.**		3	7	6	217	1,3	NaFor (18)	175	615,4	1025	35	7			1. Species that are not rare
Leucobryum glaucum **(Hedw.) Angstr.**		3	7	6	220	5,2	PeBog (62)	250	612,6	950	46	77			3. Species with narrow ecological tolerance
Leucobryum juniperoideum **(Brid.) Müll. Hal.**		3	9	9	357	2,4	NaFor (201)	100	578,4	1000	27	298			1. Species that are not rare
Leucodon canariensis **(Brid.) Schwägr.**	MAC	2	3	1	76	dd	na (1)	50	141,7	275	1	4	r		
Leucodon sciuroides **(Hedw.) Schwägr.**		2	4	2	30	dd	InPas (6)	50	100,0	150	0	8			
Leucodon treleasei **(Cardot) Paris**	MAC	3	9	5	311	2,3	Mesic (7)	25	178,1	275	13	9	k		4. Restricted species (rare by range)
Loeskeobryum brevirostre **(Brid.) M.Fleisch.**		2	4	4	56	1,4	NaFor (10)	225	637,5	850	10	7			2. Scarce species (rare by abundance)
Microcampylopus laevigatus **(Thér.) Giese *et* Frahm**		3	8	7	293	1,7	NaFor (19)	275	564,3	925	28	48	r	es	1. Species that are not rare

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Mnium hornum **Hedw.**		3	6	4	145	1,4	NaFor (10)	375	638,0	1550	23	16			1. Species that are not rare
Myurium hochstetteri **(Schimp.) Kindb.**		3	9	9	977	1,6	NaFor (321)	10	610,5	1925	164	382			1. Species that are not rare
Neckera cephalonica **Jur.** ***et*** **Unger**	MAC	1	1	1	4	dd	na (1)	1500	1500,0	1500	1	0	k	es	
Neckera complanata **(Hedw.) Huebener**		1	1		dd	dd	na (0)	dd	dd	dd	0	1			
Neckera crispa **Hedw.**		3	4	2	8	dd	na (2)	625	625,0	625	2	0			
Neckera intermedia **Brid.**	IB-MAC	3	9	8	399	1,7	NaFor (31)	50	565,7	1925	60	52	rt	es	1. Species that are not rare
Neckera pumila **Hedw.**		1	1	1	dd	dd	Mount (3)	1000	1166,7	1500	3	0			
Orthotrichum diaphanum **Schrad.** ***ex*** **Brid.**		3	5	2	54	5,7	Urban (8)	100	100,0	100	12	2			5. Scarce species with narrow ecological tolerance
Orthotrichum tenellum **Bruch** ***ex*** **Brid.**		1	1	1	25	dd	na (1)	dd	dd	dd	2	0			
Oxyrrhynchium hians **(Hedw.) Loeske**		3	9	7	181	1,2	NaFor (9)	100	352,7	800	17	26			1. Species that are not rare
Oxyrrhynchium pumilum **(Wilson) Loeske**		3	9	5	231	2,0	Caves (9)	75	310,7	675	27	18			1. Species that are not rare
Oxyrrhynchium speciosum **(Brid.) Warnst.**		2	5		48	9,2	Caves (20)	150	477,1	700	10	24			5. Scarce species with narrow ecological tolerance
Philonotis arnellii **Husn.**		1	2	1	3	dd	Aquat (3)	525	543,8	550	0	5			
Philonotis caespitosa **Jur.**		3	3	3	54	dd	na (2)	50	366,7	525	5	3			
Philonotis calcarea **(Bruch** ***et*** **Schimp.) Schimp.**		3	3	2	49	dd	na (2)	dd	dd	dd	3	0			
Philonotis fontana **(Hedw.) Brid.**		3	5	3	104	8,5	NaFor (8)	575	822,7	950	9	8			3. Species with narrow ecological tolerance
Philonotis hastata **(Duby) Wijk** ***et*** **Margad.**		3	6	4	142	1,6	Aquat (11)	50	497,2	1000	19	8	k		1. Species that are not rare
Philonotis marchica **(Hedw.) Brid.**		2	3	1	24	4,0	Aquat (10)	300	300,0	300	14	2			5. Scarce species with narrow ecological tolerance
Philonotis rigida **Brid.**		3	9	9	643	1,1	NaFor (43)	10	486,9	1050	74	86			1. Species that are not rare
Philonotis tomentella **Molendo**		1	1		dd	dd	na (1)	dd	dd	dd	0	1			
Philonotis uncinata **(Schwägr.) Brid.**		3	8		dd	dd	na (0)	dd	dd	dd	0	2			

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Physcomitrium pyriforme **(Hedw.) Brid.**		1	2	1	19	dd	na (1)	dd	dd	dd	2	0			
Plagiomnium rostratum **(Schrad.) T. J. Kop.**		2	3	1	2	dd	na (2)	450	450,0	450	2	1			
Plagiomnium undulatum **(Hedw.) T. J. Kop.**		3	8	7	266	3,7	NaFor (50)	175	579,7	1000	39	81			3. Species with narrow ecological tolerance
Plagiothecium nemorale **(Mitt.) A. Jaeger**		3	8	8	352	6,0	NaFor (61)	100	543,1	1200	45	97			3. Species with narrow ecological tolerance
Plagiothecium succulentum **(Wilson) Lindb.**		2	4	3	6	dd	Aquat (6)	150	590,6	875	1	8			
Plasteurhynchium meridionale **(Schimp.) M.Fleisch.**		3	7	4	32	3,5	Parks (4)	175	325,0	550	6	7			5. Scarce species with narrow ecological tolerance
Platyhypnidium riparioides **(Hedw.) Dixon**		3	9	7	268	5,0	Aquat (40)	50	423,4	900	43	30			3. Species with narrow ecological tolerance
Pleuridium acuminatum **Lindb.**		3	5	2	75	dd	na (2)	dd	dd	dd	0	2			
Pleuridium subulatum **(Hedw.) Rabenh.**		3	4		dd	dd	Mesic (3)	dd	dd	dd	5	0			
Pleurozium schreberi **(Brid.) Mitt.**		3	6	5	63	2,1	NaFor (16)	425	786,9	1300	14	9			2. Scarce species (rare by abundance)
Pogonatum aloides **(Hedw.) P. Beauv.**		3	8	8	322	1,3	NaFor (36)	150	545,8	900	45	41			1. Species that are not rare
Pogonatum nanum **(Hedw.) P. Beauv.**		1	2	2	23	dd	NaFor (5)	750	775,0	800	8	0			
Pogonatum urnigerum **(Hedw.) P. Beauv.**		2	2	1	64	3,4	NaFor (14)	350	703,6	800	17	2			5. Scarce species with narrow ecological tolerance
Pohlia andalusica **(Höhn.) Broth.**		1	1		dd	dd	na (1)	dd	dd	dd	1	0			
Pohlia annotina **(Hedw.) Lindb.**		3	7	6	76	0,9	NaFor (8)	800	885,0	1000	11	4			2. Scarce species (rare by abundance)
Pohlia bulbifera **(Warnst.) Warnst.**		2	2	2	76	dd	Aquat (3)	550	600,0	650	4	2			
Pohlia cruda **(Hedw.) Lindb.**		1	1	1	32	dd	Mount (3)	1225	1312,5	1400	3	0			
Pohlia melanodon **(Brid.) A. J. Shaw**		1	1	1	14	dd	na (1)	dd	dd	dd	2	0			
Pohlia nutans **(Hedw.) Lindb.**		1	1	1	1	dd	na (2)	1500	1500,0	1500	2	0			
Pohlia proligera **(Kindb.) Broth.**		3	5	4	31	3,1	InPas (6)	550	550,0	550	5	13			5. Scarce species with narrow ecological tolerance

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Polytrichastrum formosum **(Hedw.) G. L. Sm.**		3	8	6	139	2,4	NaFor (50)	300	716,7	1500	25	43			1. Species that are not rare
Polytrichum commune **Hedw.**		3	8	8	289	5,3	PeBog (173)	225	623,4	1050	63	312			3. Species with narrow ecological tolerance
Polytrichum juniperinum **Hedw.**		3	9	7	71	1,4	NaFor (9)	250	549,0	2350	18	12			2. Scarce species (rare by abundance)
Polytrichum piliferum **Hedw.**		3	7	4	78	7,6	Mount (9)	700	1800,0	2350	15	3			5. Scarce species with narrow ecological tolerance
Pseudephemerum nitidum **(Hedw.) Loeske.**		3	3	2	67	dd	NaFor (5)	375	460,0	550	4	4			
Pseudocrossidium hornschuchianum **(Schultz.) R. H. Zander**		1	1		1	dd	na (1)	dd	dd	dd	1	0			
Pseudocrossidium revolutum **(Brid.) R. H. Zander**		1	1		24	dd	na (1)	dd	dd	dd	0	2			
Pseudoscleropodium purum **(Hedw.) M. Fleisch.**		3	9	9	487	3,1	InPas (127)	150	580,1	950	53	269			3. Species with narrow ecological tolerance
Pseudotaxiphyllum elegans **(Brid.) Z. Iwats.**		3	9	8	418	2,6	NaFor (119)	25	619,2	1050	189	49			1. Species that are not rare
Pseudotaxiphyllum laetevirens **(Koppe *et* Düll) Hedenäs**	EUR	3	8	7	199	3,2	NaFor (134)	225	666,9	1000	17	158	r	es	3. Species with narrow ecological tolerance
Pterogonium gracile **(Hedw.) Sm.**		3	6	2	16	4,1	Caves (8)	150	217,2	450	3	16			5. Scarce species with narrow ecological tolerance
Ptychomitrium nigrescens **(Kunze) Wijk et Marg.**	EUR	3	9	5	464	1,9	Mesic (26)	10	341,7	1200	21	75	rt		1. Species that are not rare
Ptychomitrium polyphyllum **Bruch *et* Schimp.**	EUR	3	8	7	487	1,2	NaFor (52)	50	517,5	1500	61	81			1. Species that are not rare
Ptychostomum capillare **(Hedw.) D. T. Holyoak *et* N. Pedersen**		3	9	5	164	2,0	ExFor (16)	10	362,8	575	13	44			1. Species that are not rare
Ptychostomum dichotomum **Hedw.**		3	6	4	137	dd	Aquat (4)	325	325,0	325	5	5			
Ptychostomum donianum **(Grev.) D. T. Holyoak *et* N. Pedersen**		3	9	6	155	1,6	NaFor (9)	200	426,0	1000	9	25			1. Species that are not rare
Ptychostomum imbricatulum **(Müll. Hal.) D. T. Holyoak *et* N. Pedersen**		2	3		2	dd	na (1)	175	212,5	250	1	2			
Ptychostomum pseudotriquetrum **(Hedw.) J. R. Spence *et* H. P. Ramsay *ex* D. T. Holyoak *et* N. Pedersen**		3	7	7	219	2,0	NaFor (17)	200	637,5	1550	23	15			1. Species that are not rare

Species	**Endemic grouping**	**Groups of Islands**	**Number of Islands**	**Presence in Island Parks**	**Number of 500 x 500 m cells**	**Lloyd index (>11 records)**	**Habitat with highest number of records**	**Minimum altitude (m)**	**Mean altitude (m)**	**Maximum altitude (m)**	**Records <1976**	**Records >1975**	**Old IUCN criteria**	**Experts' opinion**	**Vulnerability Index**
***Ptychostomum rubens* (Mitt.) D. T. Holyoak *et* N. Pedersen**		2	2	2	25	dd	na (2)	dd	dd	dd	0	2			
***Racomitrium aciculare* (Hedw.) Brid.**		3	7	6	207	1,8	NaFor (24)	100	515,0	950	37	31			1. Species that are not rare
***Racomitrium aquaticum* (Brid. *ex* Schrad.) Brid.**		3	6	4	52	2,5	NaFor (25)	300	633,8	850	22	15			2. Scarce species (rare by abundance)
***Racomitrium elongatum* Frisvoll**		3	4	2	111	dd	NaFor (3)	800	1350,0	2200	4	4			
***Racomitrium ericoides* (Brid.) Brid.**		1	1	1	dd	dd	na (1)	900	950,0	1000	3	0			
***Racomitrium fasciculare* (Hedw.) Brid.**		3	7	4	104	6,1	NaFor (15)	250	1053,3	2350	16	17			3. Species with narrow ecological tolerance
***Racomitrium heterostichum* (Hedw.) Brid.**		3	7	6	138	3,3	NaFor (14)	300	858,3	2300	26	6			3. Species with narrow ecological tolerance
***Racomitrium lanuginosum* (Hedw.) Brid.**		2	5	5	164	3,7	NaFor (20)	100	1089,6	2350	27	32			3. Species with narrow ecological tolerance
***Rhabdoweisia fugax* (Hedw.) Bruch *et* Schimp.**		1	1		dd	dd	na (0)	dd	dd	dd	1	1			
***Rhamphidium purpuratum* Mitt.**	EUR	3	7	7	211	1,7	NaFor (38)	125	601,3	1050	23	79	v		1. Species that are not rare
***Rhizomnium punctatum* (Hedw.) T.J. Kop.**		3	6	5	54	4,4	NaFor (7)	600	753,6	875	9	5			5. Scarce species with narrow ecological tolerance
***Rhynchostegiella bourgaeana* (Mitt.) Broth.**		1	1		dd	dd	na (1)	75	75,0	75	2	0			
***Rhynchostegiella curviseta* (Brid.) Limpr.**		3	4	3	20	dd	Mesic (3)	75	316,7	575	6	3			
***Rhynchostegiella durieui* (Mont.) P. Allorge *et* Perss.**		3	4	2	11	dd	Mesic (3)	300	300,0	300	6	0	r		
***Rhynchostegiella tenella* (Dicks.) Limpr.**		3	8	5	226	1,3	InPas (5)	50	246,2	550	7	14			1. Species that are not rare
***Rhynchostegium confertum* (Dicks.) Schimp.**		3	8	7	325	1,2	ExFor (17)	25	318,6	875	37	41			1. Species that are not rare
***Rhynchostegium megapolitanum* (F. Weber *et* D. Mohr.) Schimp.**		3	8	5	100	4,0	Urban (4)	350	666,7	900	10	10			3. Species with narrow ecological tolerance
***Rhytidiadelphus loreus* (Hedw.) Warnst.**		1	3	3	62	7,0	NaFor (13)	600	981,8	1500	11	12			5. Scarce species with narrow ecological tolerance
***Rhytidiadelphus squarrosus* (Hedw.) Warnst.**		3	8	7	281	2,6	InPas (68)	25	675,6	1200	31	142			1. Species that are not rare

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***Rhytidiadelphus subpinnatus* (Lindb.) T.J. Kop.**		3	6	5	30	1,0	NaFor (8)	200	660,7	1000	9	13			2. Scarce species (rare by abundance)
***Schistidium agassizii* Sull. *et* Lesq.**		2	2	1	14	dd	NaFor (1)				1	4			
***Schistidium apocarpum* (Hedw.) Bruch *et* Schimp.**		1	2	1	5	dd	na (2)	1500	1500,0	1500	2	0			
***Schistidium rivulare* (Brid.) Podp.**		2	2		dd	dd	na (0)	dd	dd	dd	0	2			
***Sciuro-hypnum plumosum* (Hedw.) Ignatov *et* Huttunen**		3	9	9	452	1,2	NaFor (28)	25	460,4	1500	55	63			1. Species that are not rare
***Sciuro-hypnum populeum* (Hedw.) Ignatov *et* Huttunen**		3	9	7	350	1,3	Mesic (16)	75	383,2	925	31	34			1. Species that are not rare
***Scleropodium touretii* (Brid.) L. F. Koch**		3	7	5	75	1,1	NaFor (9)	225	596,9	900	17	2			2. Scarce species (rare by abundance)
***Scopelophila ligulata* (Spruce) Spruce**		1	1	1	25	dd	na (2)	400	400,0	400	0	2			
***Scorpiurium circinatum* (Brid.) M. Fleisch. *et* Loeske**		3	9	9	409	1,9	Mesic (25)	10	184,8	550	28	49			1. Species that are not rare
***Sematophyllum substrumulosum* (Hampe) Britton**		3	9	9	389	1,9	NaFor (54)	10	426,4	875	51	102			1. Species that are not rare
***Sphagnum affine* Renauld *et* Cardot**		2	3	1	17	dd	Mount (3)	550	895,0	1025	1	5			
***Sphagnum auriculatum* Schimp.**		3	7	4	107	3,5	PeBog (47)	325	678,8	1025	19	116			3. Species with narrow ecological tolerance
***Sphagnum capillifolium* (Ehrh.) Hedw.**		2	4	3	52	9,4	PeBog (20)	550	688,3	950	0	32			5. Scarce species with narrow ecological tolerance
***Sphagnum centrale* C.E.O. Jensen**		3	3	1	34	12,9	PeBog (213)	450	602,2	950	1	213			5. Scarce species with narrow ecological tolerance
***Sphagnum compactum* DC. *ex* Lam *et* DC.**		2	2	1	6	dd	PeBog (10)	550	667,5	925	0	11			
***Sphagnum cuspidatum* Ehrh. *ex* Hoffm.**		1	1	1	7	dd	NaFor; PeBog (4)	600	811,1	1025	0	11			
***Sphagnum girgensohnii* Russow**		2	3	1	9	dd	NaFor (6)	dd	dd	dd	8	0			
***Sphagnum inundatum* Russow**		3	3	1	dd	dd	na (2)	dd	dd	dd	3	2			
***Sphagnum magellanicum* Brid.**		2	2	2	41	dd	NaFor (5)	600	668,8	1000	6	4			

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Sphagnum nitidulum **Warnst.** *ex* **Warnst.**	AZ	1	1	1	10	10,5	PeBog (14)	10	532,7	650	6	9	t		8. Restricted and scarce species with narrow ecological tolerance
Sphagnum palustre **L.**		3	7	7	388	8,5	PeBog (350)	300	621,9	1225	53	466			3. Species with narrow ecological tolerance
Sphagnum papillosum **Lindb.**		3	7	6	106	9,1	PeBog (41)	450	558,3	725	28	44			3. Species with narrow ecological tolerance
Sphagnum recurvum **P. Beauv.**		1	1	1	22	dd	na (1)	dd	dd	dd					
Sphagnum rubellum **Wilson**		1	1	1	14	11,9	PeBog (22)	400	606,5	650	1	24			5. Scarce species with narrow ecological tolerance
Sphagnum squarrosum **Crome**		3	4	4	39	3,6	NaFor (6)	425	618,8	725	6	7			5. Scarce species with narrow ecological tolerance
Sphagnum subnitens **Russow** *et* **Warnst.**		3	7	6	408	4,1	NaFor (100)	325	706,0	1225	46	130			3. Species with narrow ecological tolerance
Splachnobryum obtusum **(Brid.) Müll. Hal.**	i	1	2	1	dd	dd	na (0)	dd	dd	dd	0	2			
Syntrichia laevipila **Brid.**		3	5	2	42	dd	Urban (5)	dd	dd	dd	6	1			
Syntrichia ruralis **(Hedw.) F. Web.** *et* **D. Mohr**		1	2		dd	dd	na (2)	100	100,0	100	2	1			
Tetrastichium fontanum **(Mitt.) Cardot**	IB-MAC	3	9	9	622	6,2	Caves (152)	50	533,4	1925	94	288	r		3. Species with narrow ecological tolerance
Tetrastichium virens **(Cardot) S. P. Churchill**	IB-MAC	3	9	8	389	3,0	NaFor (115)	75	479,9	1050	58	196	r		3. Species with narrow ecological tolerance
Thamnobryum alopecurum **(Hedw.) Nieuwl.**		3	9	9	331	2,5	NaFor (110)	75	566,1	1100	95	141			1. Species that are not rare
Thamnobryum rudolphianum **Mastracci**	AZ	2	5	4	83	4,8	Caves (12)	500	608,3	700	10	23			8. Restricted and scarce species with narrow ecological tolerance
Thuidium delicatulum **(Hedw.) Schimp.**		1	1	1	4	dd	na (2)	800	800,0	800	0	2			
Thuidium tamariscinum **(Hedw.) Schimp.**		3	9	7	689	1,8	NaFor (402)	150	662,1	2300	185	563			1. Species that are not rare
Timmiella barbuloides **(Brid.) Mönk.**		2	5	2	91	dd	na (2)	100	612,5	825	5	3			
Tortella flavovirens **(Bruch.) Broth.**		3	8	8	164	3,0	Mesic (18)	10	174,1	700	10	38			3. Species with narrow ecological tolerance
Tortella fragilis **(Hook. et Wilson) Limpr.**		1	1		dd	dd	na (1)	dd	dd	dd	0	1			

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Tortella inflexa **(Bruch) Broth.**		1	1		dd	dd	na (1)	dd	dd	dd	0	1			
Tortella nitida **(Lindb.) Broth.**		3	8	6	197	1,4	Mesic (13)	10	245,5	550	20	22			1. Species that are not rare
Tortella squarrosa **(Brid.) Limpr.**		2	3	2	37	dd	na (2)	125	308,3	400	2	4			
Tortella tortuosa **(Hedw.) Limpr.**		1	1		dd	dd	na (1)	dd	dd	dd	0	2			
Tortula atrovirens **(Sm.) Lindb.**		2	3	1	38	dd	na (2)	dd	dd	dd	4	0			
Tortula bogosica **(Müll. Hal.) R. H. Zander**	MAC	2	2	1	35	dd	na (1)	dd	dd	dd	0	2	e		
Tortula canescens **Mont.**		1	1		20	dd	na (1)	dd	dd	dd	0	1			
Tortula cuneifolia **(Dicks.) Turner**		3	6	3	96	dd	Urban (3)	350	350,0	350	8	1			
Tortula marginata **(Bruch *et* Schimp.) Spruce**		3	5	4	182	4,2	Urban (9)	25	208,3	500	20	3			3. Species with narrow ecological tolerance
Tortula muralis **Hedw.**		3	9	7	279	3,0	Urban (9)	50	206,3	875	18	23			3. Species with narrow ecological tolerance
Tortula revolvens **(Schimp.) G. Roth**		1	1		8	dd	na (1)	dd	dd	dd	0	1	k		
Tortula solmsii **(Schimp.) Limpr.**		3	4	2	197	4,4	Urban (5)	10	390,0	575	9	5	r		3. Species with narrow ecological tolerance
Tortula truncata **(Hedw.) Mitt.**		3	5	2	51	2,6	InPas (6)	325	392,9	800	2	11			2. Scarce species (rare by abundance)
Tortula vahliana **(Schultz) Mont.**		1	1	1	56	dd	na (1)	150	150,0	150	0	2			
Trematodon perssoniorum **P. Allorge *et* Thér. *ex* V. Allorge**	AZ	1	1	1	65	dd	Aquat (7)	150	266,7	400	8	3	k		
Trichostomum brachydontium **Bruch**		3	9	7	596	2,0	Mesic (45)	10	290,3	1500	89	91			1. Species that are not rare
Trichostomum crispulum **Bruch**		3	6	5	139	3,9	Coast (13)	25	188,8	800	21	7			3. Species with narrow ecological tolerance
Trichostomum triumphans **De Not.**		2	4	3	33	3,4	Mesic (5)	10	30,0	50	12	2	k		5. Scarce species with narrow ecological tolerance
Ulota calvescens **Wilson**	EUR	3	6	3	65	5,3	NaFor (8)	600	927,3	1500	10	3			5. Scarce species with narrow ecological tolerance
Ulota crispa **(Hedw.) Brid.**		1	1	1	2	dd	na (1)	1200	1200,0	1200	0	1			

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Warnstorfia fluitans **(Hedw.) Loeske**		3	6	5	55	1,8	Aquat (7)	525	590,0	775	5	12			2. Scarce species (rare by abundance)
Weissia brachycarpa **(Nees *et* Hornsch.) Jur.**		1	3	1	2	dd	na (2)	50	350,0	650	1	3			
Weissia condensa **(Voit) Lindb.**		1	3	2	93	1,5	ExFor (7)	10	257,1	600	2	26			1. Species that are not rare
Weissia controversa **Hedw.**		3	9	8	210	1,4	NaFor (13)	25	266,8	875	30	32			1. Species that are not rare
Zygodon conoideus **(Dicks.) Hook. *et* Taylor**		2	4	2	73	dd	NaFor (5)	500	633,3	850	4	3			
Zygodon rupestris **Schimp. *ex* Lorentz**		2	4		dd	dd	Parks (3)	100	187,5	275	4	2			
Zygodon viridissimus **(Dicks.) Brid.**		3	9	7	301	3,0	ExFor (24)	25	242,1	800	38	50			3. Species with narrow ecological tolerance