

PRESENTACIÓN

El presente volumen del Boletín de la Sociedad Española de Briología aparece con cierto retraso ya que la previsión del Comité Editorial era publicarlo a finales del pasado año 2018. Desde el principio de su gestación fue nuestra intención dedicarlo a presentar la checklist y lista roja de los briófitos de Cataluña, trabajo elaborado por los colegas de la Universitat Autònoma de Barcelona.

Cataluña es una de las áreas briológicamente mejor conocida de la Península Ibérica, fruto de una intensa actividad briológica que se remonta a muchas décadas, cuando la siempre recordada dra. Creu Casas inició su carrera científica en la Briología. Sin embargo, nunca se había publicado un catálogo que recogiera la rica brioflora catalana. Es por ello que nos pareció muy importante dedicar el volumen 51 del Boletín de la Sociedad Española de Briología a presentar el artículo *Bryophyte Flora of Catalonia (Northeastern Iberian Peninsula): Checklist and Red List*. Sus autores, Llorenç Sáez, Elena Ruiz y Montserrat Brugués, han elaborado el primer listado revisado y actualizado de la brioflora de Cataluña, que comprende 827 táxones de briófitos. También aportan la primera lista roja de los briófitos catalanes, que comprende 152 briófitos amenazados y regionalmente extintos, el 18.3% de la brioflora catalana.

Su extensión e interés justifica sobradamente haber dedicado este volumen del Boletín de la Sociedad Española de Briología a este único artículo, así como el inevitable retraso que ha provocado en su edición, por la laboriosidad y minuciosidad que este tipo de trabajos requiere.

Nos parece importante que nuestro Boletín de la Sociedad Española de Briología recoja este tipo de trabajos fundamentales para recopilar el conocimiento briológico de un territorio. Sirva el caso de la *Bryophyte Flora of Catalonia (Northeastern Iberian Peninsula): Checklist and Red List* para animar a otros briólogos a hacer parecido con sus áreas de estudio.

CONTENIDOS

LL. SÁEZ, E. RUIZ & M. BRUGUÉS

<i>Bryophyte flora of Catalonia (northeastern Iberian Peninsula): Checklist and Red List</i>	1
Reseña de la XXVI Reunión de Briología	127
Resúmenes de las comunicaciones científicas presentadas en la XXVI Reunión de Briología	127
Anuncios.....	131
Personalía	132
Nuevos socios.....	132
Revisores del <i>Boletín de la Sociedad Española de Briología 51</i>	132
Suscripciones / Subscriptions	133
Protección de datos y Política de Privacidad.....	134
Normas de publicación.....	137

BRYOPHYTE FLORA OF CATALONIA (NORTHEASTERN IBERIAN PENINSULA): CHECKLIST AND RED LIST

Llorenç Sáez^{1,2}, Elena Ruiz³ & Montserrat Brugués³

1. Sistemàtica i Evolució de Plantes Vasculares (UAB) – Unitat associada al CSIC, Botànica, Facultat de Biociències, Universitat Autònoma de Barcelona, ES-08193, Bellaterra, Barcelona. Email: gymnesicum@yahoo.es
2. SHNB, Societat d'Història Natural de les Balears, C/Margarida Xirgu 16, ES-07011 Palma de Mallorca, Illes Balears.
3. Botànica, Facultat de Biociències, Universitat Autònoma de Barcelona, ES-08193, Bellaterra, Barcelona.

Abstract: Although the bryophyte flora of Catalonia (northeastern Spain) has been intensively studied over the last decades, neither a revised catalogue nor a red list of the bryophytes of this area have ever been published. In this contribution, we present an updated checklist of the Catalanian bryophyte flora. A total of 827 species were recorded, out of which four were hornworts, 191 liverworts and 632 mosses. A Red List following standardised IUCN criteria is presented for the first time for Catalonia's bryophyte flora.

Resumen: Aunque la flora briofítica de Cataluña (noreste de España) ha sido estudiada con intensidad en las últimas décadas, nunca se ha publicado un catálogo ni una Lista Roja de esta área. En esta contribución, se presenta el primer catálogo revisado de la flora briofítica de Cataluña. Se han catalogado un total de 827 especies, cuatro de las cuales son antocerotas, 191 corresponden a hepáticas y 632 son musgos. Se presenta por primera vez una Lista Roja de la flora de los briófitos de Cataluña de acuerdo con los criterios estandarizados de la UICN.

Keywords: Biodiversity, conservation, bryophytes, South Europe, Mediterranean Region.

Palabras clave: Biodiversidad, conservación, briófitos, Sur de Europa, Región Mediterránea.

INTRODUCTION

Checklists are one of the most important tools in the progress of knowledge of biological diversity. Checklists provide information of the species richness of a particular area, which i) allows to quantitatively evaluate diversity and compare it among different areas ii) is useful in systematic and biogeographical studies, and iii) provides the basis for the implementation of conservation actions. The relevant function of checklists is now even more justified, since human destruction of natural environments and climate change are causing significant reduction and extinction of plant species with unknown environmental and potential subsequent social consequences (Boyd, 2008). Moreover, as a result of the current dynamism of taxonomy, updates and corrections, the information on the diversity (taxa richness) of a specific area should be regularly updated through the publication of checklists.

Red Lists are conservation assessments that classify species according to their extinction risk. The risk of species extinction can be evaluated at global, national or regional level using the categories and criteria provided by the International Union for Conservation of Nature (IUCN, 2003, 2012a, b). These categories are widely used as a standard method for preparing red lists of threatened species. The first Spanish red list of bryophytes was published in 2012 (Brugués & González-Mancebo, 2012) and it was updated by Brugués *et al.* (2014a). Recently, proposals for additions and corrections have been made to this red list (Puche & Segarra, 2013, Segarra *et al.*, 2014; Luceño *et al.*, 2017; Sáez *et al.*, 2018a).

Catalonia, with a total land area of 32 114 km² is an autonomous region located in the northeastern Iberian Peninsula, Spain. This region has a relatively long tradition of studying its bryophyte flora (see Llimona *et al.*, 1985), reflected in the large number of specimens housed in scientific collections, mainly in the herbarium of the Autonomous University of Barcelona (BCB), and by numerous scientific publications. Although the bryophyte flora of this area has been intensively studied over the last seven decades by C. Casas and her team, neither a revised catalogue nor a red list of the bryophytes of this area has ever been published.

The aims of this contribution are i) to provide a catalogue of the bryophyte flora of Catalonia, which is expected to serve as a basis for a better understanding of the bryophyte flora from northeastern Iberian Peninsula and to promote more comprehensive floristic and taxonomic studies, and ii) to establish a red list of this area following IUCN (2012b) criteria.

MATERIAL AND METHODS

The basis for the checklist is all published literature on bryophytes from the studied area, which are mostly included in databases such as the Biodiversity Data Bank of Catalonia (BDBC, <http://biodiver.bio.ub.es>), *Flora Briofítica Ibérica* monographs (6 volumes) and *Cartografía de Briofitas* (<http://briofits.iec.cat/>), in addition to herbarium material revision, mainly from BCB, for some records also MA, MUB and PC [the herbaria codes follow Thiers (2018, continuously updated)]. Nomenclature follows Söderström *et al.* (2016) for liverworts and hornworts, updated by Long *et al.* (2016), and Ros *et al.* (2013) for mosses, updated by Müller (2014), Lara *et al.* (2016), Câmara *et al.* (2018) and Hassel *et al.* (2018).

Regarding the native status of the species, they are categorized as taxa in a given area whose presence there is due to intentional or unintentional human involvement, or which have arrived there without the help of people from an area in which they are alien (Pyšek *et al.*, 2004).

Three relatively well-defined geographical regions can be recognised in the studied area (Fig. 1).

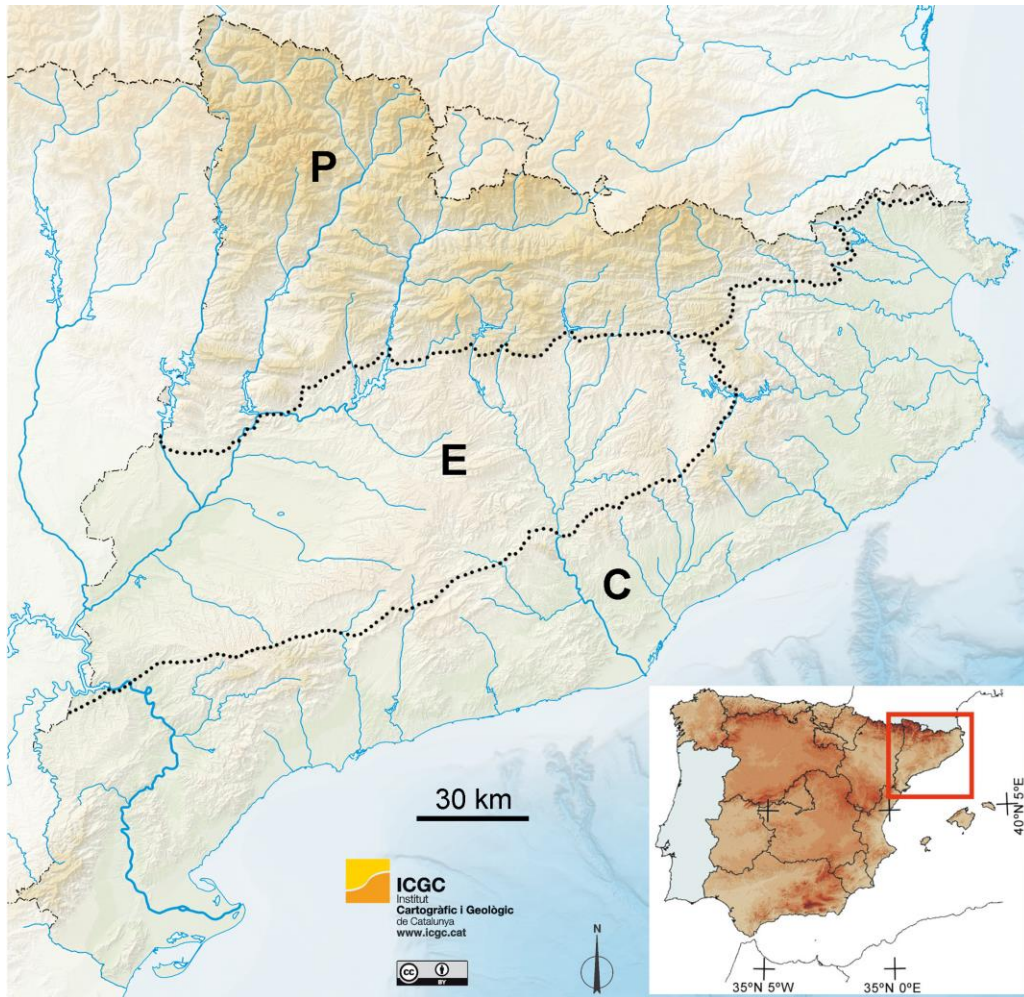


Figure 1. Map of the studied area divided in its main three geographical regions: P: Pyrenees; E: Ebro Basin; C: Catalan Ranges.

Pyrenees (P): This mountain range separates the Iberian Peninsula from the rest of continental Europe and it contains the highest point in Catalonia, Pica d'Estats at 343 m a.s.l. Regarding the geology, both silicate rocks and limestone are well represented. The climate is Mediterranean to Submediterranean in the eastern sector, while in the western sector shows a clear continental influence, with the exception of the Aran Valley (located on the northern side of the Pyrenees) characterized by an Atlantic climate. In the Pyrenees, the Mediterranean vegetation is well represented (mainly in the pre-Pyrenees), as well as the medio-European, the Boreo-Alpine and the Alpine vegetation.

Ebro Basin (E): In our study area it is a large depression surrounded by the Pyrenees to the north and the Catalan Ranges to the east and south. The western half is part of the northernmost area of truly semi-arid climate in Europe (González-Sampériz *et al.*, 2008). The eastern half is more humid and has elevations that reach 1000 m a.s.l. The geological materials are various quaternary and tertiary sediments with some saline areas. The climate ranges from

Mediterranean to Submediterranean, always with a continental tendency. The vegetation is mainly Mediterranean.

Catalan Ranges (C): This area includes a system of mountain ranges and depressions running parallel to the coast. The highest peak is 1706 m a.s.l. at the Montseny massif. The geological materials are heterogeneous, comprising limestone, siliceous and volcanic substrates. The climate ranges from Mediterranean to Subatlantic. In this region the Mediterranean vegetation is well represented, although there is also a significant penetration of Eurosiberian flora in the pre-coastal mountains (Montseny, Prades, Els Ports massif, etc.). Vestiges of Boreo-Alpine vegetation in the upper area of the Montseny massif can be found.

Application of IUCN criteria

The extinction risk of all species included in the checklist has been assessed using the IUCN Red List Categories and Criteria version 3.1 (IUCN, 2012a, b). We have also used the Guidelines for Using the IUCN Red List Categories and Criteria (IUCN, 2017). We have not been able to apply criteria A (percentage decline of a taxon) and E (population viability analyses) since this information is not available for any species. The criteria B (restricted distribution combined with other factors: i) Severe fragmentation or small number of locations ii) continuing decline iii) extreme fluctuation), C (small population size and decline) and D (very small or restricted population) have been applied. Since numbers of individuals are usually not known and difficult to estimate (Hallingbäck et al., 1998; Garilleti & Albertos, 2012: 13), the extent of occurrence (EOO), area of occupancy (AOO) and the number of locations (the definition of “location” is based on IUCN, 2017) can only be applied. However, in some cases data on the estimation of mature individuals have been used. In these cases, the term 'individual' is defined. EOO and AOO were determined using the Geospatial Conservation Assessment Tool (Bachman et al. 2011) with a default cell width of 2 km (IUCN, 2017). Population size reduction and trend criteria (ongoing or predicted population trend, measured either by changes in population size or area of occupancy) are difficult criteria to apply to bryophytes (Glenny et al., 2011). Such information is rarely available, and trend criteria have been therefore rarely used in this study. However, in some cases a decline in EOO and AOO, habitat quality, and number of locations or subpopulations is inferred. For most of the species when criterion B was applied, subcriteria B1 and B2 (based on EOO and AOO, respectively) resulted in the assessment of the species under the same IUCN category. However, when B1 and B2 subcriteria allowed us to assess the species in different categories, the most restrictive criteria was applied (following González-Mancebo et al., 2012 and IUCN, 2012), such that AOO was the most important criteria considered in those cases.

A potential rescue effect from populations located in adjacent territories has not been considered since, although it may exist in some cases, there is no unequivocal evidence of its occurrence. However, data on the distribution of species in adjacent areas (Andorra, southern France and northern Aragón, etc.) are provided. Perhaps it would be advisable to reconsider the potential rescue effect in the future.

Species for which information is either lacking or insufficient to undertake IUCN threat analysis have been assessed as DD. Below, several examples of species assessed as DD are provided:

- 1) Species with not well-known distribution: they may be part of complex or poorly known genera, or species with no significant identification problems, but for which the available data do not allow an assessment of their state of risk according to IUCN criteria (2012b). An example of these cases can be the species included within *Scapania* sect. *Curtae* (Müll. Frib.) H. Buch.
- 2) Rare species recently collected, but with no population data available from the field and with possible confusion with other morphologically related species. This is the case of *Cratoneuron curvicaule*: the species is known so far from a single location Serra de Cadí-Moixeró (Ruiz *et al.*, 2018c) where it grows in a well-conserved area. However, the species is easily confused with the common *Cratoneuron filicinum*.
- 3) Species known from several localities, but with old records (>50 years) and without specific prospections carried out to relocate the species. This would be the case of taxa such as *Homalia trichomanoides* (Casas, 1999) which is currently known from nearby areas (Hugonnot *et al.*, 2018). In the case that some surveys have been carried out (without positive results) and there seems to be potential habitat for the species in question, the taxon is assessed as DD: this is the case of taxa such as *Timmiella anomala*.

Data used for the Red List came from published literature, databases and herbarium material. The information contained in the scientific collections has been confirmed as essential to use the IUCN criteria in the development process of a red list in more detail (Hernández & Navarro, 2007). In addition, a limited number of data were collected in the field by the authors.

All native bryophytes found in the studied area have been assessed, varieties and forms are not considered in the Red List but they are mentioned in the checklist. Excluded taxa, doubtful or uncertain taxa and naturalized non-native species are listed separately at the end of the checklist. Non-native species are listed as NA (Not Applicable).

RESULTS

CHECKLIST

Within the checklist, the taxa are arranged alphabetically within each group: hornworts, liverworts and mosses. For each taxon, the full authority is given, followed by the information about the distribution in the studied area (Pyrenees (P), Ebro Basin (E) and Catalan Ranges (C)). A question mark “?” in front the abbreviation of a geographical region indicates uncertain presence of the species in that region. The last entry for each species is the information about the IUCN redlist category (IUCN, 2012a,b), which is indicated in brackets (categories: RE – Regionally Extinct; CR – Critically Endangered; EN – Endangered; VU – Vulnerable; NT –

near threatened; LC – Least Concern; DD – Data Deficient; NA – Not Applicable). In some cases, comments are provided.

HORNWORTS

- Anthoceros punctatus* L.: C [NT]
Phaeoceros carolinianus (Michx.) Prosk.: C [VU]
Phaeoceros laevis (L.) Prosk.: C [LC]
Phymatoceros bulbiculosus (Brot.) Stotler, W.Doyle & Crand.-Stotl.: C [LC]

LIVERWORTS

- Aneura maxima* (Schiffn.) Steph.: P [VU]
Aneura pinguis (L.) Dumort.: P, E, C [LC]
Anthelia juratzkana (Limpr.) Trevis.: P [LC]
Barbilophozia barbata (Schreb.) Loeske: P, C, [LC]
Barbilophozia hatcheri (A.Evans) Loeske: P, C, [LC]
Barbilophozia lycopodioides (Wallr.) Loeske: P [LC]
Barbilophozia sudetica (Nees ex Huebener) L.Söderstr.: P [LC]
Bazzania flaccida (Dumort.) Grolle: P, C [LC]
Bazzania tricrenata (Wahlenb.) Lindb.: P [VU]. Records from Catalan Ranges (Montseny massif) are due to confusion with *B. flaccida*.
Blasia pusilla L.: P [DD]
Blepharostoma trichophyllum (L.) Dumort.: P, C [LC]
Calypogeia arguta Nees & Mont.: C [NT]
Calypogeia azurea Stotler & Crotz: P [LC]. Records from Catalan Ranges are due to confusion with other species of the genus.
Calypogeia fissa (L.) Raddi: P, C [LC]
Calypogeia integristipula Steph.: P [EN]
Calypogeia muelleriana (Schiffn.) Müll.Frib.: P, C [LC]
Calypogeia neesiana (C.Massal. & Carestia) Müll.Frib.: P [VU]
Calypogeia sphagnicola (Arnell & J.Perss.) Warnst. & Loeske: P, C [NT]
Calypogeia suecica (Arnell & J.Perss.) Müll.Frib.: P [VU]
Cephalozia ambigua C.Massal.: P, C [VU]
Cephalozia bicuspidata (L.) Dumort.: P, E, C [LC]
Cephaloziella baumgartneri Schiffn.: E, C [LC]
Cephaloziella calyculata (Durieu & Mont.) Müll.Frib.: C [EN]
Cephaloziella divaricata (Sm.) Schiffn.: P, C [LC]
Cephaloziella grimsulana (J.B.Jack ex Gottsche & Rabenh.) Lacout.: P [EN]
Cephaloziella hampeana (Nees) Schiffn. ex Loeske: P, C [LC]
Cephaloziella stellulifera (Taylor ex Carrington & Pearson) Croz.: P, C [LC]
Cephaloziella turneri (Hook.) Müll.Frib.: C [LC]

- Chiloscyphus pallescens* (Ehrh.) Dumort.: P [NT]
Chiloscyphus polyanthos (L.) Corda: P, C [LC]
Clevea nana (Lindb.) Crandall-Stotler & D.G.Long: P [NT]
Clevea spathysii (Lindenb.) Müll.Frib.: C [CR]
Cololejeunea calcarea (Lib.) Steph.: P, E, C [LC]
Cololejeunea rossettiana (C.Massal.) Schiffn.: C [LC]
Conocephalum conicum (L.) Dumort.: P, C [LC]
Conocephalum salebrosum Szwejkowski, Buczkowska & Odrzykoski: P, C [LC]
Corsinia coriandrina (Spreng.) Lindb.: C [LC]
Crossocalyx hellerianus (Nees ex Lindenb.) Meyl.: P [CR]
Diplophyllum albicans (L.) Dumort.: P, C [LC]
Diplophyllum obtusifolium (Hook.) Dumort.: P [LC]
Diplophyllum taxifolium (Wahlenb.) Dumort.: P [LC]
Exormotheca pustulosa Mitt.: C [EN]
Fossombronia angulosa (Dicks.) Raddi: C [LC]
Fossombronia caespitiformis Rabenh.: E, C [LC]. Represented by subsp. *caespitiformis* (recorded from E and C sectors) and subsp. *multispira* (Schiffn.) J.R.Bray & D.C.Cargill, which is found in C sector.
Fossombronia pusilla (L.) Nees: C [LC]
Fossombronia wondraczekii (Corda) Lindb.: C [VU]
Frullania cesatiana De Not.: P, C [VU]
Frullania dilatata (L.) Dumort.: P, E, C [LC]
Frullania fragilifolia (Taylor) Gottsche, Lindenb. & Nees: P, C [NT]
Frullania tamarisci (L.) Dumort.: P, C [LC]
Fuscocephaloziopsis albescens (Hook.) Váňa & L.Söderstr.: P [VU]
Fuscocephaloziopsis loitlesbergeri (Schiffn.) Váňa & L.Söderstr.: P [CR]
Fuscocephaloziopsis lunulifolia (Dumort.) Váňa & L.Söderstr.: P [NT]
Fuscocephaloziopsis pleniceps (Austin) Váňa & L.Söderstr.: P [NT]
Gongylanthus ericetorum (Raddi) Nees: C [LC]
Gymnocolea inflata (Huds.) Dumort.: P [NT]
Gymnomitrium concinnatum (Lightf.) Corda: P [LC]
Gymnomitrium obtusum Lindb.: P [LC]
Gymnomitrium alpinum (Gottsche ex Husn.) Schiffn.: P [VU]
Gymnomitrium brevissimum (Dumort.) Warnst.: P [VU]
Harpalejeunea molleri (Steph.) Grolle: C [VU]
Isopaches bicrenatus (Schmidel ex Hoffm.) H.Buch: P, C [NT]
Jungermannia atrovirens Dumort.: P, E, C [LC]
Jungermannia exsertifolia Steph.: P [LC]. Represented by subsp. *cordifolia* (Dumort.) Váňa.
Jungermannia leiantha Grolle: P [VU]
Jungermannia polaris Lindb.: P [EN]
Jungermannia pumila With.: P, C [NT]
Jungermannia sphaerocarpa Hook.: P, C [LC]

- Kurzia sylvatica* (A.Evans) Grolle: C [CR]
Lejeunea cavifolia (Ehrh.) Lindb.: P, E, C [LC]
Lepidozia reptans (L.) Dumort.: P, C [LC]
Lophocolea bidentata (L.) Dumort.: P, C [LC]
Lophocolea heterophylla (Schrad.) Dumort.: P, C [LC]
Lophocolea minor Nees: P, E, C [LC]
Lophozia ascendens (Warnst.) R.M.Schust.: P [VU]
Lophozia guttulata (Lindb. & Arnell) A.Evans: P [NT]
Lophozia ventricosa (Dicks.) Dumort.: P, C [LC]. Represented by var. *ventricosa*.
Lophozia wenzelii (Nees) Steph.: P [NT]
Lophoziaopsis excisa (Dicks.) Konstant. & Vilnet: P, C [LC]
Lophoziaopsis longidens (Lindb.) Konstant. & Vilnet: P [VU]
Lunularia cruciata (L.) Lindb.: E, C [LC]
Mannia androgyna (L.) A.Evans: P, C [LC]
Mannia fragrans (Balb.) Frye & L.Clark: C [CR]
Mannia gracilis (F.Weber) D.B.Schill & D.G.Long: P [DD]
Marchantia paleacea Bertol.: E, C [LC]
Marchantia polymorpha L.: P, C [LC]. The following subspecies have been listed for the studied area: subsp. *polymorpha*, subsp. *montivagans* Bischl. & Boissel.-Dub. and subsp. *ruderalis* Bischl. & Boissel.-Dub. The precise distribution of these subspecies is unknown. The native status of subsp. *ruderalis*, which colonizes preferentially man-made habitat or disturbed sites (Boisselier-Dubayle *et al.*, 1995; Shimamura, 2016), is unclear.
Marchantia quadrata Scop.: P, C [LC]
Marchesinia mackaii (Hook.) Gray: C [VU]
Marsupella emarginata (Ehrh.) Dumort.: P, C [LC]
Marsupella funckii (F.Weber & D.Mohr) Dumort.: P, C [LC]
Marsupella sphacelata (Giesecke ex Lindenb.) Dumort.: P [NT]
Marsupella sprucei (Limpr.) Bernet: P [CR]
Mesoptychia bantriensis (Hook.) L.Söderstr. & Váňa: P, C [LC]
Mesoptychia turbinata (Raddi) L.Söderstr. & Váňa: P, E, C [LC]
Mesoptychia heterocolpos (Thed. ex Hartm.) L.Söderstr. & Váňa: P, C [VU]
Metzgeria conjugata Lindb.: P, C [LC]
Metzgeria furcata (L.) Dumort.: P, E, C [LC]
Metzgeria pubescens (Schrank) Raddi: P, C [LC]
Microlejeunea ulicina (Taylor) A.Evans: C [VU]
Leiomylia anomala (Hook.) J.J.Engel & Braggins: P [VU]
Myriocoleopsis minutissima (Sm.) R.L.Zhu, Y.Yu & Pócs: C [VU]
Nardia breidleri (Limpr.) Lindb.: P [CR]
Nardia compressa (Hook.) Gray: P, C [LC]
Nardia geoscyphus (De Not.) Lindb.: P [NT]
Nardia insecta Lindb.: P [CR]
Nardia scalaris Gray: P [LC]

- Neorthocaulis floerkei* (F.Weber et D.Mohr) L.Söderstr., De Roo & Hedd.: P [NT]
Nowellia curvifolia (Dicks.) Mitt.: P [VU]
Obtusifolium obtusum (Lindb.) S.W.Arnell: P [VU]
Odontoschisma elongatum (Lindb.) A.Evans: P [LC]
Oxymitra incrassata (Broth.) Sérgio & Sim-Sim: C [NT]
Pallavicinia lyellii (Hook.) Gray: C [CR]
Pedinophyllum interruptum (Nees) Kaal.: P, C [LC]
Pellia endiviifolia (Dicks.) Dumort.: P, E, C [LC]
Pellia epiphylla (L.) Corda: P, C [LC]
Pellia neesiana (Gottsche) Limpr.: P, C, [LC]
Plagiochasma rupestre (J.R.Forst. & G.Forst.) Steph.: C [LC]
Plagiochila asplenioides (L.) Dumort.: P [LC]
Plagiochila porelloides (Nees) Lindenb.: P, E, C [LC]
Porella arboris-vitae (With.) Grolle: P, E, C [LC]
Porella cordaeana (Huebener) Moore: P, C [LC]
Porella obtusata (Taylor) Trevis: P, E, C [LC]
Porella platyphylla (L.) Pfeiff.: P, E, C [LC]
Ptilidium ciliare (L.) Hampe: P [NT]
Ptilidium pulcherrimum (Weber) Vain.: P [EN]
Radula complanata (L.) Dumort.: P, E, C [LC]
Radula lindenbergiana C.Hartm.: P, C [DD]
Reboulia hemisphaerica (L.) Raddi: P, E, C [LC]
Riccardia chamedryfolia (With.) Grolle: P, E, C [LC]
Riccardia incurvata Lindb.: P [EN]
Riccardia latifrons (Lindb.) Lindb.: P [VU]
Riccardia multifida (L.) Gray: P, C [NT]
Riccardia palmata (Hedw.) Carruth.: P [NT]
Riccia atromarginata Levier: C [NT]
Riccia beyrichiana Hampe: C [NT]
Riccia bifurca Hoffm.: C [LC]. Represented by var. *bifurca* and var. *subinermis* Heeg.
Riccia cavernosa Hoffm.: P, C [LC]
Riccia ciliata Hoffm.: C [LC]. Reports of *R. canescens* Steph., *Riccia crinita* Taylor and *R. trichocarpa* Howe from northeastern Catalonia are probably referable to *R. ciliata*, according to the characters provided by Hugonnot (2010).
Riccia ciliifera Link: P, C [LC]
Riccia crozalsii Levier: C [NT]
Riccia crustata Trab.: E [VU]
Riccia crystallina L.: C [DD]
Riccia fluitans L.: C [NT]
Riccia glauca L.: C [VU]. Represented by var. *glauca*
Riccia gougetiana Durieu & Mont.: C [LC]. Represented by var. *gougetiana* and var. *armatissima* Levier ex Müll. Frib.

- Riccia huebeneriana* Lindenb.: C [VU]
Riccia lamellosa Raddi: C [LC]
Riccia macrocarpa Levier: C [NT]
Riccia michelii Raddi: C [VU]
Riccia nigrella DC.: P, C [LC]
Riccia papillosa Moris: C [VU]
Riccia sorocarpa Bisch.: P, C [LC]. Represented by var. *sorocarpa*.
Riccia subbifurca Warnst. ex Cruz.: C [VU]
Riccia trabutiana Steph.: C [DD]
Riccia warnstorffii Limpr.: P, C [NT]
Riella cossoniana Trab.: C [DD]
Scapania aequiloba (Schwägr.) Dumort.: P, C [LC]
Scapania aspera M.Bernet & Bernet: P, E, C [LC]
Scapania calcicola (Arnell & J.Perss.) Ingham: P, C [NT]
Scapania compacta (Roth) Dumort.: P, C [LC]
Scapania curta (Mart.) Dumort.: P, C [DD]
Scapania cuspiduligera (Nees) Müll. Frib.: P [VU]
Scapania gymnostomophila Kaal.: P, C [CR]
Scapania irrigua (Nees) Nees: P [LC]
Scapania mucronata H.Buch: P [DD]
Scapania nemorea (L.) Grolle: P, C [LC]
Scapania paludosa (Müll.Frib.) Müll.Frib.: P [DD]
Scapania praetervisa Meyl.: P, C [DD]
Scapania scandica (Arnell & H.Buch) Macvicar: P [DD]
Scapania umbrosa (Schrad.) Dumort.: P, [VU]
Scapania undulata (L.) Dumort.: P, C [LC]
Scapania verrucosa Heeg: P [RE]
Schistochilopsis opacifolia (Culm. ex Meyl.) Konstant.: P, C [VU]
Schistochilopsis incisa (Schrad.) Konstant.: P [NT]
Schljakovia kunzeana (Huebener) Konstant. & Vilnet: P [VU]
Solenostoma confertissimum (Nees) Schljakov: P [VU]
Solenostoma gracillimum (Sm.) R.M.Schust.: P, C [LC]
Solenostoma hyalinum (Lyell) Mitt.: P, C [LC]
Solenostoma obovatum (Nees) C.Massal.: P [DD]
Southbya nigrella (De Not.) Henriq.: E, C [LC]
Southbya tophacea (Spruce) Spruce: P, E, C [LC]
Sphaerocarpos michelii Bellardi: C [DD]
Sphaerocarpos texanus Austin: C [NT]
Sphenolobus minutus (Schreb. ex D.Crantz) Berggr.: P, C [LC]
Targionia hypophylla L.: P, E, C [LC]
Targionia lorbeeriana Müll.Frib.: C [DD]
Trichocolea tomentella (Ehrh.) Dumort.: P, C [NT]

- Trilophozia quinquedentata* (Huds.) Bakalin: P, C [LC]
Tritomaria exsecta (Schmidel) Schiffn. ex Loeske: P, ?C [LC]. Its presence in Garrotxa county (Allorge & Casas de Puig, 1968) requires confirmation.
Tritomaria exsectiformis (Breidl.) Schiffn. ex Loeske: P, C [NT]
Tritomaria scitula (Taylor) Jörg.: P [CR]

MOSSES

- Abietinella abietina* (Hedw.) M.Fleisch.: P, E, C [LC]
Acaulon casasianum Brugués & H.A.Crum: E [NT]
Acaulon dertosense Casas, Sergio, Cros & Brugués: C [VU]
Acaulon fontiquerianum Casas & Sérgio: C [NT]
Acaulon mediterraneum Limpr.: C [NT]
Acaulon muticum (Hedw.) Müll.Hal.: C [NT]
Acaulon triquetrum (Spruce) Müll.Hal.: E, C [LC]
Alleniella besseri (Lobarz.) S.Olsson, Enroth & D.Quandt: P, C [LC]
Alleniella complanata (Hedw.) S.Olsson, Enroth & D.Quandt: P, E, C [LC]
Aloina aloides (Schultz) Kindb.: E, C [LC]
Aloina ambigua (Bruch & Schimp.) Limpr.: C [LC]
Aloina bifrons (De Not.) Delgad.: E, C [DD]
Aloina rigida (Hedw.) Limpr.: P, E, C [LC]
Amblyodon dealbatus (Hedw.) Bruch & Schimp.: P [VU]
Amblystegium serpens (Hedw.) Schimp.: P, E, C [LC]
Amphidium lapponicum (Hedw.) Schimp.: P [NT]
Amphidium mougeotii (Bruch & Schimp.) Schimp.: P, C [LC]
Andreaea alpestris (Thed.) Schimp.: P [LC]
Andreaea frigida Huebener: P [LC]
Andreaea heinemannii Hampe & Müll.Hal.: P [VU]. Represented by subsp. *heinemannii*.
Andreaea mutabilis Hook. f. & Wilson: P [VU]
Andreaea nivalis Hook.: P [NT]
Andreaea rothii F.Weber & D.Mohr: P [LC]. Represented by subsp. *rothii* and subsp. *falcata* (Schimp.) Lindb.
Andreaea rupestris Hedw.: P, C [LC]. Typical *A. rupestris* is found in P and C [Montseny massif (Sáez *et al.*, 2018b)], whereas var. *papillosa* (Lindb.) Podp. is confined to P.
Anoetangium aestivum (Hedw.) Mitt.: P [DD]
Anomobryum julaceum (Schrad. ex P.Gaertn. *et al.*) Schimp.: P, C [LC]. Represented by var. *julaceum* and var. *concinatum* (Spruce) J.E.Zetterst.
Anomodon attenuatus (Hedw.) Huebener: P, C [LC]
Anomodon longifolius (Schleich. ex Brid.) C.Hartm.: P, C [VU]
Anomodon rostratus (Hedw.) Schimp.: P, C [NT]
Anomodon viticulosus (Hedw.) Hook. & Taylor: P, E, C [LC]
Antitrichia curtipendula (Hedw.) Brid.: P, C [LC]

- Archidium alternifolium* (Hedw.) Mitt.: E, C [NT]
Arctoa fulvella (Dicks.) Bruch & Schimp.: P [CR]
Aschisma carniolicum (F.Weber & D.Mohr) Lindb.: C [NT]
Aschisma cuynetii (Bizot & R.B.Pierrot) J.Guerra & M.J.Cano: C [VU]
Atrichum angustatum (Brid.) Bruch & Schimp.: P, C [LC]
Atrichum flavisetum Mitt.: P [VU]
Atrichum undulatum (Hedw.) P.Beauv.: P, C [LC]
Aulacomnium androgynum (Hedw.) Schwägr.: P, C [NT]
Aulacomnium palustre (Hedw.) Schwägr.: P, C [LC]
Barbula bolleana (Müll.Hal.) Broth.: P, C [LC]
Barbula convoluta Hedw.: P, E, C [LC]. Typical *B. convoluta* is found in all sectors, whereas var. *sardoa* Schimp. has been reported from E and C sectors.
Barbula crocea (Brid.) F.Weber & D.Mohr: P [DD]
Barbula unguiculata Hedw.: P, E, C [LC]
Bartramia aprica Müll.Hal.: C [LC]
Bartramia halleriana Hedw.: P, C [LC]
Bartramia ithyphylla Brid.: P, C [LC]
Bartramia pomiformis Hedw.: P, C [LC]
Blindia acuta (Hedw.) Bruch & Schimp.: P, C [LC]
Brachytheciastrum collinum (Schleich. ex Müll.Hal.) Ignatov & Huttunen: P [VU]
Brachytheciastrum dieckei (Roll) Ignatov & Huttunen: P [VU]
Brachytheciastrum salicinum (Schimp.) Orgaz, M.J.Cano & J.Guerra: P [LC]
Brachytheciastrum velutinum (Hedw.) Ignatov & Huttunen: P, E, C [LC]
Brachythecium albicans (Hedw.) Schimp.: P, C [LC]
Brachythecium cirrosum (Schwägr.) Schimp.: P [CR]
Brachythecium erythrorrhizon Schimp.: P [VU]
Brachythecium glareosum (Bruch ex Spruce) Schimp.: P, C [LC]
Brachythecium laetum (Brid.) Schimp.: P [EN]
Brachythecium mildeanum (Schimp.) Schimp.: P [NT]
Brachythecium rivulare Schimp.: P, E, C [LC]
Brachythecium rutabulum (Hedw.) Schimp.: P, E, C [LC]
Brachythecium salebrosum (Hoffm. ex F.Weber & D.Mohr) Schimp.: P [LC]
Brachythecium tommasinii (Sendtn. ex Boulay) Ignatov & Huttunen: P [VU]
Brachythecium turgidum (C.Hartmann) Kindb.: P [NT]
Braunia imberbis (Sm.) N.Dalton & D.G.Long: C [VU]
Bryoerythrophyllum ferruginascens (Stirt.) Giacom.: P [VU]
Bryoerythrophyllum inaequalifolium (Taylor) R.H.Zander: P [EN]
Bryoerythrophyllum recurvirostrum (Hedw.) P.C.Chen: P, E, C [LC]. Represented by var. *recurvirostrum* (found in all the sectors) and var. *robustum* K.Saito (reported from P).
Bryum argenteum Hedw.: P, E, C [LC]
Bryum canariense Brid.: C [DD]
Bryum dichotomum Hedw.: P, E, C [LC]

- Bryum elegans* Nees: P [LC]
Bryum gemmilucens R.Wilczek & Demaret: C [LC]
Bryum gemmiparum De Not.: P, E, C [LC]
Bryum intermedium (Brid.) Blandow: P [DD]
Bryum klinggraeffii Schimp.: P, C [DD]
Bryum kunzei Hornsch.: P [DD]
Bryum radiculosum Brid.: E, C [LC]
Bryum ruderale Crundw. & Nyholm: C [DD]
Bryum sauteri Bruch & Schimp.: C [DD]
Bryum schleicheri Schwägr.: P [LC]
Bryum turbinatum (Hedw.) Turner: P [DD]
Bryum weigeli Spreng.: P [LC]
Buckia vaucheri (Lesq.) D.Ríos, M.T.Gallego & J.Guerra: P, E, C [LC]
Buxbaumia aphylla Hedw.: P [EN]
Buxbaumia viridis (Moug. ex Lam. & DC.) Brid. ex Moug. & Nestl.: P, C [NT]
Calliergon giganteum (Schimp.) Kindb.: P [EN]
Calliergonella cuspidata (Hedw.) Loeske: P, E, C [LC]
Calliergonella lindbergii (Mitt.) Hedenäs: P, C [LC]
Campyliadelphus chrysophyllus (Brid.) Kanda: P, E, C [LC]
Campyliadelphus elodes (Lindb.) Kanda: P [RE]
Campylium protensum (Brid.) Kindb.: P, E [LC]
Campylium stellatum (Hedw.) Lange & C.E.O.Jensen: P, C [LC]
Campylophyllum calcareum (Crundw. & Nyholm) Hedenäs: P, E, C [LC]
Campylophyllum halleri (Hedw.) M.Fleisch.: P [NT]
Campylopus atrovirens De Not.: P [LC]
Campylopus brevipilus Bruch & Schimp.: C [NT]
Campylopus flexuosus (Hedw.) Brid.: P, C [VU]
Campylopus fragilis (Brid.) Bruch & Schimp.: P, C [LC]
Campylopus pilifer Brid.: P, C [LC]
Campylopus schimperi Milde: P [VU]
Campylopus subulatus Schimp. ex Milde: C [CR]
Campylostelium pitardii (Corb.) E.Maier: C [LC]
Catoscopium nigratum (Hedw.) Brid.: P [VU]
Ceratodon purpureus (Hedw.) Brid.: P, C [LC]. Represented by subsp. *purpureus*.
Cheilothela chloropus (Brid.) Broth.: C [VU]
Cinclidotus aquaticus (Hedw.) Bruch & Schimp.: P [NT]
Cinclidotus fontinaloides (Hedw.) P.Beauv.: P, C [LC]
Cinclidotus riparius (Host ex Brid.) Arn.: P [VU]
Cinclidotus vivesii Eder & J.Guerra: P [DD]
Cirriphyllum crassinervium (Taylor) Loeske & M.Fleisch.: P, E, C [LC]
Cirriphyllum piliferum (Hedw.) Grout: P, C [NT]
Climacium dendroides (Hedw.) F.Weber & D.Mohr: P, C [LC]

- Codonoblepharon forsteri* (Dicks.) Goffinet: C [VU]
Conardia compacta (Müll.Hal.) H. Rob.: P, C [VU]
Conostomum tetragonum (Hedw.) Lindb.: P [VU]
Coscinodon cribrosus (Hedw.) Spruce: P, C [LC]
Cratoneuron curvicaule (Juratzka) G.Roth: P [DD]
Cratoneuron filicinum (Hedw.) Spruce: P, E, C [LC]
Crossidium aberrans Holz. & E.B.Bartram: E, C [DD]
Crossidium crassinervium (De Not.) Jur.: E, C [LC]
Crossidium laevipilum Thér. & Trab.: E, C [DD]
Crossidium squamiferum (Viv.) Jur.: P, E, C [LC]
Cryphaea heteromalla (Hedw.) D.Mohr: P, E, C [LC]
Ctenidium molluscum (Hedw.) Mitt.: P, E, C [LC]
Cynodontium bruntonii (Sm.) Bruch & Schimp.: P, C [LC]. Records from Montseny massif and Garraf require confirmation.
Cynodontium gracilescens (F.Weber & D.Mohr) Schimp.: P [VU]
Cynodontium polycarpon (Hedw.) Schimp.: P [VU]
Cynodontium strumiferum (Hedw.) Lindb.: P [VU]
Cyrtomnium hymenophylloides (Huebener) T.J.Kop.: P [VU]
Dialytrichia mucronata (Brid.) Broth.: P, C [LC]. Represented by var. *mucronata*.
Dichelyma falcatum (Hedw.) Myrin: P [CR]
Dichodontium palustre (Dicks.) M.Stech: P, C [LC]
Dichodontium pellucidum (Hedw.) Schimp.: P, C [LC]
Dicranella grevilleana (Brid.) Schimp.: P [VU]
Dicranella heteromalla (Hedw.) Schimp.: P, C [LC]
Dicranella howei Renauld & Cardot: P, E, C [LC]
Dicranella rufescens (Dicks.) Schimp.: P [VU]
Dicranella schreberiana (Hedw.) Dixon: P, C [VU]
Dicranella subulata (Hedw.) Schimp.: P, C [NT]
Dicranella varia (Hedw.) Schimp.: P, E, C [LC]
Dicranodontium denudatum (Brid.) E.Britton: P [LC]
Dicranum bonjeanii De Not.: P, C [LC]
Dicranum brevifolium (Lindb.) Lindb.: P [VU]
Dicranum fuscescens Sm.: P [LC]
Dicranum muehlenbeckii Bruch & Schimp.: C [RE]
Dicranum polysetum Sw. ex anon.: P, C [LC]
Dicranum scoparium Hedw.: P, E, C [LC]
Dicranum spadiceum J.E.Zetterst.: P [NT]
Dicranum spurium Hedw.: C [VU]
Dicranum tauricum Sapjegin: P [LC]
Dicranum undulatum Schrad. ex Brid.: P [DD]
Didymodon acutus (Brid.) K.Saito: P, E, C [LC]
Didymodon asperifolius (Mitt.) H.A.Crum, Steere & L.E.Anderson: P [VU]

- Didymodon cordatus* Jur.: P, C [DD]
Didymodon fallax (Hedw.) R.H.Zander: P, E, C [LC]
Didymodon ferrugineus (Besch.) M.O.Hill: P, C [LC]
Didymodon insulanus (De Not.) M.O.Hill: P, E, C [LC]
Didymodon luridus Hornsch.: P, E, C [LC]
Didymodon nicholsonii Culm.: C [DD]
Didymodon rigidulus Hedw.: P, E, C [LC]
Didymodon sinuosus (Mitt.) Delogne: C [DD]
Didymodon spadiceus (Mitt.) Limpr.: P, E, C [LC]
Didymodon tophaceus (Brid.) Lisa: P, E, C [LC]
Didymodon vinealis (Brid.) R.H.Zander: P, E, C [LC]
Diphyscium foliosum (Hedw.) D.Mohr: P, C [LC]
Distichium capillaceum (Hedw.) Bruch & Schimp.: P, C [LC]
Distichium inclinatum (Hedw.) Bruch & Schimp.: P [DD]
Ditrichum flexicaule (Schwägr.) Hampe: P, E, C [LC]
Ditrichum gracile (Mitt.) Kuntze: P, E, C [LC]
Ditrichum pusillum (Hedw.) Hampe: P, C [NT]
Ditrichum subulatum Hampe: C [DD]
Drepanocladus aduncus (Hedw.) Warnst.: P, C [LC]
Drepanocladus polygamus (Schimp.) Hedenäs: P [CR]
Encalypta affinis R.Hedw.: P [NT]
Encalypta alpina Sm.: P [LC]
Encalypta ciliata Hedw.: P, C [LC]
Encalypta microstoma Bals.-Criv. & De Not.: P, C [VU]
Encalypta rhaptocarpa Schwägr.: P [NT]
Encalypta spathulata Müll.Hal.: P [NT]
Encalypta streptocarpa Hedw.: P, E, C [LC]
Encalypta vulgaris Hedw.: P, E, C [LC]
Entodon cladorrhizans (Hedw.) Müll.Hal.: P, C [VU]
Entodon concinnus (De Not.) Paris: P, C [LC]
Entosthodon attenuatus (Dicks.) Bryhn: P, E, C [LC]
Entosthodon convexus (Spruce) Brugués: P, C [LC]
Entosthodon duriaei Mont.: C [VU]
Entosthodon fascicularis (Hedw.) Müll.Hal.: P, C [LC]
Entosthodon kroonkurk Dirkse & Brugués: C [RE]
Entosthodon mouretii (Corb.) Jelenc: C [CR]
Entosthodon muhlenbergii (Turner) Fife: C [DD]
Entosthodon obtusus (Hedw.) Lindb.: C [NT]
Entosthodon pulchellus (H.Philib.) Brugués: P, C [LC]
Ephemerum crassinervium (Schwägr.) Hampe: C [NT]. Represented by subsp. *sessile* (Bruch) Holyoak.
Ephemerum minutissimum Lindb.: C [NT]

- Ephemerum serratum* (Hedw.) Hampe: C [NT]
Epipterygium tozeri (Grev.) Lindb.: C [LC]
Eucladium verticillatum (Brid.) Bruch & Schimp.: P, E, C [LC]
Eurhynchiastrum pulchellum (Hedw.) Ignatov & Huttunen: P, C [LC]. Represented by var. *pulchellum* (P and C sectors) and var. *diversifolium* (Schimp.) Ochyra & Żarnowiec (P sector).
Eurhynchium angustirete (Broth.) T.J.Kop.: P [NT]
Eurhynchium striatum (Hedw.) Schimp.: P, E, C [LC]
Exsertotheca crispa (Hedw.) S.Olsson, Enroth & D.Quandt: P, E, C [LC]
Fabronia ciliaris (Brid.) Brid.: P, C [NT]
Fabronia pusilla Raddi: P, C [NT]
Fissidens adianthoides Hedw.: P, C [LC]
Fissidens bryoides Hedw.: P, C [LC]. Represented by var. *bryoides*.
Fissidens crassipes Wilson ex Bruch & Schimp.: P, E, C [LC]
Fissidens crispus Mont.: E, C [DD]
Fissidens curvatus Hornsch.: C [NT]
Fissidens dubius P.Beauv.: P, E, C [LC]
Fissidens exilis Hedw.: C [DD]
Fissidens fontanus (Bach.Pyl.) Steud.: C [NT]
Fissidens grandifrons Brid.: P, C [LC]
Fissidens osmundoides Hedw.: P, C [LC]
Fissidens ovatifolius R.Ruthe: C [NT]
Fissidens pusillus (Wilson) Milde: P, C [DD]
Fissidens rivularis Bruch & Schimp.: P, C [NT]
Fissidens taxifolius Hedw.: P, E, C [LC]
Fissidens viridulus (Sw. ex anon.) Wahlenb.: P, E, C [LC]. Represented by var. *viridulus* (sectors P, E and C) and var. *incurvus* (Starke ex Röhl.) Waldh. (sectors E and C).
Fontinalis antipyretica Hedw.: P, E, C [LC]
Fontinalis hypnoides C.Hartm.: C [LC]
Fontinalis squamosa Hedw.: P, C [LC]
Funaria hygrometrica Hedw.: P, E, C [LC]
Grimmia alpestris (F.Weber & D.Mohr) Schleich.: P [LC]
Grimmia anodon Bruch & Schimp.: P [LC]
Grimmia anomala Schimp.: P [NT]
Grimmia arenaria Hampe: P [VU]
Grimmia atrata Miel. ex Hornsch.: P, C [NT]
Grimmia caespiticia (Brid.) Jur.: P [LC]
Grimmia crinita Brid.: E, C [LC]
Grimmia crinitoleucophaea Cardot: P, C [VU]
Grimmia decipiens (Schultz) Lindb.: P, C [LC]
Grimmia elatior Bruch ex Bals.-Criv. & De Not.: P [LC]
Grimmia elongata Kaulf.: P [VU]

- Grimmia funalis* (Schwägr.) Bruch & Schimp.: P, C [LC]
Grimmia hartmanii Schimp.: P, C [LC]
Grimmia incurva Schwägr.: P [VU]
Grimmia laevigata (Brid.) Brid.: P, C [LC]
Grimmia lisae De Not.: C [LC]
Grimmia longirostris Hook.: P [NT]
Grimmia meridionalis (Müll.Hal.) E.Maier: C [DD]
Grimmia mollis Bruch & Schimp.: P [VU]
Grimmia montana Bruch & Schimp.: P [LC]
Grimmia muehlenbeckii Schimp.: P [NT]
Grimmia orbicularis Bruch ex Wilson: P, E, C [LC]
Grimmia ovalis (Hedw.) Lindb.: P, C [LC]
Grimmia pulvinata (Hedw.) Sm.: P, E, C [LC]
Grimmia ramondii (Lam. & DC.) Margad.: P [LC]
Grimmia reflexidens Müll.Hal.: P [NT]
Grimmia tergestina Bruch & Schimp.: P [DD]
Grimmia torquata Drumm.: P [NT]
Grimmia trichophylla Grev.: P, E, C [LC]
Grimmia unicolor Hook.: P [DD]
Gymnostomum aeruginosum Sm. (incl. var. *obscurum* Guerra): P [LC]
Gymnostomum calcareum Nees & Hornsch.: P, E, C [LC]
Gymnostomum lanceolatum M.J.Cano, Ros & J.Guerra: C [DD]
Gymnostomum viridulum Brid.: P, E, C [LC]
Gyroweisia reflexa (Brid.) Schimp.: C [DD]
Gyroweisia tenuis (Hedw.) Schimp.: P [DD]
Habrodon perpusillus (De Not.) Lindb.: P, E, C [LC]
Hedwigia ciliata (Hedw.) P.Beauv.: P, C [LC]. Represented by var. *ciliata* and var. *leucophaea* Bruch & Schimp. (both varieties in P and C sectors).
Hedwigia stellata Hedenäs: P, C [LC]
Herzogiella seligeri (Brid.) Z.Iwats.: P, C [LC]
Herzogiella striatella (Brid.) Z.Iwats.: P [NT]
Heterocladium dimorphum (Brid.) Bruch & Schimp.: P, C [LC]
Heterocladium heteropterum Bruch & Schimp.: P [LC]. Reports from Montseny massif are due to confusion with *Pseudoleskeella nervosa* (Sáez *et al.*, 2018b).
Homalia lusitanica Schimp.: C [LC]
Homalia trichomanoides (Hedw.) Schimp.: P, C [DD]
Homalothecium aureum (Spruce) H.Rob.: C [LC]
Homalothecium lutescens (Hedw.) H.Rob.: P, E, C [LC]
Homalothecium meridionale (M.Fleisch. & Warnst.) Hedenäs: E, C [LC]. The distribution range of the species is still rather poorly known because its taxonomy has only recently been elucidated.
Homalothecium philippeanum (Spruce) Schimp.: P, C [LC]

- Homalothecium sericeum* (Hedw.) Schimp.: P, E, C [LC]
Homomallium incurvatum (Schrad. ex Brid.) Loeske: P, C [NT]
Hookeria lucens (Hedw.) Sm.: P, C [NT]
Hygroamblystegium varium (Hedw.) Mönk.: P, E, C [LC]. Two varieties occur: var. *humile* (P.Beauv.) Vanderp. & Hedenäs and var. *varium*.
Hygrohypnum cochleariifolium (Venturi) Broth.: P [RE]
Hygrohypnum duriusculum (De Not.) D.W.Jamieson: P, C [LC]
Hygrohypnum luridum (Hedw.) Jenn.: P, E, C [LC]
Hygrohypnum molle (Hedw.) Loeske: P [VU]
Hygrohypnum ochraceum (Turner ex Wilson) Loeske: P [LC]
Hygrohypnum smithii (Sw.) Broth.: P [NT]
Hylocomiastrum pyrenaicum (Spruce) M.Fleisch.: P [NT]
Hylocomiastrum umbratum (Hedw.) M.Fleisch.: P [NT]
Hylocomium splendens (Hedw.) Schimp.: P, E, C [LC]
Hymenoloma crispulum (Hedw.) Ochyra: P, C [LC]
Hymenostylium recurvirostrum (Hedw.) Dixon: P, C [LC]. Represented by var. *recurvirostrum* (P and C sectors) and var. *insigne* (Dixon) E.B.Bartram (C sector).
Hypnum andoi A.J.E.Sm.: P, E, C [LC]
Hypnum cupressiforme Hedw.: P, E, C [LC]. Five varieties occur: var. *cupressiforme*, var. *filiforme* Brid., var. *lacunosum* Brid., var. *resupinatum* (Taylor) Schimp. and var. *subjulaceum* Molendo; their detailed distribution is still poorly known.
Hypnum jutlandicum Holmen & E.Warncke: P, E, C [LC]
Hypnum pallescens (Hedw.) P.Beauv.: P [DD]
Hypnum recurvatum (Lindb. & Arnell) Kindb.: P [EN]
Hypnum revolutum (Mitt.) Lindb.: P [LC]. Represented by var. *revolutum*
Imbribryum alpinum (Huds. ex With.) N. Pedersen: P, E, C [LC]
Imbribryum mildeanum (Jur.) J.R. Spence: P, C [NT]
Isopterygiopsis muelleriana (Schimp.) Z.Iwats.: P, C [LC]
Isopterygiopsis pulchella (Hedw.) Z.Iwats.: P [LC]
Isothecium alopecuroides (Lam. ex Dubois) Isov.: P, C [LC]
Isothecium myosuroides Brid.: C [NT]. Represented by var. *myosuroides*.
Kiaeria blyttii (Bruch & Schimp.) Broth.: P [CR]
Kiaeria starkei (F.Weber & D.Mohr) I.Hagen: P [LC]
Kindbergia praelonga (Hedw.) Ochyra: P, E, C [LC]
Leptobarbula berica (De Not.) Schimp.: C [DD]
Leptobryum pyriforme (Hedw.) Wilson: P, C [LC]
Leptodictyum riparium (Hedw.) Warnst.: P, E, C [LC]
Leptodon smithii (Hedw.) F.Weber & D.Mohr: P, E, C [LC]
Lescuraea incurvata (Hedw.) E.Lawton: P [LC]
Lescuraea mutabilis (Brid.) Lindb.: P [VU]
Lescuraea patens Lindb.: P [NT]
Lescuraea plicata (Schleich. ex F.Weber & D.Mohr) Lindb.: P [NT]

- Lescuraea radicata* (Mitt.) Mönk.: P [LC]
Lescuraea saxicola (Schimp.) Molendo: P [LC]
Leucobryum glaucum (Hedw.) Ångstr.: P, C [LC]
Leucobryum juniperoideum (Brid.) Müll.Hal.: P, C [LC]
Leucodon sciuroides (Hedw.) Schwägr.: P, E, C [LC]. Two varieties, var. *sciuroides* and var. *morensis* (Schwägr.) De Not., are known from all the recognized sectors.
Lewinskya acuminata (H.Philib.) F.Lara, Garilleti & Goffinet: P, C [LC]
Lewinskya affinis (Brid.) F.Lara, Garilleti & Goffinet: P, E, C [LC]
Lewinskya rupestris (Schleich. ex Schwägr.) F.Lara, Garilleti & Goffinet: P, C [LC]
Lewinskya speciosa (Nees) F.Lara, Garilleti & Goffinet: P, C [LC]
Lewinskya striata (Hedw.) F.Lara, Garilleti & Goffinet: P, C [LC]
Loeskeobryum brevirostre (Brid.) M.Fleisch.: P, E, C [NT]
Meesia uliginosa Hedw.: P [VU]
Microbryum curvicollum (Hedw.) R.H.Zander: E, C [LC]
Microbryum davallianum (Sm.) R.H.Zander: E, C [LC]
Microbryum floerkeanum (F.Weber & D.Mohr) Schimp.: E, C [LC]
Microbryum rectum (With.) R.H.Zander: C [LC]
Microbryum starkeanum (Hedw.) R.H.Zander: E, C [LC]
Microeurhynchium pumilum (Wilson) Ignatov & Vanderp.: C [LC]
Mielichhoferia elongata (Hoppe & Hornsch. ex Hook.) Hornsch.: P [VU]
Mielichhoferia mielichhoferiana (Funck) Loeske: P [LC]
Mnium hornum Hedw.: P, C [LC]
Mnium lycopodioides Schwägr.: P, C [NT]
Mnium marginatum (Dicks. ex With.) P.Beauv.: P, C [LC]
Mnium spinosum (Voit.) Schwägr.: P, C [LC]
Mnium spinulosum Bruch & Schimp.: P [NT]
Mnium stellare Hedw.: P, C [LC]
Mnium thomsonii Schimp.: P, C [LC]
Myurella julacea (Schwägr.) Schimp.: P [LC]
Nogopterium gracile (Hedw.) Crosby & W.R.Buck: P, C [LC]
Nyholmiella obtusifolia (Brid.) Holmen & Warncke: P, E, C [LC]
Oedipodiella australis (Wager & Dixon) Dixon: P, C [VU]
Oligotrichum hercynicum (Hedw.) Lam. & DC.: P [LC]
Oncophorus virens (Hedw.) Brid.: P [LC]
Oncophorus wahlenbergii Brid.: P [CR]
Orthothecium intricatum (C.Hartm.) Schimp.: P, E, C [LC]
Orthothecium rufescens (Dicks. ex Brid.) Schimp.: P, C [LC]
Orthothecium strictum Lorentz: P [DD]
Orthotrichum alpestre Bruch & Schimp.: P [VU]
Orthotrichum anomalum Hedw.: P, E, C [LC]
Orthotrichum cupulatum Hoffm. ex Brid.: P, E, C [LC]. Represented by var. *cupulatum*.
Orthotrichum diaphanum Schrad. ex Brid.: P, E, C [LC]

- Orthotrichum hispanicum* F.Lara, Garilleti & Mazimpaka: P [VU]
Orthotrichum macrocephalum F.Lara, Garilleti & Mazimpaka: C [DD]
Orthotrichum pallens Bruch ex Brid.: P, C [LC]
Orthotrichum philibertii Venturi: C [DD]
Orthotrichum pumilum Sw. ex anon.: P, C [LC]
Orthotrichum rogeri Brid.: P [VU]
Orthotrichum scanicum Grönvall: P [NT]
Orthotrichum schimperi Hammar: P, C [LC]
Orthotrichum stramineum Hornsch. ex Brid.: P, C [NT]
Orthotrichum tenellum Bruch ex Brid.: P, E, C [LC]
Oxyrrhynchium hians (Hedw.) Loeske: P, E, C [LC]
Oxyrrhynchium schleicheri (R.Hedw.) Röhl: P, C [LC]
Oxyrrhynchium speciosum (Brid.) Warnst.: P, E, C [LC]
Oxystegus tenuirostris (Hook. & Taylor) A.J.E. Sm.: P, C [LC]
Palustriella commutata (Hedw.) Ochyra: P, E, C [LC]. Represented by var. *commutata*.
Palustriella decipiens (De Not.) Ochyra: P [LC]
Palustriella falcata (Brid.) Hedenäs: P [LC]
Paraleucobryum enerve (Thed.) Loeske: P [DD]
Paraleucobryum longifolium (Hedw.) Loeske: P [LC]
Paraleucobryum sauteri (Bruch & Schimp.) Loeske: P [VU]
Philonotis caespitosa Jur.: P, C [LC]
Philonotis calcarea (Bruch & Schimp.) Schimp.: P, C [LC]
Philonotis capillaris Lindb.: P, C [LC]
Philonotis fontana (Hedw.) Brid.: P, C [LC]
Philonotis marchica (Hedw.) Brid.: P, E, C [LC]
Philonotis rigida Brid.: C [NT]
Philonotis seriata Mitt.: P [LC]
Philonotis tomentella Molendo: P, C [LC]
Physcomitrella patens (Hedw.) Bruch & Schimp.: C [DD]
Physcomitrium pyriforme (Hedw.) Bruch. & Schimp.: P, C [LC]
Plagiomnium affine (Blandow ex Funck) T.J.Kop.: P, E, C [LC]
Plagiomnium cuspidatum (Hedw.) T.J.Kop.: P, C [LC]
Plagiomnium elatum (Bruch & Schimp.) T.J.Kop.: P, C [LC]
Plagiomnium ellipticum (Brid.) T.J.Kop.: P, C [LC]
Plagiomnium medium (Bruch & Schimp.) T.J.Kop.: P, C [LC]
Plagiomnium rostratum (Schrad.) T.J.Kop.: P, C [LC]
Plagiomnium undulatum (Hedw.) T.J.Kop.: P, E, C [LC]
Plagiopus oederianus (Sw.) H.A.Crum & L.E.Anderson: P, C [LC]
Plagiothecium cavifolium (Brid.) Z.Iwats.: P, C [LC]
Plagiothecium curvifolium Schlieph. ex Limpr.: P [NT]
Plagiothecium denticulatum (Hedw.) Schimp. [incl. var. *obtusifolium* (Turner) Moore]: P [LC]
Plagiothecium laetum Schimp.: P [NT]

- Plagiothecium nemorale* (Mitt.) A.Jaeger: P, C [LC]
Plagiothecium piliferum (Sw.) Schimp.: P [VU]
Plagiothecium succulentum (Wilson) Lindb.: P, C [LC]
Plagiothecium undulatum (Hedw.) Schimp.: P [NT]
Plasteurhynchium meridionale (Schimp.) M.Fleisch.: P, C [LC]
Plasteurhynchium striatulum (Spruce) M.Fleisch.: P, C [LC]
Platydictya jungermannioides (Brid.) H.A.Crum: P, C [LC]
Pleuridium acuminatum Lindb.: P, C [LC]
Pleuridium subulatum (Hedw.) Rabenh.: C [LC]
Pleurozium schreberi (Willd. ex Brid.) Mitt.: P, C [LC]
Pogonatum aloides (Hedw.) P.Beauv.: P, C [LC]
Pogonatum nanum (Hedw.) P.Beauv.: P, C [NT]
Pogonatum urnigerum (Hedw.) P.Beauv.: P, C [LC]
Pohlia andalusica (Höhn.) Broth.: P [NT]
Pohlia annotina (Hedw.) Lindb.: P [EN]
Pohlia camptotrachela (Renauld & Cardot) Broth.: P, C [VU]
Pohlia cruda (Hedw.) Lindb.: P, C [LC]
Pohlia drummondii (Müll.Hal.) A.L.Andrews: P [NT]
Pohlia elongata Hedw.: P [LC]. Three varieties occur: var. *elongata*, var. *acuminata* (Hoppe & Hornsch.) Huebener and var. *greenii* (Brid.) A.J.Shaw; their detailed distribution is poorly known.
Pohlia flexuosa Hook.: P [VU]
Pohlia longicolla (Hedw.) Lindb.: P [VU]
Pohlia ludwigii (Spreng. ex Schwägr.) Broth.: P [VU]
Pohlia melanodon (Brid.) A.J.Shaw: P, E, C [LC]
Pohlia nutans (Hedw.) Lindb.: P [LC]
Pohlia prolifera (Kindb.) Lindb. ex Broth.: P, C [LC]
Pohlia wahlenbergii (F.Weber & D.Mohr) A.L.Andrews: P, C [LC]
Polytrichastrum alpinum (Hedw.) G.L.Sm.: P [LC]
Polytrichastrum sexangulare (Brid.) G.L.Sm.: P [LC]
Polytrichum commune Hedw.: P, C [LC]
Polytrichum formosum Hedw.: P, C [LC]
Polytrichum juniperinum Hedw.: P, C [LC]
Polytrichum longisetum Sw. ex Brid.: P [EN]
Polytrichum piliferum Hedw.: P, C [LC]
Polytrichum strictum Menzies ex Brid.: P [LC]
Pottiopsis caespitosa (Brid.) Blockeel & A.J.E.Sm.: E, C [LC]
Pseudephemerum nitidum (Hedw.) Loeske: C [NT]
Pseudoamblystegium subtile (Hedw.) Vanderp. & Hedenäs: P, C [LC]
Pseudocrossidium hornschuchianum (Schultz) R.H.Zander: E, C [LC]
Pseudocrossidium obtusulum (Lindb.) H.A.Crum & L.E.Anderson: E [DD]
Pseudocrossidium revolutum (Brid.) R.H.Zander: P, E, C [LC]

- Pseudoleskeella catenulata* (Schrad.) Kindb.: P, E, C [LC]
Pseudoleskeella nervosa (Brid.) Nyholm: P, C [LC]
Pseudoleskeella rupestris (Berggr.) Hedenäs & L.Söderstr.: P [VU]
Pseudoleskeella tectorum (Funck ex Brid.) Kindb. ex Broth.: P, C [NT]
Pseudoscleropodium purum (Hedw.) M.Fleisch.: P, E, C [LC]
Pseudostereodon procerrimus (Molendo) M.Fleisch.: P [NT]
Pseudotaxiphyllum elegans (Brid.) Z.Iwats.: P, C [LC]
Pterigynandrum filiforme Hedw.: P, C [LC]
Pterygoneurum lamellatum (Lindb.) Jur.: E [VU]
Pterygoneurum ovatum (Hedw.) Dixon: P, E, C [LC]
Pterygoneurum sampaianum (Machado-Guim.) Machado-Guim.: E, C [LC]
Pterygoneurum subsessile (Brid.) Jur.: C [DD]
Ptilium crista-castrensis (Hedw.) De Not.: P [VU]
Ptychomitrium polyphyllum (Dicks. ex Sw.) Bruch & Schimp.: P, C [LC]
Ptychostomum archangelicum (Bruch & Schimp.) J.R.Spence: P [DD]
Ptychostomum boreale (F.Weber & D.Mohr) Ochyra & Bednarek-Ochyra: P [LC]
Ptychostomum bornholmense (Wink. & R.Ruthe) Holyoak & N.Pedersen: C [LC]
Ptychostomum capillare (Hedw.) Holyoak & N.Pedersen: P, E, C [LC]
Ptychostomum cernuum (Hedw.) Hornsch.: P [VU]
Ptychostomum compactum Hornsch.: P, C [DD]
Ptychostomum creberrimum (Taylor) J.R.Spence & H.P.Ramsay: P, C [LC]
Ptychostomum donianum (Grev.) Holyoak & N.Pedersen: P, C [LC]
Ptychostomum imbricatulum (Müll. Hal.) Holyoak & N.Pedersen: P, C [LC]
Ptychostomum moravicum (Podp.) Ros & Mazimpaka: P, C [LC]
Ptychostomum pallens (Sw.) J.R.Spence: P, C [LC]
Ptychostomum pseudotriquetrum (Hedw.) J.R.Spence & H.P.Ramsay: P, C [LC]
Ptychostomum rubens (Mitt.) Holyoak & N.Pedersen: P [LC]
Ptychostomum torquescens (Bruch & Schimp.) Ros & Mazimpaka: P, E, C [LC]
Ptychostomum zieri (Hedw.) Holyoak & N.Pedersen: P [NT]
Pulvigerella lyellii (Hook. & Taylor) Plášek, Sawicki & Ochyra: P, E, C [LC]
Pylaisia polyantha (Hedw.) Schimp.: P [LC]
Racomitrium aciculare (Hedw.) Brid.: P, C [LC]
Racomitrium affine (F.Weber & D.Mohr) Lindb.: P, C [LC]
Racomitrium aquaticum (Brid. ex Schrad.) Brid.: P [LC]. Its presence in Catalan Ranges (Montseny massif) requires confirmation (Sáez *et al.*, 2018b).
Racomitrium canescens (Hedw.) Brid.: P, C [LC]
Racomitrium elongatum Ehrh. ex Frisvoll: P [LC]
Racomitrium fasciculare (Hedw.) Brid.: P [NT]
Racomitrium heterostichum (Hedw.) Brid.: P [DD]
Racomitrium lanuginosum (Hedw.) Brid.: P, C [NT]
Racomitrium macounii Kindb.: P [LC]. Represented by subsp. *alpinum* (E.Lawton) Frisvoll.
Racomitrium sudeticum (Funck) Bruch & Schimp.: P [LC]

- Rhabdoweisia fugax* (Hedw.) Bruch & Schimp.: P, C [LC]
Rhizomnium magnifolium (Horik.) T.J.Kop.: P [NT]
Rhizomnium punctatum (Hedw.) T.J.Kop.: P, C [LC]
Rhodobryum ontariense (Kindb.) Kindb.: P, C [LC]
Rhodobryum roseum (Hedw.) Limpr.: P, E, C [LC]
Rhynchostegiella curviseta (Brid.) Limpr.: C [LC]
Rhynchostegiella litorea (De Not.) Limpr.: C [LC]
Rhynchostegiella tenella (Dicks.) Limpr.: P, E, C [LC]
Rhynchostegiella teneriffae (Mont.) Dirkse & Bouman: P, C [LC]
Rhynchostegium alopecuroides (Brid.) A.J.E.Sm.: P, C [DD]
Rhynchostegium confertum (Dicks.) Schimp.: P, E, C [LC]
Rhynchostegium megapolitanum (Blandow ex F.Weber & D.Mohr) Schimp.: P, E, C [LC]
Rhynchostegium murale (Hedw.) Schimp.: P, E, C [LC]. Two varieties occur: var. *murale* (P, E and C sectors) and var. *julaceum* Schimp. (P sector).
Rhynchostegium riparioides (Hedw.) Cardot: P, E, C [LC]
Rhytidiadelphus loreus (Hedw.) Warnst.: P, C [LC]
Rhytidiadelphus squarrosus (Hedw.) Warnst.: P [NT]
Rhytidiadelphus triquetrus (Hedw.) Warnst.: P, C [LC]
Rhytidium rugosum (Hedw.) Kindb.: P, E, C [LC]
Saelania glaucescens (Hedw.) Broth.: P, C [LC]
Sanionia uncinata (Hedw.) Loeske: P [LC]
Sarmentypnum exannulatum (Schimp.) Hedenäs: P [LC]
Sarmentypnum sarmentosum (Wahlenb.) Tuom. & T.J.Kop.: P [CR]
Schistidium agassizii Sull. & Lesq.: P [NT]
Schistidium apocarpum (Hedw.) Bruch & Schimp.: P, C [LC]
Schistidium atrofusum (Schimp.) Limpr.: P, E [NT]
Schistidium brunnescens Limpr.: P, C [LC]. Represented by subsp. *brunnescens*.
Schistidium confertum (Funck) Bruch & Schimp.: P, C [LC]
Schistidium crassipilum H.H.Blom: P, E, C [LC]
Schistidium dupretii (Thér.) W.A.Weber: P [NT]
Schistidium elegantulum H.H.Blom: P, C [LC]. Two subspecies occur: subsp. *wilsonii* H.H.Blom and subsp. *elegantulum*, both in P and C sectors.
Schistidium flaccidum (De Not.) Ochyra: P [NT]
Schistidium helveticum (Schkuhr) Deguchi: P, C [LC]
Schistidium papillosum Culm.: P [LC]
Schistidium pruinatum (Wilson ex Schimp.) G.Roth: P, C [NT]
Schistidium rivulare (Brid.) Podp.: P [LC]
Schistidium robustum (Nees & Hornsch.) H.H.Blom: P, C [NT]
Schistidium strictum (Turner) Loeske ex Martensson: P [DD]
Sciuro-hypnum curtum (Lindb.) Ignatov: P [VU]
Sciuro-hypnum glaciale (Schimp.) Ignatov & Huttunen: P [NT]
Sciuro-hypnum plumosum (Hedw.) Ignatov & Huttunen: P, C [NT]

- Sciuro-hypnum populeum* (Hedw.) Ignatov & Huttunen: P, C [LC]
Sciuro-hypnum reflexum (Starke) Ignatov & Huttunen: P [LC]
Sciuro-hypnum starkei (Brid.) Ignatov & Huttunen: P [DD]
Scleropodium touretii (Brid.) L.F.Koch.: P, C [LC]
Scopelophila ligulata (Spruce) Spruce: P, C [LC]
Scorpidium cossonii (Schimp.) Hedenäs: P [LC]
Scorpidium revolvens (Sw. ex anon.) Rubers: P [CR]
Scorpidium scorpioides (Hedw.) Limpr.: P [CR]
Scorpiurium circinatum (Brid.) M.Fleisch. & Loeske: P, E, C [LC]
Scorpiurium deflexifolium (Solms) M.Fleisch. & Loeske: C [NT]
Seligeria acutifolia Lindb.: C [VU]
Seligeria donniana (Sm.) Müll.Hal.: P, C [NT]
Seligeria pusilla (Hedw.) Bruch & Schimp.: P, C [NT]
Seligeria recurvata (Hedw.) Bruch & Schimp.: P, C [NT]
Serpoleskea confervoides (Brid.) Kartt.: P, E, C [LC]
Sphagnum angustifolium (C.E.O.Jensen ex Russow) C.E.O.Jensen: P [EN]
Sphagnum auriculatum Schimp.: P [LC]
Sphagnum capillifolium (Ehrh.) Hedw.: P [LC]
Sphagnum centrale C.E.O.Jensen: P [EN]
Sphagnum compactum Lam. & DC.: P, C [LC]
Sphagnum contortum Schultz: P [VU]
Sphagnum fallax (H.Klinggr.) H.Klinggr.: P [VU]
Sphagnum flexuosum Dozy & Molk.: P [VU]
Sphagnum fuscum (Schimp.) H.Klinggr.: P [EN]
Sphagnum girgensohnii Russow: P [NT]
Sphagnum medium Limpr.: P [VU]
Sphagnum palustre L.: P [NT]
Sphagnum papillosum Lindb.: P, C [LC]. Currently regionally extinct from C (Montseny massif).
Sphagnum platyphyllum (Lindb. ex Braithw.) Warnst.: P [NT]
Sphagnum quinquefarium (Braithw.) Warnst.: P [VU]
Sphagnum rubellum Wilson: P [NT]
Sphagnum russowii Warnst.: P [LC]
Sphagnum squarrosum Crome: P [NT]
Sphagnum subnitens Russow & Warnst.: P, C [LC]
Sphagnum subsecundum Nees: P [LC]
Sphagnum tenellum (Brid.) Pers. ex Brid.: P [EN]
Sphagnum teres (Schimp.) Ångstr.: P [NT]
Sphagnum warnstorffii Russow: P [NT]
Stegonia latifolia (Schwägr.) Venturi ex Broth.: P [NT]
Stereodon callichrous (Brid.) Braithw.: P [NT]
Straminergon stramineum (Dicks. ex Brid.) Hedenäs: P [LC]

- Syntrichia calcicola* J.J.Amann: P, E, C [LC]
Syntrichia caninervis Mitt.: E, C [NT]. Represented by var. *caninervis*. Reports of var. *gypsophila* (J.J.Amann ex G.Roth) Ochyra are due to confusion with typical *S. caninervis*.
Syntrichia fragilis (Taylor) Ochyra: P [VU]
Syntrichia laevipila Brid.: P, E, C [LC]
Syntrichia montana Nees: P, E, C [LC]. Represented by var. *montana*
Syntrichia norvegica F.Weber: P [LC]
Syntrichia papillosa (Wilson) Jur.: P, E, C [LC]
Syntrichia princeps (De Not.) Mitt.: C [DD]
Syntrichia ruralis (Hedw.) F.Weber & D.Mohr: P, E, C [LC]. Two varieties occur: var. *ruralis* (P, E and C) and var. *ruraliformis* (Besch.) Delogne (P and C).
Syntrichia sinensis (Müll.Hal.) Ochyra: P [NT]
Syntrichia subpapillossisima (Bizot & R.B.Pierrot ex W.A.Kramer) M.T.Gallego & J.Guerra: P, C [NT]
Syntrichia virescens (De Not.) Ochyra: P, E, C [LC]. Represented by var. *virescens*.
Taxiphyllum wissgrillii (Garov.) Wijk & Margad.: P, C [NT]
Tayloria froelichiana (Hedw.) Mitt. ex Broth.: P [CR]
Tayloria tenuis (Dicks.) Schimp.: P [VU]
Tetraphis pellucida Hedw.: P, C [LC]
Thamnobryum alopecurum (Hedw.) Gangulee: P, C [LC]
Thuidium assimile (Mitt.) A.Jaeger: P, C [LC]
Thuidium delicatulum (Hedw.) Schimp.: P, E, C [LC]
Thuidium recognitum (Hedw.) Lindb.: P, E, C [LC]
Thuidium tamariscinum (Hedw.) Schimp.: P, E, C [LC]
Timmia austriaca Hedw.: P [LC]
Timmia bavarica Hessel.: P [LC]
Timmia megapolitana Hedw.: P [CR]
Timmia norvegica J.E.Zetterst.: P [VU]
Timmiella anomala (Bruch & Schimp.) Limpr.: C [DD]
Timmiella barbuloidea (Brid.) Mönk.: C [NT]
Tomentypnum nitens (Hedw.) Loeske: P [NT]
Tortella flavovirens (Bruch) Broth.: P, E, C [LC]. Represented by var. *flavovirens*.
Tortella fragilis (Hook. & Wilson) Limpr.: P [NT]
Tortella humilis (Hedw.) Jenn.: P, E, C [LC]
Tortella inclinata (R.Hedw.) Limpr.: P, E, C [LC]. Two varieties occur: var. *inclinata* (P, E and C sectors) and var. *densa* (Lorentz & Molendo) Limpr., which occurs in mountain areas (P and C sectors).
Tortella inflexa (Bruch) Broth.: C [LC]
Tortella nitida (Lindb.) Broth.: P, E, C [LC]
Tortella squarrosa (Brid.) Limpr.: P, E, C [LC]
Tortella tortuosa (Hedw.) Limpr.: P, E, C [LC]. Represented by var. *tortuosa* (P, E and C sectors) and var. *fragilifolia* (Jur.) Limpr. (P and C sectors).

- Tortula acaulon* (With.) R.H.Zander: P, E, C [LC]. The following varieties have been recorded:
var. *acaulon* (P, E and C sectors), var. *papillosa* (Lindb.) R.H.Zander (P and C sectors), var. *pilifera* (Hedw.) R.H.Zander (C sector) and var. *schreberiana* (Dicks.) R.H.Zander (C sector).
- Tortula atrovirens* (Sm.) Lindb.: P, C [LC]
Tortula brevissima Schiffn.: E, C [LC]
Tortula canescens Mont.: P, E, C [LC]
Tortula caucasica Broth.: P, C [LC]
Tortula cuneifolia (Dicks.) Turner: P, C [LC]
Tortula hoppeana (Schultz) Ochyra: P [LC]
Tortula inermis (Brid.) Mont.: P, E, C [LC]
Tortula israelis Bizot & F.Bilewsky: ?C [DD]
Tortula lindbergii Broth.: P, E, C [LC]
Tortula marginata (Bruch & Schimp.) Spruce: E, C [LC]
Tortula mucronifolia Schwägr.: P [LC]
Tortula muralis Hedw.: P, E, C [LC]. Represented by var. *muralis*
Tortula pallida (Lindb.) R.H.Zander: C [VU]
Tortula protobryoides R.H.Zander: E, C [LC]
Tortula revolvens (Schimp.) G.Roth: E [NT]
Tortula schimperi M.J.Cano, Werner & J.Guerra: P, C [NT]
Tortula subulata Hedw.: P, E, C [LC]
Tortula truncata (Hedw.) Mitt.: P, C [LC]
Tortula vahliana (Schultz) Mont.: C [LC]
Tortula viridifolia (Mitt.) Blockeel & A.J.E.Sm.: C [DD]
Tortula vlassovii (Laz.) Ros & Herrnst.: E [VU]
Tortula wilsonii (Hook.) R.H.Zander: P, C [LC]
Trichodon cylindricus (Hedw.) Schimp.: P, C [DD]
Trichostomum brachydontium Bruch: P, E, C [LC]
Trichostomum crispulum Bruch: P, E, C [LC]
Ulota crispa (Hedw.) Brid.: P, C [LC]
Ulota crispula Bruch: P, C [LC]
Warnstorfia fluitans (Hedw.) Loeske: P [CR]
Weissia brachycarpa (Nees & Hornsch.) Jur.: P, C [LC]
Weissia condensata (Voit) Lindb.: E, C [LC]. Represented by var. *condensata*.
Weissia controversa Hedw.: P, E, C [LC]. Two varieties occur: var. *controversa* (P, E and C) and var. *crispata* (Nees & Hornsch.) Nyholm. (its detailed distribution is unknown).
Weissia levieri (Limpr.) Kindb.: C [DD]
Weissia longifolia Mitt.: P, E, C [LC]
Weissia rutilans (Hedw.) Lindb.: C [DD]
Weissia squarrosa (Nees & Hornsch.) Müll.Hal.: C [VU]
Weissia wimmeriana (Sendtn.) Bruch & Schimp.: P [NT]
Zygodon rupestris Schimp. ex Lorentz: P, E, C [LC]

NON-NATIVE SPECIES

Four non-native bryophytes, which were unintentionally introduced, are currently present in the studied area:

***Campylopus introflexus* (Hedw.) Brid.**

It is an alien species in Europe (Söderström, 1992; Essl & Lambdon, 2009) which exhibits highly invasive and expansive behaviour. This moss is currently known from northeastern Catalonia, between northern Alt Empordà and Prades massif (Sérgio *et al.*, 2007), where it is rapidly spreading throughout the area, even in natural habitats.

***Didymodon australasiae* (Hook. & Grev.) R.H.Zander**

Listed by Essl & Lambdon (2009) as an alien species in Europe. It is a naturalized non-invasive species in our area, where it mainly grows in habitats of anthropogenic character. It was recorded from Falset, Premià and the urban area of Barcelona (Guerra & Ros, 1987).

***Didymodon umbrosus* (Müll.Hal.) R.H.Zander**

It is regarded as an alien species in Europe (Söderström, 1992). It is a naturalized non-invasive species, very common in urban areas (Barcelona, where several locations are known).

***Leptophascum leptophyllum* (Müll.Hal.) J.Guerra & M.J.Cano**

Listed by Essl & Lambdon (2009) as an alien species in Europe. This is a naturalized non-invasive species in the Iberian Peninsula (Guerra, 2006a), which grows in lowland, in nitrophilic and strongly anthropized environments, sometimes occurs in botanical gardens and urban areas. It is known from scattered locations throughout the Catalan Ranges.

EXCLUDED TAXA***Brachytheciastrum olympicum* (Jur.) Vanderp., Ignatov, Huttunen & Goffinet**

It was reported from Vall d'Alinyà (Cros *et al.*, 2004) and Els Ports massif (Casas *et al.*, 1985b). However, the vouchers specimens belong to *B. velutinum*.

***Bryum subapiculatum* Hampe**

Casas *et al.* (1998a) reported this species from a single location in Cap de Creus Peninsula. However, the voucher specimen belongs to *B. rubens*.

***Leskea polycarpa* Hedw.**

Recorded from central Pyrenees, Val de Molières (Canalís & Casas, 1985) and Montnegre (Cros i Matas, 1985). The voucher specimens belong to *Lescuraea patens* and *Lescuraea incurvata*, respectively.

***Mesoptychia badensis* (Gottsche ex Rabenh.) L.Söderstr. & Váňa**

Records from Montnegre (Cros i Matas, 1985) and Montsant (Casals & Cros, 1995) are due to confusion with *M. turbinata*, and Cap de Creus (BCB 16950) with *Cephaloziella calyculata*.

***Syntrichia caninervis* var. *gypsophila* (J.J.Amann ex G.Roth) Ochyra**

It was reported from Tudela de Segre (Brugués *et al.*, 1993, sub *Tortula caninervis* subsp. *spuria*). However, the voucher specimen (BCB 30883) belongs to typical *Syntrichia caninervis* (Gallego, 2006).

***Tortella bambergeri* (Schimp.) Broth.**

Records of *Tortella bambergeri* from eastern Pyrenees and Montserrat (Brugués *et al.*, 2009) are referable to *T. tortuosa* following Köckinger & Hedenäs (2017) criteria.

DOUBTFUL OR UNCERTAIN TAXA

***Douinia ovata* (Dicks.) H.Buch**

It was reported from Bossost by Casas i Sicart (1986). However, the scarce herbarium material does not allow conclusive identification. Further material is needed to confirm its presence in the studied area.

***Fissidens rufulus* Schimp.**

The species was listed for Lleida province (Guerra & Ederra, 2015), based on a literature record. However, as far as we know, there are no concrete and reliable bibliographic references of this species for the studied area.

***Pohlia obtusifolia* (Vill. ex Brid.) L.F.Koch**

A report from Val d'Aran (Allorge & Casas de Puig, 1962) requires confirmation.

RED LIST

The Red List includes Regionally Extinct (RE) and threatened species (CR, EN and VU). Additionally, a list of species assessed as Near Threatened (NT) and Deficient Data (DD) is also provided. Within each IUCN category, species are arranged alphabetically within each phylum (hornworts, liverworts and mosses). The following information is provided for each species:

- 1) IUCN (2012a) category.
- 2) Basic information about its distribution in the territory, main habitat where the species is found and main threats, among other supplementary data. On the other hand, for species that in our area have most of their subpopulations in the Pyrenees, information

about to their presence in nearby areas are provided: Andorra (Sotiaux & Vanderpoorten, 2017), Aragón (Infante Sánchez & Heras Pérez, 2003); Pyrénées-Orientales (Hugonnot *et al.*, 2018) and the Midi-Pyrénées region (Infante Sánchez, 2015; Infante Sánchez *et al.*, 2015).

REGIONALLY EXTINCT SPECIES (RE)

Liverworts

***Scapania verrucosa* Heeg**

The species was found in Planoles (eastern Pyrenees) in 1964 by C. Casas, growing on slopes within a *Pinus sylvestris* forest at 1800 m a.s.l (Casas *et al.*, 2008). Although several specific surveys have been conducted to relocate this species, its presence in Planoles has not been confirmed. *S. verrucosa* was reported from Andorra, where it is currently considered extinct (Sotiaux & Vanderpoorten, 2017). These Andorran and Catalan locations are the only records of *S. verrucosa* in the Iberian Peninsula.

Mosses

***Campyliadelphus elodes* (Lindb.) Kanda**

Casas & Girbal (1988) reported this species from Estany de Basturs (central pre-Pyrenees), where it was found growing on edges and clay walls of the lake, at 570 m a.s.l. The species has not been recently found even though several surveys have been carried out in the area. There is a report (not supported by voucher specimens) from the Banyoles area (Barnola, 1920). *C. elodes* is assessed as RE in our area since all known locations (Basturs and Banyoles) have been visited and surveyed without success.

***Dicranum muehlenbeckii* Bruch & Schimp.**

The only known location of this species in the studied area corresponds to a beech forest in the Garrotxa volcanic field, at ca. 550 m, where it was collected growing on rocks by C. Casas in 1952. Although this area has been subject of bryological studies (Brugués *et al.*, 2007a) and that several specific surveys have been conducted to relocate this species, the presence of *D. muehlenbeckii* in the area has not been confirmed, so it is assigned to the RE category.

***Entosthodon kroonkurk* Dirkse & Brugués**

This ephemeral species is known from a single collection site in Cap de Creus Peninsula, where it was collected in 1959 (Dirkse & Brugués, 2010) but it has not been relocated despite several searches.

***Hygrohypnum cochleariifolium* (Venturi) Broth.**

This species has one historical locality in Val d'Aran, Tredós (Husnot, 1876). At the end of the 19th century, it was collected in a very close Aragonese locality: Maladeta massif (*leg.*

Goulard, BM). The locality where *H. cochleariifolium* was reported in our area still maintains suitable habitat for this species, but it has been surveyed without success.

CRITICALLY ENDANGERED SPECIES (CR)

Liverworts

***Clevea spathysii* (Lindenb.) Müll.Frib. – CR B1ab(iii)+2ab(iii); D**

A single population is known in Els Ports massif, between Fredes and El Caro (Casas *et al.*, 1985b). The species occurs on calcareous soil in a small cave at 1050 m a.s.l., where it has a very restricted population (EOO= 4 km²; AOO= 4 km²). A single patch measuring about 25 cm² was observed. In this study a single discrete patch of *C. spathysii* is regarded as an individual. It therefore meets the IUCN (2012a) criteria for CR, based on the number of individuals (fewer than 50) and a decline due to natural plant competition is inferred.

***Crossocalyx hellerianus* (Nees ex Lindenb.) Meyl. – CR B1ab(iii)+2ab(iii)**

So far, this species is known from a single location (EOO= 4 km²; AOO= 4 km²) in the central Pyrenees: Val d'Aran, Portilló de Bossost (BCB 24918). The species grows on decaying wet logs, at 1280 m a.s.l. A population decline is inferred due to natural causes *and disturbances* induced by human activity. *C. hellerianus* is extremely rare in nearby areas: Andorra (Sotiaux & Vanderpoorten, 2017), Aragonese Pyrenees (Casas Sicart, 1986) and the Midi-Pyrénées region, where it has been assessed as CR (Infante Sánchez *et al.*, 2015).

***Fuscocephaloziopsis loitlesbergeri* (Schiffn.) Váňa & L.Söderstr. – CR B1ab(iii)+2ab(iii)**

The presence of the species in our area is restricted to a single location (EOO= 4 km²; AOO= 4 km²) in the central Pyrenees: Trescuro lake surroundings (Casas *et al.*, 2008). The species occurs on rotting fir (*Abies alba* L.) stumps at 200 m a.s.l. A population decline was inferred by Brugués *et al.* (2014a). Apparently, this subpopulation seems to be relatively isolated, since *F. loitlesbergeri* is unknown from nearby areas: Andorra (Sotiaux & Vanderpoorten, 2017); Aragón (Infante Sánchez & Heras Pérez, 2003), Midi-Pyrénées region (Infante Sánchez, 2015) and Pyrénées-Orientales department (Hugonnot *et al.*, 2018).

***Kurzia sylvatica* (A.Evans) Grolle – CR B1ab(iii)+2ab(iii)**

The species has an isolated population (EOO= 4 km²; AOO= 4 km²) in northeastern Catalonia, which corresponds to a ravine in Rabós, L'Albera massif, at 300 m a.s.l. (Thouvenot, 2005). This ravine has a very dense maquis of *Erica* spp. and is not exposed to remarkable anthropogenic disturbances, although changes that could affect the survival of the population could occur, related to the natural vegetation dynamics or catastrophic events.

***Mannia fragrans* (Balb.) Frye & L.Clark – CR B1ab(iii)+2ab(iii); C2a(i,ii); D**

In the Iberian Peninsula the species is only known from the Garrinada volcano in the Garrotxa volcanic field (EOO= 4 km²; AOO= 4 km²) where a small population of about 14 m²

is found (Cros *et al.*, 2012) although the exact coverage is ca. 1 m² (Anonymous, 2018). According to Cros *et al.* (2012) the population includes four individuals (a single discrete patch of the species is regarded as an individual). The species occurs on clayey soils at ca. 450 m a.s.l. (Cros, 2003; Cros *et al.*, 2012). This population is practically surrounded by Olot village, so it could easily be affected by human activities as well as by grazing sheep (Cros *et al.*, 2012). Habitat loss due to invasive species is a serious threat to *M. fragans*. However, between 2009 and 2018 no decline in coverage has been detected (Anonymous, 2018).

***Marsupella sprucei* (Limpr.) Bernet** – CR B1ab(iii)+2ab(iii)

So far, this species is only known from one Pyrenean location: Norís (Casas *et al.*, 2008). The species occurs on a wet slope in an oak forest, at 1200 m a.s.l. (EOO= 4 km²; AOO= 4 km²). A population decline is inferred due to *disturbances* induced by human activity. The species is extremely rare in the Pyrénées-Orientales department, where it is known from a single location in the Canigou massif (Hugonnot *et al.*, 2018). *M. sprucei* has been assessed as DD in the Midi-Pyrénées region (Infante Sánchez *et al.*, 2015).

***Nardia breidleri* (Limpr.) Lindb.** – CR B1a(iii)+B2a(iii)

The presence of the species in our area is restricted to a single location (EOO= 4 km²; AOO= 4 km²) in the central Pyrenees: Estany de Certascan surroundings (BCB 54058). At this location *Nardia breidleri* occurs in snow-beds on acidic rocks at 2240 m a.s.l. The species is known from nearby areas: Andorra (Sotiaux & Vanderpoorten, 2017) and the Midi-Pyrénées region (Infante Sánchez *et al.*, 2015), where it has been assessed as VU.

***Nardia insecta* Lindb.** – CR B1ab(iii)+2ab(iii); D

The species is known from a single location in Alt Àneu, at the northern slope of the Roca Blanca peak (Sáez *et al.*, 2011), where it has a very restricted population size (EOO= 4 km²; AOO= 4 km²). A single patch measuring about 25 cm² was observed in a shady gully. In this study a single discrete patch of *N. insecta* is regarded as an individual. It therefore meets the IUCN (2012b) criteria for CR, based on the number of individuals (fewer than 50) and a decline due to natural plant competition is inferred. The species is known from nearby French areas: Midi-Pyrénées region (Infante Sánchez *et al.*, 2015), where it has been assessed as VU and Pyrénées-Orientales department [3 locations] (Hugonnot *et al.*, 2018).

***Pallavicinia lyellii* (Hook.) Gray** – CR B1ab(iii)+2ab(iii)

This species, which is more or less widespread in western Iberian Peninsula, has an isolated population (EOO= 4 km²; AOO= 4 km²) in a ravine in Rabós, L'Albera massif, at 300 m a.s.l. (Thouvenot, 2005). This ravine has a very dense maquis of *Erica* spp. and is not exposed to remarkable anthropogenic perturbations, although changes that could affect the survival of the population could occur, related to the natural vegetation dynamics or catastrophic events.

***Scapania gymnostomophila* Kaal.** – CR B1ab(ii,iii)+2ab(ii,iii)

The species is only known from two locations (EOO= 8 km²; AOO= 8 km²) in eastern Pyrenees and Catalan Ranges: La Molina and Prades, L'Abellera (Casas de Puig, 1954;

Brugués, 1978). The species occurs on rocky places between 970 and 1700 m a.s.l. A population decline is inferred due to natural causes *and disturbances* induced by human activity: urbanisation and tourism activities (in La Molina subpopulation) and trampling in L'Abellera subpopulation. *S. gymnostomophila* is extremely rare in the Midi-Pyrénées region, where it has been assessed as DD (Infante Sánchez *et al.*, 2015).

***Tritomaria scitula* (Taylor) Jörg. – CR B1ab(iii)+2ab(iii)**

The species is known from Pic del Pinetó, central Pyrenees (Sáez *et al.*, 2011) where two small stands are known (EOO= 4 km²; AOO= 4 km²). A population decline in Pic del Pinetó is inferred due to *disturbances* induced by human activity. *T. scitula* was also reported from Andorra (Sotiaux & Schumacker, 2002), where it is currently considered rare (Sotiaux & Vanderpoorten, 2017), while its presence in the French slope of the Pyrenees (Hautes Pyrénées) is uncertain (Infante Sánchez, 2015).

Mosses

***Arctoa fulvella* (Dicks.) Bruch & Schimp. – CR B1ab(iii)+2ab(iii)**

It is a very rare species on the Iberian Peninsula, known as a few locations in the central Pyrenees, where it usually grows in acidic and humid rocks within the alpine belt. In Catalonia, only one confirmed location (EOO= 4 km²; AOO= 4 km²) of this species is known: a collection carried out in 1988 in the Estany de Certascan (Casas *et al.*, 2006). The species has also been recorded in nearby areas: Aragonese Pyrenees (Casas Sicart, 1986), Andorra (Sotiaux & Vanderpoorten, 2017) and France, Midi-Pyrénées region (Infante Sánchez *et al.*, 2015), where it has been assessed as DD.

***Brachythecium cirrosum* (Schwägr.) Schimp. – CR B1ab(iii,iv)+2ab(iii,iv)**

So far, this species is only known from two locations (EOO= 8 km²; AOO= 8 km²): close to Colomers refuge in Val d'Aran (Orgaz, 2012a) and Núria, eastern Pyrenees (Casas de Puig, 1957). In the latter location the species could have disappeared (Orgaz, 2012a). A population decline is inferred due to natural causes *and disturbances* induced by human activity and the loss of the Núria subpopulation justifies the application of sub-criterion “b(iv)”. *B. cirrosum* is known from nearby areas: Andorra (Sotiaux & Vanderpoorten, 2017) and France: Midi-Pyrénées region (Infante Sánchez *et al.*, 2015), where it has been assessed as DD, and Pyrénées-Orientales department [6 locations] (Hugonnot *et al.*, 2018).

***Campylopus subulatus* Schimp. ex Milde – CR B1ab(iii)+2ab(iii); C2a(ii); D**

The species is known from a single location (EOO= 4 km²; AOO= 4 km²) in Montolivet volcano, Olot (Brugués *et al.*, 2007a). It grows on rocky places, at 500 m a.s.l. A population decline is inferred due to natural causes *and disturbances* induced by human activity (trampling). The species is also known from nearby areas in Andorra (Sotiaux & Vanderpoorten, 2017) and France: Midi-Pyrénées region (Infante Sánchez *et al.*, 2015), where

it has been assessed as DD, and Pyrénées-Orientales department [3 locations] (Hugonnot *et al.*, 2018).

***Dichelyma falcatum* (Hedw.) Myrin** – CR B1ab(iii)+2ab(iii)

This arctic-alpine species is found in a single population (EOO= 4 km²; AOO= 4 km²) in the studied area: eastern Pyrenees, Puig Pedrós, where it was found growing on acidic rocks along a stream within the alpine belt (Casas & Peñuelas, 1985). The other two Pyrenean populations are found in Pyrénées-Orientales department (Hugonnot *et al.*, 2018). Recent surveys in Puig Pedrós in the last decade failed to confirm the presence of the species, although suitable habitat exists at this site, therefore it is likely that it is still present in this mountain.

***Drepanocladus polygamus* (Schimp.) Hedenäs** – CR B1ab(iii)+2ab(iii)

So far, this species is known from a single location (EOO= 4 km²; AOO= 4 km²): central Pyrenees, between Estany Mort and Estany Garguills (Fuertes *et al.*, 2010). It occurs on wet soils at 2200 m a.s.l. together with *Warnstorfia fluitans*. A population decline is inferred due to *modifications of the water regime* induced by natural causes and human activity. The species is extremely rare in Aragón (Infante Sánchez & Heras Pérez, 2003) and the Midi-Pyrénées region, where it has been assessed as DD (Infante Sánchez *et al.*, 2015).

***Entosthodon mouretii* (Corb.) Jelenc** – CR B1ab(iii)+2ab(iii)

In our area it is known from L'Albera massif (Casas *et al.*, 1998c) where it occurs at the margins of periodically flooded depressions in the lowlands. *E. mouretii* is also known from a single location in Pyrénées-Orientales department (Thouvenot, 2008; Hugonnot *et al.*, 2018). The species is assessed as CR because of the small EOO and AOO (4 km²), small number of known locations and a population decline is inferred due to *disturbances* induced by human activity (vehicle circulation, drainage of the wetland, use of fertilizers and pesticides in nearby crops).

***Kiaeria blyttii* (Bruch & Schimp.) Broth.** – CR B1ab(iii)+2ab(iii)

In the studied area the species is known from the Estany Romedo de Baix in central Pyrenees, where it occurs on stony slopes near the lake at 240 m a.s.l. (Brugués & Ruiz, 2012). The species is assessed as CR because of the small EOO and AOO (4 km²), small number of known locations and a population decline is inferred due to *natural causes or stochastic events*.

***Oncophorus wahlenbergii* Brid.** – CR B1ab(iii)+2ab(iii)

A population of the species at Ulldeter in eastern Pyrenees (Lloret, 1989) is the only confirmed record from our area (EOO= 4 km²; AOO= 4 km², covering a few square meters). The species grows on moist acidic soils between 2300 and 2400 m a.s.l. Two stands are known separated from each other by about 100 m (A. Lluent, *pers. comm.*). *O. wahlenbergii* is also known from Pyrénées-Orientales department [ca. 5 locations] (Hugonnot *et al.*, 2018). Some subpopulations found in Pyrénées-Orientales department are very close to Ulldeter. In our area a population decline is inferred due to *natural causes and disturbances* induced by human activity (ski facilities and tramplng).

***Sarmentypnum sarmentosum* (Wahlenb.) Tuom. & T.J.Kop. – CR B1ab(iii)+2ab(iii)**

This species is known from a single location: central Pyrenees, Clots del Port (Brugués & Ruiz, 2003). It occurs on wet acidic soils around streams and lakes at 2450 m a.s.l. (EOO= 4 km²; AOO= 4 km²). Two stands covering a few square meters are known separated from each other a few tens of meters (A. Lluent, *pers. comm.*). A population decline is inferred due to *modifications of the water regime* induced by natural causes and human activity. The species is also known from Andorra (Sotiaux & Vanderpoorten, 2017) and France: the Midi-Pyrénées region, where it has been assessed as EN (Infante Sánchez *et al.*, 2015) and Pyrénées-Orientales department [ca. 14 locations] (Hugonnot *et al.*, 2018). Some subpopulations found in Pyrénées-Orientales department are very close to Clots de Port.

***Scorpidium revolvens* (Sw. ex anon.) Rubers – CR B1ab(iii)+2ab(iii)**

This species is confined to a single location in our area: Val d'Aran, Aiguamòg (Canalís *et al.* (1984), where it grows on peaty soil. Since the species has an extremely restricted range (EOO= 4 km²; AOO= 4 km², covering a few square meters) and grows in a fragile habitat it is especially sensitive to environmental changes. A population decline is inferred due to hydrological changes induced by human activity, natural causes or by catastrophic events. The species is also known from France: the Midi-Pyrénées region, where it has been assessed as VU (Infante Sánchez *et al.*, 2015) and Pyrénées-Orientales department [1 location] (Hugonnot *et al.*, 2018).

***Scorpidium scorpioides* (Hedw.) Limpr. – CR B1ab(iii)+2ab(iii)**

The species is known from in Val d'Aran, Aiguamòg (Canalís & Casas, 1985; Pérez-Haase *et al.*, 2011), where there are several small stands (covering a few square meters) in two main areas separated from each other by about 1000 m (EOO= 4 km²; AOO= 4 km²). The species occurs in fens, shallow pools and streams, between 1800 and 1890 m a.s.l. A population decline is inferred for the same reasons that have been exposed for *Scorpidium revolvens*. The species is also known from Andorra (Sotiaux & Vanderpoorten, 2017) and France: the Midi-Pyrénées region (Infante Sánchez, 2015), where it has been assessed as EN (Infante Sánchez *et al.*, 2015).

***Tayloria froelichiana* (Hedw.) Mitt. ex Broth. – CR B1ab(iii)+2ab(iii)**

The presence of the species in our area is restricted to the Axial zone of the Pyrenees, with two locations (EOO= 8 km²; AOO= 8 km²): Val de Molières (Casas *et al.*, 2006) and Coma de Vaca, (Casas & Brugués, 1981) where it occurs in moist soils between 1300 and 250 m a.s.l. The species is assessed as CR because of the low EOO and AOO values, its severely fragmented range and a population decline is inferred due to *natural causes or stochastic events*. *T. froelichiana* was recorded from nearby areas in Aragón (Husnot, 1884-1890) and France: Midi-Pyrénées region (Infante Sánchez *et al.*, 2015), where it has been assessed as DD and Pyrénées-Orientales department [ca. 4 locations] (Hugonnot *et al.*, 2018).

***Timmia megapolitana* Hedw. – CR B1ab(iii)+2ab(iii)**

The population of this species found at Cova del Gel, Montsec, in central Pre-Pyrenees (Casas, 1993a) is the only confirmed record from our area (EOO= 4 km²; AOO= 4 km²). An

ancient record for Port de la Bonaigua (Husnot, 1876) requires confirmation. *T. megapolitana* was reported from Aragonese Pyrenees: Paderna (Husnot, 1876) and French central Pyrenees: Ariège, Haute Garonne and Hautes-Pyrénées (Infante Sánchez, 2015), although there is insufficient knowledge to assign a concrete threat status with confidence in the Midi-Pyrénées region: it has been assessed as DD (Infante Sánchez *et al.*, 2015). In our area a population decline is inferred due to natural causes *and disturbances* induced by human activity (trampling).

***Warnstorfia fluitans* (Hedw.) Loeske – CR B1ab(iii)+2ab(iii)**

The presence of the species in our area is restricted to a single location (EOO= 4 km²; AOO= 4 km²) in the central Pyrenees: between Estany Mort and Estany Garguils (Fuertes *et al.*, 2006). A population decline is inferred for the same reasons that have been exposed for *Drepanocladus polygamus*. The species is also known from Aragonese Pyrenees, Vall de Llauset (BCB 50942) and France: the Midi-Pyrénées region, where it has been assessed as DD (Infante Sánchez *et al.*, 2015) and Pyrénées-Orientales department [9 locations] (Hugonnot *et al.*, 2018).

ENDANGERED SPECIES (EN)

Liverworts

***Calypogeia integristipula* Steph. – EN D**

In the studied area the species occurs at two Pyrenean locations (EOO= 8 km²; AOO= 8 km²): Baga de Queràs (BCB 22998) and Carboners (BCB 23001). In absence of evidence regarding a continuous population decline, the "Bb" subcriterion (IUCN, 2012a) cannot be applied. However, according to Brugués *et al.* (2014a), the species well merits assessment as EN on the basis of the number of mature individuals (<250; a single discrete patch of the species is regarded as an individual). *C. integristipula* is also known from nearby areas: Andorra (Sotiaux & Vanderpoorten, 2017) and France: Midi-Pyrénées region (Infante Sánchez, 2015) where it has been assessed as CR (Infante Sánchez *et al.*, 2015) and Pyrénées-Orientales department [7 locations] (Hugonnot *et al.*, 2018). Some subpopulations found in Pyrénées-Orientales department are very close to Baga de Queràs and Carboners, although the possibility of any rescue from French subpopulations is unknown.

***Cephaloziella calyculata* (Durieu & Mont.) Müll.Frib. – EN B1ab(ii,iii,iv)+2ab(ii,iii,iv)**

The species is closely confined to areas of strong maritime influence (EOO= ca. 285 km²; AOO= 12 km²): Triassic outcrops of Bruguers-Cervelló (Casas de Puig *et al.*, 1956), Montseny massif (Casas Sicart, 1960; Casas, 1986b) and Port de la Selva (BCB 16950). In the first of these areas, there has been a degradation of its habitat due to a high frequentation by visitors, which could have affected the subpopulation (collections in Bruguers are from 1947 and 1950, without having been retrieved in subsequent explorations of the area). The Bruguers-Cervelló subpopulation is inferred to be lost due to anthropogenic disturbances at this site, which justifies the application of subcriteria b(ii and iv). Habitat degradation in the form of invasive plant

encroachment, as well as anthropogenic disturbances are regarded as potential threats to *C. calyculata* in Port de la Selva.

***Cephaloziella grimsulana* (J.B.Jack ex Gottsche & Rabenh.) Lacout.** – EN B1ab(ii,iii,iv)+2ab(ii,iii,iv)

The presence of the species in our area is restricted to the Pyrenees, with two locations (EOO= 8 km²; AOO= 8 km²): Núria (Casas de Puig, 1952) and Estany de Certascan (BCB 27297), where it occurs on wet rocks, between 2000 and 2230 m a.s.l. The collection corresponding to Núria dates back to about 70 years, in that locality there is an obvious risk of anthropogenic disturbances due to tourism activities and trampling. The subpopulation of Certascan was discovered in 1988. No specific surveys have been conducted to relocate this species in both areas. The available information suggests that the species' range, in spite of being restricted, is not severely fragmented and exceeds the number of locations (sub-criterion "a") for CR. The species is also known from Andorra (Sotiaux & Vanderpoorten, 2017) and France: Pyrénées-Orientales department [11 locations] (Hugonnot *et al.*, 2018).

***Exormotheca pustulosa* Mitt.** – EN B1ab(ii,iii,iv)+2ab(ii,iii,iv)

It is a very rare species in our area, where it occurs on sandy siliceous soils and rock outcrops in the lowlands. The species is known from three locations (EOO= ca. 1290 km²; AOO= 12 km²): Portbou and cap de Creus Peninsula (Casas de Puig, 1958a,b; Casas *et al.*, 1996) and Garraf massif (L. Sáez and J. Cuscó, *pers. obs.*). The population size of the latter subpopulation is of the order of several tens of mature individuals (an individual is defined a single discrete patch). A population decline in quality of habitat is inferred for Garraf massif subpopulation due to *disturbances* and nitrification induced by wild boar (*Sus scrofa* Linnaeus, 1758) and encroachment of habitat by other bryophytes (*Corsinia coriandrina*, *Plagiochasma rupestre* and *Reboulia hemisphaerica*). The Portbou subpopulation is inferred to be lost due to human activity disturbances and invasion by introduced plants (*Opuntia* spp.) at this site, which justifies the application of subcriteria b(ii and iv). *E. pustulosa* is also known from Pyrénées-Orientales department [2 locations] (Hugonnot *et al.*, 2018).

***Jungermannia polaris* Lindb.** – EN B1ab(iii)+2ab(iii)

The presence of the species in our area is restricted to the central and eastern Pyrenees (EOO= ca. 470 km²; AOO= 12 km²): Val d'Aran, Artiga de Lin (BCB 32467), and two locations from Serra del Cadí (Ruiz *et al.*, 2018a; data from BCB). The species occurs on wet rocks, on shady calcareous rocks between 1800 and 2220 m a.s.l. A population decline in Serra del Cadí is inferred due to *disturbances* and nitrification currently induced by the Alpine marmot (*Marmota marmota* Linnaeus, 1758) an introduced species in the Pyrenees (Cassola, 2016). *J. polaris* is also known from relatively nearby areas: Aragonese Pyrenees, Posets-Maladeta (Infante & Heras, 2012); Andorra (Sotiaux & Vanderpoorten, 2017) and France: Pyrénées-Orientales department (Hugonnot *et al.*, 2018) and the Midi-Pyrénées region (Infante Sánchez, 2015). In the latter region it has been assessed as NT (Infante Sánchez *et al.*, 2015).

***Ptilidium pulcherrimum* (Weber) Vain.** – EN B1ab(iii)+2ab(iii)

The species is documented so far only from two locations (EOO= 8 km²; AOO= 8 km²), both in central Pyrenees: Estanys del Mig de Saboredó and Boavi (Casas *et al.*, 1989; Casas, 1993a). The species occurs on decaying wet logs and wet rocky places between 1600 and ca. 2280 m altitude. A population decline is inferred in AOO and number of subpopulations (Brugués *et al.*, 2014a). The available information suggests that the species' range, in spite of being restricted, is not severely fragmented and exceeds the number of locations (sub-criterion "a") for CR. The species is also known from nearby areas: Andorra (Sotiaux & Vanderpoorten, 2017) and France: Midi-Pyrénées region (Infante Sánchez, 2015) where it has been assessed as NT (Infante Sánchez *et al.*, 2015) and Pyrénées-Orientales department [1 location] (Hugonnot *et al.*, 2018).

***Riccardia incurvata* Lindb.** – EN B1ab(iii)+2ab(iii)

The presence of the species in our area is restricted to the Axial zone of the central Pyrenees, with two locations (EOO= 8 km²; AOO= 8 km²): Val de Molières (Peñuelas *et al.*, 1985) and Vallferrera (BCB 54072). It occurs semi-submerged in streams or on rotting fir (*Abies alba* L.) stumps, at 1600-200 m a.s.l. A population decline for the Catalan population is inferred by human activity, natural causes or by catastrophic events. The subpopulation located in Val de Molières is exposed to anthropogenic disturbances because it is very close to a road and the tunnel facilities. The other subpopulation is close to an area frequented by hikers (Vallferrera refuge), so anthropogenic disturbances due to tourism activities and trampling cannot be ruled out. The species' range, in spite of being restricted, is not severely fragmented and exceeds the number of locations (sub-criterion "a") for CR. *R. incurvata* is found in nearby areas in France: Midi-Pyrénées region (Infante Sánchez, 2015), where it has been assessed as EN (Infante Sánchez *et al.*, 2015) and Pyrénées-Orientales department [7 locations] (Hugonnot *et al.*, 2018).

Mosses***Brachythecium laetum* (Brid.) Schimp.** – EN D

The Aranese population located in Varradós valley (Orgaz, 2012b) occurs on limestone rocks and soil at ca. 2000 m a.s.l., (EOO= 4 km²; AOO= 4 km²). It is a small population (< 250 individuals, defined as a single discrete patch) that occupies 2-3 m² at hardly accessible spots which could only be affected by biotic disturbances, caused by the frequentation of the area for livestock (Orgaz, 2012b). There is no available information on population decline, otherwise *B. laetum* would qualify as CR in terms of criterion B. In the Midi-Pyrénées region Infante Sánchez *et al.* (2015) assessed this species as VU.

***Bryoerythrophyllum inaequalifolium* (Taylor) R.H.Zander** – EN B1ab(iii)+2ab(iii)

The species is only found in the eastern Pyrenees, Ter Valley (Lloret, 1989), where it grows in slopes between 150 and 1300 m a.s.l. The values of EOO and AOO are 8 km². This Pyrenean population can be affected road improvement works. Two relatively close populations are known in French territory, specifically in Vallespir (Hugonnot *et al.*, 2018).

***Buxbaumia aphylla* Hedw.** – EN B1ab(iii)+2ab(iii)

In our area its presence is known from three Pyrenean areas (EOO= ca. 110 km²; AOO= 12 km²): Estany Llong (Casas Sicart, 1986), Ulldeter (Infante Sánchez & Heras Pérez, 1998) and Espot Valley (M. Guardiola, *pers. comm.*), where it occurs on decaying wet logs in subalpine forests. This habitat is effimerous and strongly subject to forest management. Reports from Serra de Moixeró in the eastern Pre-Pyrenees (Álvaro Martín & Hladun Simón, 1983), although plausible, require verification as in recent times in this area *Buxbaumia viridis* has been found (Carnicero & Unzeta, 2016; Ruiz *et al.*, 2018a). *B. aphylla* is not listed for Midi-Pyrénées region (Infante Sánchez *et al.*, 2015) or for Andorra (Sotiaux & Vanderpoorten, 2017). Nevertheless, at least 5 subpopulations of *B. aphylla* are known from Pyrénées-Orientales department (Hugonnot *et al.*, 2018). Some subpopulations found in Pyrénées-Orientales department are very close to Ulldeter, although the possibility of any rescue from French subpopulations is unknown.

***Calliergon giganteum* (Schimp.) Kindb.** – EN B1ab(iii)+2ab(iii)

It is a very rare species in the Iberian Peninsula, where it grows near water courses or in flooded areas. The species is known from three Aranese locations (EOO= ca. 106 km²; AOO= 12 km²): la Bassa Nera, Pla de Beret (Brugués *et al.*, 1999; Oliván *et al.*, 2005) and Vall de Toran (Pérez-Haase *et al.*, 2011). Bassa Nera subpopulation is strictly protected, while subpopulation located in Pla de Beret (near a ski resort) is exposed to anthropogenic impacts. In the Midi-Pyrénées region this species has also been assessed as EN (Infante Sánchez *et al.*, 2015).

***Hypnum recurvatum* (Lindb. & Arnell) Kindb.** – EN B1ab(iii)+2ab(iii)

The presence of the species in our area is restricted to the Pyrenees, with two locations: La Molina and La Vansa (Ruiz & Brugués, 2011). It occurs on calcareous rocky places in montane areas. The species is assessed as EN because of the small EOO and AOO (8 km²), small number of known locations and a population decline is inferred due to *disturbances* induced by human activity (urbanisation, tourism activities) and natural causes. The species' range, in spite of being restricted, is not severely fragmented and exceeds the number of locations (sub-criterion "a") for CR. *H. recurvatum* is also known from nearby areas in Aragón (Ruiz & Brugués, 2011) and France: Midi-Pyrénées region (Infante Sánchez, 2015), where it has been assessed as DD (Infante Sánchez *et al.*, 2015) and Pyrénées-Orientales department [2 locations] (Hugonnot *et al.*, 2018).

***Polytrichum longisetum* Sw. ex Brid.** – EN B1ab(iii)+2ab(iii)

The presence of the species in our area is restricted to the Axial zone of the Pyrenees, with two confirmed locations: Estany de Malniu, 2200 m (Brugués *et al.*, 1982a) and Alt Àneu, Riera del Tinter, 200 m (Cros *et al.*, 2010). A record from Hospital de Viella (Casas Sicart, 1986) requires confirmation. The species has a restricted range in our area (EOO= 8 km²; AOO= 8 km²) and it is especially sensitive to environmental changes. *P. longisetum* is assessed as EN because of the low values of EOO and AOO, small number of known locations and a population

decline is inferred due to *modifications of the water regime* induced by human activity and natural causes. The species' range, in spite of being restricted, is not severely fragmented and exceeds the number of locations (sub-criterion "a") for CR.

***Pohlia annotina* (Hedw.) Lindb.** – EN B1ab(iii)+2ab(iii)

Two confirmed locations (EOO= 8 km²; AOO= 8 km²) in our area correspond to the central Pyrenees: Port de la Bonaigua (Zetterstedt, 1965) and Aiguamòg (Pérez-Haase *et al.*, 2011). Since this species requires a high water table, any alteration of the water regime, could determine its disappearance. The species' range, in spite of being restricted, is not severely fragmented and exceeds the number of locations (sub-criterion "a") for CR. *P. annotina* is known from nearby areas: Andorra (Sotiaux & Vanderpoorten, 2017), Pyrénées-Orientales department [18 locations] (Hugonnot *et al.*, 2018) and Midi-Pyrénées region (Infante Sánchez, 2015). In the latter area the species has been assessed as DD (Infante Sánchez *et al.*, 2015).

***Sphagnum angustifolium* (C.E.O.Jensen ex Russow) C.E.O.Jensen** – EN B1ab(iii)+2ab(iii)

The species has a very restricted distribution in our area, where it is known from two Pyrenean locations (EOO= 8 km²; AOO= 8 km²): Pla de Boet and Bassa Nera - Pletiu dera Montanheta (Brugués *et al.*, 2004; Casas *et al.*, 2006; Pérez-Haase *et al.*, 2011). In both locations, *S. angustifolium* has a low cover. Around Bassa Nera the population consists only of about four stands in two 100x100 m UTM grids. The species is assessed as EN based on its restricted range in our area, small number of locations and a population decline is inferred due to *modifications of the water regime* due to natural causes and human activity. The species is also known from relatively nearby areas in France: Midi-Pyrénées region (Infante Sánchez, 2015), where it has been assessed as VU (Infante Sánchez *et al.*, 2015) and Pyrénées-Orientales department [ca. 15 locations] (Hugonnot *et al.*, 2018).

***Sphagnum centrale* C.E.O.Jensen** – EN B1ab(iii)+2ab(iii)

The presence of the species in our area is restricted to the Axial zone of the Pyrenees, with three locations (EOO= 12 km²; AOO= 12 km²): Aiguamòg, Estany Llong and Circ de Colomers (Casas Sicart, 1986). *S. centrale* is found in nearby areas in Andorra (Sotiaux & Vanderpoorten, 2017) and France: Midi-Pyrénées region (Infante Sánchez, 2015), where it has been assessed as EN (Infante Sánchez *et al.*, 2015) and Pyrénées-Orientales department [ca. 11 locations] (Hugonnot *et al.*, 2018). The species is assessed as EN for the same reasons that have been exposed for *Sphagnum angustifolium*.

***Sphagnum fuscum* (Schimp.) H.Klinggr.** – EN B1ab(iii)+2ab(iii)

The only known Iberian locations of *S. fuscum* are found in the central Pyrenees: two Aranese locations, Aiguamòg and Unhòla (Gauthier, 1991; Pérez-Haase *et al.*, 2011) in addition to three Andorran locations: Els Estanys de la Vall of Madriu, the Ferrerols and Els Colells river (Lazare *et al.*, 2005) which are not included by Sotiaux & Vanderpoorten (2017). In the Midi-Pyrénées region the species has been assessed as VU (Infante Sánchez *et al.*, 2015). *S. fuscum* has an extremely restricted range in our area (covering a few square meters; EOO= 8

km²; AOO= 8 km²) and it is especially sensitive to environmental changes. The species is assessed as EN because of the small area of occupancy, small number of known locations and a population decline is inferred due to *modifications of the water regime* induced by human activity and natural causes. Both Aranese locations are relatively close, therefore, the species' range in the studied area is not severely fragmented and exceeds the number of locations (sub-criterion "a") for CR.

***Sphagnum tenellum* (Brid.) Pers. ex Brid. – EN B1ab(iii)+2ab(iii)**

Two subpopulations (EEO= 8 km²; AOO= 8 km²) are known in our area, both in central Pyrenees: Estany de Ratera (Casas Sicart, 1986) and Pletiu de Sotllo (Casanovas, 1991). The latter site is relatively close to the Andorran population (Sotiaux & Vanderpoorten, 2017). *S. tenellum* has been assessed as NT in the Midi-Pyrénées region (Infante Sánchez *et al.*, 2015). The species is assessed as EN for the same reasons that have been exposed for *Sphagnum angustifolium*.

VULNERABLE SPECIES (VU)

Hornworts

***Phaeoceros carolinianus* (Michx.) Prosk. – VU D2**

The species is closely confined to three main areas of strong maritime influence: Bruguers, Collserola massif and two locations in Cap de Creus Peninsula (Casas *et al.*, 1998a and data from BCB). In the first of these areas, where *Ph. carolinianus* was collected in 1951, there has been a degradation of its habitat due to a high frequentation by visitors, which could have affected the subpopulation. However, no specific surveys have been conducted to relocate this subpopulation and nothing is known about its current conservation status. The other subpopulations are found within protected areas (Natural Parks). In absence of data on population trend, *Ph. carolinianus* is assessed as VU given its geographical restriction (EEO= ca. 210 km²; AOO= 16 km²) and small number of locations, which makes it potentially vulnerable to stochastic events, as well as human activities.

Liverworts

***Aneura maxima* (Schiffn.) Steph. – VU D2**

The species is known from a single area in Setcases, eastern Pyrenees (data from BCB), where three subpopulations exist (EEO= 4 km²; AOO= 4 km²). It occurs on wet rocks, streams and moist soil at 1700-200 m a.s.l. *A. maxima* has a very restricted range and grows in a relatively fragile habitat (wet rocks and streams) it is sensitive to environmental changes, so it could easily be impacted by *modifications of the water regime* induced by human activity, natural causes or by catastrophic events. The species is also known from Andorra (Sotiaux & Vanderpoorten, 2017) and Midi-Pyrénées region (Infante Sánchez, 2015), where it has been assessed as DD (Infante Sánchez *et al.*, 2015).

***Bazzania tricrenata* (Wahlenb.) Lindb. – VU D2**

Four subpopulations in the central Pyrenees (EOO= ca. 205 km²; AOO= 12 km²) are known in our area: Vall de Ruda, Portilló de Bossost and Vall de Sant Nicolau, Estany Llong (Casas de Puig, 1975a; Casas Sicart, 1986; Casas *et al.*, 1996; data from BCB). This species mainly grows on wet acidic rocks in coniferous forests, between 1200 and 2000 m a.s.l. In absence of data on population trend, *B. tricrenata* is assessed as VU given its rarity which makes it potentially vulnerable to stochastic events, as well as human activities. *B. tricrenata* is found in nearby areas in Aragón: Plan de Aiguallut (Infante Sánchez & Heras Pérez, 2003), Andorra (Sotiaux & Vanderpoorten, 2017) and France: Midi-Pyrénées region (Infante Sánchez, 2015), where it has been assessed as NT (Infante Sánchez *et al.*, 2015) and Pyrénées-Orientales department [ca. 4 locations] (Hugonnot *et al.*, 2018).

***Calypogeia neesiana* (C.Massal. & Carestia) Müll.Frib. – VU D2**

The species is known from four Pyrenean locations: Tredós, Estany Negre, Port de Tavascan and Setcases (Casas Sicart, 1986; Lloret, 1989; data from BCB). *C. neesiana* in our area grows on decaying wet logs and moist soil, mainly in the subalpine belt. The species is also known from nearby areas: Andorra (Sotiaux & Vanderpoorten, 2017), Midi-Pyrénées region (Infante Sánchez, 2015), where it has been assessed as VU (Infante Sánchez *et al.*, 2015) and Pyrénées-Orientales department [9 locations] (Hugonnot *et al.*, 2018). In our area the species has small EOO and AOO values (ca. 1425 km² and 16 km², respectively) and small number of locations and could easily be impacted by catastrophic events. There is no available information on population decline; otherwise it would qualify as EN in terms of criterion B.

***Calypogeia suecica* (Arnell & J.Perss.) Müll.Frib. – VU B1ab(iii)+2ab(iii)**

The presence of the species in our area is restricted to the Axial zone of the central Pyrenees, with six locations, which are found in 7 UTM 1x1 km squares (EOO= ca. 510 km²; AOO= 24 km²): Val de Molières, Uelhs deth Joeu, Estanys Liat, Mata de València, Aigüestortes and Aiguamòg (Casas Sicart, 1986; Carrillo *et al.*, 2008; data from BCB). Typical habitats include decaying wet logs and moist soil in the montane and subalpine belts. A population decline is inferred due to natural causes *and disturbances* induced by human activity. The available information suggests that the species' range, in spite of being relatively restricted, is not severely fragmented and exceeds the number of locations (sub-criterion "a") for EN. The species is also known from nearby areas in France: Midi-Pyrénées region (Infante Sánchez, 2015), where it has been assessed as EN (Infante Sánchez *et al.*, 2015) and Pyrénées-Orientales department [6 locations] (Hugonnot *et al.*, 2018). For *further information*, see Sáez *et al.* (2018a).

***Cephalozia ambigua* C.Massal. – VU D2**

Two subpopulations (EOO= 8 km²; AOO= 8 km²) are known in our area, both in central Pyrenees: Estanys Liat and Estany Gerber (BCB 54027 and BCB 54027, respectively). The species occurs on wet acidic rocks in the subalpine belt. The current threats are apparently limited; however, the restricted distribution of *C. ambigua* means that the species is vulnerable to potential threats. New data are needed for this species and might result in a change to a higher

threat category. The species is found in nearby areas in Aragonese Pyrenees: Paderna (Infante Sánchez & Heras Pérez, 2003) and France: Midi-Pyrénées region (Infante Sánchez, 2015), where it has been assessed as EN (Infante Sánchez *et al.*, 2015) and Pyrénées-Orientales department [1 location] (Hugonnot *et al.*, 2018).

***Fossombronia wondraczekii* (Corda) Lindb. – VU D2**

This species occurs in northeastern Catalonia: Llambilles, Garrotxa volcanic field and Montseny massif (Brugués *et al.*, 1982b; 2007a; Sáez *et al.*, 2018b), where it grows in wet soils in the lowlands. *F. wondraczekii* is assessed as VU D2 since its population appears to be small EOO and AOO values (ca. 643 km² and 12 km², respectively) and it is likely to be susceptible to anthropogenic disturbance and stochastic events.

***Frullania cesatiana* De Not. – VU D2**

It has been found in two separated areas (EOO= 8 km²; AOO= 8 km²) in northern Catalonia: eastern Pyrenees, Tregurà (Sim-Sim *et al.*, 1999) and Cap de Creus Peninsula, Cala Jòncols (BCB 52955). Typical habitats include bark of (*Quercus petraea*) and rocks in wet places, between 20 and 1300 m a.s.l. Anthropogenic disturbances are likely in the coastal location. A report of *F. muscicola* Steph. from Els Ports massif (Casas *et al.*, 1985a) is due to a confusion with *F. dilatata* (Sim-Sim *et al.*, 1999). In absence of data on population trend, *F. cesatiana* is assessed as VU given its rarity which makes it potentially vulnerable to stochastic events, as well as human activities. According to Hugonnot *et al.* (2018) there are two relatively close populations of this species in eastern French Pyrenees.

***Fuscocephalozia albens* (Hook.) Váňa & L.Söderstr. – VU D2**

The species is documented so far only from two locations (EOO= 8 km²; AOO= 8 km²), both in central Pyrenees: Bossost and Estany Gerber (Casas *et al.*, 2008). The species occurs in wet soils between 1300 and 250 m a.s.l. Some Aragonese Pyrenees locations: La Renclusa and Paderna (Casas *et al.*, 2008) are very close (about 11 km away) to Bossost, although the possibility of any rescue from these subpopulations is unknown. *Fuscocephalozia albens* is assessed as VU based on the restricted range, small number of known locations and because the species grows in environments which are especially sensitive to environmental changes. There is no available information on population decline, otherwise it would qualify as EN in terms of criterion B.

***Gymnomitrium alpinum* (Gottsche ex Husn.) Schiffn. – VU D2**

The species is documented from three Pyrenean locations (EOO= ca. 230 km²; AOO= 12 km²): Estany Liat, Estany de Certascan and Àreu (data from BCB), where it occurs on wet rocky places between 1500 and 2230 m a.s.l. The species is found in nearby areas in Andorra (Sotiaux & Vanderpoorten, 2017) and France: Midi-Pyrénées region (Infante Sánchez, 2015), where it has been assessed as LC (Infante Sánchez *et al.*, 2015) and Pyrénées-Orientales department [1 location] (Hugonnot *et al.*, 2018). Considering the restricted range and the small number of locations, the species is here assessed as VU D2. There is no available information

on population decline, otherwise it would qualify as EN in terms of criterion B. New data are needed for this species and might result in a change to a higher threat category.

***Gymnomitrium brevissimum* (Dumort.) Warnst. – VU D2**

The species is documented so far only from two locations (EEO= 8 km²; AOO= 8 km²) in central Pyrenees: Amitges and Estany de Certascan (Casas *et al.*, 1998b; data from BCB), where it occurs on wet siliceous rocky places and snowbeds, between 1500-2300 m a.s.l. In absence of data on population trend, *G. brevissimum* is assessed as VU given its rarity which makes it potentially vulnerable to stochastic events, as well as human activities. New data are needed for this species and might result in a change to a higher threat category. The species is also known from nearby areas: Andorra (Sotiaux & Vanderpoorten, 2017) and Midi-Pyrénées region where it has been assessed as EN (Infante Sánchez *et al.*, 2015).

***Harpalejeunea molleri* (Steph.) Grolle – VU D2**

This species is known to occur in Sant Llorenç de la Muga and its surroundings (Brugués *et al.*, 1974, 1981), where it occurs on acidic wet rocks in lowlands (EEO= 4 km²; AOO= 4 km²). It has been assessed as DD for the Midi-Pyrénées region (Infante Sánchez *et al.*, 2015), and 7 locations are known in Pyrénées-Orientales department (Hugonnot *et al.*, 2018), some of which are a few kilometres away from the Catalan subpopulation. In our area *the species* appears to be susceptible to anthropogenic disturbances and stochastic events. Further data on distribution and threats of *H. molleri* are required for a more accurate assessment, however, a provisional threat rating as VU D2 is considered appropriate until these data can be available.

***Jungermannia leiantha* Grolle – VU D2**

So far, this species is only known from La Val d’Aran, La Restanca, where it was collected in 1998 (BCB 54103). The species grows on wet acidic rocks, at 2008 m a.s.l. (EEO= 4 km²; AOO= 4 km²). A report of *J. leiantha* from Montnegre (Cros i Matas, 1985) has not been confirmed and is probably due to the confusion with other species of the genus. Since the species has a very restricted range and grows in a relatively fragile habitat it is sensitive to environmental changes, so it could easily be impacted by *modifications of the water regime* induced by human activity, natural causes or by catastrophic events. The species should be reassessed for a higher threat category if disturbances occur within the area.

***Leiomylia anomala* (Hook.) J.J.Engel & Braggins – VU D2**

The presence of the species in our area is restricted to the Axial zone of the central Pyrenees, with three locations: Tredós (Bassa Nera), Malniu and Circ de Baborte (Casanovas, 1991; Casas *et al.*, 2008). The species occurs on peaty soils, at 1800-200 m a.s.l. In view of the restricted range (EEO= ca. 375 km²; AOO= 16 km²), small number of locations, and specificity for a fragile habitat, the species is here assessed as VU under criterion D2. It is also known from nearby areas in Andorra (Sotiaux & Vanderpoorten, 2017) and France: Midi-Pyrénées region (Infante Sánchez, 2015), where it has been assessed as EN (Infante Sánchez *et al.*, 2015).

***Lophozia ascendens* (Warnst.) R.M.Schust. – VU D2**

The species is documented from four locations (EEO= ca. 800 km²; AOO= 16 km²) in central Pyrenees: Artiga de Lin, Portilló de Bossost, Marimanha and Mata de València (Casas & Infante, 1998; Sáez *et al.*, 2018a; data from BCB). *L. ascendens* occurs on decaying wet logs in subalpine forests. It is also known from nearby areas: Torla in Aragón (Infante Sánchez & Heras Pérez, 2003), Andorra (Sotiaux & Vanderpoorten, 2017) and France: Midi-Pyrénées region (Infante Sánchez, 2015), where it was regarded as EN (Infante Sánchez *et al.*, 2015) and Pyrénées-Orientales department [9 locations] (Hugonnot *et al.*, 2018). The species has a restricted range in our area and small number of locations and could be impacted by inadequate forest management or by catastrophic events.

***Lophozopsis longidens* (Lindb.) Konstant. & Vilnet – VU D2**

The presence of the species in our area is restricted to the Axial zone of the central Pyrenees, with two main locations: Mata de València and Sant Maurici (Casas & Infante, 1998; Cros *et al.*, 2010). In the latter area at least two subpopulations are known. *L. longidens* occurs on wet soils and decaying wet logs in subalpine forests. It is also known from nearby areas in Andorra (Sotiaux & Vanderpoorten, 2017) and France: Midi-Pyrénées region (Infante Sánchez, 2015), where it was regarded as VU (Infante Sánchez *et al.*, 2015) and Pyrénées-Orientales department [ca. 10 locations] (Hugonnot *et al.*, 2018). In absence of data on population trend, the species is assessed as VU D2, since *L. longidens* has a restricted range (EEO= 12 km²; AOO= 12 km²) and it is extremely sensitive to habitat changes and anthropogenic threats.

***Marchesinia mackaii* (Hook.) Gray – VU D2**

The species is closely confined to areas of strong maritime influence where it usually occurs in karstic cavities in mountain areas, between 300 and 715 m a.s.l. *M. mackaii* was recorded from six locations (EEO= 1850 km²; AOO= 20 km²): Garraf-Vallirana area, Serra del Pradell, Vandellós Mountains and Els Ports massif (Brugués & Folch, 1981; Casas *et al.*, 1985b; data from BCB). According to our recent observations in the Garraf massif, a subpopulation was probably lost. However, this circumstance cannot be considered as a continuous decline of the Catalan population as a whole. Further data on distribution and threats of *M. mackaii* are required for a more accurate assessment, however, a provisional threat rating as VU D2 is considered appropriate (based on its restricted range) until this information can be available.

***Mesoptychia heterocolpos* (Thed. ex Hartm.) L.Söderstr. & Váňa – VU D2**

The species is only known from two locations (EEO= 4 km²; AOO= 8 km²): Alt Àneu and Olot (Cros *et al.*, 2010; Allorge & Casas de Puig, 1968), where it grows in very humid calcareous rocks, between ca. 500-2250 m a.s.l. The latter subpopulation could easily be affected by human activities. In absence of data on population trend, *M. heterocolpos* is assessed as VU based on the restricted range, small number of known locations and because the species grows in environments which are vulnerable by natural causes, anthropogenic disturbances or by catastrophic events. New data are needed for this species and might result in a change to a higher threat category. *M. heterocolpos* is also known from nearby areas in Andorra (Sotiaux & Vanderpoorten, 2017) and France: Midi-Pyrénées region (Infante Sánchez,

2015) where it has been assessed as VU (Infante Sánchez *et al.*, 2015) and Pyrénées-Orientales department [ca. 12 locations] (Hugonnot *et al.*, 2018).

***Microlejeunea ulicina* (Taylor) A.Evans – VU D2**

The species is closely confined to areas of strong maritime influence in northern Catalan Range, where four subpopulations (EOO= ca. 42 km²; AOO= 16 km²) are currently known in Montseny, Guilleries and Montnegre (Casas Sicart, 1999; Calleja *et al.*, 2001, 2014, 2016). In our area *Microlejeunea ulicina* is an epiphyte which usually grows on a tree species with a very limited distribution (*Prunus lusitanica*).

***Myriocoleopsis minutissima* (Sm.) R.L.Zhu, Y.Yu & Pócs – VU D2**

This epiphyte is closely confined to areas of strong maritime influence: Montnegre and Montseny massif (Cros i Matas, 1985; Calleja *et al.*, 2014). Two subpopulations are currently known which are relatively isolated. In absence of data on population trend, *M. minutissima* is assessed as VU based on the restricted range (EOO= 8 km²; AOO= 8 km²), small number of known locations and because the species grows in environments which are vulnerable by natural causes, anthropogenic disturbances (inadequate forest management) or by catastrophic events. New data are needed for this species and might result in a change to a higher threat category.

***Nowellia curvifolia* (Dicks.) Mitt. – VU D2**

The species is known from three Aranese locations: Canejan, Bossost and Artiga de Lin (Casas *et al.*, 1985a; Casas Sicart, 1986; data from BCB). Typical habitats include decaying wet logs in the montane belt. The species has a restricted range (EOO= 50 km²; AOO= 12 km²) and small number of locations and could easily be impacted by inadequate forest management or by catastrophic events. It is also known from nearby areas: Aragón, in Torla (Infante Sánchez & Heras Pérez, 2003), where it was regarded as VU, Andorra (Sotiaux & Vanderpoorten, 2017) and France: Midi-Pyrénées region (Infante Sánchez, 2015), where it was regarded as NT (Infante Sánchez *et al.*, 2015) and Pyrénées-Orientales department [7 locations] (Hugonnot *et al.*, 2018).

***Obtusifolium obtusum* (Lindb.) S.W.Arnell – VU D2**

It is documented so far only from central Pyrenees: Valarties and Alins (Casas *et al.*, 2008). The species occurs in wet shaded rocks between 1600 and 1750 m altitude. In absence of data on population trend, *Obtusifolium obtusum* is assessed as VU based on the restricted range (EOO= 16 km²; AOO= 16 km²), small number of known locations and because the species grows relatively fragile habitat which are vulnerable by natural causes, anthropogenic disturbances or by catastrophic events. New data are needed for this species and might result in a change to a higher threat category.

***Riccardia latifrons* (Lindb.) Lindb. – VU D2**

The species is documented from four locations (EOO= ca. 270 km²; AOO= 16 km²) in central Pyrenees: Artiga de Lin, Mata de València, Bossost and Estany de Trescuro (Cros *et al.*, 2010 and data from BCB). It occurs on decaying wet logs, mainly in the subalpine belt. The

species is also known from nearby areas: Andorra (Sotiaux & Vanderpoorten, 2017) and France: Midi-Pyrénées region, where it has been assessed as CR (Infante Sánchez *et al.*, 2015) and Pyrénées-Orientales department [1 location] (Hugonnot *et al.*, 2018). The species has a small AOO value and small number of locations and could be impacted by inadequate forest management or by catastrophic events.

***Riccia crustata* Trab. – VU D2**

In the studied area is known from three locations in Segarra county: Sanahuja, Biosca and Torà (Casas *et al.*, 1985a; Brugués *et al.*, 1993), where it occurs on open gypsiferous or saline soils, temporarily wet. Moreover, a small subpopulation (ca. 1 m²) has been recently discovered by us in Prat de Montsoar, Urgell county, (data in BCB). The species is also known from nearby areas in Aragón (Infante Sánchez & Heras Pérez, 2003). Habitat degradation in the form of agricultural development, and other human activities, as well as cattle trampling are regarded as the most severe threats to *R. crustata* in the studied area. In view of the restricted range (EOO= ca. 185 km²; AOO= 16 km²), small number of locations, and specificity for a fragile habitat, the species is here assessed as VU.

***Riccia glauca* L. – VU D2**

The species is known from northeastern Catalonia: Bescanó and Montseny massif (Sáez *et al.*, 2018b and data from BCB), where it occurs on wet exposed soils between 100 and 1000 m a.s.l. The species has a restricted range (EOO= 8 km²; AOO= 8 km²) and small number of locations and could easily be impacted by human disturbances or by catastrophic events. The nearest locations are in southeastern Pyrénées-Orientales department [2 locations] (Hugonnot *et al.*, 2018).

***Riccia huebeneriana* Lindenb. – VU D2**

A population of this species found at L'Albera massif, Capmany is the only confirmed record from our area (EOO= 4 km²; AOO= 4 km²). The species grows on wet soil at the edge of periodically flooded grassland, at 122 m a.s.l. (Thouvenot, 2015). In absence of data on population trend, since the species has a restricted range and grows in a fragile habitat, it is especially sensitive to environmental changes, so it could easily be impacted by *modifications of the water regime* induced by human activity, natural causes or by catastrophic events. Therefore, it is assessed as VU D2. The species should be reassessed if further data become available on the population trend, and may qualify for a higher threat category.

***Riccia michelii* Raddi – VU D2**

So far, this species is known from a single location (EOO= 4 km²; AOO= 4 km²) in Cap de Creus Peninsula, Mas de la Birba, where it occurs on wet siliceous ledges among rocks at 100 m a.s.l. (Casas *et al.*, 1998a). Barnola (1918) reported *R. michelii* from Tortosa. However, we cannot confirm this report either by herbarium specimens or by new field research. The population of *the species* appears to be very small and is likely to be extremely susceptible to anthropogenic disturbance and stochastic events. Further data on distribution and threats of *R. michelii* are required for a more accurate assessment, however, a provisional threat rating as

VU D2 is considered appropriate until this data can be available. New data are needed for this species and might result in a change to a higher threat category.

***Riccia papillosa* Moris – VU D2**

The species is currently known from a single location: Cap de Creus Peninsula, Mas de la Birba (Casas *et al.*, 1988a). The species occurs on wet siliceous ledges among rocks at 100 m a.s.l. EOO and AOO value are 4 km². In absence of data about population trend, since the species has a restricted range and grows in a relatively fragile habitat, it is especially sensitive to environmental changes, so it could easily be impacted by human activity, natural causes or by catastrophic events. New data are needed for this species and might result in a change to a higher threat category.

***Riccia subbifurca* Warnst. ex Croz. – VU D2**

The species is currently known from a single location: L'Albera massif, Cantallops (Casas *et al.*, 1998c), where it occurs on periodically flooded siliceous soils at 170 m a.s.l. The EOO and AOO values are so small (4 km²) that the species would be rapidly impacted by human activities or stochastic events. There is no available information on population decline, otherwise it would qualify as CR in terms of criterion B.

***Scapania cuspiduligera* (Nees) Müll.Frib. – VU D2**

The presence of this species in our area is restricted to the Pyrenees, with two main areas: Vall d'Àssua and Serra de Cadí (Manobens i Rigol & Casas Sicart 1985; Ruiz *et al.*, 2018a) (EOO= ca. 70 km²; AOO= 20 km²). The species occurs on shady calcareous rocky places between 1700 and 2700 m a.s.l., within protected areas. It is also known from nearby areas in Andorra (Sotiaux & Vanderpoorten, 2017) and France: Midi-Pyrénées region (Infante Sánchez, 2015) and Pyrénées-Orientales department (Hugonnot *et al.*, 2018).

***Scapania paludosa* (Müll.Frib.) Müll.Frib. – VU D2**

So far this species, which was sometimes confused in our area with *S. undulata* and *S. uliginosa*, is only known from Val d'Aran, Estanys Liat (BCB 54222). The species occurs on submerged stones in running waters, at 200 m a.s.l. Since the species has a very restricted range (EOO= 4 km²; AOO= 4 km²) and grows in a fragile habitat, it could easily be impacted by *modifications of the water regime* induced by human activity, natural causes or by catastrophic events. There is no available information on population decline, otherwise it would qualify as CR in terms of criterion B. The species should be reassessed if new data become available on the population and threats, and may quickly qualify for a more threatened category if disturbances occur within the area.

***Scapania umbrosa* (Schrad.) Dumort. – VU D2**

Two subpopulations are known in central Pyrenees: Còth de Baretja and Mata de València (Casas Sicart, 1986; Cros *et al.*, 2010). *S. umbrosa* in our area grows on decaying wet logs in subalpine forests. In absence of data on population trend, *S. umbrosa* is assessed as VU based on the restricted range (EOO= 8 km²; AOO= 8 km²), small number of known locations and because the species grows in environments which are vulnerable by natural causes,

anthropogenic disturbances (inadequate forest management) or by catastrophic events. New data are needed for this species and might result in a change to a higher threat category.

***Schistochilopsis opacifolia* (Culm. ex Meyl.) Konstant. – VU D2**

The species is known only from two locations: eastern Pyrenees, Núria and Montseny massif (Casas & Infante 1998), where it occurs on humid siliceous rocks and soils, at 100-2000 m a.s.l. It is known from nearby areas: Andorra (Sotiaux & Vanderpoorten, 2017) and Pyrénées-Orientales department (Hugonnot *et al.*, 2018) and Midi-Pyrénées region (Infante Sánchez *et al.*, 2015). In the latter region it has been assessed as VU (Infante Sánchez *et al.*, 2015). Although there is some decline in habitat quality at the northern subpopulation (Núria), it is not certain if this is impacting this species or not, hence is not considered a continuing decline. *S. opacifolia* is assessed as VU D2 because of its restricted range (EOO= 8 km²; AOO= 8 km²) and there are potential future threats. New data are urgently needed for this species and might result in a change to a higher threat category.

***Schljakovia kunzeana* (Huebener) Konstant. & Vilnet – VU D2**

In the studied area it is known from, at least, four locations (EOO= ca. 450 km²; AOO= 16 km²) in central Pyrenees: Estany Gerber, La Restanca, Pla de Beret i and Estany de Malniu (Casas Sicart, 1986; data from BCB). Typical habitats are wet or damp soils in the subalpine belt. In absence of data on population trend, *S. kunzeana* is assessed as VU based on the restricted range, small number of known locations and because the species grows in environments which are vulnerable by natural causes or anthropogenic disturbances. The species is also known from nearby areas: Aragonese Pyrenees, Maladeta massif; Andorra (Sotiaux & Vanderpoorten, 2017); and France: Pyrénées-Orientales department [4 locations] (Hugonnot *et al.*, 2018). *Disturbances* induced by human activity cannot be ruled out in the locality of Pla de Beret.

***Solenostoma confertissimum* (Nees) Schljakov – VU D2**

A Pyrenean population of this species found at Estany Llong (BCB 32469, sub *Jungermannia sphaerocarpa*) is the only confirmed record from our area (EOO= 4 km²; AOO= 4 km²), in our area it grows on wet soil at 2000 m a.s.l. The species is also known from nearby areas: Andorra (Sotiaux & Vanderpoorten, 2017) and France: Midi-Pyrénées region (Infante Sánchez *et al.*, 2015), where it was regarded as VU, and Pyrénées-Orientales department [ca. 15 locations] (Hugonnot *et al.*, 2018). In absence of data on population trend, since the species has a restricted range and grows in a fragile habitat, it is especially sensitive to environmental changes, so it could easily be impacted by *modifications of the water regime* by natural causes or by catastrophic events. Therefore *S. confertissimum* is assessed as VU D2. The species should be reassessed if further data become available on the population trend, and may qualify for a higher threat category.

Mosses

***Acaulon dertosense* Casas, Sérgio, Cros & Brugués – VU D2**

The species has a very restricted area (EEO= ca. 4070 km²; AOO= 16 km²), it is known only from three disperse areas: Els Ports massif (2 locations), Mollet del Vallès and Cap de Creus Peninsula (Casas *et al.*, 1986, 1998a; data from BCB), where it grows on exposed, calcareous soils in lowlands. Although there is some decline in habitat quality at some location, it is not certain if this is impacting this species or not, hence is not considered a continuing decline. *Acaulon dertosense* is therefore assessed as VU D2 because of its restricted range, but there are potential additional threats.

***Amblyodon dealbatus* (Hedw.) Bruch & Schimp. – VU D2**

The presence of the species in our area is restricted to the Axial zone of the central Pyrenees, with three main areas (EEO= ca. 870 km²; AOO= 20 km²): Àssua and Tor Valleys and Núria (Manobens i Rigol, 1984, 1985), where it occurs on peaty soils at 1650-2200 m a.s.l. In the location of Núria, where *A. dealbatus* was collected in 1949, there have been changes due to human activity (development for tourism), which could have affected the subpopulation. However, no specific surveys have been conducted to relocate this subpopulation and nothing is known about its current conservation status. The species is also known from nearby areas: Andorra (Sotiaux & Vanderpoorten, 2017) and France: Midi-Pyrénées region (Infante Sánchez *et al.*, 2015), where it was regarded as VU, and Pyrénées-Orientales department [ca. 21 locations] (Hugonnot *et al.*, 2018). According to the best evidence available, *A. dealbatus* has a very restricted range and is subject to potential threats, therefore the species is assessed as VU D2.

***Andreaea heinemannii* Hampe & Müll.Hal. subsp. *heinemannii* – VU D2**

The species is documented so far from one location in central Pyrenees (EEO= 4 km²; AOO= 4 km²): Besiberri massif, where it occurs in siliceous rocks at ca. 3000 m altitude (Ballesteros & Canalís, 1991). The current threats are apparently limited; however, the restricted distribution of this taxon means that the species is vulnerable to potential threats. It is also known from nearby areas: Andorra (Sotiaux & Vanderpoorten, 2017) and France: Midi-Pyrénées region (Infante Sánchez *et al.*, 2015), where it has been assessed as VU (Infante Sánchez *et al.*, 2015) and Pyrénées-Orientales department [1 location] (Hugonnot *et al.*, 2018).

***Andreaea mutabilis* Hook. f. & Wilson – VU D2**

In our area, *A. mutabilis* is confined to central Pyrenees: Vall de Ruda and Estany de Gèmena (Casas *et al.*, 1996, 2006). Both subpopulations (EEO= 8 km²; AOO= 8 km²) are found on acidic rocks between 1850 and 2200 m a.s.l. located in protected areas. Information on distribution and threats of the species are required for a more accurate assessment, however, a provisional threat rating as VU D2 is considered appropriate until this data can be available. The species is also known from nearby areas: Aragonese Pyrenees (Infante Sánchez & Heras Pérez, 2003); Andorra (Sotiaux & Vanderpoorten, 2017) and Midi-Pyrénées region (Infante Sánchez *et al.*, 2015), where it has been assessed as VU (Infante Sánchez *et al.*, 2015).

***Anomodon longifolius* (Schleich. ex Brid.) C.Hartm. – VU D2**

The species is known from three locations in northeastern Catalonia: Santa Maria de Besora, El Collell and Sant Martí Sacalm (Granzow de la Cerda, 1988; Casas & Brugués, 1995 and data from BCB), where it grows on shady calcareous rocky places. In the latter location some human disturbances could have affected the subpopulation. However, no specific surveys have been conducted to relocate this subpopulation and nothing is known about its current conservation status. The species is assessed as VU D2 based on its geographical restriction (EEO= ca. 140 km²; AOO= 12 km²), which makes it vulnerable to stochastic events, as well as human activities. Moreover, these subpopulations are relatively isolated since nearby location of *A. longifolius* are unknown. The species is not listed for Pyrénées-Orientales department (Hugonnot *et al.*, 2018) although it is known from Midi-Pyrénées region (Infante Sánchez *et al.*, 2015) where the species has been assessed as DD.

***Aschisma cynetii* (Bizot & R.B.Pierrot) J.Guerra & M.J.Cano – VU D2**

So far, this species is only known from Cap de Creus Peninsula, Cap Norfeu, where it grows on rocks and dry exposed soils (Casas *et al.*, 1998a). In Cap Norfeu *A. cynetii* does not seem to be a rare species, since it has been collected repeatedly in several years. Its habitat is not particularly fragile and the area is currently strictly protected (*Reserva Natural Integral*). Nevertheless, *the species* is assessed as VU D2 since its population appears to be small (EEO= 4 km²; AOO= 4 km²) and is likely to be susceptible to stochastic events. There is no available information on population decline, otherwise it would qualify as CR in terms of criterion B. New data are needed for this species and might result in a change to a higher threat category.

***Atrichum flavisetum* Mitt. – VU D2**

In the studied area it is known from a single collection (EEO= 4 km²; AOO= 4 km²) in eastern Pyrenees, Baga de Queràs, where it grows on acidic soils at 1700 m a.s.l. (Brugués *et al.*, 2007b). According to these authors, another Iberian population is known from Pineta in the Aragonese Pyrenees. The restricted distribution of *A. flavisetum* means that the species is vulnerable to potential threats. There is no available information on population decline, otherwise it would qualify as CR in terms of criterion B. The species was not listed for nearby areas in Andorra (Sotiaux & Vanderpoorten, 2017) and France (Infante Sánchez, 2015; Hugonnot *et al.*, 2018).

***Brachytheciastrum collinum* (Schleich. ex Müll.Hal.) Ignatov & Huttunen – VU D2**

In the studied area *B. collinum* is confined to central and eastern Pyrenees (EEO= ca. 830 km²; AOO= 12 km²): Anàs and Plan de Tor (Orgaz, 2018) and Núria (BCB 37132), where it grows on rocky places in the subalpine belt. The species is also known from nearby areas: Parque Nacional de Ordesa y Monte Perdido (Infante Sánchez & Heras Pérez, 2003), Posets-Maladeta (Infante & Heras, 2012); Andorra (Sotiaux & Vanderpoorten, 2017) and France: Pyrénées-Orientales department [4 locations] (Hugonnot *et al.*, 2018) and Midi-Pyrénées region (Infante Sánchez *et al.*, 2015) where the species has been assessed as DD. New data are needed for this species and might result in a change to a higher threat category.

***Brachythecium erythrorrhizon* Schimp. – VU D2**

A population of this species found at 2010 m a.s.l. in Estany de Romedo de Baix (Orgaz *et al.*, 2012b, Guerra *et al.*, 2015) is the only confirmed record from our area (EOO= 4 km²; AOO= 4 km²). The species is not listed for nearby areas (Infante Sánchez, 2015; Sotiaux & Vanderpoorten, 2017; Hugonnot *et al.*, 2018). The population of *the species* appears to be small and is likely to be susceptible to anthropogenic disturbance and stochastic events. Further data on distribution and threats of *B. erythrorrhizon* are required for a more accurate assessment, however, a provisional threat rating as VU D2 is considered appropriate until additional information is can be available.

***Brachythecium tommasinii* (Sendtn. ex Boulay) Ignatov & Huttunen – VU D2**

So far, this species is known from three Pyrenean locations (EOO= ca. 75 km²; AOO= 12 km²): Serra de Cadí-Moixeró (two subpopulations) and Núria (Orgaz, 2018; Ruiz *et al.*, 2018a; data from BCB). It grows on wet calcareous rocks between 2000 and 250 m a.s.l. The species is also known from relatively nearby areas in Aragón (Infante Sánchez & Heras Pérez, 2003); Andorra (Sotiaux & Vanderpoorten, 2017) and several areas within the French Pyrenees: Pyrénées-Orientales department (Hugonnot *et al.*, 2018) and Midi-Pyrénées region (Infante Sánchez, 2015). In the latter region *B. tommasinii* has been assessed as DD (Infante Sánchez *et al.*, 2015). New data are needed for this species and might result in a change to a lower threat category.

***Braunia imberbis* (Sm.) N.Dalton & D.G.Long – VU D2**

A population of this species found at Sant Llorenç de la Muga (Brugués *et al.*, 1974) is the only known from our area (EOO= 4 km²; AOO= 4 km²). It occurs on shady siliceous rocks, between 200 and 250 m a.s.l. The population of *the species* appears to be very small and is likely to be susceptible to stochastic events. There is no available information on population decline, otherwise it would qualify as CR in terms of criterion B. New data on distribution and threats of *B. imberbis* are required for a more accurate assessment, however, a provisional threat rating as VU D2 is considered appropriate until this data can be available. The species is also known from nearby areas in Pyrénées-Orientales department [ca. 6 locations] (Hugonnot *et al.*, 2018).

***Bryoerythrophyllum ferruginascens* (Stirt.) Giacom. – VU D2**

The species is documented so far only from two locations (EOO= 8 km²; AOO= 8 km²), both in central Pyrenees: Tavascan and Sorpe (Casas Sicart, 1986), where it grows on moist soils in montane and subalpine areas. The species is also known from relatively nearby areas in Aragón: La Renclusa and Panticosa (Casas Sicart, 1986; Infante Sánchez & Heras Pérez, 2003), and France: Midi-Pyrénées region (Infante Sánchez, 2015), where it has been assessed as VU (Infante Sánchez *et al.*, 2015) and Pyrénées-Orientales department [3 locations] (Hugonnot *et al.*, 2018). New data are needed for this species and might result in a change to a higher threat category.

***Campylopus flexuosus* (Hedw.) Brid. – VU D2**

The presence of the species in our area is restricted to three locations (EOO= ca. 64 km²; AOO= 12 km²): Val d'Aran in Uelhs deth Joeu, Sant Llorenç de la Muga and Sant Esteve del Llop (Brugués *et al.* 1974; Casas *et al.*, 1983, 2006), where it occurs on acidic rock crevices and soils, between 500 and 2450 m. The species is assessed as VU D2 on the basis of its restricted range and small number of locations, which makes it vulnerable to stochastic events. The species is also known from relatively nearby areas in Andorra (Sotiaux & Vanderpoorten, 2017) and France: Midi-Pyrénées region (Infante Sánchez, 2015), where it has been assessed as VU (Infante Sánchez *et al.*, 2015).

***Campylopus schimperi* Milde – VU D2**

It is confined to central and eastern Pyrenees (EOO= ca. 395 km²; AOO= 16 km²): between Estany Llong and Ulldeter (Casas Sicart, 1986; Lloret, 1989; Casas *et al.*, 2006). Many of these collections were made before 1960. Although *C. schimperi* does not grow in fragile habitats (siliceous rocks, at 2000-2450 m a.s.l.), it is assessed as VU D2 based on its geographic restriction, in absence of data on population trend. The species is known from France: Midi-Pyrénées region (Infante Sánchez, 2015), where it has been assessed as DD (Infante Sánchez *et al.*, 2015).

***Catoscopium nigratum* (Hedw.) Brid. – VU D2**

It is documented from three main locations (EOO= ca. 65 km²; AOO= 12 km²) in central Pyrenees: Vall d'Àssua, Llessui and Coma de Burg (Manobens i Rigol & Casas Sicart, 1985; Casas *et al.*, 1985a; Ederra, 2010). The species forms turfs on limestone rocks by streams in high mountain areas. *C. nigratum* is also known from nearby areas in Aragonese Pyrenees, Benasque (Ederra, 2010), in Andorra (Sotiaux & Vanderpoorten, 2017) and France: Midi-Pyrénées region, where it has been assessed as NT (Infante Sánchez *et al.*, 2015) and Pyrénées-Orientales department [1 location] (Hugonnot *et al.*, 2018). In absence of data on population trend, the species is assessed as VU D2, since it has a restricted range and it is extremely sensitive to habitat changes and anthropogenic threats.

***Cheilothela chloropus* (Brid.) Broth. – VU D2**

So far, this species is only known from Tarragona province, Marçà (EOO= 4 km²; AOO= 4 km²) where it was collected in 1973 (BCB 27796). Given its geographic restriction the species is potentially vulnerable to stochastic events or human activities. There is no available information on population decline, otherwise it would qualify as CR in terms of criterion B. New data are needed for this species and might result in a change to a higher threat category.

***Cinclidotus riparius* (Host ex Brid.) Arn. – VU D2**

The species is documented from three scattered Pyrenean locations: Setcases, Lés and Pobra de Segur (Lloret, 1989; Casas *et al.*, 2006; data from BCB), where it occurs on submerged rocks in montane areas. In absence of data on population trend, *C. riparius* is assessed as VU D2, since it has a restricted range (EOO= 3712 km²; AOO= 12 km²) and it is extremely sensitive to habitat changes and anthropogenic threats, such as water extraction and pollution. The

species is also known from relatively nearby areas in Aragón (Infante Sánchez & Heras Pérez, 2003), Andorra (Sotiaux & Vanderpoorten, 2017) and France: Midi-Pyrénées region (Infante Sánchez, 2015), where it has been assessed as VU (Infante Sánchez *et al.*, 2015) and Pyrénées-Orientales department [6 locations] (Hugonnot *et al.*, 2018).

***Codonoblepharon forsteri* (Dicks.) Goffinet – VU D2**

In the study area this epiphyte is known from northern and southern Catalan Ranges: Montnegre and Els Ports massif (Cros i Matas, 1981; Casas *et al.*, 1985b) (EEO= 8 km²; AOO= 8 km²), where it was found on *Quercus ilex*, between 300 and 400 m a.s.l. The species was erroneously reported from Montseny massif (Sáez *et al.*, 2018b), since the data referred to *Z. rupestris*. Further data on distribution and threats of *Z. forsteri* are required for a more accurate assessment, however, a provisional threat rating as VU D2 is considered appropriate until this data can be available.

***Conardia compacta* (Müll.Hal.) H.Rob. – VU D2**

The species has a wide but scattered distribution (EEO= ca. 12 450 km²; AOO= 20 km²; five locations) in the study area: the Axial zone of the Pyrenees, central Pre-Pyrenees, and Catalan Ranges (Guerra & Brugués, 2014), where it occurs on wet shaded calcareous rocks, throughout a wide altitudinal range, between 500 and 2450 m a.s.l. *C. compacta* has not been found recently at two locations corresponding to Catalan Ranges: Sant Miquel del Fai and l'Abellera. However, no specific surveys have been conducted to relocate both subpopulations and nothing is known about their current conservation status. The species is known from Midi-Pyrénées region (Infante Sánchez, 2015), where it has been assessed as DD (Infante Sánchez *et al.*, 2015).

***Conostomum tetragonum* (Hedw.) Lindb. – VU D2**

The species is known in our area only from three Pyrenean locations (EEO= ca. 350 km²; AOO= 12 km²): Agulles d'Amitges, Estany de Certascan and Estanys Liat, where it occurs on acidic rocky places at 200-2400 m a.s.l. (Casas, 1992 and data from BCB). The current threats are apparently limited; however, the restricted distribution of *C. tetragonum* means that the species is vulnerable to potential threats. It is also known from nearby areas in Aragón (Maladeta massif, BCB); Andorra (Sotiaux & Vanderpoorten, 2017) and France: Midi-Pyrénées region (Infante Sánchez *et al.*, 2015) and Pyrénées-Orientales department [1 location] (Hugonnot *et al.*, 2018).

***Cynodontium gracilescens* (F.Weber & D.Mohr) Schimp. – VU D2**

The species is documented so far only from two locations, both in Pyrenees: Baga de Carboners and Sant Nicolau (Lloret, 1989; Heras & Infante 2015), where it occurs in rock crevices in the subalpine belt. The species is assessed as VU D2 on the basis of its restricted range (EEO= 8 km²; AOO= 8 km²) and small number of locations, which makes it vulnerable to stochastic events. *C. gracilescens* is not listed for nearby areas (Infante Sánchez, 2015; Sotiaux & Vanderpoorten, 2017; Hugonnot *et al.*, 2018).

***Cynodontium polycarpon* (Hedw.) Schimp. – VU D2**

The species is extremely rare in our area, known only from two Pyrenean locations: Aigüestortes and Vilallonga de Ter (Casas, 1986a; Lloret, 1989), corresponding to four UTM 1x1 km squares (EOO= 8 km²; AOO= 8 km²). In these locations it grows on rocky places within the subalpine belt. There is no available information on population decline, otherwise it would qualify as CR in terms of criterion B. The species is assessed as VU based on the restricted range, small number of known locations and because the species grows in environments which are vulnerable by natural causes or anthropogenic disturbances. *C. polycarpon* is also known from nearby areas in Andorra (Sotiaux & Vanderpoorten, 2017) and France: Midi-Pyrénées region (Infante Sánchez *et al.*, 2015) where it has been assessed as DD (Infante Sánchez *et al.*, 2015), and Pyrénées-Orientales department [ca. 10 locations] (Hugonnot *et al.*, 2018).

***Cynodontium strumiferum* (Hedw.) Lindb. – VU D2**

Three locations are known in our area, all of them found in the Pyrenees: Vall Ferrera, Baga de Carboners and Esterrí d'Àneu (Casas Sicart, 1986; Lloret, 1989; Cros *et al.*, 2010). It grows on decaying wood, sometimes on wet rocks. The species has a restricted range (EOO= ca. 275 km²; AOO= 12 km²) and small number of locations and could easily be impacted by inadequate forest management or by catastrophic events. *C. strumiferum* is also known from nearby areas in Aragonese Pyrenees (Infante Sánchez & Heras Pérez, 2003), Andorra (Sotiaux & Vanderpoorten, 2017) and France: Midi-Pyrénées region (Infante Sánchez *et al.*, 2015) where it has been assessed as EN (Infante Sánchez *et al.*, 2015) and Pyrénées-Orientales department [8 locations] (Hugonnot *et al.*, 2018).

***Cyrtomnium hymenophylloides* (Huebener) T.J.Kop. – VU D2**

The presence of the species in the Pyrenees (as a whole) is documented so far only from two locations: Serra del Cadí-Moixeró, in the eastern Prepyrenees and Pineta in the Aragonese Pyrenees (Ruiz *et al.*, 2018a,b). These are the southernmost European populations of the species. In the studied area *C. hymenophylloides* occurs on northfacing limestone cliffs and rock outcrops, 2270–2310 m a.s.l. It is assessed as VU D2 on the basis of its restricted range (EOO= 4 km²; AOO= 4 km²) and small number of locations, which makes it vulnerable to stochastic events. There is no available information on population decline (and there is no evidence to infer it), otherwise it would qualify as CR in terms of criterion B.

***Dicranella grevilleana* (Brid.) Schimp. – VU D2**

This is a rare species in the Iberian Peninsula, where it is known from a few sites in the Pyrenees. So far, this species is only confirmed for Escart, central Pyrenees (EOO= 4 km²; AOO= 4 km²; Casas *et al.*, 2006), where it occurs on humid soils at 100 m a.s.l. Reports from Núria (Allorge & Casas de Puig, 1976) and Val d'Aran (Casares Gil, 1932), are not confirmed. *D. grevilleana* is also known from nearby areas in Aragonese Pyrenees: Maladeta massif (Casas Sicart, 1986) and Valle de Barrabés (Casas *et al.*, 2006); Andorra (Sotiaux & Vanderpoorten, 2017) and France: Midi-Pyrénées region (Infante Sánchez, 2015), where it has been assessed as DD (Infante Sánchez *et al.*, 2015) and Pyrénées-Orientales department [1 location]

(Hugonnot *et al.*, 2018). The species may be worth a higher threat category, but until further data based on field research can be gathered, it is assessed as VU D2.

***Dicranella rufescens* (Dicks.) Schimp. – VU D2**

In the studied area it is known from a single collection site in the central Pyrenees, Val d’Aran, Canejan, where it occurs in a humid siliceous slope at 780 m a.s.l. (BCB 25509). Given its geographic restriction (EOO= 4 km²; AOO= 4 km²) the species is potentially vulnerable to stochastic events or human activities. It is also known from Midi-Pyrénées region (Infante Sánchez *et al.*, 2015) where it has been assessed as DD (Infante Sánchez *et al.*, 2015) and Pyrénées-Orientales department [3 locations] (Hugonnot *et al.*, 2018). New data are needed for this species and might result in a change to a higher threat category.

***Dicranella schreberiana* (Hedw.) Dixon – VU D2**

So far, this species is only confirmed for central Pyrenees: La Guingueta (Puche, 2015c), where it occurs on humid siliceous rocks at ca. 1000 m a.s.l. (EOO= 4 km²; AOO= 4 km²). It was also reported from Garrotxa volcanic field (Allorge & Casas de Puig, 1968). The species is also known from nearby areas in Andorra (Sotiaux & Vanderpoorten, 2017) and France: Midi-Pyrénées region (Infante Sánchez, 2015), where it has been assessed as DD (Infante Sánchez *et al.*, 2015) and Pyrénées-Orientales department [1 location] (Hugonnot *et al.*, 2018). *D. schreberiana* is assessed as VU D2 on the basis of its restricted distribution and small number of locations, which makes it vulnerable to stochastic events. The species may be worth a higher threat category, but until further data based on field research can be gathered, it is assessed as VU D2.

***Dicranum brevifolium* (Lindb.) Lindb. – VU D2**

The species is known from two Aranese locations (EOO= 8 km²; AOO= 8 km²): Vaqueira (Brugués & Ruiz, 2015) and Port de la Bonaigua (BCB 58278) where it was collected in 1966 and 1973, respectively. No further surveys in neither areas have been made. *D. brevifolium* is known from nearby areas: Andorra (Sotiaux & Vanderpoorten, 2017), and France: Pyrénées-Orientales department [2 locations] (Hugonnot *et al.*, 2018). Considering the type of habitat (limestone rocks) and the high altitude of one location (2450 m a.s.l.) the probability of impact due to the ski facilities should be scarce. Brugués *et al.* (2014a) assessed *D. brevifolium* as DD due to the lack of sufficient information for a sound status assessment. But as the taxon range is suspected to be restricted and a considerably period of time has elapsed since the last record in one out of two localities, it is justified considering it as threatened (IUCN, 2017). Nevertheless, new data are needed for this species and might result in a change to a higher threat category.

***Dicranum spurium* Hedw. – VU D2**

The species is only known from two locations in the Catalan Ranges: Sau (Vives i Codina, 1979) and Sant Martí de Llàmena (Brugués *et al.*, 1982b) where it occurs on shady humus-rich soils in the lowlands. *D. spurium* is assessed as VU D2 by its restricted range (EOO= 8 km²; AOO= 8 km²) and small number of locations and it is likely to be susceptible to stochastic

events and anthropogenic disturbances. There is no available information on population decline, otherwise it would qualify as EN in terms of criterion B.

***Didymodon asperifolius* (Mitt.) H.A.Crum, Steere & L.E.Anderson – VU D2**

So far, this Arctic-Alpine species has only been collected from Besiberri massif (EOO= 4 km²; AOO= 4 km²) in the central Pyrenees (Ballesteros & Canalís, 1991). This is the only report of *D. asperifolius* from the Iberian Peninsula. The species grows on exposed siliceous rocks at high elevations (3000 m a.s.l.). In the Midi-Pyrénées region it was assessed as DD (Infante Sánchez *et al.*, 2015). The current threats are, apparently limited; however, the restricted distribution of *D. asperifolius* means that the species is vulnerable to potential threats.

***Encalypta microstoma* Bals.-Criv. & De Not. – VU D2**

This species is very rare and scattered in the Iberian Peninsula, which grows in rocky places in mountainous areas. In the study area the species has been found in two separated areas (EOO= 8 km²; AOO= 8 km²): central Pyrenees, Estanys de la Pera (Casas *et al.*, 2006), and the Montseny massif (Sáez *et al.*, 2018b). The restricted distribution of *E. microstoma* means that the species is vulnerable to potential threats. There is no available information on population decline, otherwise it would qualify as CR in terms of criterion B. The species is also known from relatively nearby areas in Midi-Pyrénées region (Infante Sánchez, 2015), where it has been assessed as VU (Infante Sánchez *et al.*, 2015) and Pyrénées-Orientales department [9 locations] (Hugonnot *et al.*, 2018).

***Entodon cladorrhizans* (Hedw.) Müll.Hal. – VU D2**

The species is documented from three areas: Puig Sacalm, Pardines and Vilallonga de Ter (EOO= ca. 74 km²; AOO= 16 km²), where it occurs on wet soils in montane forests (Casas & Brugués, 1981; Lloret, 1989; Casas *et al.*, 2006). Its presence in Puig Sacalm, where it was collected more than a century ago by R. de Bolòs, has not been confirmed recently. On the contrary, its presence in Pardines has recently been confirmed by A. Lluent (*pers. comm.*). In absence of data on population trend, the species is assessed as VU based on the restricted range, small number of known locations and because the species grows in environments which are especially sensitive to environmental changes. The species is also known from Midi-Pyrénées region, where it has been assessed as DD (Infante Sánchez *et al.*, 2015).

***Entosthodon duriaei* Mont. – VU D2**

In our area, *E. duriaei* is known from two separated areas (EOO= 8 km²; AOO= 8 km²): Cadaqués, where it was collected in 1959 by C. Casas (Brugués & Ruiz, 2010) and La Bisbal de Falset, where it grows on wet rocks from the wall of a source (Pascual Garsaball *et al.*, 2017). The species is here assessed as VU D2 given its geographical restriction, which makes it potentially vulnerable to stochastic events, as well as human disturbances.

***Grimmia arenaria* Hampe – VU D2**

This species is known from a single location (EOO= 4 km²; AOO= 4 km²) in central Pyrenees: Alins, Vallferrera (Muñoz, 1998), where it occurs at ca. 1000 m a.s.l. on siliceous rocky places, close to a road and subject to potential disturbances. Therefore, this species is

assessed as Vulnerable under criterion D2. There is no available information on population decline, otherwise *G. arenaria* would qualify as CR in terms of criterion B. *G. arenaria* is known from nearby areas: Andorra (Sotiaux & Vanderpoorten, 2017), Pyrénées-Orientales department [2 locations] (Hugonnot *et al.*, 2018) and Midi-Pyrénées region (Infante Sánchez, 2015). In the latter area the species has been assessed as DD (Infante Sánchez *et al.*, 2015). Information on the detailed distribution and demographic data of this species are required for a more accurate assessment.

***Grimmia crinitoleucophaea* Cardot – VU D2**

In our area the species is documented so far from three locations (EEO= ca. 2010 km²; AOO= 12 km²): two in central Pyrenees (Estáis and Vilaller) and a disjunct subpopulation is found in Montseny massif (Casas Sicart, 1999 and data from BCB). It is also known from nearby areas in Aragón (Casas *et al.*, 2006; Muñoz *et al.*, 2015a) and Andorra (Sotiaux & Vanderpoorten, 2017). Although the species does not grow in a fragile habitat (siliceous rocks, at 1000-1400 m a.s.l.), it is assessed as VU D2 based on its geographic restriction. Disturbances induced by human activity cannot be ruled out in the Montseny massif. In fact, this species was locally assessed as VU in the Montseny massif by Casas Sicart (1999, sub *G. tergestina*).

***Grimmia elongata* Kaulf. – VU D2**

The species is documented so far only from two locations (EEO= 8 km²; AOO= 8 km²), both in the central Pyrenees: Amitges and Àreu (Casas *et al.*, 2006; Muñoz *et al.*, 2015a), where it occurs on siliceous rocks in high mountain areas. The current threats are apparently limited; however, the restricted range of the species means that it is vulnerable to stochastic events. There is no available information on population decline, otherwise it would qualify as EN in terms of criterion B. *G. elongata* is also known from nearby areas in Aragón (Casas *et al.*, 2006; Muñoz *et al.*, 2015a), Andorra (Sotiaux & Vanderpoorten, 2017) and France: Midi-Pyrénées region (Infante Sánchez, 2015), where it has been assessed as VU (Infante Sánchez *et al.*, 2015).

***Grimmia incurva* Schwägr. – VU D2**

This saxicolous species is known from Besiberri massif and Tuc de Molières, both in central Pyrenees. Several subpopulations are found in high altitude areas, between 2995 and 3030 m a.s.l. (Ballesteros & Canalís, 1991; Casas *et al.*, 2006) where anthropogenic disturbances are virtually non-existent. The report from Pica d'Estats (Casas *et al.*, 2006) corresponds to the northern slope, entirely located within France (Ariège department). *G. incurva* is also known from nearby areas in Aragón (Pico Russell), Andorra (Sotiaux & Vanderpoorten, 2017) and France: Midi-Pyrénées region (Infante Sánchez, 2015), where it has been assessed as DD (Infante Sánchez *et al.*, 2015), and Pyrénées-Orientales department [ca. 8 locations] (Hugonnot *et al.*, 2018). In absence of data on population trend, since the species has a restricted range (EEO= 12 km²; AOO= 12 km²) it is potentially vulnerable to stochastic events. Therefore, *G. incurva* is assessed as VU.

***Grimmia mollis* Bruch & Schimp. – VU D2**

Three locations are known from central Pyrenees (EEO= ca. 250 km²; AOO= 12 km²): Pica d'Estats, Montgarri and Val de Molières (Canalís & Casas, 1985; Casas *et al.*, 2006), where it grows on wet acidic rocks in high mountain areas (2450-2900 m a.s.l.). The current threats are apparently limited; however, the restricted distribution of *G. mollis* means that the species is vulnerable to potential threats. *G. mollis* is found in nearby areas: Andorra (Sotiaux & Vanderpoorten, 2017), Aragón (Infante Sánchez & Heras Pérez, 2003) and France: Midi-Pyrénées region (Infante Sánchez, 2015), where it has been assessed as EN (Infante Sánchez *et al.*, 2015) and Pyrénées-Orientales department [4 locations] (Hugonnot *et al.*, 2018).

***Hygrohypnum molle* (Hedw.) Loeske – VU D2**

The species is documented from four Pyrenean locations (EEO= ca. 286 km²; AOO= 16 km²): Molières, Colomers, Portarró d'Espot and Ter Valley, where it occurs on streams between 1700-2450 m a.s.l. (Allorge & Casas de Puig, 1962; Canalís & Casas, 1985; Lloret, 1989; Casas *et al.*, 1992). The species is also known from relatively nearby areas in Aragón (Casas Sicart, 1986; Infante Sánchez & Heras Pérez, 2003) and France: Midi-Pyrénées region (Infante Sánchez, 2015), where it has been assessed as VU (Infante Sánchez *et al.*, 2015) and Pyrénées-Orientales department [5 locations] (Hugonnot *et al.*, 2018).

***Lescuraea mutabilis* (Brid.) Lindb. – VU D2**

A population close to Estany de Gerber in central Pyrenees (EEO= 4 km²; AOO= 4 km²) is the only confirmed record from our area (Brugués & Ruiz, 2018a). This location (a subalpine forest), is found within an area where practically no human disturbances exist, and it is also a protected area. *L. mutabilis* is also known from nearby areas in Andorra (Sotiaux & Vanderpoorten, 2017) and France: Midi-Pyrénées region (Infante Sánchez, 2015), where it has been assessed as DD (Infante Sánchez *et al.*, 2015) and Pyrénées-Orientales department [4 locations] (Hugonnot *et al.*, 2018). In absence of data on population trend, the species is assessed as VU based on the restricted range, small number of known locations and because the species grows in environments which are especially sensitive to environmental changes. New data are needed for this species and might result in a change to a higher threat category.

***Meesia uliginosa* Hedw. – VU D2**

The species is known from in three main Pyrenean areas: Núria (Noufonts and Finestrelles streams), Aigols Podrits and Muntanyó de Llacs (Casas de Puig, 1952; Allorge & Casas de Puig, 1976; Casanovas, 1991; Casas Sicart, 1986). Four subpopulations (EEO= ca. 145 km²; AOO= 16 km²) are known. The species occurs on wet soils at 2000-2600 m a.s.l. *M. uliginosa* is also known from nearby areas in Aragón (Casas Sicart, 1986), Andorra (Sotiaux & Vanderpoorten, 2017) and France: Midi-Pyrénées region (Infante Sánchez, 2015), where it has been assessed as DD (Infante Sánchez *et al.*, 2015) and Pyrénées-Orientales department [ca. 12 locations] (Hugonnot *et al.*, 2018). There is an obvious risk of anthropogenic disturbances due to tourism activities and trampling in the locality of Núria. Some subpopulations found in Pyrénées-Orientales department are very close (about 1 km away) to Núria.

***Mielichhoferia elongata* (Hoppe & Hornsch. ex Hook.) Hornsch. – VU D2**

The species is known to occur on heavy metals rich substrate. In our area it is known from three Pyrenean locations (EOO= ca. 1290 km²; AOO= 12 km²): Núria, Estany de Certascan and Vall del Riu Pamano (Manobens i Rigol & Casas Sicart, 1985; Casas *et al.*, 2006 and data from BCB); at the border between the *alpine and subalpine belts*. The current threats are apparently limited; however, the restricted range of the species means that it is vulnerable to stochastic events. The species is also known from relatively nearby areas in Midi-Pyrénées region (Infante Sánchez, 2015), where it has been assessed as DD (Infante Sánchez *et al.*, 2015).

***Oedipodiella australis* (Wager & Dixon) Dixon – VU B2ab(ii,iii,iv)**

It is known from at least seven locations (EOO= ca. 3310 km²; AOO= 24 km²), which correspond to four main areas: Cap de Creus Peninsula, Portbou, Olot and Vallferrera, where it usually grows in acidic rocks and wall crevices, between and 20 and 900 m a.s.l. (Casas de Puig, 1970; Casas *et al.*, 1998a; Brugués *et al.*, 2007a). Recently a new locality has been found in Garrotxa county, but its specific location has not been indicated (Anonymous, 2018). Therefore, the value of AOO is likely to exceed 24 km². The species is also known from nearby areas in Andorra (Sotiaux & Vanderpoorten, 2017) and southeastern Pyrénées-Orientales department [ca. 5 locations] (Hugonnot *et al.*, 2018). Subpopulations found in the latter area are very close to Portbou and Cap de Creus Peninsula. In our area a population decline is inferred due to *disturbances* induced by human activity (urbanisation, tourism activities) and invasion by introduced species (*Opuntia* spp.). At least a subpopulation found in Cap de Creus Peninsula (Cadaqués) is inferred to be lost due to anthropogenic disturbances at this site, which justifies the application of subcriteria b(ii and iv). The available information suggests that the species' range, in spite of being relatively restricted, is not severely fragmented and exceeds the number of locations (sub-criterion "a") for EN.

***Orthotrichum alpestre* Bruch & Schimp. – VU D2**

Two subpopulations of the species at Sant Maurici and Port de la Bonaigua (central Pyrenees) are the only confirmed records from our area (EOO= 8 km²; AOO= 8 km²). The species occurs on rocks and tree bases in the subalpine belt (Lara & Garilleti, 2014). *O. alpestre* is also known from relatively nearby areas in Aragón (Infante Sánchez & Heras Pérez, 2003), Andorra (Sotiaux & Vanderpoorten, 2017) and France: Midi-Pyrénées region (Infante Sánchez, 2015), where it has been assessed as VU (Infante Sánchez *et al.*, 2015) and Pyrénées-Orientales department [ca. 7 locations] (Hugonnot *et al.*, 2018).

***Orthotrichum hispanicum* F.Lara, Garilleti & Mazimpaka – VU D2**

It is known from central Pyrenees: Barruera and Caldes de Boí (Lara *et al.*, 2000; Lara & Garilleti, 2014) (EOO= 4 km²; AOO= 4 km²). The species is also known from relatively nearby areas in Aragonese Pyrenees (Lara *et al.*, 2000; Lara & Garilleti, 2014; Infante & Heras, 2007) and from France: Midi-Pyrénées region (Infante Sánchez, 2015), where it has been assessed as VU (Infante Sánchez *et al.*, 2015) and Pyrénées-Orientales department [ca. 5 locations] (Hugonnot *et al.*, 2018). Further data on distribution and threats of *O. hispanicum* are required

for a more accurate assessment; however, a provisional threat rating as VU D2 is considered appropriate until these data can be available.

***Orthotrichum rogeri* Brid. – VU D2**

In our area this epiphytic species is documented so far only from two locations (EOO= 8 km²; AOO= 8 km²), both in central Pyrenees: Port Bonaigua and Estany Sant Maurici (Garilleti *et al.*, 2002). According to Gorro Caelles (2005), *O. rogeri* is also found in eastern Pyrenees (Serra de Cadí) but this record has not been checked. The current threats are apparently limited; however, the restricted range of the species means that it is vulnerable to stochastic events. The species is also known from nearby areas in Aragón (Garilleti *et al.*, 2002; Infante & Heras, 2012) and France: Midi-Pyrénées region (Infante Sánchez, 2015), where it has been assessed as NT (Infante Sánchez *et al.*, 2015), and Pyrénées-Orientales department [20 locations] (Hugonnot *et al.*, 2018).

***Paraleucobryum sauteri* (Bruch & Schimp.) Loeske – VU D2**

Four locations are known in our area, all of them found in the central Pyrenees: Vall de Sant Nicolau, Hospital de Viella, Artiga de Lin and Marimanya (Casas Sicart, 1986; data from BCB). *Paraleucobryum sauteri* in our area grows on decaying wood, sometimes on wet rocks in subalpine areas. The species has a restricted range (EOO= ca. 268 km²; AOO= 16 km²) and small number of locations and could be impacted by inadequate forest management or by catastrophic events. The species is also known from nearby areas in Aragón (Infante *et al.*, 2002) and France: Midi-Pyrénées region (Infante Sánchez, 2015), where it has been assessed as NT (Infante Sánchez *et al.*, 2015), and Pyrénées-Orientales department [20 locations] (Hugonnot *et al.*, 2018).

***Plagiothecium piliferum* (Sw.) Schimp. – VU D2**

The species is known from three Aranese locations, according to Allorge & Casas (1962) and Casas Sicart (1986): Uelhs deth Joeu, Val de Molières and Valarties (EOO= ca. 34 km²; AOO= 12 km²). The species occurs on wet rocks at 1400-1800 m a.s.l. No further collections have been made. In absence of data on population trend, *P. piliferum* is assessed as VU based on the restricted range, small number of known locations and because the species grows in environments which are vulnerable by natural causes or anthropogenic disturbances. The species is known from nearby areas: Andorra (Sotiaux & Vanderpoorten, 2017) and France: Midi-Pyrénées region (Infante Sánchez *et al.*, 2015), where it was regarded as DD, and Pyrénées-Orientales department [1 location] (Hugonnot *et al.*, 2018).

***Pohlia camptotrachela* (Renauld & Cardot) Broth. – VU D2**

The species is known from only two locations (EOO= 8 km²; AOO= 8 km²), Montseny massif, and eastern Pyrenees, Ogassa (data from BCB). It occurs on wet soils in montane areas. Although there is some decline in habitat quality at the Montseny subpopulation, it is not certain if this is impacting this species, hence it is not considered a continuing decline. *P. camptotrachela* is assessed as VU D2 because of its restricted range and there are potential future threats. *P. camptotrachela* is known from nearby areas: Andorra (Sotiaux &

Vanderpoorten, 2017) and France: Midi-Pyrénées region (Infante Sánchez, 2015), where it has been assessed as VU (Infante Sánchez *et al.*, 2015) and Pyrénées-Orientales department [7 locations] (Hugonnot *et al.*, 2018).

***Pohlia flexuosa* Hook.** – VU D2

It is documented so far from a single location in eastern Pyrenees: Vall de Feitús (Guerra, 2010), where *P. flexuosa* grows on ferruginous rocks at an altitude of 1400 m. This species has been found in French Pyrenees: Bagnères-de-Luchon, where it is not uncommon (Hugonnot & Lagrandie, 2018). According to the latter authors, *P. flexuosa* is able to spread in anthropogenic secondary habitats such as eroded banks or quarries. The current threats are apparently limited; however, the restricted distribution of the species (EOO= 4 km²; AOO= 4 km²) means that it is vulnerable to stochastic events. There is no available information on population decline, otherwise it would qualify as CR in terms of criterion B. New data are needed for this species and might result in a change to a higher threat category.

***Pohlia longicolla* (Hedw.) Lindb.** – VU D2

Two subpopulations of the species at Val de Molières and Núria, in central and eastern Pyrenees, respectively (Guerra, 2010) are the only confirmed records from our area (EOO= 8 km²; AOO= 8 km²). The species occurs on rocks and soil in the alpine belt (Guerra, 2010). In absence of data on population trend, *P. longicolla* is assessed as VU based on the restricted range, small number of known locations and because the species grows in environments which are vulnerable by natural causes or anthropogenic disturbances. The species is known from nearby areas in Andorra (Brugués, 2007; Sotiaux & Vanderpoorten, 2017) and France: Midi-Pyrénées region (Infante Sánchez, 2015), where it has been assessed as DD (Infante Sánchez *et al.*, 2015) and Pyrénées-Orientales department [3 locations] (Hugonnot *et al.*, 2018).

***Pohlia ludwigii* (Spreng. ex Schwägr.) Broth.** – VU D2

The species is known from two locations in central Pyrenees: Tavascan and Vall d'Àssua (Manobens i Rigol, 1985; Casas *et al.*, 2006), where it is confined to snow-beds between 1830 and 240 m a.s.l. The current threats are apparently limited; however, the restricted distribution of the species (EOO= 8 km²; AOO= 8 km²) means that it is vulnerable to stochastic events. The species is known from nearby areas in Aragón (Infante Sánchez & Heras Pérez, 2003) and France: Midi-Pyrénées region (Infante Sánchez, 2015), where it has been assessed as DD (Infante Sánchez *et al.*, 2015) and Pyrénées-Orientales department [2 locations] (Hugonnot *et al.*, 2018).

***Pseudeskeella rupestris* (Berggr.) Hedenäs & L.Söderstr.** – VU D2

In our area the species is documented so far from a single location (EOO= 4 km²; AOO= 4 km²) in Val d'Aran: Bosc de Loseron (Brugués & Ruiz, 2018a). The species usually grows on limestone rocks in montane areas, although in the Aranese location it was collected growing on a foliose lichen epiphyte on Birch (*Betula* sp.) bark. *P. rupestris* is a rare species in Aragón (Infante Sánchez & Heras Pérez, 2003) but it is not listed for Midi-Pyrénées region (Infante Sánchez, 2015) or Andorra (Sotiaux & Vanderpoorten, 2017). Hugonnot *et al.* (2018) provide

a single location of this species for Pyrénées-Orientales department. Information on distribution and threats of the species are required for a more accurate assessment; however, a provisional threat rating as VU D2 is considered appropriate until this data can be available.

***Pterygoneurum lamellatum* (Lindb.) Jur. – VU D2**

In our area the species is documented so far from a single location in Ebro basin: Balaguer (BCB 30390). Given its geographic restriction (EEO= 4 km²; AOO= 4 km²), the species is potentially vulnerable to stochastic events or human activities which affect soil structure (changes in land uses and agro-pastoral practices). There is no available information on population decline, otherwise it would qualify as CR in terms of criterion B. New data are needed for this species and might result in a change to a higher threat category.

***Ptilium crista-castrensis* (Hedw.) De Not. – VU D2**

In our area *P. crista-castrensis* is confined to central and eastern Pyrenees, between Portilló de Bossost and Upper Ter Valley, where it occurs in humid forests at 100-1600 m a.s.l. It is also known from nearby areas in Andorra (Sotiaux & Vanderpoorten, 2017) and France: Midi-Pyrénées region (Infante Sánchez, 2015), where it has been assessed as LC (Infante Sánchez *et al.*, 2015) and Pyrénées-Orientales department [3 locations] (Hugonnot *et al.*, 2018). In absence of data on population trend, the species is assessed as VU based on the restricted range (EEO= ca. 1015 km²; AOO= 16 km²) and because the species grows in environments which are vulnerable by natural causes, anthropogenic disturbances or by catastrophic events.

***Ptychostomum cernuum* (Hedw.) Hornsch. – VU D2**

In our area the species is documented so far only from two locations (EEO= 8 km²; AOO= 8 km²), both in central Pyrenees: Montgarri and Esterra de Cardós (Guerra *et al.*, 2010b). The species grows on slopes and wet siliceous rocks in montane areas. The species was not listed for nearby areas (Infante Sánchez & Heras Pérez, 2003; Infante Sánchez, 2015; Sotiaux & Vanderpoorten, 2017; Hugonnot *et al.*, 2018). Information on distribution and threats of the species are required for a more accurate assessment; however, a provisional threat rating as VU D2 is considered appropriate until this data can be available.

***Sciuro-hypnum curtum* (Lindb.) Ignatov – VU D2**

The species is documented so far from a single location (EEO= 4 km²; AOO= 4 km²) in central Pyrenees: Vall de Varradós (Orgaz, 2018), where it grows on subalpine and alpine meadows and snowbeds. *Sciuro-hypnum curtum* was found in a nearby Aragonese Pyrenees location: Maladeta massif, where it was collected in 1966 by C. Casas. There is no available information on population decline, otherwise it would qualify as CR in our area in terms of criterion B. New data are needed for this species and might result in a change to a higher threat category.

***Seligeria acutifolia* Lindb. – VU D2**

In our area the species is documented so far from a single location (EEO= 4 km²; AOO= 4 km²) in northern Catalan Ranges: Castelltersol, where it occurs on calcareous rocks in a montane area (BCB 5418). Further data on distribution and threats of *S. acutifolia* are required

for a more accurate assessment; however, a provisional threat rating as VU D2 is considered appropriate until this data can be available.

***Sphagnum contortum* Schultz – VU D2**

In our area, the species is known from five main locations (EOO= ca. 255 km²; AOO= 20 km²) in central Pyrenees: Aiguamòg, Pletiu de Sotllo, Pla de Boet, Port de la Bonaigua and Pla de Beret (Casanovas, 1991; Pérez-Haase *et al.*, 2011). The species has a small number of locations and grows in a fragile habitat; it is especially sensitive to environmental changes, so it could easily be impacted by *modifications of the water regime* by natural causes or by catastrophic events. The species is known from nearby areas in Andorra (Brugués, 2007; Sotiaux & Vanderpoorten, 2017) and France: Midi-Pyrénées region (Infante Sánchez, 2015), where it has been assessed as NT (Infante Sánchez *et al.*, 2015) and Pyrénées-Orientales department [5 locations] (Hugonnot *et al.*, 2018).

***Sphagnum fallax* (H.Klinggr.) H.Klinggr. – VU D2**

In our area, the species is known from five locations in central Pyrenees (EOO= ca. 630 km²; AOO= 20 km²), between Pla de Tor, Gèmena and Baiau (Casanovas, 1991; Pérez-Haase *et al.*, 2011; Brugués *et al.*, 2004). The species is reported from nearby areas in Andorra (Sotiaux & Vanderpoorten, 2017) and France: Midi-Pyrénées region (Infante Sánchez, 2015), where it has been assessed as NT (Infante Sánchez *et al.*, 2015) and Pyrénées-Orientales department [ca. 14 locations] (Hugonnot *et al.*, 2018). *S. fallax* is assessed as VU for the same reasons that have been exposed for *Sphagnum contortum*.

***Sphagnum flexuosum* Dozy & Molk. – VU D2**

In our area, this species is confined geographically to central Pyrenees (five locations, EOO= ca. 170 km²; AOO= 16 km²), mainly in the subalpine belt: Vall de Toran, Pla de Tor, Boavi, and Vallferrera (Casas de Puig, 1972; Casas Sicart, 1986; Casas *et al.*, 1994; Pérez-Haase *et al.*, 2011, data from BCB). The species is known from nearby areas: Aragón (Infante Sánchez & Heras Pérez, 2003) and France: Midi-Pyrénées region (Infante Sánchez, 2015), where it has been assessed as NT (Infante Sánchez *et al.*, 2015) and Pyrénées-Orientales department [2 locations] (Hugonnot *et al.*, 2018). The species is assessed as VU for the same reasons that have been exposed for *Sphagnum contortum*.

***Sphagnum medium* Limpr. – VU D2**

Sphagnum medium had been reported as *S. magellanicum* Brid., but recent molecular and experimental studies show that this latter species is confined to Chile and Argentina and *S. medium* (considered as a synonymous) is reinstated as a distinct species (Hassel *et al.*, 2018). Revision of Catalan specimens confirms the presence of *S. medium* in five locations (EOO= ca. 50 km²; AOO= 20 km²) in the Axial zone of the Pyrenees, between Tredós and Estany de Trescuro (Casas de Puig, 1972; Casas Sicart, 1986; Casas *et al.*, 1994; Brugués *et al.*, 2004; Pérez-Haase *et al.*, 2011, data from BCB). Reports of *S. magellanicum* from nearby areas in Andorra (Sotiaux & Vanderpoorten, 2017) and France: Midi-Pyrénées region (Infante Sánchez, 2015), where it has been assessed as NT (Infante Sánchez *et al.*, 2015) and Pyrénées-Orientales

department [ca. 14 locations] (Hugonnot *et al.*, 2018), are probably referable to *S. medium*. The species is assessed as VU for the same reasons that have been exposed for *Sphagnum contortum*.

***Sphagnum quinquefarium* (Braithw.) Warnst. – VU D2**

In the studied area there are two main locations in which the presence of this species is known: Prats d'Aiguadasi and Valarties (Munín, 1995; Casas *et al.*, 2006), corresponding to 3 UTM 1x1 km squares (EEO= 8 km²; AOO= 8 km²). In the latter area two nearby subpopulations are known. It is also known from nearby areas in Aragón, Panticosa (Munín, 1995), Andorra (Sotiaux & Vanderpoorten, 2017) and France: Midi-Pyrénées region (Infante Sánchez *et al.*, 2015) where it has been assessed as LC (Infante Sánchez *et al.*, 2015) and Pyrénées-Orientales department [3 locations] (Hugonnot *et al.*, 2018). Further data on distribution and threats of *S. quinquefarium* are required for a more accurate assessment; however, a provisional threat rating as VU D2 is considered appropriate until this data can be available.

***Syntrichia fragilis* (Taylor) Ochyra – VU D2**

In our area the species is documented so far from the eastern Pyrenees, Ter Valley (Lloret Maya, 1986), where it grows on shaded acidic rocks at 100-1350 m a.s.l. At least 3 subpopulations located in the 3 UTM 1x1 km squares are currently known. Given its geographic restriction (EEO= 8 km²; AOO= 8 km²) and low number of locations the species is potentially vulnerable to stochastic events or human activities. The species is also known from nearby areas in Andorra (Sotiaux & Vanderpoorten, 2017) and Pyrénées-Orientales department [ca. 13 locations] (Hugonnot *et al.*, 2018). Further field surveys could expand its known distribution in our area, so *S. fragilis* could be assessed as NT.

***Tayloria tenuis* (Dicks.) Schimp. – VU B1ab(ii,iii,iv)+2ab(ii,iii,iv)**

Six Pyrenean locations are known in the studied area in central and eastern Pyrenees: Aiguamòg, Espot, Arcalís, Malniu and two locations in Ter Valley (Cros i Matas, 1983; Lloret, 1990; Casas *et al.*, 2006 and data from BCB). These locations are found in 7 UTM 1x1 km squares (EEO= ca. 780 km²; AOO= 28 km²). The species usually occurs on cattle dung, wet soil in coniferous forests and decaying wood in the subalpine belt. *T. tenuis* is found in nearby areas in Andorra (Sotiaux & Vanderpoorten, 2017) and France: Midi-Pyrénées region (Infante Sánchez, 2015), where it has been assessed as EN (Infante Sánchez *et al.*, 2015) and Pyrénées-Orientales department [4 locations] (Hugonnot *et al.*, 2018). For *information about population dynamics of this species in eastern Pyrenees* see Lloret (1990, 1991). The species has not been found subsequently in some locations and Brugués *et al.* (2014a) inferred a decline in AOO, habitat quality, and number of locations or subpopulations. The available information suggests that the species' range, in spite of being relatively restricted, is not severely fragmented and exceeds the number of locations (sub-criterion "a") for EN.

***Timmia norvegica* J.E.Zetterst. – VU D2**

It is documented from three locations (EEO= ca. 2060 km²; AOO= 16 km²) in central and eastern Pyrenees: Rasos de Peguera, Serra de Cadí, Artiga de Lin and Núria (Casas Sicart, 1986;

Álvaro, 2010, data from BCB), where it occurs on calcareous rocky places and wet soil in high mountain areas. The collection corresponding to Núria area (Casas Sicart, 1993) dates back to 1919. The current threats are apparently limited; however, the restricted distribution of *T. norvegica* means that the species is vulnerable to potential threats. The species is also known from relatively nearby areas in Andorra (Sotiaux & Vanderpoorten, 2017) and France: Midi-Pyrénées region (Infante Sánchez, 2015), where it has been assessed as NT (Infante Sánchez *et al.*, 2015) and Pyrénées-Orientales department [3 main locations] (Hugonnot *et al.*, 2018). Some subpopulations found in Pyrénées-Orientales department are very close to Núria, although the possibility of any rescue from French subpopulations is unknown.

***Tortula pallida* (Lindb.) R.H.Zander – VU D2**

A population of the species at Aiguamolls de l'Empordà is the only confirmed record from our area (EEO= 4 km²; AOO= 4 km²), where it occurs on wet saline soils close to the coast (Álvaro, 1994). The population of the species appears to be very small and is likely to be susceptible to anthropogenic disturbance and stochastic events. Further data on distribution and threats of *T. pallida* are required for a more accurate assessment; however, a provisional threat rating as VU D2 is considered appropriate until this data can be available.

***Tortula vlassovii* (Laz.) Ros & Herrnst. – VU D2**

Two subpopulations of the species at Castellfollit de Riubregós and Torà (Jiménez *et al.*, 1990; Brugués *et al.*, 1993) are the only confirmed records from our area. The species grows on dry exposed gypsum soils in the Ebro Basin. Given its geographic restriction (EEO= 8 km²; AOO= 8 km²) and low number of locations the species is potentially vulnerable to stochastic events or human activities (changes in land uses and in agro-pastoral practices).

***Weissia squarrosa* (Nees & Hornsch.) Müll.Hal. – VU D2**

It is documented so far from two locations in northeastern Catalonia: L'Albera massif (Casas *et al.*, 1998c) and cap de Creus Peninsula (Guerra, 2006c), where it occurs on exposed periodically flooded soils and open scrub at 170-400 m a.s.l. Given its geographic restriction (EEO= 8 km²; AOO= 8 km²) and low number of locations, the species is potentially vulnerable to stochastic events or human activities. *W. squarrosa* is also known from a nearby location in Pyrénées-Orientales department (Hugonnot *et al.*, 2018).

NEAR THREATENED SPECIES (NT)

Hornworts

***Anthoceros punctatus* L.**

The species is known from five locations in northeastern Catalonia (EEO= ca. 150 km²; AOO= 20 km²): Palau-saverdera (Casas *et al.*, 1998a), Cassà de la Selva (Jover Benjumea, 2016) and three locations in Montseny massif (Casas Sicart, 1960 and data from BCB). Typical habitats are wet soils and shaded banks, at 40-925 m a.s.l.

Liverworts

***Calypogeia arguta* Nees & Mont.**

The species is closely confined to areas of strong maritime influence in northeastern Catalonia (EEO= ca. 680 km²; AOO= 16 km²): Santa Ceclina, Llambilles, Rabós and Montnegre massif (Cros i Matas, 1985; Casas *et al.*, 1992; Thouvenot, 2005; data from BCB), where it grows on wet shaded acidic soils in the lowlands. Despite being a rare species, the four subpopulations known as a whole is not prone to the effects of human activities or stochastic events within a very short time period. The species is also known from Midi-Pyrénées region (Infante Sánchez, 2015), where it has been assessed as LC (Infante Sánchez *et al.*, 2015) and Pyrénées-Orientales department [2 locations] (Hugonnot *et al.*, 2018).

***Calypogeia sphagnicola* (Arnell & J.Perss.) Warnst. & Loeske**

At least five Pyrenean locations: Val de Molières, Estany Llong, Tredós, Estany de Trescuro and Collada Verda, and one located in Alt Empordà, Comes Llobes, are known (Canalís & Casas, 1985; Casas Sicart, 1986; Casanovas Poch, 1991; data from BCB). Typical habitats include wetlands and streams, at 300-2050 m a.s.l. The species is also known from Andorra (Sotiaux & Vanderpoorten, 2017) and France: Midi-Pyrénées region (Infante Sánchez, 2015), where it has been assessed as EN (Infante Sánchez *et al.*, 2015) and Pyrénées-Orientales department [ca. 9 locations] (Hugonnot *et al.*, 2018). In our area there is no evidence of a continuous population decline. The number of locations (6) together with the geographic restriction (EEO= ca. 2480 km²; AOO= 24 km²) preclude the assignation of this species to VU D2.

***Chiloscyphus pallescens* (Ehrh.) Dumort.**

The species is documented from three Pyrenean locations: Vall de Cardós, Torrent de Grau and Torrent de Riu (Álvaro Martín, 2001; data from BCB). Of these, the latter two are founding Cadí-Moixeró Range. *Ch. pallescens* occurs on streams and wet rocky places in the montane and subalpine belts. Despite being a rare species (EEO= 8 km²; AOO= 8 km², 3 UTM 1x1 km squares), the known subpopulations are not prone to the effects of human activities or stochastic events within a very short time period. *Ch. pallescens* is found in nearby areas in Andorra (Sotiaux & Vanderpoorten, 2017), and France: Midi-Pyrénées region (Infante Sánchez, 2015), where it has been assessed as LC (Infante Sánchez *et al.*, 2015) and Pyrénées-Orientales department [ca. 25 locations] (Hugonnot *et al.*, 2018).

***Clevea nana* (Lindb.) Crandall-Stotler & D.G.Long**

Four Pyrenean subpopulations found in 5 UTM 1x1 km squares (EEO= ca. 690 km²; AOO= 20 km²) are known: Val de Molières, Pedraforca massif and two subpopulations in Cadí-Moixeró Range (Miguel Velasco *et al.*, 1995; Ruiz *et al.*, 2018a). The species occurs in wet rocks and soils between 1800 and 2490 m a.s.l. *C. nana* is also known from Andorra (Sotiaux & Vanderpoorten, 2017) and France: Midi-Pyrénées region (Infante Sánchez, 2015), where it has been assessed as VU (Infante Sánchez *et al.*, 2015) and Pyrénées-Orientales department

[ca. 9 locations] (Hugonnot *et al.*, 2018). The species is assessed as NT for the same reasons that have been exposed for *Chiloscyphus pallescens*.

***Frullania fragilifolia* (Taylor) Gottsche, Lindenb. & Nees**

This epiphytic species is known from 5 locations (EOO= ca. 6210 km²; AOO= 20 km²) in the central Pyrenees and the Catalan Ranges: Portilló de Bossost and Vilamós, Sant Llorenç de la Muga and two locations in Montseny massif (Casas *et al.*, 1996; Casas Sicart, 1999; data from BCB). The subpopulations are mainly found within protected areas, throughout a relatively wide altitudinal range (ca. 400-1400 m a.s.l.). The species is also known from Andorra (Sotiaux & Vanderpoorten, 2017) and France: Midi-Pyrénées region (Infante Sánchez, 2015), where it has been assessed as NT (Infante Sánchez *et al.*, 2015) and Pyrénées-Orientales department [ca. 25 locations] (Hugonnot *et al.*, 2018).

***Fuscocephaloziopsis lunulifolia* (Dumort.) Váňa & L.Söderstr.**

At least 12 locations (EOO= ca. 170 km²; AOO= 48 km²) are currently known in the central and eastern Pyrenees (Casas Sicart, 1986; Álvaro Martín, 2001; Cros *et al.*, 2010; Carrillo *et al.*, 2008; Pérez-Haase *et al.*, 2011, data from BCB). Although the species usually grows in a fragile habitat (decaying wood), its relatively small range is not severely fragmented and the number of locations and AOO value preclude the assignation of this species to VU D2. The species is also known from Andorra (Sotiaux & Vanderpoorten, 2017) and France: Midi-Pyrénées region (Infante Sánchez, 2015), where it has been assessed as EN (Infante Sánchez *et al.*, 2015) and Pyrénées-Orientales department [ca. 10 locations] (Hugonnot *et al.*, 2018).

***Fuscocephaloziopsis pleniceps* (Austin) Váňa & L.Söderstr.**

At least six Pyrenean locations (EOO= ca. 1260 km²; AOO= 24 km²) are known, between Bossost and Ulldeter (Casas de Puig, 1957; Lloret, 1989; Pérez-Haase *et al.*, 2011; data from BCB). The species occurs in wet acidic soils at 1600-2400 m a.s.l. It is also known from Andorra (Sotiaux & Vanderpoorten, 2017) and France: Midi-Pyrénées region (Infante Sánchez, 2015), where it has been assessed as EN (Infante Sánchez *et al.*, 2015) and Pyrénées-Orientales department [ca. 14 locations] (Hugonnot *et al.*, 2018). In our area there is no evidence of a continuous population decline. The number of locations and AOO value preclude the assignation of this species to VU D2.

***Gymnocolea inflata* (Huds.) Dumort.**

The presence of the species in our area is restricted to the Pyrenees, with eight locations (EOO= ca. 880 km²; AOO= 32 km²) between Portilló de Bossost and Vallferrera (Casas, 1968; Casas Sicart, 1986; data from BCB), where it occurs on peaty soils in montane or subalpine areas. The species is also known from nearby areas in Aragón (Infante Sánchez & Heras Pérez, 2003), Andorra (Sotiaux & Vanderpoorten, 2017) and France: Midi-Pyrénées region (Infante Sánchez, 2015), where it has been assessed as VU (Infante Sánchez *et al.*, 2015) and Pyrénées-Orientales department [ca. 14 locations] (Hugonnot *et al.*, 2018).

***Isopaches bicrenatus* (Schmidel ex Hoffm.) H.Buch**

Six locations are known in our area (EOO= ca. 6590 km²; AOO= 24 km²): Catalan ranges (from Montnegre massif to Sant Llorenç de la Muga) and central Pyrenees in Vall d'Àssua (Brugués *et al.*, 1981; Cros i Matas, 1985; Manobens i Rigol, 1985; data from BCB). It grows on humid siliceous soils at 200-250 m a.s.l. *I. bicrenatus* is found in nearby areas: Andorra (Sotiaux & Vanderpoorten, 2017) and France: Midi-Pyrénées region (Infante Sánchez, 2015), where it has been assessed as VU (Infante Sánchez *et al.*, 2015) and Pyrénées-Orientales department [6 locations] (Hugonnot *et al.*, 2018). The species is currently known from six locations, so that is close to qualifying for VU D2, accordingly it is assessed as NT.

***Jungermannia pumila* With.**

Five locations of this species are known in Catalonia: Estanys Liat (BCB 54105), Vall de Ruda (BCB 25981), and Saboredo (BCB 25982) in central Pyrenees and Sant Marçal (BCB 46919) and Mosqueroles (BCB 25983) in Montseny massif. *J. pumila* must be added to the catalogue of the Montseny massif (Sáez *et al.*, 2018b). Despite being a rare species (EOO= ca. 1315 km²; AOO= 20 km²), the known subpopulations, which occur on humid rocky siliceous places throughout a wide altitudinal range: 400-2250 m a.s.l., are not prone to the effects of human activities or stochastic events within a very short time period. The species is also known from nearby areas in France: Midi-Pyrénées region (Infante Sánchez, 2015), where it has been assessed as VU (Infante Sánchez *et al.*, 2015) and Pyrénées-Orientales department [11 locations] (Hugonnot *et al.*, 2018).

***Lophozia guttulata* (Lindb. & Arnell) A.Evans**

In our area the species is confined geographically to central and eastern Pyrenees, where at least ten locations (EOO= ca. 170 km²; AOO= 40 km²) are known, between Portilló de Bossost and Meranges (Casas Sicart, 1986; Cros *et al.*, 2010; data from BCB). Reports of this species (as *L. longiflora* (Nees) Schiffn.) from Cadi Range and Ter Valley (Álvaro-Martín & Hladún Simón, 1983; Lloret, 1989) require confirmation. *L. guttulata* usually occurs on decaying wet logs in the subalpine belt. Most subpopulations are found within protected areas. The species is also known from nearby areas in Aragón (Infante Sánchez & Heras Pérez, 2003), Andorra (Sotiaux & Vanderpoorten, 2017) and France: Midi-Pyrénées region (Infante Sánchez, 2015), where it has been assessed as VU (Infante Sánchez *et al.*, 2015) and Pyrénées-Orientales department [ca. 12 locations] (Hugonnot *et al.*, 2018).

***Lophozia wenzelii* (Nees) Steph.**

The presence of the species in our area is restricted to the central and eastern Pyrenees, with six locations (EOO= ca. 780 km²; AOO= 24 km²) between Tredós and Núria (Casas & Infante, 1998; Carrillo *et al.*, 2008; data from BCB) where it occurs in humid rocky places and banks at 1800-250 m a.s.l. *L. wenzelii* could become threatened in the near future if its habitat becomes increasingly under pressure. The species is also known from nearby areas in Aragón (Casas & Infante, 1998; Infante Sánchez & Heras Pérez, 2003), Andorra (Sotiaux & Vanderpoorten, 2017) and France: Midi-Pyrénées region (Infante Sánchez, 2015), where it has

been assessed as VU (Infante Sánchez *et al.*, 2015) and Pyrénées-Orientales department [ca. 14 locations] (Hugonnot *et al.*, 2018).

***Marsupella sphacelata* (Giesecke ex Lindenb.) Dumort.**

Eight locations of this species are known in our area (EOO= ca. 2685 km²; AOO= 28 km²), between Val d'Aran (Salardú) and Alt Empordà (Rabós), where it grows on wet rocks, between 300 m and ca. 2500 m a.s.l. (Lloret, 1989; Thouvenot, 2005; data from BCB). Most subpopulations are within well-conserved areas. The species is also known from nearby areas in Aragón (Infante Sánchez & Heras Pérez, 2003), Andorra (Sotiaux & Vanderpoorten, 2017) and France: Midi-Pyrénées region (Infante Sánchez, 2015), where it has been assessed as DD (Infante Sánchez *et al.*, 2015) and Pyrénées-Orientales department [5 main locations] (Hugonnot *et al.*, 2018).

***Nardia geoscyphus* (De Not.) Lindb.**

In our area the species is confined to central and eastern Pyrenees, where at least seven locations (EOO= ca. 510 km²; AOO= 24 km²) are known between Valarties and Puigmal (Allorge & Casas de Puig, 1976 and data from BCB). The species occurs grows on wet rocks, between 1500 m and ca. 2400 m a.s.l. *N. geoscyphus* is also known from nearby areas in Aragón (Infante Sánchez & Heras Pérez, 2003), Andorra (Sotiaux & Vanderpoorten, 2017) and France: Midi-Pyrénées region (Infante Sánchez, 2015), where it has been assessed as EN (Infante Sánchez *et al.*, 2015) and Pyrénées-Orientales department [ca. 11 locations] (Hugonnot *et al.*, 2018).

***Neorthocaulis floerkei* (F.Weber et D.Mohr) L.Söderstr., De Roo & Hedd.**

The species occurs scattered in mountain areas in central and eastern Pyrenees (Casas Sicart, 1986; Lloret, 1989; Cros *et al.*, 2010 and data from BCB). It is known from at least six locations (EOO= ca. 670 km²; AOO= 24 km²) where it grows in wet rocks and moist soil between 1500 and 250 m a.s.l. Most subpopulations are within well-conserved areas. The species is also known from nearby areas in Andorra (Sotiaux & Vanderpoorten, 2017) and France: Midi-Pyrénées region (Infante Sánchez, 2015), where it has been assessed as NT (Infante Sánchez *et al.*, 2015) and Pyrénées-Orientales department [5 locations] (Hugonnot *et al.*, 2018).

***Oxymitra incrassata* (Broth.) Sérgio & Sim-Sim**

The species is known from northeastern Catalonia: Montseny, Montgrí, L'Albera, Portbou and Cap de Creus Peninsula (Casas *et al.*, 1998a,c; Corominas Xifra, 2003; Sáez *et al.*, 2018b), where it grows in open sandy or clayey soils in lowlands. Most subpopulations are within protected areas. *O. incrassata* is currently known from six locations (EOO= ca. 1960 km²; AOO= 24 km²), so that is close to qualifying for VU D2, accordingly it is assessed as NT. The species is also known from nearby areas in southeastern Pyrénées-Orientales department [4 locations] (Hugonnot *et al.*, 2018).

***Ptilidium ciliare* (L.) Hampe**

The presence of the species in our area is restricted to the central and eastern Pyrenees, with six locations corresponding to 7 UTM 1x1 km squares (EOO= ca. 1835 km²; AOO= 28 km²) between Conangles and Ulldeter (Canalís & Casas, 1985; Lloret, 1989; Casas *et al.*, 1989 and data from BCB) where it occurs on wet rocks and soils between 1800 and 2400 m a.s.l. The species is also known from nearby areas in Aragón (Infante Sánchez & Heras Pérez, 2003), Andorra (Sotiaux & Vanderpoorten, 2017) and France: Midi-Pyrénées region (Infante Sánchez, 2015), where it has been assessed as NT (Infante Sánchez *et al.*, 2015) and Pyrénées-Orientales department [8 main locations] (Hugonnot *et al.*, 2018).

***Riccardia multifida* (L.) Gray**

This species has a wide but scattered distribution in our area (EOO= ca. 11020 km²; AOO= 24 km²; six locations) in the study area: four from central Pyrenees, and the rest found in Serra de Prades and Montseny massif (Brugués, 1978; Casas Sicart, 1986; Sáez *et al.*, 2018b; and data from BCB), where it usually grows on decaying wood or wet rocks in montane areas. A report from eastern Pyrenees, Circ de Concrós (Lloret, 1989) is due to confusion with *R. chamaedryfolia*. There is also an ancient record (Casares Gil, 1919) for Collserola massif which has not been confirmed later, and that is not included in the values of EOO and AOO. The species is also known nearby areas in Aragón (Infante Sánchez & Heras Pérez, 2003) and France: Midi-Pyrénées region (Infante Sánchez, 2015), where it has been assessed as LC (Infante Sánchez *et al.*, 2015) and Pyrénées-Orientales department [9 locations] (Hugonnot *et al.*, 2018).

***Riccardia palmata* (Hedw.) Carruth.**

It is restricted to the central and eastern Pyrenees, with ten locations (EOO= ca. 190 km²; AOO= 40 km²) between Val de Molières and Ter Valley (Seró Navàs, 1945; Canalís & Casas, 1985; Casas Sicart, 1986; Lloret, 1989; Cros *et al.*, 2010; data from BCB). The species is also known nearby areas in Aragón (Infante Sánchez & Heras Pérez, 2003), Andorra (Sotiaux & Vanderpoorten, 2017) and France: Midi-Pyrénées region (Infante Sánchez, 2015), where it has been assessed as LC (Infante Sánchez *et al.*, 2015) and Pyrénées-Orientales department [9 main locations] (Hugonnot *et al.*, 2018).

***Riccia atromarginata* Levier**

The species is known from southern Catalonia: Baix Ebre, Baix Llobregat, Baix Penedès and Montsià counties (Casas & Brugués, 1983; Casas *et al.*, 1985b; data from BCB), where it occurs on dry calcareous exposed soils, in lowlands. The species is currently known from six locations (EOO= ca. 1500 km²; AOO= 24 km²), so that is close to qualifying for VU D2, accordingly it is assessed as NT.

***Riccia beyrichiana* Hampe**

The species is currently known from six locations (EOO= ca. 1070 km²; AOO= 24 km²) in northeastern Catalonia: Alt Empordà and La Selva counties (Casas *et al.*, 1983, 1998c; data from BCB). It grows in open scrub and exposed periodically flooded soils in lowlands. The

species is also known nearby areas in Pyrénées-Orientales department [11 locations] (Hugonnot *et al.*, 2018).

***Riccia crozalsii* Levier**

The species is known from three main areas in northeastern Catalonia: Cap de Creus Peninsula, L'Albera massif, Olot and La Roca del Vallès (Allorge & Casas de Puig, 1968; Casas *et al.*, 1998a,c; data from BCB). It grows in grassland, open scrub and exposed periodically flooded soils in lowlands. Most subpopulations are found within protected areas. The species is currently known from eight locations (EOO= ca. 2470 km²; AOO= 28 km²), so that is close to qualifying for VU D2, accordingly it is assessed as NT. The species is also known nearby areas in Pyrénées-Orientales department [ca. 8 main locations] (Hugonnot *et al.*, 2018).

***Riccia fluitans* L.**

The species occurs scattered in lowland areas. At least nine locations (EOO= ca. 7030 km²; AOO= 36 km²) are known: la Jonquera, Banyoles, two subpopulations, Gavarres, Riudellots, Armentera, Les Closes, Delta del Llobregat, and Deltebre (Álvaro, 1994; Casas & Girbal, 1998; Casas *et al.*, 1998c; Jover, 2016; data from BCB). It is usually found in eutrophic water, although it can also be found in humid soils, in the lowlands. There is no clear evidence of a decline in the number of locations or AOO. Even if some subpopulations were lost, this circumstance cannot be considered as a continuous decline. The number of locations together with the AOO value preclude the assignation of this species to VU D2. Therefore, it is assessed as NT.

***Riccia macrocarpa* Levier**

The species is known from the main areas in northeastern Catalonia: L'Albera massif and Cap de Creus peninsula (Casas *et al.*, 1992, 1998a,c; data from BCB). It grows in grassland, open scrub and exposed periodically flooded soils in lowlands. Most populations are found within protected areas. The species is currently known from seven locations (EOO= ca. 92 km²; AOO= 28 km²), so that is close to qualifying for VU D2, accordingly it is assessed as NT.

***Riccia warnstorffii* Limpr.**

It is documented so far from nine locations corresponding to 9 UTM 1x1 km squares (EOO= ca. 6480 km²; AOO= 32 km²): Montseny massif, Massanet de la Selva, L'Albera massif and central Pyrenees, Sant Antoni reservoir (Casas Sicart, 1960; Casas *et al.*, 1983, 1998c; data from BCB). Typical habitats include exposed periodically flooded soils, open scrub, siliceous rocks and waysides, throughout a wide altitudinal range (140-140 m a.s.l.) The species is also known nearby areas in southeastern Pyrénées-Orientales department [6 locations] (Hugonnot *et al.*, 2018).

***Scapania calcicola* (Arnell & J.Perss.) Ingham**

The species occurs scattered in mountain areas in the Pre-Pyrenees (Cadí-Moixeró, Port del Comte, Rasos de Peguera) and central Catalan ranges in Garraf massif and Prades (Brugués, 1978; Álvaro Martín, 2001; Ruiz *et al.*, 2018a and data from BCB). It is known from at least eight locations (EOO= ca. 7620 km²; AOO= 32 km²) where it grows in limestone rocks

throughout a wide altitudinal range (240-2200 m a.s.l.). Most of the subpopulations are within well-preserved areas.

***Schistochilopsis incisa* (Schrad.) Konstant.**

The species is known from six Pyrenean locations (EEO= 180 km²; AOO= 24 km²), between Portilló de Bossost and Ulldeter (Allorge & Allorge, 1946; Casas Sicart, 1986; Lloret, 1989 Casas & Infante, 1998, Cros *et al.*, 2010). Typical habitats include decaying wet logs and siliceous rocks and soils in subalpine areas. *S. incisa* is known from nearby areas: Andorra (Sotiaux & Vanderpoorten, 2017) and France: Pyrénées-Orientales department [ca. 20 locations] (Hugonnot *et al.*, 2018) and Midi-Pyrénées region (Infante Sánchez, 2015) where it has been assessed as VU (Infante Sánchez *et al.*, 2015).

***Sphaerocarpos texanus* Austin**

This species has a scattered distribution in the study area (four locations are known): El Perelló, Gavarres massif, Roses and Palau-saverdera (Casas *et al.*, 1998a; Jover, 2016; data from BCB). Typical habitats include cultivated fields and moist soils in lowlands. Despite being a rare species (EEO= 3840 km²; AOO= 16 km²), the known subpopulations as a whole are not prone to the effects of human activities or stochastic events within a very short time period.

***Trichocolea tomentella* (Ehrh.) Dumort.**

The species is restricted in our area to central Pyrenees and northern Coastal Ranges, where it grows on wet soils and rocks in montane areas. It is known from the central Pyrenees (Mata de València, Bossost and Portilló), and from several disjunct subpopulations in Olot-Vidrà and Montseny massif (Casas Sicart, 1960; Allorge & Casas de Puig, 1968; Sanz i Magrané & Casas i Sicart, 1983; Casas Sicart, 1986; Cros *et al.*, 2010). *T. tomentella* is currently known from eight locations (EEO= ca. 3300 km²; AOO= 28 km²), so that is close to qualifying for VU D2, accordingly it is assessed as NT. However, the species could be listed as VU if a reduction of its geographic range and number of locations occurs. *T. tomentella* is also known nearby areas in France: Midi-Pyrénées region (Infante Sánchez, 2015), where it has been assessed as VU (Infante Sánchez *et al.*, 2015) and Pyrénées-Orientales department [ca. 3 locations] (Hugonnot *et al.*, 2018).

***Tritomaria exsectiformis* (Breidl.) Schiffn. ex Loeske**

The presence of the species in our area is restricted to the Axial zone of the Pyrenees: Val d'Aran (several subpopulations), Pica d'Estats, Ter and Fresser headwaters, with a separate subpopulation in Sant Esteve del Llop (Brugués *et al.*, 1981; Casas Sicart, 1986; Lloret, 1989; data from BCB). The species is also known nearby areas in Andorra (Sotiaux & Vanderpoorten, 2017) and France: Midi-Pyrénées region (Infante Sánchez, 2015), where it has been assessed as VU (Infante Sánchez *et al.*, 2015) and Pyrénées-Orientales department [13 locations] (Hugonnot *et al.*, 2018). Although the species usually grows in a fragile habitat (decaying wood), its relatively small range is not severely fragmented, and at least 10 locations are known (EEO= ca. 2200 km²; AOO= 40 km²), what precludes the assignation of this species to VU D2.

Mosses

Acaulon casasianum Brugués & H.A.Crum

The species is restricted in our area to the Ebro Basin where seven locations (EOO= ca. 150 km²; AOO= 28 km²) are currently known: Biosca, Castellfullit de Riubregós, Plandogau, between Calaf and Sanahuja, Torà de Riubregós, Tudela de Segre and Vilanova de l'Aguda (Casas *et al.*, 1989; Brugués *et al.*, 1993; data from BCB). *A. casasianum* is generally restricted to dry exposed gypsum soils. It is potentially impacted by human activities, although there is no evidence of a continuous population decline. The value of AOO and the number of locations exceed the thresholds established for criterion D2. The species could become threatened in the near future if its habitat becomes increasingly under pressure.

Acaulon fontiquerianum Casas & Sérgio

In the studied area several subpopulations (most of them recently discovered) are known in Montgrí massif area and its area of influence (Jover Benjumea, 2007; Guerra *et al.*, 2010a) without being exposed to significant risk factors in the short or medium term. The EOO and AOO values are ca. 38 km² and 24 km², respectively. The species occurs in grassland and open scrub in calcareous soils in the lowlands. Most of the subpopulations are found within a protected area. The number of locations and AOO value preclude the assignation of this species to VU D2. However, since the species has a relatively restricted range in our area, it is assessed as NT.

Acaulon mediterraneum Limpr.

It is documented so far from at least four confirmed locations (EOO= ca. 40 km²; AOO= 16 km²) in northeastern Catalonia: Cap de Creus Peninsula (with several subpopulations) and Vilajuïga (Casas de Puig, 1958b; Casas *et al.*, 1983; 1998a), where it occurs on exposed soils in the lowlands. Despite being a rare species, the known subpopulations as a whole are not prone to the effects of human activities or stochastic events within a very short time period. The species is also known nearby areas in eastern Pyrénées-Orientales department [2 locations] (Hugonnot *et al.*, 2018).

Acaulon muticum (Hedw.) Müll.Hal.

The species is closely confined to areas of strong maritime influence in two main areas: Cap de Creus Peninsula and Montgrí massif (Casas *et al.*, 1998a; Jover Benjumea, 2007; data from BCB), where it occurs on exposed soils in the lowlands within protected areas. *A. muticum* is currently known from six locations (EOO= ca. 40 km²; AOO= 24 km²), so that is close to qualifying for VU D2, accordingly it is assessed as NT. The species is also known nearby areas in eastern Pyrénées-Orientales department [3 locations] (Hugonnot *et al.*, 2018).

Amphidium lapponicum (Hedw.) Schimp.

The presence of the species in our area is restricted to the central and eastern Pyrenees, with six locations (EOO= ca. 325 km²; AOO= 24 km²) between La Restanca and Ter valley (Allorge & Casas de Puig, 1976; Lloret, 1989; Casas *et al.*, 1996, 2006). *A. lapponicum* occurs on siliceous rock crevices at 1700-2400 m a.s.l. It is also known in nearby areas in Aragón

(Infante Sánchez & Heras Pérez, 2003), Andorra (Sotiaux & Vanderpoorten, 2017) and France: Midi-Pyrénées region (Infante Sánchez, 2015), where it has been assessed as VU (Infante Sánchez *et al.*, 2015) and Pyrénées-Orientales department [1 main location] (Hugonnot *et al.*, 2018).

***Andreaea nivalis* Hook.**

The species occurs scattered in high mountain areas in central Pyrenees between Val de Molières and Estany de Certascan (Canalís & Casas, 1985; Casas Sicart, 1986; Casas *et al.*, 1996; data from BCB). It is known from at least seven locations (EOO= ca. 785 km²; AOO= 28 km²) where it grows in wet acidic rocks crevices at 200-2700 m a.s.l. Most of the subpopulations are found within protected areas. It is also known from nearby areas in Aragón (Infante Sánchez & Heras Pérez, 2003), Andorra (Sotiaux & Vanderpoorten, 2017) and France: Midi-Pyrénées region (Infante Sánchez, 2015), where it has been assessed as NT (Infante Sánchez *et al.*, 2015) and Pyrénées-Orientales department [4 locations] (Hugonnot *et al.*, 2018).

***Anomodon rostratus* (Hedw.) Schimp.**

The species is known from eight locations corresponding to 7 UTM 1x1 km squares (EOO= ca. 95 km²; AOO= 24 km²) seven of which correspond to Vidrà area and one to Vilallonga de Ter (Sanz i Magrané, 1984; Granzow de la Cerda, 1988; Lloret, 1989; data from BCB). Typical habitats include bark of trees (*Quercus petraea*, *Fagus sylvatica* and *Buxus sempervirens*) and humid calcareous rocks at 830-1200 m a.s.l. *A. rostratus* is also known from nearby areas in France: Midi-Pyrénées region (Infante Sánchez *et al.*, 2015), where it was regarded as VU, and Pyrénées-Orientales department [6 locations] (Hugonnot *et al.*, 2018).

***Archidium alternifolium* (Hedw.) Mitt.**

The species is known from 14 locations (EOO= ca. 8990 km²; AOO= 56 km²). It is potentially impacted by human activities in some areas, although there is no evidence of a continuous population decline. The values of AOO and the number of locations exceed the thresholds established for criterion D2. The species is also known nearby areas in southeastern Pyrénées-Orientales department [2 locations] (Hugonnot *et al.*, 2018).

***Aschisma carniolicum* (F.Weber & D.Mohr) Lindb.**

The species is closely confined to areas of strong maritime influence in two main areas: Montgrí massif and L'Albera massif (Masip, 1978; Brugués *et al.*, 1981; Casas *et al.*, 1985a, 1998a,c), where it occurs on exposed soils in the lowlands. At least five concrete locations are currently known (EOO= ca. 60 km²; AOO= 20 km²). Records of the species from Cap Norfeu are due to confusion with *A. cuynetii*.

***Aulacomnium androgynum* (Hedw.) Schwägr.**

The species occurs scattered in mountain areas in northern Catalonia (EOO= ca. 15200 km²; AOO= 32 km², 8 locations): Val d'Aran, Alta Vall del Ter, Collsacabra, Montseny and Prades (Casares Gil, 1915; Allorge & Casas, 1968; Casas Sicart, 1960; Lloret, 1989; Casas *et al.*, 2006; data from BCB). It grows on wet soils, tree stumps and base of trees in montane

areas. The species is also known nearby areas in Aragón (Infante Sánchez & Heras Pérez, 2003), Andorra (Sotiaux & Vanderpoorten, 2017) and France: Midi-Pyrénées region (Infante Sánchez, 2015), where it has been assessed as LC (Infante Sánchez *et al.*, 2015) and Pyrénées-Orientales department [6 locations] (Hugonnot *et al.*, 2018).

***Brachythecium mildeanum* (Schimp.) Schimp.**

The species is known from at least five locations (EEO= ca. 160 km²; AOO= 20 km²) in central and eastern Pyrenees (Casanovas Poch, 1991; Casas, 2000; Casas *et al.*, 2006; Orgaz *et al.*, 2009). *Brachythecium mildeanum* occurs on wet soils and humid rocks in montane or subalpine areas. Most populations are found within protected areas in which no significant disturbances are predictable. *B. mildeanum* is also known from nearby areas in Aragón (Infante Sánchez & Heras Pérez, 2003) and Midi-Pyrénées region (Infante Sánchez *et al.*, 2015), where it was regarded as CR and DD, respectively.

***Brachythecium turgidum* (C.Hartmann) Kindb.**

The presence of the species in our area is restricted to the central and eastern Pyrenees, with seven locations (EEO= ca. 1530 km²; AOO= 28 km²) between Vall de Varradós and Pedraforca massif (Casas, 2004; Orgaz *et al.*, 2012a; Cros *et al.*, 2010; Ruiz *et al.*, 2018a; data from BCB). *Brachythecium turgidum* occurs on humid calcareous rocky places, between 1900 and 2600 m a.s.l. The species is also known from Midi-Pyrénées region, where it has been assessed as NT (Infante Sánchez *et al.*, 2015).

***Buxbaumia viridis* (Moug. ex Lam. & DC.) Brid. ex Moug. & Nestl.**

The species is found in the central and eastern Pyrenees (Casas Sicart, 1986; Cros *et al.*, 2010; Carnicero & Unzeta, 2016; Ruiz *et al.*, 2018a; data from BCB and personal observations of L. Sáez) and a disjunct subpopulation in Montseny massif is currently known (Sáez *et al.*, 2018b). *Buxbaumia viridis* occurs on decaying wet logs, mainly in subalpine forests, at 150-2000 m a.s.l. In our area there is no evidence of a continuous population decline, and most of its range lies within protected areas. The knowledge of the distribution of *B. viridis* has improved significantly in recent years. A noticeable number of recent records of the species have increased its AOO in our area. Previous assessments of *B. viridis* as threatened were based on imperfect knowledge about its status. The EEO and AOO values (ca. 5440 km² and 84 km², respectively) and the number of locations (21) exceed the thresholds established for criterion D2. However, since *B. viridis* grows in a relatively fragile habitat, it is assessed as NT. The species is also known from nearby areas in Aragón (Infante Sánchez & Heras Pérez, 2003); Andorra (Sotiaux & Vanderpoorten, 2017) and France: Midi-Pyrénées region (Infante Sánchez, 2015), where it has been assessed as NT (Infante Sánchez *et al.*, 2015) and western Pyrénées-Orientales department [ca. 15 locations] (Hugonnot *et al.*, 2018).

***Campylophyllum halleri* (Hedw.) M.Fleisch.**

The species is currently known from eight locations (EEO= ca. 950 km²; AOO= 32 km²), scattered in central and eastern Pyrenees, between Artiga de Lin and Cadí-Moixeró range (Manobens i Rigol, 1985; Casas Sicart, 1986; Álvaro Martín, 2001; Casas *et al.*, 2006; Ruiz *et*

al., 2018a; data from BCB), where it grows in wet calcareous soil in the subalpine and alpine belts. Most subpopulations are within well-conserved areas. The species is also known from nearby areas in Andorra (Sotiaux & Vanderpoorten, 2017) and France: Midi-Pyrénées region (Infante Sánchez, 2015), where it has been assessed as LC (Infante Sánchez *et al.*, 2015) and Pyrénées-Orientales department [3 locations] (Hugonnot *et al.*, 2018).

***Campylopus brevipilus* Bruch & Schimp.**

The presence of the species in our area is restricted to northeastern Catalonia: Cadiretes, Gavarres, La Roca, Llagostera, Caldes de Malavella and Sils (Casas de Puig *et al.*, 1956; Cros, 2001; Jover, 2016; data from BCB), where it occurs on acidic rock crevices and soils in the lowlands. *C. brevipilus* is currently known from six locations (EEO= ca. 390 km²; AOO= 24 km²), so that is close to qualifying for VU D2, accordingly it is assessed as NT. However, the species could be listed as VU if a reduction of its geographic range and number of locations occurs.

***Cinclidotus aquaticus* (Hedw.) Bruch & Schimp.**

The species is known from at least six locations (EEO= ca. 870 km²; AOO= 24 km²) in central and eastern Pyrenees (Casas *et al.*, 2006; Ederra, 2006; data from BCB), where it occurs on submerged calcareous rocks in the lowlands and the montane areas. It is also known from nearby areas in France: Midi-Pyrénées region (Infante Sánchez, 2015), where it has been assessed as VU (Infante Sánchez *et al.*, 2015) and Pyrénées-Orientales department [c. 17 locations] (Hugonnot *et al.*, 2018).

***Cirriphyllum piliferum* (Hedw.) Grout**

The species occurs scattered in northern Catalonia: Garrotxa volcanic field, central Pyrenees and eastern Pyrenees, between Artiga de Lin and Cadí-Moixeró range (Allorge & Casas de Puig, 1968; Casas Sicart, 1986; Ruiz *et al.*, 2018a). It grows on wet rocky places throughout a wide altitudinal range 650-2495 m. Two subpopulations from Cadí-Moixeró range (Ruiz *et al.*, 2018a), are found in almost inaccessible areas. All the subpopulations are within protected areas without remarkable threats for the habitat of *C. piliferum*. Despite being a rare species (EEO= ca. 1325 km²; AOO= 16 km²) *C. piliferum* is not prone to the effects of human activities or stochastic events within a very short time period. The species is also known from nearby areas in Andorra (Sotiaux & Vanderpoorten, 2017) and France: Midi-Pyrénées region (Infante Sánchez, 2015), where it has been assessed as LC (Infante Sánchez *et al.*, 2015) and Pyrénées-Orientales department [4 locations] (Hugonnot *et al.*, 2018).

***Dicranella subulata* (Hedw.) Schimp.**

The species is known from at least five locations (EEO= ca. 120; AOO= 20 km²) in central and eastern Pyrenees and Garrotxa volcanic field (Casas Sicart, 1993; Casas *et al.*, 2006; Brugués *et al.*, 2007a), where it occurs on wet soils throughout a wide altitudinal range (630-2450 m a.s.l.). Despite being a rare species, the known subpopulations as a whole are not prone to the effects of human activities or stochastic events within a very short time period. The species is also known from nearby areas in Andorra (Sotiaux & Vanderpoorten, 2017) and

France: Midi-Pyrénées region (Infante Sánchez, 2015), where it has been assessed as DD (Infante Sánchez *et al.*, 2015) and Pyrénées-Orientales department [ca. 20 locations] (Hugonnot *et al.*, 2018).

***Dicranum spadiceum* J.E.Zetterst.**

There are four main areas in which the presence of this species is known: La Restanca, Portarró d'Espot, Núria and Setcases (Allorge & Casas de Puig, 1976; Brugués & Ruiz, 2015 and data from BCB), in these last two areas with two subpopulations in each of them (EOO= ca. 570 km²; AOO= 24 km²). The species occurs in rocky places between 200 and 2600 m a.s.l. All the subpopulations are within protected areas without remarkable threats for the habitat of the species. It is also known from nearby areas in France: Midi-Pyrénées region (Infante Sánchez *et al.*, 2015) and Pyrénées-Orientales department [c. 10 locations] (Hugonnot *et al.*, 2018).

***Ditrichum pusillum* (Hedw.) Hampe**

The species occurs scattered in, at least, four main mountain areas corresponding to 6 UTM 1x1 km squares: Espot, Vilallonga de Ter, Garrotxa volcanic field and Sant Feliu de Pallarols (Lloret, 1989; Brugués *et al.*, 2007a; Puche, 2015a; data from BCB). It grows on wet rocky places throughout a wide altitudinal range (500-2000 m a.s.l.). Most subpopulations are within protected areas without remarkable threats for the habitat of *D. pusillum*. Despite being a rare species (EOO= ca. 1380 km²; AOO= 20 km²), it is not prone to the effects of human activities or stochastic events within a very short time period. The species is also known from nearby areas in France: Midi-Pyrénées region (Infante Sánchez, 2015), where it has been assessed as DD (Infante Sánchez *et al.*, 2015).

***Encalypta affinis* R.Hedw.**

It is known from eight locations (EOO= ca. 1810 km²; AOO= 32 km²) in the central and eastern Pyrenees, between Tuc de Cravera and La Molina (Canalís & Casas, 1992; Álvaro Martín, 2001; Casas, 2004; Casas *et al.*, 2006; Ruiz *et al.*, 2018a; data from BCB), where it grows on calcareous rocks between 1800 and 2600 m a.s.l. This species has been reported from nearby areas in France: Midi-Pyrénées region (Infante Sánchez, 2015), where it has been assessed as DD (Infante Sánchez *et al.*, 2015). Most subpopulations are found within protected areas and without remarkable threats for the habitat of *E. affinis*. The species is close to qualifying for VU D2, accordingly it is assessed as NT.

***Encalypta rhapsocarpa* Schwägr.**

The species occurs scattered in mountain areas in central and eastern Pyrenees. It is known from at least eight locations (EOO= ca. 1560 km²; AOO= 32 km²) found in a zone between Tuc de Molières and Cadí-Moixeró range (Manobens i Rigol, 1985; Casas Sicart, 1986; Ballesteros & Canalís, 1991; Álvaro Martín, 2001), where it occurs on calcareous or siliceous rocks in high mountain areas. Most subpopulations are found within protected areas. *E. rhapsocarpa* is also known from nearby areas in Aragón (Infante Sánchez & Heras Pérez, 2003) –where it is regarded as “rare”–; Andorra (Sotiaux & Vanderpoorten, 2017) and France:

Midi-Pyrénées region (Infante Sánchez *et al.*, 2015) where it has been assessed as DD, and Pyrénées-Orientales department [15 locations] (Hugonnot *et al.*, 2018).

***Encalypta spathulata* Müll.Hal.**

The presence of the species in our area is restricted to eastern Pyrenees, with three locations in Cadí-Moixeró range: Moixeró, Barranc de Font Llebrera and Torreta de Cadí (Álvaro Martín, 2001; Ruiz *et al.*, 2018a). *E. spathulata* occurs on calcareous rocks and soils, mainly in shady places, between 1350 and 2530 m a.s.l. Despite being a rare species (EOO= ca. 42 km²; AOO= 12 km²), the known subpopulations as a whole are not prone to the effects of human activities or stochastic events within a very short time period. The species is also known from nearby areas in Andorra (Sotiaux & Vanderpoorten, 2017) and Midi-Pyrénées region (Infante Sánchez, 2015), where it has been assessed as DD (Infante Sánchez *et al.*, 2015).

***Entosthodon obtusus* (Hedw.) Lindb.**

It occurs scattered in northeastern Catalonia: Plana de la Selva, Cadiretes, L'Albera massif and Cap de Creus Peninsula (Brugués *et al.*, 1982b; Casas *et al.*, 1996, 1998a; Thouvenot, 2005; Jover, 2016; data from BCB) where it occurs on humid soils and banks in the lowlands. *E. obtusus* is currently known from seven locations (EOO= ca. 900 km²; AOO= 28 km²), so that is close to qualifying for VU D2, accordingly it is assessed as NT. The species is also known from nearby areas in eastern Pyrénées-Orientales department [4 locations] (Hugonnot *et al.*, 2018).

***Ephemerum crassinervium* subsp. *sessile* (Bruch) Holyoak**

The species, which is generally restricted to exposed temporary flooded soils in lowlands, is currently known from 6 locations in our area (EOO= ca. 2950 km²; AOO= 24 km²): La Roca, Gavà, Sant Climent Sescebes, Gavarres and two locations in Port de la Selva (Casas de Puig, 1958; Casas *et al.*, 1989, 1998a,c; Jover, 2016; data from BCB), where it occurs on grassland and periodically flooded siliceous soils in the lowlands. The species is also known from a nearby location in southeastern Pyrénées-Orientales department (Hugonnot *et al.*, 2018).

***Ephemerum minutissimum* Lindb.**

The species is closely confined to areas of strong maritime influence: Montnegre, Cervelló, Roses, Gavarres and L'Albera massif (Casas *et al.*, 1998a; Jover, 2016; data from BCB), where it occurs on bare soils in grassland and temporary flooded soils in lowlands. At least seven locations are currently known (EOO= ca. 3490 km²; AOO= 28 km²). The species is also known from nearby areas in Pyrénées-Orientales department [9 locations] (Hugonnot *et al.*, 2018).

***Ephemerum serratum* (Hedw.) Hampe**

In our area, it is confined geographically to northeastern Catalonia, where at least ten locations (EOO= ca. 2260 km²; AOO= 40 km²) are known in Montseny massif, Cap de Creus Peninsula, Gavarres and L'Albera massif (Casas *et al.*, 1998a; Jover, 2016; Sáez *et al.*, 2018b; data from BCB). The species occurs on bare soils in open scrub, grassland and temporary flooded siliceous soils between 100 and 1085 m a.s.l. According to Sáez *et al.* (2018b) the Montseny massif subpopulation was probably lost. However, this circumstance cannot be

considered as a continuous decline of the Catalan population as a whole. *E. serratum* is listed here as NT as it is close to qualifying for VU under criterion D2. The species is also known from nearby areas in southeastern Pyrénées-Orientales department [2 locations] (Hugonnot *et al.*, 2018).

***Eurhynchium angustirete* (Broth.) T.J.Kop.**

The species is known from 8 locations (EEO= ca. 1040 km²; AOO= 32 km²) in central and eastern Pyrenees, between Portilló de Bossost and Setcases (Casas de Puig, 1974; Casas Sicart, 1986; Lloret, 1989; Cros *et al.*, 2010; data from BCB), where it grows in humus-rich-soils and rocks, between 100 and 1800 m a.s.l. Both, the number of locations and the value of AOO far exceed the geographical restriction threshold established for VU D2. It is also known from nearby areas in Aragón (Heras *et al.*, 2004); Andorra (Sotiaux & Vanderpoorten, 2017) and France: Midi-Pyrénées region (Infante Sánchez, 2015), where it has been assessed as VU (Infante Sánchez *et al.*, 2015) and Pyrénées-Orientales department [8 main locations] (Hugonnot *et al.*, 2018).

***Fabronia ciliaris* (Brid.) Brid.**

This epiphytic species is known from 5 locations (EEO= ca. 2960 km²; AOO= 20 km²) in the Catalan Ranges and eastern Pyrenees: Arbúcies, Sant Llorenç del Munt, Pardines, Garrotxa volcanic field and Grèixer (Casas Sicart, 1960; data from BCB). Despite being a rare species, the known subpopulations as a whole are not prone to the effects of human activities or stochastic events within a very short time period. The species is also known from a single location in southern Pyrénées-Orientales department (Hugonnot *et al.*, 2018).

***Fabronia pusilla* Raddi**

This species has a wide but scattered distribution in our area (EEO= ca. 16500 km²; AOO= 20 km²) in the study area: Els Ports massif, Alt Pallars, Montseny massif, Cabrerès-Guilleries and Blanes (Casas de Puig, 1970; Casas *et al.*, 1985a; Sáez *et al.*, 2018b; data from BCB). The species is assessed as VU for the same reasons that have been exposed for *F. ciliaris*. *F. pusilla* is also known from nearby areas in Andorra (Sotiaux & Vanderpoorten, 2017) and France: Midi-Pyrénées region (Infante Sánchez, 2015), where it has been assessed as DD (Infante Sánchez *et al.*, 2015) and Pyrénées-Orientales department [7 locations] (Hugonnot *et al.*, 2018).

***Fissidens curvatus* Hornsch.**

The species is closely confined to areas of strong maritime influence, in the Cap de Creus Peninsula and several massifs: Montseny, Montnegre and Cadiretes (Casas de Puig, 1958b; Casas Sicart 1960; Cros i Matas, 1985; Casas *et al.*, 1985a; 1998a), where it occurs on wet soils and rocks in the lowlands. *F. curvatus* is currently known from seven locations (EEO= ca. 1790 km²; AOO= 28 km²), so that is close to qualifying for VU D2, accordingly it is assessed as NT. The species is also known from 4 locations in eastern Pyrénées-Orientales department (Hugonnot *et al.*, 2018).

***Fissidens fontanus* (Bach.Pyl.) Steud.**

It is known from six concrete locations (EOO= ca. 850 km²; AOO= 24 km²) in northeastern Catalonia: Esponellà, Gavarres massif and Cap de Creus Peninsula, four subpopulations are found within the latter area (Peñuelas, 1984; Casas *et al.*, 1989; 1998a; data from BCB). This aquatic species is found, submerged or seasonally exposed, in natural and man-made aquatic habitats (rivers, water reservoirs, irrigation canals, etc.) and it seems to be able to tolerate a reasonable range of pollution levels, from pure water to moderately polluted water (see Sérgio *et al.*, 2010 and references therein). General threats to freshwater ecosystems such as water extraction and pollution could affect some subpopulations. The species has been assessed as NT, close to meeting VU under D2.

***Fissidens ovatifolius* R.Ruthe**

The species occurs in northeastern Catalonia (Cap de Creus Peninsula and Garrotxa volcanic field) and in Tarragona Province, Montroig (Allorge & Casas de Puig, 1968; data from BCB), where it occurs on wet soils and rocks in the lowlands. It is currently known from six locations (EOO= ca. 3420 km²; AOO= 24 km²), so that is close to qualifying for VU D2, accordingly it is assessed as NT. *F. ovatifolius* is also known from 4 locations in eastern Pyrénées-Orientales department (Hugonnot *et al.*, 2018).

***Fissidens rivularis* Bruch & Schimp.**

The species is known from four main areas in the eastern Pyrenees and northern Catalan ranges: Fonts del Llobregat, Montnegre, Collserola and several subpopulations in Montseny massif (Casas Sicart, 1960; Álvaro Martín *et al.*, 2009; Sáez *et al.*, 2018b; data from BCB). Seven subpopulations are known (EOO= ca. 2030 km²; AOO= 28 km²), which are found in moist soils and rocks by streams, between 100 and 1300 m a.s.l. The species is also known from nearby areas in Aragón (Infante Sánchez & Heras Pérez, 2003), Andorra (Sotiaux & Vanderpoorten, 2017) and France: Midi-Pyrénées region (Infante Sánchez, 2015), where it has been assessed as DD (Infante Sánchez *et al.*, 2015) and Pyrénées-Orientales department [12 locations] (Hugonnot *et al.*, 2018).

***Grimmia anomala* Schimp.**

The species is known from seven concrete locations (EOO= ca. 110 km²; AOO= 28 km²) in central and eastern Pyrenees, between Aiguamòg and Setcases (Lloret, 1989; Casas *et al.*, 2006; Carrillo *et al.*, 2008; Muñoz *et al.*, 2015a), *G. anomala* occurs on more or less exposed acidic rocks, between 1900 and 2500 m a.s.l. The species is also known from nearby areas in Aragón (Infante Sánchez & Heras Pérez, 2003), Andorra (Sotiaux & Vanderpoorten, 2017) and France: Midi-Pyrénées region (Infante Sánchez, 2015), where it has been assessed as NT (Infante Sánchez *et al.*, 2015) and Pyrénées-Orientales department [ca. 5 locations] (Hugonnot *et al.*, 2018).

***Grimmia atrata* Miel. ex Hornsch.**

The presence of the species in our area is restricted to the central Pyrenees: Vallferrera and Estany de Gèmena and Estany Romedo (Casas Sicart, 1986; Casas *et al.*, 2006) and L'Albera

massif (Thouvenot, 2005). It occurs on exposed rocky siliceous places throughout a wide altitudinal range: 300-2200 m a.s.l. *G. atrata* is also known from nearby areas in Andorra (Sotiaux & Vanderpoorten, 2017) and France: Midi-Pyrénées region (Infante Sánchez *et al.*, 2015), where it has been assessed as DD, and Pyrénées-Orientales department [11 locations] (Hugonnot *et al.*, 2018). Despite being a rare species (EOO= ca. 1580 km²; AOO= 16 km²), the known subpopulations as a whole are not prone to the effects of human activities or stochastic events within a very short time period.

***Grimmia longirostris* Hook.**

The species occurs in mountain areas in central Pyrenees: between Tuc de Molières and Vall de la Llosa (Ballesteros & Canalís, 1991; Casas *et al.*, 2006; Muñoz *et al.*, 2015a; data from BCB). Reports from Ter valley (Lloret, 1989, sub *G. affinis*) are due to confusion with *G. funalis* and *G. montana*. The EOO and AOO values are c. 170 km² and 32 km², respectively. It grows on dry-exposed non-calcareous rocks between 1500 and 3000 m a.s.l. *G. longirostris* is also known from nearby areas in Andorra (Sotiaux & Vanderpoorten, 2017) and France: Midi-Pyrénées region (Infante Sánchez *et al.*, 2015), where it has been assessed as DD, and Pyrénées-Orientales department [ca. 23 locations] (Hugonnot *et al.*, 2018). Most subpopulations are within in well-preserved areas.

***Grimmia muehlenbeckii* Schimp.**

The species occurs in central Pyrenees: Montgarri, Colomers, Pla de Boavi, Tredós and Espot (Allorge & Casas de Puig, 1962; Casas Sicart, 1986; Casas *et al.*, 2006; Muñoz *et al.*, 2015a). The EOO and AOO values are ca. 380 km² and 20 km², respectively. It occurs on exposed siliceous rocks, between 1600 and 2000 m a.s.l., and most subpopulations are found within protected areas. *G. muehlenbeckii* is also known from nearby areas in Aragón (Infante Sánchez & Heras Pérez, 2003), Andorra (Sotiaux & Vanderpoorten, 2017) and France: Midi-Pyrénées region (Infante Sánchez *et al.*, 2015), where it has been assessed as VU, and Pyrénées-Orientales department [4 locations] (Hugonnot *et al.*, 2018).

***Grimmia reflexidens* Müll.Hal.**

At least, five Pyrenean locations (EOO= ca. 150 km²; AOO= 20 km²) are known: between the Besiberri massif and Ter Valley (Casas *et al.*, 2006; Muñoz *et al.*, 2015a; data from BCB). It occurs on siliceous rocks, between 2300 and 3000 m a.s.l., and all the subpopulations are found within protected areas. The species is known from nearby areas in Aragón --Pic de Salenques, less than 1000 meters away from our area--, Andorra (Sotiaux & Vanderpoorten, 2017) and France: Midi-Pyrénées region (Infante Sánchez *et al.*, 2015), where it has been assessed as VU, and Pyrénées-Orientales department [13 locations] (Hugonnot *et al.*, 2018). Some subpopulations found in Pyrénées-Orientales department are very close to Ter Valley.

***Grimmia torquata* Drumm.**

It is documented so far from five locations in central Pyrenees in Pallars Sobirà county (Casas Sicart, 1986; Casas *et al.*, 2006; Muñoz *et al.*, 2015a; data from BCB), where it occurs on humid siliceous rocks, between 1900 and 2300 m a.s.l. Despite being a rare species (EOO=

ca. 390 km²; AOO= 20 km²), the known subpopulations as a whole are not prone to the effects of human activities or stochastic events within a very short time period. The species is also known from nearby areas in Andorra (Sotiaux & Vanderpoorten, 2017) and France: Midi-Pyrénées region (Infante Sánchez *et al.*, 2015), where it has been assessed as DD, and Pyrénées-Orientales department [11 locations] (Hugonnot *et al.*, 2018).

***Herzogiella striatella* (Brid.) Z.Iwats.**

The species is documented from central Pyrenees, Val d'Aran and Pallars Sobirà counties (Allorge & Casas de Puig, 1962; Casas, 1993c; Cros *et al.*, 2010; data from BCB) where it grows in wet places in subalpine forests, sometimes in rocky places, between 975 and 2050 m a.s.l. All the locations correspond to protected areas and without remarkable threats for the habitat of *H. striatella*. The area of the species, in spite of being relatively restricted (EOO= ca. 325 km²; AOO= 28 km², seven locations) is not severely fragmented and the number of locations and the value of AOO exceed the geographical restriction threshold established for VU D2. In the absence of evidence regarding a continuous decrease in AOO or the disappearance of a significant number of subpopulations, *H. striatella* is assessed as NT. The species is also known from nearby areas in Aragón (Guerra, 2018), Andorra (Sotiaux & Vanderpoorten, 2017) and France: Midi-Pyrénées region (Infante Sánchez, 2015), where it has been assessed as DD (Infante Sánchez *et al.*, 2015).

***Homomallium incurvatum* (Schrad. ex Brid.) Loeske**

The species occurs scattered in eastern Pyrenees, Ter Valley, Montseny massif and Garrotxa volcanic field (Casas *et al.*, 1985c; Lloret, 1989; Sáez *et al.*, 2018b; data from BCB). Reports from Vaqueira and Sant Llorenç del Munt (Allorge & Casas de Puig, 1962; Casas & Zuttere, 1989) are due to confusion with *Hypnum revolutum* and *H. cupressiforme*, respectively. Typical habitats include wet rocks and tree bases, between 500 and 1800 m a.s.l. It is currently known from seven locations (EOO= ca. 480 km²; AOO= 28 km²), so that is close to qualifying for VU D2, accordingly it is assessed as NT. *H. incurvatum* is also known from nearby areas in Aragón (Infante Sánchez & Heras Pérez, 2003), Andorra (Sotiaux & Vanderpoorten, 2017) and France: Midi-Pyrénées region (Infante Sánchez *et al.*, 2015), where it has been assessed as VU, and Pyrénées-Orientales department [ca. 20 locations] (Hugonnot *et al.*, 2018).

***Hookeria lucens* (Hedw.) Sm.**

The species is known from central Pyrenees (Portilló de Bossost, Arties Valley and Conangles) and Montseny massif (Canalís & Casas, 1985; Casas *et al.*, 1992; Sáez & al., 2018b). The EOO and AOO values are ca. 950 km² and 28 km², respectively. It occurs on wet soils and seeping rocks, between 700 and 1760 m a.s.l., within protected areas. In the latter area several subpopulations are known in Turó de Morou and Santa Fe. *Hookeria lucens* is also known from nearby areas in France: Midi-Pyrénées region (Infante Sánchez, 2015), where it has been assessed as DD (Infante Sánchez *et al.*, 2015), and Pyrénées-Orientales department [3 locations] (Hugonnot *et al.*, 2018).

***Hygrohypnum smithii* (Sw.) Broth.**

The species is documented from eleven Pyrenean locations (EOO= ca. 700 km²; AOO= 44 km²), between Conangles and Puigpedrós (Casas & Peñuelas, 1985; Peñuelas *et al.*, 1985; Casas Sicart, 1986; Casas *et al.*, 2006; data from BCB) where it grows on wet or submerged rocks in mountain streams, between 1800 and 2700 m a.s.l. It is also known from nearby areas in Aragón (Oliván & Fuertes, 2018) and France: Midi-Pyrénées region (Infante Sánchez, 2015), where it has been assessed as DD (Infante Sánchez *et al.*, 2015), and Pyrénées-Orientales department [6 locations] (Hugonnot *et al.*, 2018).

***Hylocomiastrum pyrenaicum* (Spruce) M.Fleisch.**

Eight locations (EOO= ca. 490 km²; AOO= 32 km²) are known from central Pyrenees, between Artiga de Lin and Plans de Boavi (Casas Sicart, 1986; Casas *et al.*, 1985a, 2006 and data from BCB) where it grows on rocks, slopes and streams, between 1750 and 2450 m a.s.l. Most subpopulations are within protected areas. The species is also known from nearby areas in Andorra (Sotiaux & Vanderpoorten, 2017) and France: Midi-Pyrénées region (Infante Sánchez, 2015), where it has been assessed as DD (Infante Sánchez *et al.*, 2015).

***Hylocomiastrum umbratum* (Hedw.) M.Fleisch.**

In our area, *H. umbratum* is confined geographically to central Pyrenees, where at least six locations (EOO= ca. 465 km²; AOO= 24 km²) are known between Portilló de Bossost, Montgarri and Aigüestortes (Casas Sicart, 1986; Casas *et al.*, 1992 and data from BCB). The species usually occurs on humus-rich-soils and humid rocks in the montane and subalpine belts, mostly within protected areas. *Hylocomiastrum umbratum* does not seem especially vulnerable to the effects of human activity or short-term fortuitous events, and therefore does not verify the D2 criterion for VU. The species is also known from nearby areas in Andorra (Sotiaux & Vanderpoorten, 2017) and France: Midi-Pyrénées region (Infante Sánchez, 2015), where it has been assessed as DD (Infante Sánchez *et al.*, 2015) and Pyrénées-Orientales department [2 locations] (Hugonnot *et al.*, 2018).

***Imbriobryum mildeanum* (Jur.) J.R.Spence**

At least seven locations (EOO= ca. 2950 km²; AOO= 28 km²) are known in Pyrenees and Montseny massif (Casas Sicart, 1960; 1986; Casanovas Poch, 1991; Guerra *et al.*, 2008), where it occurs on wet soils and rocks, between 500 and 1950 m a.s.l. A report from Llorenç del Munt requires confirmation. The species is also known from nearby areas in Andorra (Sotiaux & Vanderpoorten, 2017) and France: Midi-Pyrénées region (Infante Sánchez, 2015), where it has been assessed as DD (Infante Sánchez *et al.*, 2015) and Pyrénées-Orientales department [7 locations] (Hugonnot *et al.*, 2018).

***Isothecium myosuroides* Brid.**

The species occurs scattered in northeastern Catalonia (Casas Sicart, 1960; Brugués *et al.*, 1974, 1981; Cros i Matas, 1985; data from BCB) where it occurs on rocks and tree bases in wet places, between 170 and 1300 m a.s.l. It is currently known from seven locations (EOO= ca. 1400 km²; AOO= 28 km²), so that is close to qualifying for VU D2, accordingly it is assessed

as NT. The species is also known from nearby areas in Pyrénées-Orientales department [ca. 25 locations] (Hugonnot *et al.*, 2018).

***Lescuraea patens* Lindb.**

In our area the species is documented so far from three locations in central Pyrenees: Amitges, Naorte and Val de Molières (Casas *et al.*, 2006; data from BCB), where it grows on shady rocks in the subalpine and alpine belts. Despite being a rare species (EOO= ca. 135 km²; AOO= 16 km²), the known subpopulations as a whole are not prone to the effects of human activities or stochastic events within a very short time period and therefore does not verify the D2 criterion for VU. However, the species could be listed as Vulnerable if a reduction of its geographic range and number of locations occurs. The species is known from nearby areas: Andorra (Sotiaux & Vanderpoorten, 2017), Aragón (Infante Sánchez & Heras Pérez, 2003), and France: Midi-Pyrénées region (Infante Sánchez, 2015), where it has been assessed as LC (Infante Sánchez *et al.*, 2015) and Pyrénées-Orientales department [ca. 10 locations] (Hugonnot *et al.*, 2018).

***Lescuraea plicata* (Schleich. ex F.Weber & D.Mohr) Lindb.**

The species is known from at least eight locations (EOO= ca. 1760 km²; AOO= 32 km²) found in a zone between Val d'Aran and Cadí-Moixeró range (Casas, 1993c, 1997a, Manobens i Rigol, 1985; Ruiz *et al.*, 2018a; data from BCB), where it usually grows on shady calcareous rocks and at the foot of cliffs between 1600 and 2460 m a.s.l. Most subpopulations are found within protected areas. *L. plicata* is also known from nearby areas in Aragón (Infante Sánchez & Heras Pérez, 2003), Andorra (Sotiaux & Vanderpoorten, 2017) and France: Midi-Pyrénées region (Infante Sánchez *et al.*, 2015), where it has been assessed as DD, and Pyrénées-Orientales department [4 locations] (Hugonnot *et al.*, 2018).

***Loeskeobryum brevirostre* (Brid.) M.Fleisch.**

It is known in four main areas in northern Catalonia: Montseny massif, Bellmunt, Vidrà and Ter Valley (Casas Sicart, 1960; Sanz i Magrané, 1984; Lloret, 1989; Casas *et al.*, 1992; data from BCB). Typical habitats include humid rocks, tree bases and moist humus-rich soils in the montane belt. It is currently known from seven locations (EOO= ca. 360 km²; AOO= 24 km²), so that is close to qualifying for VU D2, accordingly it is assessed as NT. However, the species could be listed as Vulnerable if a reduction of its geographic range and number of locations occurs. The species is also known from nearby areas in France: Midi-Pyrénées region (Infante Sánchez, 2015), where it has been assessed as DD (Infante Sánchez *et al.*, 2015) and Pyrénées-Orientales department [5 locations] (Hugonnot *et al.*, 2018).

***Mnium lycopodioides* Schwägr.**

The species is known from central and eastern Pyrenees and Montseny massif (Fuertes & Acón, 1999) where it occurs on wet mainly siliceous rocks in the montane and subalpine belts. It is currently known from seven locations (EOO= ca. 3370 km²; AOO= 28 km²), so that is close to qualifying for VU D2, accordingly it is assessed as NT. The species is also known from nearby areas in Aragón (Infante Sánchez & Heras Pérez, 2003), Andorra (Sotiaux &

Vanderpoorten, 2017) and France: Midi-Pyrénées region (Infante Sánchez, 2015), where it has been assessed as DD (Infante Sánchez *et al.*, 2015) and Pyrénées-Orientales department [ca. 20 locations] (Hugonnot *et al.*, 2018).

***Mnium spinulosum* Bruch & Schimp.**

At least 8 confirmed locations (EOO= ca. 125 km²; AOO= 28 km²) are known in central Pyrenees (Casares Gil, 1915; Casas Sicart, 1986; Fuertes & Acón, 1999; Cros *et al.*, 2010 and data from BCB). This species is found on wet rocks and soil, mainly in the montane belt. *Mnium spinulosum* is also known from nearby areas in Andorra (Sotiaux & Vanderpoorten, 2017) and France: Midi-Pyrénées region (Infante Sánchez, 2015), where it has been assessed as DD (Infante Sánchez *et al.*, 2015) and Pyrénées-Orientales department [2 locations] (Hugonnot *et al.*, 2018).

***Orthotrichum scanicum* Grönvall**

Garilleti *et al.* (1999) summarized the known distribution of the species in the Iberian Peninsula. The species is documented from three locations in the studied area: Aigüestortes, Port de la Bonaigua and Montcortés, where it occurs on trunks and branches of *Abies alba* and *Salix caprea*, sometimes on calcareous rocks, between 100 and 1950 m a.s.l. (Garilleti *et al.*, 1999). The species is also known from nearby areas in Aragón (Infante Sánchez & Heras Pérez, 2003) and France: Midi-Pyrénées region (Infante Sánchez, 2015), where it has been assessed as VU (Infante Sánchez *et al.*, 2015) and Pyrénées-Orientales department [ca. 10 locations] (Hugonnot *et al.*, 2018). Despite being a rare species (EOO= ca. 90 km²; AOO= 12 km²), the known subpopulations as a whole are not prone to the effects of human activities or stochastic events within a very short time period.

***Orthotrichum stramineum* Hornsch. ex Brid.**

In our area the species is documented from three locations in Val d’Aran: Tredós, Les Bordes and Montgarri (Casas *et al.*, 2006; Garilleti *et al.*, 2002; Lara & Garilleti, 2014) and a separate subpopulation is found in Montserrat (data from BCB). Despite being a rare species (EOO= ca. 1570 km²; AOO= 16 km²), the known subpopulations as a whole are not prone to the effects of human activities or stochastic events within a very short time period. The species is known from Andorra (Sotiaux & Vanderpoorten, 2017), Aragón (Infante Sánchez & Heras Pérez, 2003), and France: Midi-Pyrénées region (Infante Sánchez, 2015), where it has been assessed as LC (Infante Sánchez *et al.*, 2015) and Pyrénées-Orientales department [ca. 40 locations] (Hugonnot *et al.*, 2018).

***Philonotis rigida* Brid.**

It is documented so far from five locations in northeastern Catalonia. These locations are found in Montseny massif, Bescanó, and Montnegre (Casas *et al.*, 1985c; Cros i Matas, 1985; data from BCB), where it usually grows on and wet siliceous rocks and banks, between and 200 and 800 m a.s.l. Despite being a rare species (EOO= ca. 525 km²; AOO= 20 km²), the known subpopulations as a whole are not prone to the effects of human activities or stochastic events within a very short time period.

***Plagiothecium curvifolium* Schlieph. ex Limpr.**

In our area the species is documented from six locations (EOO= ca. 1600 km²; AOO= 24 km²) in central and eastern Pyrenees, between Alt Àneu and Ter Valley (Lloret, 1989; Casas *et al.*, 2006; Cros *et al.*, 2010; data from BCB). Typical habitats include and wet soils and banks and decaying wet logs, between 1000 and 200 m a.s.l. In absence of data on population trend, the number of locations and AOO value precludes assigning *P. curvifolium* to VU D2. However, since the species has a restricted range, it is assessed as NT. The species is known from nearby areas in France: Midi-Pyrénées region (Infante Sánchez, 2015), where it has been assessed as NT (Infante Sánchez *et al.*, 2015) and Pyrénées-Orientales department [7 locations] (Hugonnot *et al.*, 2018).

***Plagiothecium laetum* Schimp.**

The presence of the species in our area is restricted to eight locations (EOO= ca. 910 km²; AOO= 32 km²) in central and eastern Pyrenees, between Portilló de Bossost and Ter Valley (Lloret, 1989; Casas *et al.*, 2006; Cros *et al.*, 2010; data from BCB), where it occurs on wet soils and decaying wet logs, between 1450 and 250 m a.s.l. The species is also known from nearby areas in Andorra (Sotiaux & Vanderpoorten, 2017) and France: Midi-Pyrénées region (Infante Sánchez, 2015), where it has been assessed as VU (Infante Sánchez *et al.*, 2015) and Pyrénées-Orientales department [1 location] (Hugonnot *et al.*, 2018).

***Plagiothecium undulatum* (Hedw.) Schimp.**

It is documented from five locations (EOO= ca. 320 km²; AOO= 20 km²) in the central Pyrenees, between Portilló de Bossost and Sorpe (Allorge & Casas de Puig, 1962; Casas de Puig, 1974; Casas Sicart, 1986; Casas *et al.*, 1992; data from BCB), where it usually occurs on wet soils, banks and rocks, between 1450 and 250 m a.s.l. The species is also known from nearby areas in Aragón: Vall de Llauset (Infante Sánchez & Heras Pérez, 2003) and France: Midi-Pyrénées region (Infante Sánchez, 2015), where it has been assessed as LC (Infante Sánchez *et al.*, 2015) and Pyrénées-Orientales department [6 locations] (Hugonnot *et al.*, 2018).

***Pogonatum nanum* (Hedw.) P.Beauv.**

This species has a scattered distribution in the study area: Vall de Cardós, Montseny massif, Guilleries and L'Albera massif (Brugués *et al.*, 1982a; Casas Sicart, 1999; data from BCB), where it grows in humid slopes and banks, between, 150 and 1300 m a.s.l. A report from Collserola (Barnola, 1903) requires confirmation. Despite being a rare species (EOO= ca. 5410 km²; AOO= 16 km²), the known subpopulations as a whole are not prone to the effects of human activities or stochastic events within a very short time period. Only the population of Montseny massif could have been affected by anthropogenic disturbances, but this cannot be generalized to all the known subpopulations. The species is also known from nearby areas in France: Midi-Pyrénées region (Infante Sánchez, 2015), where it has been assessed as DD (Infante Sánchez *et al.*, 2015) and Pyrénées-Orientales department [8 locations] (Hugonnot *et al.*, 2018).

***Pohlia andalusica* (Höhn.) Broth.**

It is documented from five locations (EOO= ca. 260 km²; AOO= 20 km²) in central and eastern Pyrenees, between Amitges and Clots del Port, (Casas, 1997b; Casas *et al.*, 2006; Guerra, 2007 and data from BCB). The known subpopulations, which occur on humid siliceous soils and rocks throughout a wide altitudinal range 1000-2450 m, a.s.l., are not prone to the effects of human activities or stochastic events within a very short time period. The species is also known from nearby areas in Andorra (Sotiaux & Vanderpoorten, 2017) and Pyrénées-Orientales department [ca. 14 locations] (Hugonnot *et al.*, 2018).

***Pohlia drummondii* (Müll.Hal.) A.L.Andrews**

It is currently known from seven locations (EOO= ca. 1285 km²; AOO= 28 km²) in central and eastern Pyrenees, between Colomers and Setcases (Casas de Puig, 1952; Casas *et al.*, 2006; Lloret, 1989). The species occurs on snow-beds or wet siliceous soils, between 1900 and 300 m a.s.l. The species is also known from nearby areas in Aragón (Infante Sánchez & Heras Pérez, 2003), Andorra (Sotiaux & Vanderpoorten, 2017) and France: Midi-Pyrénées region (Infante Sánchez, 2015), where it has been assessed as DD (Infante Sánchez *et al.*, 2015) and Pyrénées-Orientales department [ca. 16 locations] (Hugonnot *et al.*, 2018).

***Pseudephemerum nitidum* (Hedw.) Loeske**

So far, this species is known from eight locations (EOO= ca. 1360 km²; AOO= 32 km²) in northeastern Catalonia, in L'Albera, Montseny massif and Gavarres (Casas *et al.*, 1985c; 1998c; Jover, 2016). The species usually occurs on wet or seasonally flooded siliceous soils, throughout a wide altitudinal range, between 140 and 1000 m. According to Sáez *et al.* (2018b) the Montseny massif subpopulation was probably lost. However, this circumstance cannot be considered as a continuous decline of the Catalan population as a whole. The available data exceed the thresholds established for D2 criterion, so this species is assigned to NT.

***Pseudoleskeella tectorum* (Funck ex Brid.) Kindb. ex Broth.**

The species occurs scattered in Pyrenees and Catalan Ranges. It is known from five locations (EOO= ca. 2970 km²; AOO= 20 km²): Montseny massif, Sant Feliu de Pallarols, Vall d'Alinyà [2 locations] and Estany Sant Maurici (Casas de Puig, 1957; Casas Sicart, 1960; Casas, 1986b; Cros *et al.*, 2004). Typical habitats include bark of trees (*Quercus ilex*) and shady rocks calcareous, between 600 and 1000 m a.s.l. The species does not seem especially vulnerable to the effects of human activity or short-term fortuitous events, and therefore does not verify the D2 criterion for VU. *P. tectorum* is also known from nearby areas in Pyrénées-Orientales department [6 locations] (Hugonnot *et al.*, 2018).

***Pseudostereodon procerrimus* (Molendo) M.Fleisch.**

In the studied area six Pyrenean locations, found between Artiga de Lin and Cadí-Moixeró Range, are currently known (EOO= ca. 1540 km²; AOO= 24 km²). The number of locations and AOO value precludes assigning this species to VU D2. However, since *P. procerrimus* has a restricted range, it is assessed as NT. The species is also known from nearby areas in Aragón

(Infante Sánchez & Heras Pérez, 2003), Andorra (Sotiaux & Vanderpoorten, 2017) and France: Midi-Pyrénées region (Infante Sánchez, 2015), where it has been assessed as DD (Infante Sánchez *et al.*, 2015) and Pyrénées-Orientales department [1 location] (Hugonnot *et al.*, 2018).

***Ptychostomum zieri* (Hedw.) Holyoak & N.Pedersen**

In the studied area *P. zieri* is restricted to seven locations (EOO= ca. 630 km²; AOO= 28 km²) in central and eastern Pyrenees, between Muntanyó de Llacs and Ter Valley. It occurs on wet banks and rocks throughout a wide altitudinal range: 100-2450 m a.s.l. The species is also known from nearby areas in Aragón (Infante Sánchez & Heras Pérez, 2003), Andorra (Sotiaux & Vanderpoorten, 2017) and France: Midi-Pyrénées region (Infante Sánchez, 2015), where it has been assessed as DD.

***Racomitrium fasciculare* (Hedw.) Brid.**

The species is confined to central Pyrenees, between Portilló de Bossost and Estany Gerber (Casas Sicart, 1986; Casas *et al.*, 2006; Carrillo *et al.*, 2008; data from BCB; Muñoz *et al.*, 2015b), where it usually occurs on wet acidic rocks in streams in subalpine areas. It is currently known from seven locations (EOO= ca. 170 km²; AOO= 28 km²). *R. fasciculare* is also known from nearby areas in Aragón (Infante Sánchez & Heras Pérez, 2003), Andorra (Sotiaux & Vanderpoorten, 2017) and France: Midi-Pyrénées region (Infante Sánchez, 2015), where it has been assessed as LC (Infante Sánchez *et al.*, 2015) and Pyrénées-Orientales department [6 locations] (Hugonnot *et al.*, 2018).

***Racomitrium lanuginosum* (Hedw.) Brid.**

It is known from central Pyrenees, between Hospital de Viella and Estany de Certascan, Garrotxa volcanic field and Montseny massif (Casas Sicart, 1960, 1986; Allorge & Casas de Puig, 1968; data from BCB). The species occurs on siliceous rocks throughout a wide altitudinal range: 100-2400 m a.s.l. At least six locations (EOO= ca. 4950 km²; AOO= 20 km²) are currently known. It is assessed as NT because it is close to qualify as threatened under criterion D2 due to its relatively small AOO and number of locations. The species is also known from nearby areas in Aragón (Infante Sánchez & Heras Pérez, 2003), Andorra (Sotiaux & Vanderpoorten, 2017) and France: Midi-Pyrénées region (Infante Sánchez, 2015), where it has been assessed as DD (Infante Sánchez *et al.*, 2015) and Pyrénées-Orientales department [4 locations] (Hugonnot *et al.*, 2018).

***Rhizomnium magnifolium* (Horik.) T.J.Kop.**

In our area, it is known from seven Pyrenean locations (EOO= ca. 730 km²; AOO= 28 km²), between Estanys Liat and Arànsér (Navarro *et al.*, 1997; Casas *et al.*, 2006; Carrillo *et al.*, 2008; Cros *et al.*, 2010), where it occurs on damp peaty soils between 1700 and 250 m a.s.l. The subpopulations are found in protected areas and current threats are apparently limited. The species is also known from nearby areas in Aragón (Infante Sánchez & Heras Pérez, 2003), Andorra (Sotiaux & Vanderpoorten, 2017) and France: Midi-Pyrénées region (Infante Sánchez, 2015), where it has been assessed as NT (Infante Sánchez *et al.*, 2015) and Pyrénées-Orientales department [ca. 20 locations] (Hugonnot *et al.*, 2018).

***Rhytidiadelphus squarrosus* (Hedw.) Warnst.**

It is found in central and eastern Pyrenees, between Artiga de Lin and Ter Valley, and Vidrà (Allorge & Casas de Puig, 1962; Sanz i Magrané, 1984; Casas Sicart, 1986; Lloret, 1989; Casas *et al.*, 2006), where it occurs on wet forest soils and peat bogs between 950 and 1700 m a.s.l. About ten locations (EEO= ca. 2640 km²; AOO= 40 km²) are currently known. Ancient reports from Montserrat and Collserola seem questionable. The species is also known from nearby areas in Andorra (Sotiaux & Vanderpoorten, 2017) and France: Midi-Pyrénées region (Infante Sánchez, 2015), where it has been assessed as LC (Infante Sánchez *et al.*, 2015) and Pyrénées-Orientales department [5 locations] (Hugonnot *et al.*, 2018).

***Schistidium agassizii* Sull. & Lesq.**

The species is known from four locations in central Pyrenees: Saboredo, Plans de Boavi, Tavascan and Torrent dels Clots (Casas, 2001; Suárez & Muñoz, 2015; data from BCB), where it occurs in streams in montane or subalpine areas. Reports from eastern Pyrenees and Alt Empordà (Lloret, 1989, sub *S. alpicola*; Casas, 1983a, sub *S. alpicola*) are due to confusion with *S. rivularis*. On the other hand, some records from central Pyrenees require confirmation (Manobens i Rigol, 1985; Peñuelas, 1987). Despite being a rare species (EEO= ca. 480 km²; AOO= 16 km²), the known subpopulations are not prone to the effects of human activities or stochastic events within a very short time period. The species is also known from nearby areas in Andorra (Sotiaux & Vanderpoorten, 2017) and France: Midi-Pyrénées region (Infante Sánchez, 2015), where it has been assessed as VU (Infante Sánchez *et al.*, 2015) and Pyrénées-Orientales department [14 locations] (Hugonnot *et al.*, 2018).

***Schistidium atrofusum* (Schimp.) Limpr.**

This species is known from four Pyrenean locations, Durro, Estaís, Comabella and Urús, and in Roda de Ter (Casas, 2000; Álvaro Martín, 2001; Casas *et al.*, 2006; data from BCB). It usually grows on calcareous rocks between 500 and 1500 m a.s.l. The known subpopulations are mainly found within protected areas. Despite being a rare species (EEO= ca. 1975 km²; AOO= 20 km²), the known subpopulations are not prone to the effects of human activities or stochastic events within a very short time period. The species is also known from nearby areas in Midi-Pyrénées region (Infante Sánchez, 2015), where it has been assessed as VU (Infante Sánchez *et al.*, 2015).

***Schistidium dupretii* (Thér.) W.A. Weber**

Four locations (EEO= ca. 780 km²; AOO= 16 km²) are currently known in central and eastern Pyrenees, between Pla de Vaqueira and Núria (Casas, 2001; Cros *et al.*, 2010; data from BCB), where it usually grows on calcareous or siliceous rocks between 1500 and 2000 m a.s.l. *Schistidium dupretii* does not seem especially vulnerable to the effects of human activity or short-term fortuitous events, and therefore does not verify the D2 criterion for VU. The species is also known from nearby areas in France: Midi-Pyrénées region (Infante Sánchez, 2015), where it has been assessed as VU (Infante Sánchez *et al.*, 2015) and Pyrénées-Orientales department [4 locations] (Hugonnot *et al.*, 2018).

***Schistidium flaccidum* (De Not.) Ochyra**

Four locations (EOO= ca. 215 km²; AOO= 16 km²) of the species are known in central and eastern Pyrenees, between Vall de Cardós and Tregurà (Casas, 2001). The subpopulations are found in rocky places in montane areas, and mostly correspond to protected areas. The species is also known from nearby areas in Andorra (Sotiaux & Vanderpoorten, 2017) and France: Midi-Pyrénées region (Infante Sánchez, 2015), where it has been assessed as DD (Infante Sánchez *et al.*, 2015) and Pyrénées-Orientales department [1 main location] (Hugonnot *et al.*, 2018).

***Schistidium pruinosum* (Wilson ex Schimp.) G.Roth**

This species is known from three Pyrenean locations (Espot, Alins, Circ de Colomers) and it also occurs in the Garrotxa volcanic field (Casas, 2001; Brugués *et al.*, 2007a; data from BCB). The known subpopulations (EOO= ca. 290 km²; AOO= 16 km²), which occur on exposed siliceous rocks and artificial stone walls throughout a wide altitudinal range (630-2200 m a.s.l.) are not prone to the effects of human activities or stochastic events within a very short time period. The species is also known from nearby areas in Andorra (Sotiaux & Vanderpoorten, 2017).

***Schistidium robustum* (Nees & Hornsch.) H.H.Blom**

This saxicolous species is known from seven locations (EOO= ca. 13050 km²; AOO= 28 km²) in central and eastern Pyrenees, between Artiga de Lin and Queralbs and it also occurs in Els Ports massif, Mont Caro (Casas, 2001; data from BCB). *S. robustum* occurs on humid calcareous rocks in the montane belt. The number of locations and AOO value precludes assigning this species to VU D2. However, since the species has a restricted range, it is assessed as NT. The species is also known from nearby areas in Aragón (Casas, 2001), Andorra (Sotiaux & Vanderpoorten, 2017) and France: Midi-Pyrénées region (Infante Sánchez, 2015), where it has been assessed as VU (Infante Sánchez *et al.*, 2015) and Pyrénées-Orientales department [4 locations] (Hugonnot *et al.*, 2018).

***Sciuro-hypnum glaciale* (Schimp.) Ignatov & Huttunen**

In our area the species is confined to central and eastern Pyrenees, between Besiberri massif and Ter Valley (Allorge & Casas de Puig, 1968; Casas Sicart, 1986; Lloret, 1989; Ballesteros & Canalís, 1991; data from BCB). *Sciuro-hypnum glaciale* occurs on snow-beds and wet soils, between 2000 and 2800 m a.s.l. At least eight locations (EOO= ca. 1370 km²; AOO= 32 km²) are currently known. The species is also known from nearby areas in Aragón (Infante Sánchez & Heras Pérez, 2003), Andorra (Sotiaux & Vanderpoorten, 2017) and France: Midi-Pyrénées region (Infante Sánchez, 2015), where it has been assessed as LC (Infante Sánchez *et al.*, 2015) and Pyrénées-Orientales department [3 locations] (Hugonnot *et al.*, 2018).

***Sciuro-hypnum plumosum* (Hedw.) Ignatov & Huttunen**

The confirmed locations are found in Pyrenees (Vall de la Llosa) and northeastern Catalonia, between Montseny massif and Cap de Creus Peninsula (Brugués *et al.*, 1981; Casas Sicart, 1960; Casas, 1986; data from BCB). Despite being a rare species (six locations, EOO=

ca. 4340 km²; AOO= 24 km²), the known subpopulations, which usually occur on wet siliceous rocks by streams, throughout a wide altitudinal range (100-1725 m a.s.l.), are not prone to the effects of human activities or stochastic events within a very short time period. The species is close to qualifying for VU D2, accordingly it is assessed as NT. *Sciuro-hypnum plumosum* is also known from nearby areas in Andorra (Sotiaux & Vanderpoorten, 2017) and France: Midi-Pyrénées region (Infante Sánchez, 2015), where it has been assessed as LC (Infante Sánchez *et al.*, 2015) and Pyrénées-Orientales department [ca. 39 locations] (Hugonnot *et al.*, 2018).

***Scorpiurium deflexifolium* (Solms) M.Fleisch. & Loeske**

It is known from seven locations (EOO= ca. 1770 km²; AOO= 28 km²) in northeastern Catalonia: Banyoles, Collserola and Cap de Creus Peninsula (Casas de Puig, 1956, 1958b; Casas *et al.*, 1996, 1998a). Typical habitats include wet calcareous or siliceous rocks and moist soils by streams in the lowlands. The known subpopulations are found within protected areas. It is assessed as NT because it is close to qualify as threatened under criterion D2 due to its relatively small AOO and number of locations. Some subpopulations from Collserola massif are probably lost. However, this circumstance cannot be considered as a continuous decline of the Catalan population as a whole. The species is also known from nearby areas in eastern Pyrénées-Orientales department [7 locations] (Hugonnot *et al.*, 2018).

***Seligeria donniana* (Sm.) Müll.Hal.**

It is known from central and eastern Pyrenees (between Mata de València and Ter Valley) and northern Catalan Ranges, Castellterçol (Casas Sicart, 1986; Cros *et al.*, 2010; Lloret, 1989). In the Ter Valley the species was recorded from seven UTM squares of 1x1 km (Lloret, 1989). *S. donniana* occurs on calcareous or siliceous rocks throughout a wide altitudinal range: 1350-2300 m a.s.l. The known subpopulations are mainly found within protected areas. However, since the species has a restricted range (EOO= ca. 4280 km²; AOO= 28 km²), it is assessed as NT. The species is also known from nearby areas in Andorra (Sotiaux & Vanderpoorten, 2017) and France: Midi-Pyrénées region (Infante Sánchez, 2015), where it has been assessed as DD (Infante Sánchez *et al.*, 2015) and Pyrénées-Orientales department [ca. 10 locations] (Hugonnot *et al.*, 2018).

***Seligeria pusilla* (Hedw.) Bruch & Schimp.**

Four locations (EOO= ca. 890 km²; AOO= 16 km²) are known in northern Catalan Ranges and eastern Pyrenees: Castellterçol, Tregurà, Santa María de Besora and Peguera (Lloret, 1989; Puche, 1990, 2015d; Casas, 2002; data from BCB). The species grows in calcareous rocks in montane areas. Despite being a rare species, the known subpopulations are not prone to the effects of human activities or stochastic events within a very short time period and, therefore does not verify the D2 criterion for VU. *S. pusilla* is also known from nearby areas in Andorra (Sotiaux & Vanderpoorten, 2017) and France: Midi-Pyrénées region (Infante Sánchez, 2015), where it has been assessed as NT (Infante Sánchez *et al.*, 2015) and Pyrénées-Orientales department [3 locations] (Hugonnot *et al.*, 2018).

***Seligeria recurvata* (Hedw.) Bruch & Schimp.**

This saxicolous species is known from seven locations (EEO= ca. 1470 km²; AOO= 28 km²) in central and eastern Pyrenees and northeastern Catalonia (Manobens i Rigol, 1985; Casas Sicart, 1986; Lloret, 1989; Puche, 1990, 2015d; Álvaro Martín, 2001; data from BCB). The known subpopulations, which are found throughout a wide altitudinal range (1000-200 m a.s.l.), are mainly found within protected areas. The number of locations and AOO value precludes assigning this species to VU D2. However, since the species has a restricted range, it is assessed as NT. The species is also known from nearby areas in Andorra (Sotiaux & Vanderpoorten, 2017) and France: Midi-Pyrénées region (Infante Sánchez, 2015), where it has been assessed as DD (Infante Sánchez *et al.*, 2015) and Pyrénées-Orientales department [4 locations] (Hugonnot *et al.*, 2018).

***Sphagnum girgensohnii* Russow**

At least ten Pyrenean locations (EEO= ca. 1210 km²; AOO= 40 km²) are found between Estanys Liat and Arànsér (Casas de Puig, 1972; Casas Sicart, 1986; Munín, 1995; Casas *et al.*, 2006; Pérez-Haase *et al.*, 2011; data from BCB). *S. girgensohnii* is assessed as NT because it is close to qualifying as threatened under criterion D2 due to its relatively small AOO and number of locations. The species is also known from nearby Pyrenean areas in Aragón (Infante Sánchez & Heras Pérez, 2003), Andorra (Sotiaux & Vanderpoorten, 2017), and France: Midi-Pyrénées region (Infante Sánchez, 2015), where it has been assessed as DD (Infante Sánchez *et al.*, 2015) and Pyrénées-Orientales department [ca. 6 locations] (Hugonnot *et al.*, 2018).

***Sphagnum palustre* L.**

About 18 Pyrenean locations (EEO= ca. 880 km²; AOO= 68 km²) are found between Vall de Toran and Vallferrera (Casares Gil, 1915; Casas, 1968; Casas de Puig, 1972; Ballesteros i Segarra *et al.*, 1983; Casas Sicart, 1986; Casanovas Poch, 1991, 1996; Casas *et al.*, 1992; 2006; Carrillo *et al.*, 2008; Pérez-Haase *et al.*, 2011; data from BCB). Records from Comes de Rubió and eastern Pyrenees require confirmation, whereas a report from Montseny massif is due to confusion with *S. papillosum* (Sáez *et al.*, 2018b). The species is also known from nearby areas in Aragonese Pyrenees (Infante Sánchez & Heras Pérez, 2003), Andorra (Sotiaux & Vanderpoorten, 2017), and France: Midi-Pyrénées region (Infante Sánchez, 2015), where it has been assessed as NT (Infante Sánchez *et al.*, 2015) and Pyrénées-Orientales department [ca. 20 locations] (Hugonnot *et al.*, 2018).

***Sphagnum platyphyllum* (Lindb. ex Braithw.) Warnst.**

About 20 Pyrenean locations (EEO= ca. 1600 km²; AOO= 76 km²) are found between Conangles and Clots del Port (Casas, 1968; Casas de Puig, 1972; Ballesteros i Segarra *et al.*, 1983; Casas Sicart, 1986; Casanovas Poch, 1991, 1996; Pérez-Haase *et al.*, 2011; data from BCB). The species is also known from nearby areas in Aragonese Pyrenees (Infante Sánchez & Heras Pérez, 2003), Andorra (Sotiaux & Vanderpoorten, 2017), and France: Midi-Pyrénées region (Infante Sánchez, 2015), where it has been assessed as CR (Infante Sánchez *et al.*, 2015) and Pyrénées-Orientales department [ca. 10 locations] (Hugonnot *et al.*, 2018).

***Sphagnum rubellum* Wilson**

The species occurs scattered in central Pyrenees, between Estanys de Gèmena and Pla de Tor (Casas de Puig, 1972; Casas Sicart, 1986; Fuertes & Munín, 1994; Pérez-Haase *et al.*, 2011; data from BCB). The species is currently known from six locations (EOO= ca. 190 km²; AOO= 24 km²), so that is close to qualifying for VU D2, accordingly it is assessed as NT. The species is also known from nearby areas in The Aragonese Pyrenees (Infante Sánchez & Heras Pérez, 2003), Andorra (Sotiaux & Vanderpoorten, 2017), and France: Midi-Pyrénées region (Infante Sánchez, 2015), where it has been assessed as NT (Infante Sánchez *et al.*, 2015) and Pyrénées-Orientales department [ca. 6 locations] (Hugonnot *et al.*, 2018).

***Sphagnum squarrosum* Crome**

In our area the species is confined geographically to central and eastern Pyrenees, where eight subpopulations are known between Portilló de Bossost and Vallferrera (Casares Gil, 1915; Allorge & Casas de Puig, 1968; Casas de Puig, 1972; Casas Sicart, 1986; Casas *et al.*, 1996; Carrillo *et al.*, 2008; Pérez-Haase *et al.*, 2011; data from BCB). It is assessed as NT because it is close to qualifying as threatened under criterion D2 due to its relatively restricted range (EOO= ca. 990 km²; AOO= 32 km²) and small number of locations. The species is also known from nearby areas in Andorra (Sotiaux & Vanderpoorten, 2017), and France: Midi-Pyrénées region (Infante Sánchez, 2015), where it has been assessed as NT (Infante Sánchez *et al.*, 2015) and Pyrénées-Orientales department [ca. 9 locations] (Hugonnot *et al.*, 2018).

***Sphagnum teres* (Schimp.) Ångstr.**

At least thirteen Pyrenean locations (EOO= ca. 1870 km²; AOO= 52 km²) are found between Vall de Toran, Conangles and Malniu (Casas, 1968; Casas de Puig, 1972; Casas Sicart, 1986; Casanovas Poch, 1991, 1996; Casas *et al.*, 1996; 2006; Carrillo *et al.*, 2008; Pérez-Haase *et al.*, 2011; data from BCB). The species is also known from nearby areas in Andorra (Sotiaux & Vanderpoorten, 2017), and France: Midi-Pyrénées region (Infante Sánchez, 2015), where it has been assessed as LC (Infante Sánchez *et al.*, 2015) and Pyrénées-Orientales department [ca. 30 locations] (Hugonnot *et al.*, 2018).

***Sphagnum warnstorffii* Russow**

About fifteen Pyrenean locations (EOO= ca. 970 km²; AOO= 60 km²) are found between Molières and Malniu (Casanovas Poch, 1991, 1996; Munín, 1995; Casas *et al.*, 2006; Carrillo *et al.*, 2008; Cros *et al.*, 2010; Pérez-Haase *et al.*, 2011; data from BCB). The species is also known from nearby areas in Aragonese Pyrenees (Infante Sánchez & Heras Pérez, 2003), Andorra (Sotiaux & Vanderpoorten, 2017), and France: Midi-Pyrénées region (Infante Sánchez, 2015), where it has been assessed as VU (Infante Sánchez *et al.*, 2015) and Pyrénées-Orientales department [ca. 7 locations] (Hugonnot *et al.*, 2018).

***Stegonia latifolia* (Schwägr.) Venturi ex Broth.**

At least five locations (EOO= ca. 960 km²; AOO= 20 km²) are known in central and eastern Pyrenees, between Pla de Baqueria and Cadí Moixeró range (Manobens i Rigol, 1984, 1985; Casas Sicart, 1986; Álvaro Martín, 2001; Sáez *et al.*, 2011). The species grows on calcareous

rocky places in high mountain areas (between 2050 and 2647 m a.s.l.). *S. latifolia* is also known from nearby areas in Andorra (Sotiaux & Vanderpoorten, 2017) and France: Midi-Pyrénées region (Infante Sánchez *et al.*, 2015) and Pyrénées-Orientales department [5 locations] (Hugonnot *et al.*, 2018). Although *S. latifolia* has a small range in our area, it is not severely fragmented and the known subpopulations are not prone to the effects of human activities or stochastic events within a very short time period.

***Stereodon callichrous* (Brid.) Braithw.**

Nine Pyrenean locations corresponding to 9 UTM squares 1x1 km (EOO= ca. 1330 km²; AOO= 36 km²) are found between Tredós and Puigmal (Ruiz & Brugués, 2011), where it occurs on rocks, soil and bark between 1500 and 2200 m a.s.l. This species is also known from nearby locations in Aragonese Pyrenees (Ruiz & Brugués, 2011), Andorra (Ruiz & Brugués, 2011; Sotiaux & Vanderpoorten, 2017) and the French Pyrenees (Infante Sánchez, 2015), where it has been assessed as NT (Infante Sánchez *et al.*, 2015). The species is assessed as NT because it is close to qualify as threatened under criterion D2 due to its relatively small AOO and number of locations.

***Syntrichia caninervis* Mitt.**

The species, which is generally restricted to dry exposed calcareous or gypsum soils, is currently known from Serra de Prades (where at least three subpopulations are known) and Tudela de Segre (Casas de Puig, 1975b; Brugués *et al.*, 1993; Gallego, 2005). The values of EOO and AOO are ca. 98 km² and 16 km², respectively. Despite being a rare species, the known subpopulations are not prone to the effects of human activities or stochastic events within a very short time period and therefore does not verify the D2 criterion for VU.

***Syntrichia sinensis* (Müll.Hal.) Ochyra**

The species occurs in eastern Pyrenees: Castellar de n'Hug and several locations in the Ter Valley (Lloret Maya, 1986; Lloret, 1989; Gallego, 2005). The known populations are found on shaded siliceous rocky places, between 100 and 2300 m a.s.l. *S. sinensis* is currently known from seven locations (EOO= ca. 80 km²; AOO= 28 km²), so that is close to qualifying for VU D2, accordingly it is assessed as NT. Two populations are also known from nearby areas in the Pyrénées-Orientales department (Hugonnot *et al.*, 2018).for

***Syntrichia subpapillossisima* (Bizot & R.B.Pierrot ex W.A.Kramer) M.T.Gallego & J.Guerra**

At least four collection sites (EOO= ca. 3080 km²; AOO= 16 km²) are known in Pyrenees (St. Llorenç dels Porxos and Bor in Cerdanya) and central Catalan Ranges (Prades and Olèrdola) (data from BCB). The species occurs on calcareous soils and rocks, between 300 and 1600 m a.s.l. and does not seem especially vulnerable to the effects of human activity or short-term fortuitous events, and therefore does not verify the D2 criterion for VU. *Syntrichia subpapillossisima* was not listed for Andorra (Sotiaux & Vanderpoorten, 2017) and it is extremely rare in Pyrénées-Orientales department [1 location] (Hugonnot *et al.*, 2018). The species has been recently collected in Midi-Pyrénées region (M. Infante Sánchez, *pers. comm.*).

***Taxiphyllum wissgrillii* (Garov.) Wijk & Margad.**

It is known from scattered locations in northern Catalonia: Pyrenees (Artiga de Lin and Ter valley), Montseny massif and two locations in Garrotxa volcanic field (Allorge & Casas de Puig, 1968; Casas Sicart, 1986; Sáez *et al.*, 2018b). Typical habitats include wet rocks and soils in the montane and subalpine belts. Despite being a rare species (EOO= ca. 4800 km²; AOO= 16 km²) the known subpopulations are not prone to the effects of human activities or stochastic events within a very short time period and therefore does not verify the D2 criterion for VU.

***Timmiella barbuloides* (Brid.) Mönk.**

It is known from scattered locations in central and southern Catalonia: Gavà, Martorell, Cervelló, Els Guiamets and Tarragona (Casas, 1951; Casas de Puig *et al.*, 1956; Brugués, 1978; data from BCB), where it usually grows on somewhat humid, calcareous soils in the lowlands. Despite being a rare species (EOO= ca. 1500 km²; AOO= 20 km²) it is probably not prone to the effects of human activities or stochastic events within a very short time period.

***Tomentypnum nitens* (Hedw.) Loeske**

At least six locations (corresponding to 7 UTM squares 1x1 km) are known in central Pyrenees: Val de Molières, Bassa Nera, Riu Ruda, Pla de Beret, Estany de Trescuro, and Comes de Rubió (Canalís & Casas, 1985; Casanovas Poch, 1996; Pérez-Haase *et al.*, 2011; data from BCB). The values of EOO and AOO are ca. 510 km² and 28 km², respectively. The species, which occurs on peat in the montane and subalpine belts, is also known from nearby areas in Aragonese Pyrenees: Vall de Barravés (Canalís & Casas, 1985) and France: Midi-Pyrénées region (Infante Sánchez, 2015), where it has been assessed as NT (Infante Sánchez *et al.*, 2015) and Pyrénées-Orientales department [ca. 5 locations] (Hugonnot *et al.*, 2018). The species was listed as VU B2ab(ii,iii) by Brugués *et al.* (2014a), although the most recent data (discovery of new subpopulations) suggest that there is no evidence of a decline in area, extent and/or quality of habitat. The number of locations and AOO value preclude the assignation of this species to VU D2 (IUCN, 2012). Therefore, it is assessed here as NT as it is close to qualifying for VU under criterion D2.

***Tortella fragilis* (Hook. & Wilson) Limpr.**

The species is currently known from seven locations corresponding to nine UTM 1x1 km squares (EOO= 2870 km²; AOO= 28 km²) in central and eastern Pyrenees, between Barruera and Setcases (Lloret, 1989; Casas Sicart, 1993; Cros *et al.*, 2010; data from BCB and BCN), where it usually occurs on rocky places in high mountain areas. It is assessed as NT because it is close to qualify as threatened under criterion D2 due to its relatively small AOO and number of locations.

***Tortula revolvens* (Schimp.) G.Roth**

The species, which is generally restricted to dry exposed gypsum soils, is currently known from seven locations (EOO= ca. 430 km²; AOO= 28 km²) in the Ebro Basin: Anoya, Noguera and Segarra counties (Brugués *et al.*, 1993). Despite being a rare species, the known subpopulations are not prone to the effects of human activities or stochastic events within a

very short time period. The species could become threatened in the near future if its habitat becomes increasingly under pressure.

***Tortula schimperi* M.J.Cano, Werner & J.Guerra**

Five locations (EOO= ca. 400 km²; AOO= 20 km²) are known: central and eastern Pyrenees (between Estany de Cavallers and Ter Valley) and Montseny massif (Casas *et al.*, 2006; Sáez *et al.*, 2018b; data from BCB). The species occurs on diverse and not especially fragile habitats (slopes, rocky places, etc.) in montane and subalpine areas (Cano *et al.*, 2017). *T. schimperi* does not seem especially vulnerable to the effects of human activity or short-term fortuitous events, and therefore does not verify the D2 criterion for VU. The species is also known from nearby areas in Andorra (Sotiaux & Vanderpoorten, 2017) and France: Midi-Pyrénées region (Infante Sánchez, 2015), where it has been assessed as VU (Infante Sánchez *et al.*, 2015) and Pyrénées-Orientales department [4 locations] (Hugonnot *et al.*, 2018).

***Weissia wimmeriana* (Sendtn.) Bruch & Schimp.**

Nine Pyrenean locations (EOO= ca. 530 km²; AOO= 36 km²) are found between Colomers and Ter Valley (Casas Sicart, 1986, 1993; Lloret, 1989; data from BCB), where the species occurs on rock crevices and slopes, between 1600 and 2400 m a.s.l. It is also known from nearby areas in Aragonese Pyrenees (Casas *et al.*, 1986), Andorra (Sotiaux & Vanderpoorten, 2017) and France: Midi-Pyrénées region (Infante Sánchez, 2015), where it has been assessed as VU (Infante Sánchez *et al.*, 2015) and Pyrénées-Orientales department [5 locations] (Hugonnot *et al.*, 2018). It is assessed as NT because it is close to qualify as threatened under criterion D2 due to its relatively small AOO and number of locations.

DATA DEFICIENT SPECIES (DD)

Liverworts

***Blasia pusilla* L.**

The species is known only from a single locality in Val d'Aran, Canejan, where it occurs on shady banks at 780 m a.s.l. (Casas, 1993b). *B. pusilla* is known from nearby areas in French territory: Ariège, Hautes-Pyrénées and Haute-Garonne (Infante Sánchez, 2015), where it is not considered a threatened species (Infante Sánchez *et al.*, 2015). Despite its rarity, this species would be able to colonize somewhat disturbed environments. The species and may be worth a threat category, but until further data based on field research can be gathered, it is assessed as DD.

***Mannia gracilis* (F.Weber) D.B.Schill & D.G.Long**

The species is documented so far from a single location in eastern Pyrenees: Núria (Casas de Puig, 1957). It was found growing on acidic rocks, at 2000 m a.s.l. between 1950 and 1956. There is potentially a threat from *disturbances* induced by human activity in the area, but this cannot be confirmed based on current evidence. Further information on the distribution, population size and trends is required for *M. gracilis*; in the absence of this information it is

currently assessed as DD. The species is known from nearby areas: Andorra (Sotiaux & Vanderpoorten, 2017) and France: Midi-Pyrénées region (Infante Sánchez *et al.*, 2015) –where it was regarded as VU-- and Pyrénées-Orientales department [6 locations] (Hugonnot *et al.*, 2018).

***Radula lindenbergiana* C.Hartm.**

The distribution of this species in our area remains unclear. It is frequently confused with *R. complanata*. The species is known from nearby areas: Andorra (Sotiaux & Vanderpoorten, 2017) and France: Midi-Pyrénées region (Infante Sánchez, 2015), where it was regarded as DD (Infante Sánchez *et al.*, 2015), and Pyrénées-Orientales department [11 locations] (Hugonnot *et al.*, 2018).

***Riccia crystallina* L.**

This is an apparently rare species, having only been collected once in Central Catalan Ranges, l'Abellera by Brugués (1978). However, no specific surveys have been conducted to relocate this population and nothing is known about its current conservation status. The species was found in an area under some anthropogenic disturbances (trampling) which may impact this species, but this cannot be confirmed based on current evidence. Further information on the population size and trends is required for *R. crystallina*. In the absence of this information it is currently assessed as Data Deficient (DD).

***Riccia trabutiana* Steph.**

The distribution of the species in our area is poorly known. It was collected from central and southern Catalonia: Garraf, Baix Penedès and Els Ports massif (data from BCB). Inadequate information is available to make an assessment beyond DD. Surveys are needed to determine the current distribution, habitat preferences, and to evaluate threats.

***Riella cossoniana* Trab.**

Its only known location in our area corresponds to artificial ponds found in Cal Tet, Llobregat river mouth (Seguí *et al.*, 2007). When this species was found, this place was still fed with water of a certain quality (from the “El Prat” treatment plant). Subsequently, the water supply was of phreatic origin. The species has not been relocated in the area since 2004, although surveys are conducted every year (E. de Roa, *pers. comm.*, 18 Sept 2017).

***Scapania curta* (Mart.) Dumort.**

This species has been recorded from the Pyrenees and the Catalan Ranges (Casas Sicart, 1960; Allorge *et al.*, 1962; Brugués, 1978; Cros i Matas, 1985; Manobens i Rigol, 1985; Álvaro Martín, 2001). However, its detailed distribution in our area remains unclear, since *S. curta* may be confused with other species included within sect. *Curtae* (Müll. Frib.) H. Buch. The species is also known from nearby areas in France: Midi-Pyrénées region (Infante Sánchez, 2015), where it has been assessed as DD (Infante Sánchez *et al.*, 2015) and Pyrénées-Orientales department [3 locations] (Hugonnot *et al.*, 2018).

***Scapania mucronata* H.Buch**

The distribution of the species in our area remains unclear. *Scapania mucronata* may be confused with *S. scandica*. It was collected from central Pyrenees, Espot (*det.* J. Váña, voucher in BCB). The species is also known from nearby areas in France: Midi-Pyrénées region (Infante Sánchez, 2015), where it has been assessed as EN (Infante Sánchez *et al.*, 2015). Further studies to understand its distribution, threats, and conservation status of the species are required.

***Scapania praetervisa* Meyl.**

This species has been recorded from the Catalan Ranges and Pyrenees (Sáez *et al.*, 2018b, data from BCB). However, its distribution in our area remains unclear (see comments under *S. curta*). The species is also known from nearby areas in Andorra (Sotiaux & Vanderpoorten, 2017) and France: Midi-Pyrénées region (Infante Sánchez, 2015), where it has been assessed as VU (Infante Sánchez *et al.*, 2015) and Pyrénées-Orientales department [15 locations] (Hugonnot *et al.*, 2018).

***Scapania scandica* (Arnell & H.Buch) Macvicar**

The distribution of the species in our area remains unclear (see comments under *Scapania mucronata*). In our area it is known from central Pyrenees, Norís (voucher in BCB). The species is also known from nearby areas in Aragonese Pyrenees: Panticosa (Casas Sicart, 1986); Andorra (Sotiaux & Vanderpoorten, 2017) and France: Midi-Pyrénées region (Infante Sánchez, 2015), where it has been assessed as VU (Infante Sánchez *et al.*, 2015) and Pyrénées-Orientales department [7 locations] (Hugonnot *et al.*, 2018).

***Solenostoma obovatum* (Nees) C.Massal.**

Although its distribution in our area is poorly known, the species is probably not threatened. *Solenostoma obovatum* is confirmed for, at least, two Pyrenean locations: Vall de Ruda and Espot (data from BCB). Moreover, it was reported from Portilló de Bossost (Casas Sicart, 1986). No specific surveys have been conducted to relocate these populations. The species is found in nearby areas: Andorra (Sotiaux & Vanderpoorten, 2017) and France: Midi-Pyrénées region (Infante Sánchez, 2015), where it has been assessed as LC (Infante Sánchez *et al.*, 2015) and Pyrénées-Orientales department [5 locations] (Hugonnot *et al.*, 2018).

***Sphaerocarpos michelii* Bellardi**

The species is known from several locations in our area: Barcelona and Bescanó (Casas de Puig *et al.*, 1956; Brugués *et al.*, 1982b). Reports from Montnegre massif by Barnola (1918) and from Núria by Vayreda (1882) are probably wrong. No additional information is available about this species. The available information is not adequate to assess the conservation status of the species, although it is probably rare and may deserve a threat category. Therefore, it is assessed as DD, and further field research is required to determine its current distribution and threats to existing subpopulations.

***Targionia lorbeeriana* Müll.Frib.**

Its presence has been confirmed for Catalan Ranges where it is found in, at least, two separated areas: Prades and Garrotxa volcanic field (data from BCB). Its distribution is poorly known, and the species can be confused with *T. hypophylla*. The information available is not adequate to assess the conservation status of *T. lorbeeriana* and it is therefore assessed as DD. Further research on its distribution, ecology and threats is needed.

Mosses***Aloina bifrons* (De Not.) Delgad.**

The species is documented from Ebro basin: Batea, where it was collected in 1973 (Casas & Brugués, 1983). On the other hand, Jover *et al.* (2013) reported *A. bifrons* from Segrià county, but without indicating any concrete location. It is not known if there are any threats to this species, but its habitats are generally not under threat. Further field research is required to determine the current distribution and conservation status of this species.

***Anoetangium aestivum* (Hedw.) Mitt.**

The species was reported from Val d'Aran, Montgarri (Husnot, 1876). It is known from nearby areas: La Renclusa (Guerra & Cano, 2013); Port de Benasc (Zetterstedt, 1865) and La Glère (Husnot, 1876). In the Iberian Peninsula *A. aestivum* grows on shady calcareous rocks in alpine and subalpine regions (Cano *et al.*, 2016). The species is also known from nearby areas in Midi-Pyrénées region (Infante Sánchez, 2015), where it has been assessed as DD (Infante Sánchez *et al.*, 2015). However, no specific surveys have been conducted to relocate the Montgarri subpopulation and nothing is known about its current conservation status. Therefore, there is insufficient information available to carry out conservation assessment with confidence. The species is probably rare and may be worth a threatened category, but until further data based on field research can be gathered, it is assessed as DD.

***Barbula crocea* (Brid.) F.Weber & D.Mohr**

Casas *et al.* (2006) reported the species from Val d'Aran, Uelhs deth Joeu. However, the herbarium specimen (BCB 14659) on which this report is based is referable to *B. convoluta*. *B. crocea* is known from nearby areas in Aragonese Pyrenees: Maladeta massif, Pineta and Ordesa. In our area *B. crocea* was also reported from Puigmal massif (Braun-Blanquet, 1948), where it was found on Devonian calcareous rocks at 2200 m altitude. Extensive surveying in Pyrenees would also help to determine if further populations exist. On the other hand, *B. amplexifolia* (Mitt.) A.Jaeger is a largely overlooked species mistaken for *B. crocea* (Köckinger & Kučera, 2007), which has been listed for Andorra (Sotiaux & Vanderpoorten (2017).

***Bryum canariense* Brid.**

The species is only known from three locations: Montseny massif, Montsant range and Foixà, (Casas Sicart, 1960; Casals & Cros, 1995; Corominas Xifra, 2003), where it occurs on calcareous humus-rich soils in the lowlands. It is not known if there are any threats to this species, but its habitats are generally not under threat. *Bryum canariense* could be assessed as

NT or even LC, further field research is required to determine the current distribution and conservation status of this species.

***Bryum intermedium* (Brid.) Blandow**

Its presence has been confirmed for Pyrenean locations: Vall de Cardós and Arànsers (Casas *et al.*, 2006; Guerra *et al.*, 2010b), where it occurs on wet soils between 900 and 220 m a.s.l. The species is also known from nearby areas in Aragón (Infante Sánchez & Heras Pérez, 2003) and Midi-Pyrénées region (Infante Sánchez, 2015), where it has been assessed as DD (Infante Sánchez *et al.*, 2015). The distribution of the species in the studied area is poorly known, since it can be confused with *B. caespiticium*, *B. creberrimum* and *B. pallescens* (Guerra *et al.*, 2010b). The information available is not adequate to assess the conservation status of *Bryum intermedium* and it is therefore assessed as DD.

***Bryum klinggraeffii* Schimp.**

The species occurs scattered in northern Catalonia. It is known from at least four locations: Cadaqués, Bescanó, Basturs and Cadí Range (Casas *et al.*, 1998a; data from BCB), where it grows in wet sandy or clayey soils in lowlands and montane belt. The species is also known nearby areas in Andorra (Sotiaux & Vanderpoorten, 2017) and France: Midi-Pyrénées region (Infante Sánchez, 2015), where it has been assessed as VU (Infante Sánchez *et al.*, 2015) and Pyrénées-Orientales department [2 locations] (Hugonnot *et al.*, 2018). Although *B. klinggraeffii* could be assessed as NT, or even LC, further field research is required to determine the current distribution and conservation status of this species.

***Bryum kunzei* Hornsch.**

The species is currently known from a single Pyrenean location: Val de Molières (Guerra *et al.*, 2010b). It is found in nearby areas in France: Midi-Pyrénées region (Infante Sánchez, 2015), where it has been assessed as DD (Infante Sánchez *et al.*, 2015) and Pyrénées-Orientales department [3 locations] (Hugonnot *et al.*, 2018). Its distribution should be clarified on the basis of revision of herbarium specimens and future fieldwork.

***Bryum ruderale* Crundw. & Nyholm**

The species is known from three locations in northern Catalonia: L'Albera massif, Montgrí massif and Serra de Prades (Brugués *et al.*, 1981; Jover Benjumea, 2007; BCB 46808) where it occurs on dry exposed calcareous or siliceous soils in lowlands. It is not known if there are any threats to *B. ruderale*, but its habitats are generally not under threat. The species is found in nearby areas in Pyrénées-Orientales department [6 locations] (Hugonnot *et al.*, 2018). No additional information is available about this species. Further field research is required to determine the current distribution and conservation status of this species.

***Bryum sauteri* Bruch & Schimp.**

The species, which can be confused with *Bryum klinggraeffii* (Guerra *et al.*, 2010b), is known from a single collection site in Montseny massif. It was collected by C. Casas in 1951 at 700 m a.s.l. (Casas, 2000), but otherwise nothing is known of its ecology or possible threats.

It has not been collected in recent years, but nor has it been searched for intensively. There is not enough information to assess the conservation status of this species.

***Bryum turbinatum* (Hedw.) Turner**

The distribution of the species is poorly known, since it was listed for Barcelona and Lleida provinces (Guerra *et al.*, 2010b). According to the latter authors, it can be confused with *B. schleicheri* so perhaps not all records of *B. turbinatum* actually correspond to this species. The information available is not adequate to assess the conservation status of *B. turbinatum* and it is therefore assessed as DD.

***Cinclidotus vivesii* Ederra & J.Guerra**

This species was described by Ederra & Guerra (2005) on the basis a specimen collected in Cercs (eastern Prepyrenees) in 1971 by J. Vives. The specimen was originally labelled as *C. fontinaloides*, a closely related species. Information on the morphological characters the recognition as a separate species were provided by Ederra & Guerra (2005). Apparently, *C. vivesii*, is only known in sterile condition. No additional information is available about this species. Further research is required to determine the relationships of *C. vivesii*, its current distribution and conservation status.

***Cratoneuron curvicaule* (Jur.) G.Roth**

Recently detected in the studied area in eastern Pre-Pyrenees, Serra de Cadí-Moixeró, Tossa d'Alp massif (Ruiz *et al.*, 2018c) where it occurs on calcareous soil in karstified ridges at 2390 m a.s.l. This subpopulation is found in a well-conserved area with no apparent conservation problems. The species was also collected in Aragonese Pyrenees, Pico Culebras. *C. curvicaule* is assessed as DD, however, more information on its current distribution and threats may show it to be threatened.

***Crossidium aberrans* Holz. & E.B.Bartram**

The species, which is generally restricted to dry exposed calcareous, gypsum or saline soils in the lowlands, is currently known from few locations in southern Catalan ranges and Ebro basin (Segarra and Baix Ebre counties, data from BCB). *C. aberrans* is found in nearby areas in Aragón (Alcántara *et al.*, 2007 and BCB data). Further field research is required to determine the current distribution and conservation status of this species.

***Crossidium laevipilum* Thér. & Trab.**

The species has been documented so far from a single location in Ebro basin, Batea (Casas *et al.*, 1993). Jover *et al.* (2013) reported *C. laevipilum* from Segrià county, but without indicating any specific location. It is not known if there are any threats to this species, but its habitats are generally not under threat. Further information is required on the species habitat and subpopulations, as well as the impact of habitat loss.

***Dicranum undulatum* Schrad. ex Brid.**

This species has been reported from a single location in the Iberian Peninsula: Meranges area (central Pyrenees), where it was collected only once in 1958 (Brugués & Ruiz, 2013). No

detailed surveys have been conducted to locate this species in our area, so there is insufficient knowledge to assign a threat status with confidence. *D. undulatum* is assessed as DD, however, more information on its current distribution and threats may show it to be threatened. The species is known from nearby areas in France: Midi-Pyrénées region (Infante Sánchez, 2015), where it has been assessed as EN (Infante Sánchez *et al.*, 2015) and Pyrénées-Orientales department [6 locations] (Hugonnot *et al.*, 2018).

***Didymodon cordatus* Jur.**

Not enough is known about the ecology and distribution of this species in our area since it has been confused with other *Didymodon* species. *D. cordatus* is known from central Pyrenees, Sort (data from BCB) where it occurs in anthropized environments. Further field research is required to determine the current distribution and conservation status of *D. cordatus*.

***Didymodon nicholsonii* Culm.**

According to Jiménez *et al.* (2003) *D. nicholsonii* has been confused with other species of the genus, mainly *D. rigidulus*. In our area the species has been reported from Estellís, Batea and Montcada (Casas, 2000). However, it is advisable to confirm the attribution of these samples to *D. nicholsonii*. Further research on its distribution, ecology and threats is needed.

***Didymodon sinuosus* (Mitt.) Delogne**

So far, this species is only known from two locations in central and southern Catalonia: Cervelló and Poblet (data from BCB). Some records from northeastern Catalonia require confirmation. It is not known if there are any threats to this species, but its habitats are generally not under threat. Further field research is required to determine the current distribution and conservation status of this species.

***Distichium inclinatum* (Hedw.) Bruch & Schimp.**

So far, this species is only known from eastern Pyrenees, Núria, where it was collected in 1919 (Casas i Sicart, 1993). Several Pyrenean records (Casas *et al.*, 2006) based on sterile material require confirmation. The species is probably rare and may deserve a threat category, but until further data based on field research can be gathered, it is assessed as DD.

***Ditrichum subulatum* Hampe**

The species is known from Montseny massif and Montnegre Range (Casas Sicart, 1960; Cros i Matas, 1985). Three subpopulations occur on acidic rocky slopes in the lowlands, which are found in protected areas. Moreover, there is a report, not supported by voucher specimens, from the Cap de Creus Peninsula (Casas *et al.*, 1998a). The information is not adequate to assess the conservation status of *D. subulatum*. Therefore, it is assessed as DD, and further field research is required to determine its current distribution and threats to existing subpopulations.

***Entosthodon muhlenbergii* (Turner) Fife**

This is an apparently rare species in our area, having only been collected once on Montserrat at 750 m a.s.l., in 1927 (Allorge & Allorge, 1946; data from BCB). No specific surveys have been conducted to relocate this population and nothing is known about its current

conservation status. Other records of *E. muhlenbergii* may be due to confusion with other species of the genus, mainly *Entosthodon pulchellus*. Further information on the population size and trends is required for *E. muhlenbergii*. In the absence of this information it is currently assessed as Data Deficient (DD).

***Fissidens crispus* Mont.**

The species has been recorded from only one site in Montnegre and at least two sites in Moianès county (Guerra & Ederra, 2015, Brugués *et al.*, 2014b), where it occurs on humid calcareous or siliceous rocks in the lowlands. Threats are unknown. On the other hand, *Fissidens crispus* can be confused with *F. viridulus*. The species is probably rare, but until further data based on field research can be gathered, it is assessed as DD.

***Fissidens exilis* Hedw.**

Its distribution in our area is poorly known. The species was listed for Girona provinces (Guerra & Ederra, 2015), corresponding to a report from Sant Feliu de Pallarols (Allorge & Casas de Puig, 1968). Inadequate information is available to make an assessment beyond DD. Its distribution should be clarified on the basis of revision of herbarium specimens and future fieldwork.

***Fissidens pusillus* (Wilson) Milde**

So far, this species is only known from three locations in northeastern Catalonia: Sant Feliu de Pallarols, Setcases and Montcada. There is not enough information to assess the conservation status of this species. Its distribution should be clarified on the basis of revision of herbarium specimens and future fieldwork.

***Grimmia meridionalis* (Müll.Hal.) E.Maier**

The species is documented so far from a single location: Puig Margall, Port de la Selva (Muñoz *et al.*, 2015a). However, *G. meridionalis* can be confused with the common *G. trichophylla*. There is not enough information to assess the conservation status of *G. meridionalis*. Further research on its distribution, ecology and threats is needed.

***Grimmia tergestina* Bruch & Schimp.**

Its distribution is poorly known, and the species has been confused with *G. crinitoleucophaea*. *Grimmia tergestina* is currently known from 4 Pyrenean locations: Tagast, Sant Llorenç dels Porxos, Vall d'Alinyà and Pont de Suert. *Grimmia tergestina* is known from nearby areas in Andorra (Sotiaux & Vanderpoorten, 2017) and France: Midi-Pyrénées region (Infante Sánchez, 2015), where it has been assessed as VU (Infante Sánchez *et al.*, 2015) and Pyrénées-Orientales department [ca. 25 locations] (Hugonnot *et al.*, 2018). Although *G. tergestina* could be assessed as NT, there is insufficient information available to carry out conservation assessment with confidence. Further field research is required to determine the current distribution and conservation status of this species.

***Grimmia unicolor* Hook.**

Five collections of this species are known for our area, in the central and eastern Pyrenees. However, none of them is recent (they were made between 1944 and 1953). In the Núria area it would have been collected in three nearby locations, and the other areas correspond to Ulldeter and Estany Llebreta. These locations occur within protected areas. This species is found in nearby areas: Maladeta massif (Muñoz, *et al.*, 2015a), Andorra (Sotiaux & Vanderpoorten, 2017) and France: Midi-Pyrénées region (Infante Sánchez, 2015), where it has been assessed as NT (Infante Sánchez *et al.*, 2015). The distribution of *G. unicolor* in our area is relatively restricted, which would allow to justify its threatened species status, but there is insufficient knowledge to assign a threat status with confidence.

***Gymnostomum lanceolatum* M.J.Cano, Ros & J.Guerra**

Not enough is known about the ecology and distribution of this species in our area, which was listed for Barcelona province by Guerra (2006b). Its distribution should be clarified on the basis of revision of herbarium specimens and future fieldwork.

***Gyroweisia reflexa* (Brid.) Schimp.**

The species is documented so far from a single location within the urban area of Barcelona, where it was collected in a garden (BCB 46401); thus, its native status is unclear. There is not enough information to assess the conservation status of this species.

***Gyroweisia tenuis* (Hedw.) Schimp.**

The species has been confirmed from only one site in Vilallonga de Ter (Lloret, 1989). Most records have been confused with *Gymnostomum viridulum* Brid. Not enough is known about the ecology and distribution of *G. tenuis* in our area. Its distribution should be clarified on the basis of revision of herbarium specimens and future fieldwork.

***Homalia trichomanoides* (Hedw.) Schimp.**

Casas (1999) summarized the known distribution of the species in our area, based on an old herbarium record from 1877 (*leg.* R. de Bolòs) and another collection carried out in 1952 in Font del Serrat, Vall de Bianya (*leg.* V. Allorge). In addition, *H. trichomanoides* was reported from eastern Pyrenees: Núria and Camprodon due to Vayreda (1882) and Morer (1879), respectively. These ancient reports were regarded as credible by Casas (1999). The species is found in nearby areas: Pyrénées-Orientales department [6 locations] (Hugonnot *et al.*, 2018). In Midi-Pyrénées region it was assessed as NT (Infante Sánchez *et al.*, 2015). The distribution of *H. trichomanoides* in our area is restricted, which would allow to justify its threatened species status, but there is insufficient information available to assign a threat status with confidence.

***Hypnum pallescens* (Hedw.) P.Beauv.**

The species was collected in Val d'Aran, Viella by Jeanbernat (Ruiz & Brugués, 2011). The specific location is unknown, but it could have been affected by *disturbances* induced by human activity. Recently, it has been reported from Pyrenees, Rasos de Peguera (Ríos *et al.*, 2018). On the other hand, the species was reported from a nearby area: Paderna, in Maladeta

massif (Ruiz & Brugués, 2011). No specific surveys have been conducted to relocate this subpopulation in Val d'Aran and nothing is known about its current conservation status. Therefore, there is insufficient information available to carry out conservation assessment with confidence. The species is probably rare in our area, and may be worth a threat category, but until further data based on field research can be gathered, it is assessed as DD.

***Leptobarbula berica* (De Not.) Schimp.**

So far, this species is only known from two locations in southern and central Catalan Ranges: Els Ports massif and Collserola (Casas *et al.*, 1985b; Álvaro-Martín *et al.*, 2009). There is not enough information to assess the conservation status of this species. Further field research is required to determine the current distribution and conservation status of this species.

***Orthothecium strictum* Lorentz**

This is an apparently rare species in our area, having only been collected once eastern Prepyrenees: Creu de Peguera, in 1973 (Cano & Hedenäs, 2016). So far, this is the only known location of *O. strictum* in the Iberian Peninsula. No surveys have been conducted to locate this species, so there is insufficient knowledge to assign a threat status with confidence. Further information on the distribution, population size and trends is required for *O. strictum*. In the absence of this information it is currently assessed as Data Deficient (DD). The species is known from Midi-Pyrénées region (Infante Sánchez, 2015), where it has been assessed as DD (Infante Sánchez *et al.*, 2015).

***Orthotrichum macrocephalum* F.Lara, Garilleti & Mazimpaka**

This epiphytic species is documented so far from a single location in central Catalan Ranges: Serra de Prades, Farena, where it was collected on *Quercus ilex* by C. Casas in 1975 (BCB 4003). Inadequate information is available to make an assessment beyond DD. Information on distribution and threats of the species are required for a more accurate assessment.

***Orthotrichum philibertii* Venturi**

Reported from a single locality in Montseny massif, where it was collected on *Quercus ilex*, at 700 m a.s.l. (Sáez *et al.*, 2018b). Despite its rarity, in the Iberian Peninsula it is not considered a threatened species, since it can colonize anthropized environments (see Sáez *et al.*, 2018a). There is not enough information to assess the conservation status of this species. Surveys are needed to determine the current distribution, habitat preferences, and to evaluate threats.

***Paraleucobryum nerve* (Thed.) Loeske**

Although the species was reported from several Pyrenean locations, only one collection site is confirmed: Ulldeter (eastern Pyrenees). Reports from central Pyrenees: Estanys Liat (Allorge & Casas de Puig, 1962), Estany de Certascan and Aigüestortes (Casas Sicart, 1986), require confirmation, since confusion with *P. longifolium* is not ruled out. *Paraleucobryum nerve* is also known from nearby areas in Aragonese Pyrenees (Infante Sánchez & Heras Pérez, 2003) where it was regarded as Near Threatened, Andorra (Sotiaux & Vanderpoorten, 2017),

and France: Midi-Pyrénées region (Infante Sánchez, 2015), where it has been assessed as DD (Infante Sánchez *et al.*, 2015), and Pyrénées-Orientales department [9 locations] (Hugonnot *et al.*, 2018). Some subpopulations found in Pyrénées-Orientales department are very close to Ulldeter, although the possibility of any rescue from French subpopulations is unknown. Further field research is required to determine the current distribution and conservation status of this species.

***Physcomitrella patens* (Hedw.) Bruch & Schimp.**

The presence of this ephemeral species is known from lowlands in coastal areas and Catalan Ranges, where it is found in two separated areas: Vallvidrera (Casares Gil, 1905) and Aiguamolls de l'Empordà (Álvaro Martín, 1984). According to the latter author, there are interannual fluctuations with regard to its abundance, which would be related to precipitation. Its current presence in Vallvidrera requires confirmation. Despite its rarity, this species would be able to colonize somewhat disturbed environments. The species may be worth a threat category, but until further data based on field research can be gathered, it is assessed as DD.

***Pseudocrossidium obtusulum* (Lindb.) H.A.Crum & L.E.Anderson**

Its distribution in our area is poorly known. The species was listed for Lleida and Tarragona provinces (Cano, 2006a). Moreover, is known from Serra de la Llena: between Bellaguarda and Coll de la Creueta, where it was collected in 2003 (MUB 15100). Inadequate information is available to make an assessment beyond DD. Its distribution should be clarified on the basis of revision of herbarium specimens and future fieldwork.

***Pterygoneurum subsessile* (Brid.) Jur.**

This is an apparently rare species in our area, having only been collected once in northeastern Catalonia, Palau-saverdera, in 1987 (BCB 44791); it was found in exposed soils in an olive grove. No specific surveys have been conducted to relocate this population and nothing is known about its current conservation status. The presence of *P. subsessile* in the Ebro Basin, where potential habitat exists, is plausible, as there are nearby populations in Aragón (Alcántara *et al.*, 2007). Further data on distribution and threats of *P. subsessile* are required for a more accurate assessment; in the absence of this information it is currently assessed as Data Deficient (DD).

***Ptychostomum archangelicum* (Bruch & Schimp.) J.R.Spence**

The species has been listed for Barcelona, Girona and Lleida provinces (Guerra *et al.*, 2010b). A concrete collection site in eastern Prepyrenees (Rasos de Peguera) was provided by Guerra *et al.*, (2010a). Although *P. archangelicum* could be assessed as LC, further field research is required to determine the current distribution and conservation status of this species.

***Ptychostomum compactum* Hornsch.**

The species is known from scattered locations throughout the Catalan Ranges and Pyrenees: Castelldefels, Montsent de Pallars, Cadí-Moixeró and (Casares Gil, 1915; Manobens i Rigol, 1985; Álvaro Martín, 2001). Not enough is known about the ecology and distribution

of *P. compactum* in our area. Its distribution should be clarified on the basis of revision of herbarium specimens and future fieldwork.

***Racomitrium heterostichum* (Hedw.) Brid.**

This species is relatively common in western Iberian Peninsula, but it is rare in the eastern part. In our area its presence has been confirmed for central Pyrenees, where it is found at least, in two locations: Val d'Aran, Les and Pallars Sobirà, Les Planes. However, there are several records for this species from central and eastern Pyrenees (Canalís & Casas, 1985; Casas Sicart, 1986; Lloret, 1989) which in some cases may be due to confusion with other species of the genus. Reports from Montseny massif are due to confusion with *R. affine* (Sáez *et al.*, 2018b). *Racomitrium heterostichum* is also found in nearby areas: Andorra (Sotiaux & Vanderpoorten, 2017) and France: Midi-Pyrénées region (Infante Sánchez, 2015), where it has been assessed as DD (Infante Sánchez *et al.*, 2015) and Pyrénées-Orientales department [7 locations] (Hugonnot *et al.*, 2018).

***Rhynchostegium alopecuroides* (Brid.) A.J.E.Sm.**

The species is relatively common in northwestern Iberian Peninsula. In the study area there is only one confirmed record from central Pyrenees, Vall de Cardós (BCB 29192, *Vid.* J. Guerra). Inadequate information is available to make an assessment beyond DD. Further studies to understand its distribution, threats, and conservation status of the species are required.

***Schistidium strictum* (Turner) Loeske ex Martensson**

In our area the presence of the species is known for eastern Pyrenees where it is found in one location: Núria (Casas, 2001). The specimen from Bosc de Ribes should be referred to *S. crassipilum*. Several records of *S. strictum* are probably due to confusion with other species of the genus. Further studies to understand its distribution, threats, and conservation status of the species are required.

***Sciuro-hypnum starkei* (Brid.) Ignatov & Huttunen**

In our area, *S. starkei* is confined geographically to central and eastern Pyrenees: Port de La Bonaigua, Núria and Setcases (Allorge & Casas de Puig, 1962, 1976; Lloret, 1989). The species was also reported from Taüll (Casas *et al.*, 2006) although this record requires confirmation. *Sciuro-hypnum starkei* occurs on shaded soils and tree bases between 1600 and 2200 m a.s.l. The species is known from nearby areas: Andorra (Sotiaux & Vanderpoorten, 2017), Aragonese Pyrenees, Maladeta massif (Infante Sánchez & Heras Pérez, 2003; Casas *et al.*, 2006) and France: Midi-Pyrénées region (Infante Sánchez, 2015) where it has been assessed as DD, and Pyrénées-Orientales department [7 locations] (Hugonnot *et al.*, 2018). Although *S. starkei* could be assessed as NT, there is insufficient information available to carry out conservation assessment with confidence. Further field research is required to determine the current distribution and conservation status of this species.

***Syntrichia princeps* (De Not.) Mitt.**

This species is reported from Montseny massif and Els Ports massif (Sáez *et al.*, 2018b; BCB data). A report from Banyoles (Barnola, 1920) is not supported by any herbarium material.

Although its distribution in our area is poorly known, the species is probably not threatened. Its distribution should be clarified on the basis of revision of herbarium specimens and further field research is required to determine the current distribution and conservation status of this species.

***Timmiella anomala* (Bruch & Schimp.) Limpr.**

The species is known from two locations: Sant Miquel del Fai and Serra de Finestres, where it was collected in the late 19th century by J. Puiggarí and R. de Bolòs, respectively (Geheeb, 1879; Brugués & Ruiz, 2018b). No further collections have been made and preliminary surveys in both areas have failed to find it again. However, the occurrence of the species in other similar suitable areas has not been studied. The species is probably rare and may be deserve a threat category, but until further data based on field research can be gathered, it is assessed as DD.

***Tortula israelis* Bizot & F.Bilewsky**

Not enough is known about the ecology and distribution of this species in our area, which was listed for Barcelona province by Cano (2006b). *T. israelis* is, in all probability, overlooked and undercollected. Inadequate information is available to make an assessment beyond DD. Its distribution should be clarified on the basis of revision of herbarium specimens and future fieldwork.

***Tortula viridifolia* (Mitt.) Blockeel & A.J.E.Sm.**

The species is known from three main areas in northeastern Catalonia: Aiguamolls de l'Empordà, cap de Creus Peninsula and Gavarres (Álvaro, 1994; Casas *et al.*, 1998a; Jover Benjumea, 2016). The species occurs on exposed soils in lowlands. Although perhaps the species could be assessed as NT, further field research is required to determine the current distribution and conservation status of this species.

***Trichodon cylindricus* (Hedw.) Schimp.**

The species is known from, at least, three separated locations: Montoliu, Rasos de Peguera and Santa Margarida volcano (Casas Sicart, 1986; Brugués *et al.*, 2007a; Puche, 2015b). The species occurs on wet banks and tracks throughout a wide altitudinal range (650-2350 m a.s.l.). It is known from nearby areas in Andorra (Sotiaux & Vanderpoorten, 2017) and France: Midi-Pyrénées region (Infante Sánchez, 2015), where it has been assessed as DD (Infante Sánchez *et al.*, 2015) and Pyrénées-Orientales department [6 locations] (Hugonnot *et al.*, 2018). Although *T. cylindricus* could be assessed as NT, there is insufficient information available to carry out conservation assessment with confidence. Further field research is required to determine the current distribution and conservation status of the species.

***Weissia levieri* (Limpr.) Kindb.**

The species was recorded from Cap de Creus Peninsula (Casas *et al.*, 1998a), where it occurs in exposed siliceous soils in lowlands. The species is known from nearby areas in eastern Pyrénées-Orientales department [8 locations] (Hugonnot *et al.*, 2018). Inadequate information is available to make an assessment beyond DD. Further new survey data are required for an accurate assessment of the conservation status of this species and to determine its current range.

***Weissia rutilans* (Hedw.) Lindb.**

The species is known from northeastern Catalonia: Gironès county and Cadiretes massif (Brugués *et al.*, 1982b; data from BCB). On the other hand, there are herbarium materials from La Selva, Alt Empordà and Baix Llobregat counties that could correspond to *W. rutilans*. No additional information is available about this species. Its distribution should be clarified on the basis of revision of herbarium specimens and further field research is required to determine the current distribution and conservation status of this species.

DISCUSSION***Analysis of the bryoflora***

The bryoflora of Catalonia includes 828 species with five additional subspecies and 26 varieties (four species of hornworts, 191 species of liverworts with three additional subspecific taxa and two additional varieties, and 633 species of mosses with two additional subspecific taxa and 24 additional varieties). This represents approximately three-quarters of the Spanish bryoflora (Canary Islands excluded). Information on bryophyte diversity (number of species) for several countries and regions is summarized in Table 1, which is arranged from higher to lower number of species.

Country/region	Area (Km ²)	Number of Species			Total species
		Hornworts	Liverworts	Mosses	
Europe Mainland ^{1,2}	10 180 000	8	474	1330	1812
Spain+Baleares ³	497 167	5	276	857	1138
Austria ⁴	83 879	4	264	862	1130
British Isles ⁵	315 159	4	297	755	1056
Romania ⁶	238 397	4	217	758	979
Midi-Pyrénées ⁷	48 970	2	222	748	972
Czech Republic ⁸	78 867	4	207	652	863
Pyrénées-Orientales ⁹	4 116	3	199	645	847
Catalonia ¹⁰	32 114	4	191	633	828
Slovenia ¹¹	20 273	2	173	638	813
Aragón ¹²	47 720	0	128	559	687
Hungary ¹³	93 030	2	146	511	659
Estonia ¹⁴	45 336	2	127	468	597
Andorra ¹⁵	468	0	137	445	582

Table 1. Comparison of the number of bryophyte species for several European regions and countries. Data from: 1: Hodgetts (2016a); 2: Hodgetts (2016b); 3: Brugués *et al.* (2017); 4: Köckinger *et al.* (2017); 5: Hill *et al.* (2008); 6: Stefanut & Goia (2012); 7: Infante Sánchez (2015); 8: Kucera *et al.* (2012); 9: Hugonnot *et al.* (2018); 10: this study; 11: Martinčič (2016); 12: Infante Sánchez & Heras Pérez (2003); 13: Papp *et al.* (2010); 14: Ingerpuu *et al.* (2018); 15: Sotiaux & Vanderpoorten (2017).

The taxa richness (defined as the total number of species) is rather uneven: the Pyrenees contain the highest richness (677 species, 81.7% over total, Table 2). This geographical region holds greater altitudinal range and wetter climate conditions and it also harbours more diverse and unique habitats especially favourable for some bryophytes. The richness in the Catalan Ranges is also relatively high (546 species, 65.9% over total), while in the Ebro Basin the bryophyte diversity seems to be considerably lower (181 species, 21.8% over total). The latter sector has, unlike the other two, less altitudinal gradient, lower annual average precipitation and a low diversity of lithological substrates (silicates are virtually non-existent). However, it is very likely that in the highest areas of this geographic sector, such as the easternmost area (Lluçanès) or the Pinós and Castelltallat ranges (all of them are areas virtually unexplored from the bryological point of view) can exist a relatively large number of species that have not been inventoried so far. Moreover, most of the floristic studies traditionally focused on the Pyrenees and the northern Catalan Ranges, whilst relatively few bryological surveys were conducted in the Ebro Basin and the southern Catalan Ranges.

Total taxa	Geographical sectors		
	P	E	C
Hornworts	0	0	4
Liverworts	146	26	127
Mosses	531	155	415
Total	677	181	546

Table 2. Number of species in the geographical regions recognized in this study (P: Pyrenees; E: Ebro Basin; C: Catalan Ranges).

Red List: Analysis

The total number of threatened (CR, EN and VU) and regionally extinct (RE) species is 152 (1 hornwort, 53 liverworts and 98 mosses). This represents 18.3% of the bryophyte flora of the studied area. These 152 threatened species are distributed according to IUCN (2012) categories as shown in table 3.

Threatened taxa	RE	CR	EN	VU
Hornworts	--	--	--	1
Liverworts	1	11	7	34
Mosses	4	14	11	69
Total	5	25	18	104

Table 3. Number of threatened species distributed according to IUCN (2012) threat categories.

The geographical sector with the highest number of threatened species is the Pyrenees (118 species, 77.6% over total threatened species, Table 4). The richness in the Catalan Ranges is lower (43 species, 28.3% over total threatened species). In agreement with the relative low bryophyte diversity found in the Ebro Basin, the number of threatened species in this sector is very low: 3 (1.9% over total threatened species), although all of them are exclusive to this sector in the study area: the liverwort *Riccia crustata* and the mosses *Pterygoneurum lamellatum* and *Tortula vlassovii*.

Threatened taxa	Geographical sectors		
	P	E	C
Hornworts	0	0	1
Liverworts	36	1	21
Mosses	82	2	21
Total	118	3	43

Table 4. Number of taxa assessed as threatened (CR, EN and VU) or extinct at a regional level (RE) in the geographical sectors recognized in this study (P: Pyrenees; E: Ebro Basin; C: Catalan Ranges).

In particular, the Axial central Pyrenees (Val d'Aran and northern Pallars Sobirà) has the highest number of threatened species by UTM 10x10 km square (fig. 2). The maximum values are reached in 31TCH22 and 31TCH32 UTM squares, with 21 and 22 species, respectively. Both squares correspond, basically, to Aran Valley, an area with strong Atlantic influence. This area, which includes peaks over 2800 m a.s.l., exhibits wide variety mountain habitats favourable for rare bryophytes or associated with fragile ecosystems: fens, streams, lakes, subalpine forests, snow-beds, acidic or calcareous high mountain rocks, etc. Other mountain areas in eastern Pyrenees (Núria and Upper Ter Valley) have also a high number of threatened species (31TDG39: 12 species, 31T DG49: 11 species). These lower values (with respect to the central Pyrenees) could be related to the relative scarcity of aquatic habitats in the eastern Pyrenees. Outside the Pyrenean area the Montseny massif contains a noticeably number of threatened species (31TDG52: 8 species). This massif is decisive for the persistence of small and isolated populations of bryophytes of subalpine areas or strong maritime influence. Some coastal areas, such as the cap de Creus Peninsula (31TEG28: 6 species), have also a remarkable number of threatened species, most of which are Mediterranean species.

In this study 132 species (1 hornwort, 30 liverworts and 101 mosses) have been assessed as Near Threatened (NT). Most of these species (102) are found in the Pyrenees, while in the Catalan Ranges and the Ebro Basin there are 64 and 6 species assessed as NT, respectively. Within this group of NT taxa, there are species that are not very rare (such as *Buxbaumia viridis* or *Sphagnum warnstorffii*) but restricted to fragile habitats. On the other hand, much more rare species growing in non-fragile habitats (rocky places in mountain areas), have also been

assessed as NT: this is the case of *Encalypta spathulata* and *Schistidium flaccidum*, known from 3 and 4 locations, respectively.

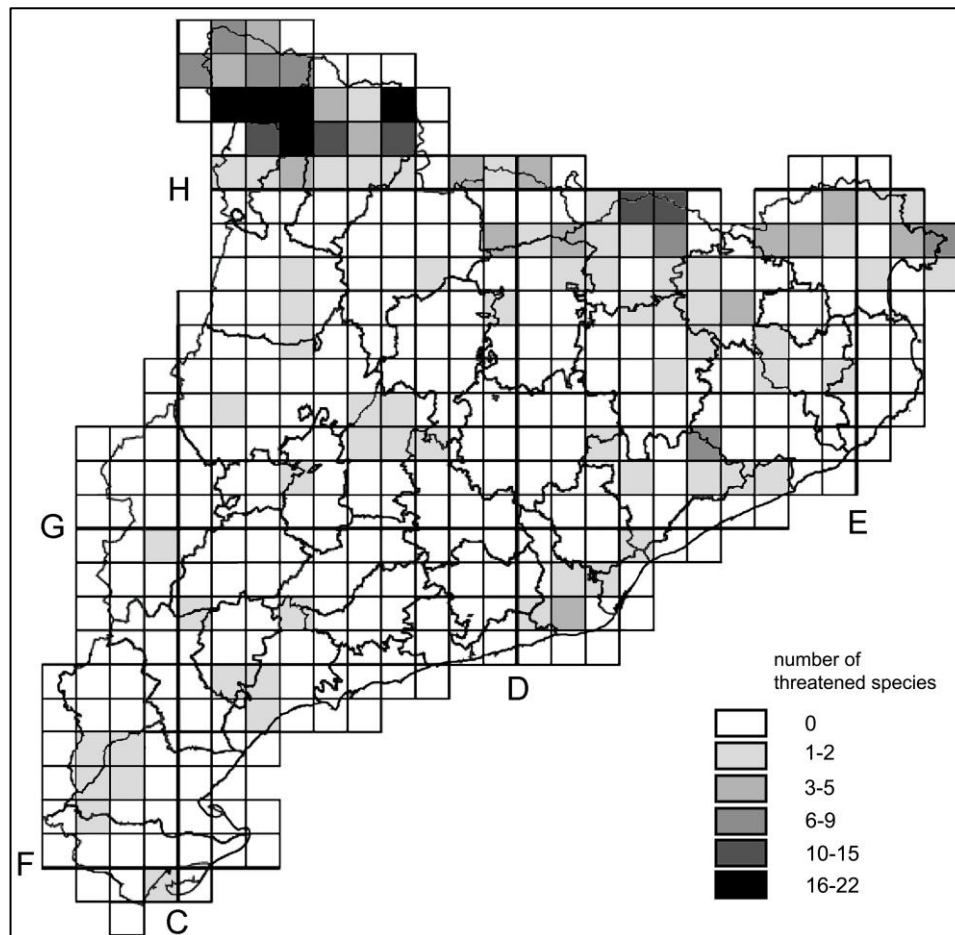


Figure 2. Number of threatened species (RE, CR, EN and VU) by UTM 10 x 10 km squares in the studied area

In this study 66 species (13 liverworts, 53 mosses) have been assessed as DD. Unlike previous distribution analysis by regions, in which the Pyrenees always have a higher number of species, the largest number of DD species (41) is found in the Catalan ranges (vs. 33 and 5 species in the Pyrenees and the Ebro Basin, respectively). 54.7% of the mosses assessed as DD belong to the Pottiaceae and Bryaceae families. These results suggest that it is necessary to establish in more detail the distribution of a large part of the species included in both families.

The comparison of the percentages in the various threat categories in different areas (Table 5) is difficult. According to Kučera *et al.* (2012), although the criteria used in different countries to evaluate species for inclusion on the Red List are largely identical, the baseline data for the different regions vary greatly in both quantity and quality, and even the application of the criteria is very far from being comparable.

The data in table 5 show that the percentage of threatened species of Catalonia is very similar to that of mainland Spain and the Balearic Islands, and so are those related to categories VU, RE and DD. Only the proportion of taxa assigned to CR and EN in mainland Spain and the Balearic Islands is somewhat higher, but in general data are largely comparable. It is very significant the low percentage of poorly known taxa (assigned to DD) in territories such as Sweden and the United Kingdom, in both cases less than 2%, so is the fact that these countries have a relatively low percentage of threatened taxa, compared to other territories considered in Table 5. In the case of the United Kingdom, the low percentage of DD taxa can be related to the deep knowledge of the bryoflora in this territory. An example of another kind is the surprising low percentage of DD taxa in Romania (4.4%), and even more the fact that the quantitatively more important group of threatened taxa in that country corresponds to those evaluated as CR. The percentage of EN taxa is also higher than that of VU taxa. All this is quite unusual and could be due to the method of applying the IUCN criteria (2012) or to the baseline information available for the conservation status assessments.

Country/region	IUCN Category (%)						Sum extinct and threatened taxa (%)
	EX	RE	CR	EN	VU	DD	
Romania ¹	-	-	16.0	11.5	10.6	4.4	38.1
Switzerland ²	-	1.4	5.6	5.3	25.8	9.0	38.1
Czech Republic ³	-	4.5	7.8	9.9	10.4	6.1	32.6
Estonia ⁴	-	2.5	3.2	4.0	19.3	1.8	29.0
Hungary ⁵	-	0.5	3.0	13.7	9.6	21.1	26.8
Mainland Spain+Baleares ⁶	0.09	1.2	4.0	4.5	14.0	7.2	23.8
Midi-Pyrénées ⁷	-	-	3	5	13	41	21.0
Slovenia ⁸	-	-	0.86	10.21	9.10	20.05	20.2
Catalonia ⁹	-	0.6	3.0	2.2	12.5	8.0	18.3
United Kingdom ¹⁰	-	2.4	1.5	3.8	8.2	1.8	15.9
Sweden ¹¹	-	1.0	0.6	2.8	5.0	1.6	9.4

Table 5. Comparison of the percentages in the various threat categories in different areas. Data source from: 1: Stefanut & Goia (2012); 2: Schnyder *et al.* (2004); 3: Kučera *et al.* (2012); 4: Ingerpuu *et al.* (2018); 5: Papp *et al.* (2010); 6: Brugués *et al.* (2014a); 7: Infante Sánchez *et al.* (2015); 8: Martinčič (2016); 9: this study; 10: Hodgetts (2011); 11: Artfakta (2017).

The percentage of threatened taxa in the studied area, including those that are extinct at the regional level (categories RE, CR, EN and VU: 18.3%), is more than three times higher than in the case of vascular plants: 5.5% according to Sáez *et al.* (2010: 730). The information about vascular plants in our area is much more abundant and detailed than that corresponding to the bryophytes, and it is possible that by means of a substantial improvement of the information on the distribution of the bryophyte species, a good part of the species that are now considered as threatened based on the geographical restriction criterion of VU (D2), cannot be included in

this category. However, an eventual improvement of bryophyte chorological information would probably not mean a decrease in the percentage of threatened taxa so that it can be comparable to that of vascular plants. Certain ecological requirements (habitat specificity, particular substrates, etc.) are very important in the viability of bryophyte populations. Most bryophytes are dependent of a stable and humid microclimate for growth, while many other species thrive in relatively low temperatures. In fact, 9.5% of the total threatened species of vascular plants in Catalonia are ferns, lycophytes included (Sáez *et al.*, 2010: 730). This group of plants, as well as bryophytes, usually require specific and often humid environments for such of being able to complete its life cycle and thus to be able to form viable populations. This percentage is much higher than corresponds to the total of ferns with respect to the vascular flora taxa as a whole, which is 2.5%. Therefore, it does not seem possible to make objective comparisons based on quantitative data between different groups of plants in relation to their risk situations.

Although the assessments carried out for many of the species has limitations due to the characteristics of the available information, this contribution can serve to establish a first approximation to the state of conservation of the bryophyte flora of Catalonia. This Red List should be revised periodically in the future, as it is done in other territories (Hodgetts, 2011; Kučera *et al.*, 2012), where re-evaluations allow comparisons to be made over time.

ACKNOWLEDGEMENTS

We are grateful to B. Albertos, P. Heras and M. Infante for providing helpful comments on the manuscript. Our colleagues P. Aymerich, M.J. Cano, J. Cuscó, M. Guardiola, A. Lluent and E. de Roa provided information, in some cases from their own field observations. This research was supported from “Departament de Territori i Sostenibilitat, Generalitat de Catalunya”.

REFERENCES

- ALCÁNTARA, M., D. GOÑI, D. GUZMÁN & J. PUENTE (2007). *Catálogo de especies amenazadas en Aragón flora*. Gobierno de Aragón, Departamento de Medio Ambiente. Huesca. http://www.aragon.es/DepartamentosOrganismosPublicos/Departamentos/DesarrolloRuralSostenibilidad/AreasTematicas/MA_Biodiversidad/ci.05_Catalogo_especies_amenazadas_Aragon.detalleDepartamento?channelSelected=4ab736552883a210VgnVCM100000450a15acRCRD
- ALLORGE, V. & P. ALLORGE (1946). Notes sur la flore bryologique de la Péninsule Ibérique. X. Muscinées du Sud et de l'Est de l'Espagne. *Rev. Bryol. Lichénol.* 15: 172-200.
- ALLORGE, V. & C. CASAS DE PUIG (1962). Contribution a la flore bryologique du Val d'Aran. Instituto de Estudios Pirenaicos (CSIC). *Actas del III Congreso Internacional de Estudios Pirenaicos* 1958: 163-177. Girona.
- ALLORGE, V. & C. CASAS DE PUIG (1968). Contribución al estudio de la flora briológica catalana. II. Briófitos del llano de Olot y zonas próximas. *Collect. Bot. (Barcelona)* 7: 47-68.
- ALLORGE, V. & C. CASAS DE PUIG (1976). Contribución al estudio de la flora briológica catalana. III. Briófitos del Valle de Núria. *Collect. Bot. (Barcelona)* 10: 13-28.

- ALLORGE, V., C. CASAS DE PUIG & P. SERÓ (1962). Contribución al estudio de la flora briológica catalana. I. Briófitos de los montes de Prades (Cordillera prelitoral catalana). *Collect. Bot. (Barcelona)* 6: 331-348.
- ÁLVARO, I. (1994). Els briòfits dels aiguamolls de l'Alt Empordà. En: J. Gosàlbez, J. Serra & E. Velasco (eds.) Els sistemes naturals dels aiguamolls 138-149. *Treb. Inst. Catalana Hist. Nat.* 13.
- ÁLVARO, I. (2010). *Timmia* Hedw. En: Guerra, J., Brugués, M., Cano, M.J. & Cros, R.M. (eds.), *Flora Briofítica Ibérica* Volumen IV, pp. 290-295. Universidad de Murcia-Sociedad Española de Briología. Murcia.
- ÁLVARO MARTÍN, M.I. (1984). *Physcomitrella patens* (Hedw.) B.S.G. en el Alt Empordà (Girona). *Anales Biol.* 2: 197-200.
- ÁLVARO MARTÍN, M.I. (2001). *Estudio de la Flora Briológica del Moixeró*. Tesis Doctoral. Universitat de Barcelona.
- ÁLVARO MARTÍN, I., M.E. BARBERO CASTRO, E. LLOP VALLVERDÚ & A. GÓMEZ-BOLEA (2009). Riquesa briològica i líquenològica del Parc de Collserola (Catalunya). Estacions d'especial interès. *Acta Bot. Barcinon.* 52: 5-44.
- ÁLVARO MARTÍN, I. & N. L. HLADUN SIMÓN (1983). Observaciones sobre la colonización briológico-líquénica de la madera en descomposición en los bosques del Moixeró (Cataluña). *Collect. Bot. (Barcelona)* 14: 19-25.
- ANONYMOUS (2018). Catàleg dels briòfits de la Garrotxa, 2018: *Notícies de la Institució. Circular Inst. Catalana Hist. Nat.* 140: 6-7.
- ARTFAKTA (2017). ArtDatabanken. <https://artfakta.artdatabanken.se>. [accessed: 2 Nov 2017]
- BACHMAN, S., J. MOAT, A. HILL J. DE LA TORRE & B. SCOTT (2011). Supporting Red List threat assessments with GeoCAT: geospatial conservation assessment tool. *ZooKeys* 150: 117-126.
- BALLESTEROS, E. & V. CANALÍS (1991). La vegetació culminal dels massissos de Besiberis i de Mulleres (Pirineus Centrals Catalans). *Bull. Inst. Catalana Hist. Nat.* 59: 95-106.
- BALLESTEROS I SAGARRA, E., X. BAULIES I BOCHACA, V. CANALÍS I HERNÁNDEZ, & T. SEBASTIÀ I ÀLVAREZ (1983). Landes, torberes i mulleres de l'Alta Ribagorça. *Collect. Bot. (Barcelona)* 14: 53-84.
- BARNOLA, J.M. (1903). Notes criptogàmiques. VI. *Bull. Inst. Catalana Hist. Nat.* 3: 67-79.
- BARNOLA, J.M. (1918). Notes criptogàmiques. I. Un grapat de Hepàtiques catalanes, una espècie i dugues varietats noves per a la península ibèrica. *Bull. Inst. Catalana Hist. Nat.* 18: 124-130.
- BARNOLA, J.M. (1920). Notas fitostáticas sobre la vegetación briológica de las cercanías del Lago de Bañolas. *Broteria* 18: 64-73.
- BOISSELIER-DUBAYLE, M.C., M.F. JUBIER, B. LEJEUNE & H. BISCHLER (1995). Genetic variability in the three subspecies of *Marchantia polymorpha* (Hepaticae): isozymes, RFLP and RAPD markers. *Taxon* 44: 363-376.
- BOYD, A.E. (2008). Collecting for Education: Herbaria at Small Liberal Arts Colleges. *Plant Sci. Bull.* 54(3): 86-91.
- BRAUN-BLANQUET, J. (1948). *La Végétation alpine des Pyrénées Orientales*. Consejo Superior de Investigaciones Científicas. Monografía de la Estación de Estudios Pirenaicos y del Instituto Español de Edafología y Fisiología Vegetal 9, Botánica 1: 1-306.
- BRUGUÉS, M. (1978). Flora briológica de los estratos del Buntsandstein de la cordillera Costero Catalana. *Rev. Bryol. Lichenol.* 44: 149-201.
- BRUGUÉS, M. (2007). *Sphagnum contortum* y *Pohlia longicolla* en Andorra. *Bol. Soc. Esp. Briol.* 30-31: 37-38.
- BRUGUÉS, M., C. CASAS & M. ALCARAZ (1982a). Estudio monográfico del Orden Polytrichales en España. (Ensayo para una flora briológica española). *Acta Bot. Malacitana* 7: 45-86.
- BRUGUÉS, M., C. CASAS & R.M. CROS (1981). Estudio sobre la flora briológica de los alcornocales del Alt Empordà. *Pirineos* 113: 33-48.
- BRUGUÉS, M., C. CASAS & J. GIRBAL (1982b). Dades per a la brioflora del Gironès. *Folia Bot. Miscellanea* 3: 21-26.
- BRUGUÉS, M., C. CASAS & L. SOLÉ (2007a). Los briófitos de la zona volcánica de Olot. *Bol. Soc. Esp. Briol.* 30-31: 19-24.

- BRUGUÉS, M., C. CASAS DE PUIG & R.M. CROS (1974). Aportación a la brioflora catalana. *Leucobryum juniperoideum* (Brid.) C. Müll. en los alcornoques del Alto Ampurdán. *Anales Inst. Bot. Cavanilles* 31: 109-117.
- BRUGUÉS, M., R.M. CROS & M. INFANTE (2014a). Lista Roja de los briófitos amenazados de España peninsular y balear. En: Garilleti, R. & B. Albertos (Coords.). *Atlas de los briófitos amenazados de España*. Universitat de València. <http://www.uv.es/abraesp>. Publicado en línea el 04/07/2014.
- BRUGUÉS, M., R.M. CROS & F. LLORET (1993). Dades per a la brioflora dels guixos de Catalunya. *Orsis* 8: 147-149.
- BRUGUÉS, M. & R. FOLCH (1981). *Marchesinia mackaii* al Coll de la Teixeta (Tarragona), nova localitat per als Països Catalans. *Folia Bot. Misc.* 2: 15-17.
- BRUGUÉS, M. & J.M. GONZÁLEZ-MANCEBO (2012). Lista Roja de los briófitos amenazados de España. En: Garilleti R. & Albertos B. (coord.), *Atlas y Libro Rojo de los Briófitos Amenazados de España*. Madrid, Organismo Autónomo Parques Nacionales, pp. 26-42.
- BRUGUÉS, M., M. INFANTE & E. RUIZ (2017). Catàleg de les moltes de l'Espanya peninsular i les Illes Balears. <http://pagines.uab.cat/briologia/content/catàleg-de-les-moltes-de-lespanya-peninsular>. Accés: 20.04.2017.
- BRUGUÉS, M., J. MUÑOZ, E. RUIZ & P HERAS (2004). *Sphagnum*. En: J. Guerra & R.M. Cros (Coords./eds.) *Flora Briofítica Ibérica Volumen I*, pp. 5-73. Sociedad Española de Briología. Murcia.
- BRUGUÉS M, F. PUCHE & K. CEZÓN (2009). *Tortella bambergeri* (Pottiaceae) in the Iberian Peninsula, with an updated key to Iberian *Tortella*. *Bryologist* 112: 164- 168.
- BRUGUÉS, M. & E. RUIZ (2003). Nota sobre *Drepanocladus sendtneri* (H. Müll.) Warnst., *Callialaria curvicaulis* (Jur.) Ochyra y *Warnstorfia sarmentosa* (Wahlenb.) Hedenäs en la Península Ibérica. *Bol. Soc. Española Briol.* 22-23: 17-20.
- BRUGUÉS, M. & E. RUIZ (2010). Entosthodon *Schwägr.* En: Guerra, J., Brugués, M., Cano, M.J. & Cros, R.M. (eds.). *Flora Briofítica Ibérica Volumen IV*, pp. 44-59. Universidad de Murcia-Sociedad Española de Briología, Murcia.
- BRUGUÉS, M. & E. RUIZ (2012). The genus *Kiaeria* in Spain, including *K. blyttii* (Bruch et Schimp.) Broth. new to Spain. *Cryptog., Bryol.* 33: 263-266.
- BRUGUÉS, M. & E. RUIZ (2013). *Dicranum*. En: Brugués, M. & J. Guerra (eds.). *Flora Briofítica Ibérica Volumen II*, pp. 97-120. Universidad de Murcia-Sociedad Española de Briología.
- BRUGUÉS, M. & E. RUIZ (2015). *Dicranum* Hedw. En: Brugués, M. & Guerra, J. (eds). *Flora Briofítica Ibérica Volumen II*, pp. 105-128. Universidad de Murcia-Sociedad Española de Briología. Murcia.
- BRUGUÉS, M. & E. RUIZ (2018a). Leskeaceae. En: J. Guerra, M. J., Cano & M. Brugués (eds.). *Flora Briofítica Ibérica Volumen VI*, pp. 19-35. Universidad de Murcia-Sociedad Española de Briología, Murcia.
- BRUGUÉS, M. & E. RUIZ (2018b). *Timmia anomala* (Bruch & Schimp.) Limpr. en Cataluña. *Bol. Soc. Española Briol.* 50: 13-15.
- BRUGUÉS, M., E. RUIZ & A. BARRÓN (1999). Les moltes tradicionalment incloses en els gèneres *Calliergon*, *Scorpidium*, *Drepanocladus* i *Cratoneuron* a Catalunya. *Orsis* 14: 21-29.
- BRUGUÉS, M., E. RUIZ, & R.M. CROS (2014b). Nuevos datos para la brioflora del centro de Cataluña. *Bol. Soc. Española Briol.* 42-43: 7-12.
- BRUGUÉS, M., E. RUIZ, & C. CASAS (2007b). Polytrichaceae. En: Brugués, M., Cros, R.M. & Guerra, J. (eds.). *Flora Briofítica Ibérica Volumen I*, pp. 101-128. Universidad de Murcia-Sociedad Española de Briología, Murcia.
- CALLEJA, J.A., B. ALBERTOS, V. MAZIMPAKA & F. LARA (2001). Brioflora epífita de las loreras de la Península Ibérica *Bol. Soc. Española Briol.* 18-19: 15-24.
- CALLEJA, J.A., L. MINGORANCE & F. LARA (2016). Epiphytic Bryophyte Communities of *Prunus lusitanica* Iberian Forests: Biogeographic Islands Shaped by Regional Climates. *Cryptog., Bryol.* 37(1): 53-85.
- CALLEJA, J.A., L. MINGORANCE, M. SIM-SIM & F. LARA (2014). Ampliación de la distribución bérica conocida de algunas hepáticas localizadas en poblaciones de *Prunus lusitanica* L. *Bol. Soc. Española Briol.* 42-43: 41-46.

- CÂMARA, P.E.A.S., M. CARVALHO-SILVA, D. KNOP HENRIQUES, J. GUERRA, M.T. GALLEGO, D. RÍOS POVEDA & M. STECH (2018). *Pylaisiaceae* Schimp. (Bryophyta) revisited, *J. Bryol.* 40: 251-264.
- CANALÍS, V., X. BAULIES, T. SEBASTIÀ & E. BALLESTEROS (1984). Aportació al coneixement florístic de l'Alta Ribagorça i de la Vall d'Aran. *Butll. Inst. Catalana Hist. Nat.* 51: 135-137.
- CANALÍS, V. & C. CASAS (1985). Novetats per a la brioflora dels Pirineus centrals. *Collect. Bot. (Barcelona)* 16: 59-62.
- CANALÍS, V. & C. CASAS (1992). *Encalypta affinis* Hedw. f. i *Encalypta alpina* Sm. als Pirineus. En: J.A. Conesa & J. Recasens (eds.), Actes del Simposi Internacional de Botànica "Pius Font i Quer". Vol. I: 223-229 Criptogàmia. Institut d'Estudis Ilerdencs, Lleida.
- CANO, M.J. (2006a). *Pseudocrossidium*. En: Guerra J., Cano M.J. & Ros R.M. (eds.). *Flora Briofítica Ibérica* Volumen III, pp. 106-113. Universidad de Murcia-Sociedad Española de Briología, Murcia.
- CANO, M.J. (2006b). Tortula. En: Guerra J., Cano M.J. & Ros R.M. (eds.). *Flora Briofítica Ibérica* Volumen III, pp. 146-176. Universidad de Murcia, Sociedad Española de Briología, Murcia.
- CANO, M. J. & L. HEDENÄS (2016). *Orthothecium strictum* Lorentz. En: Ellis, L.T. et al. New National and Regional Bryophyte Records, 49. *J. Bryol.* 38: 334.
- CANO, M.J., J. GUERRA, B. CABEZUDO & R. TAMAJÓN (2017). Novedades corològiques para la flora briofítica ibérica. VIII. *Anales Biol.* 39: 203-209.
- CANO, M.J., D. RÍOS & J. GUERRA (2016). Novedades corològiques para la flora briofítica ibérica. VII. *Anales Biol.* 38: 115-117.
- CARNICERO, P. & M. UNZETA (2016). Primera cita de la molsa protegida *Buxbaumia viridis* (Buxbaumiaceae) pels Prepirineus catalans. *Butll. Inst. Catalana Hist. Nat.* 80: 83-85.
- CARRILLO, E., M. BRUGUÉS, J. CARRERAS, R. M. CROS, A. FERRÉ, J. M. NINOT, A. PÉREZ-HAASE & E. RUIZ. 2008. *Singularitat de la vegetació de les reserves integrals de Trescuró i d'Aiguamòg*. VII Jornades sobre Recerca al Parc Nacional d'Aiguastortes i Estany de Sant Maurici.
- CASALS, C. & R.M. CROS (1995). Contribució a la brioflora de les serres del Montsant i de la Llena. *Orsis* 10: 51-61.
- CASANOVAS POCH, L. (1991). *Estudis sobre l'estructura i l'ecologia de les molleres pirinenques*. Tesis Doctoral (inèdita). Universitat de Barcelona.
- CASANOVAS POCH, L. (1996). Contribució a l'estudi de les molleres dels Pirineus. *Folia Bot. Misc.* 10: 175-201.
- CASARES GIL, A. (1905). Nota briològica. *Bol. Real Soc. Esp. Hist. Nat.* 5: 175-180.
- CASARES GIL, A. (1915). Enumeración y distribución geográfica de las muscíneas de la Península Ibérica; *Trab. Mus. Nac. Ci. Nat., Ser. Bot.*, 8: 1-179.
- CASARES GIL, A. (1919). *Flora Ibérica. Briófitas (1a parte). Hepáticas*. Museo Nacional de Ciencias Naturales, Madrid.
- CASARES GIL, A. (1932). *Flora Ibérica. Briófitas (2a parte). Musgos*. Museo Nacional de Ciencias Naturales. Madrid.
- CASAS, C. (1951). Algunas briófitas del macizo de Garraf. *Collect. Bot. (Barcelona)* 3: 69-75.
- CASAS, C. (1968). Algunes espècies de *Sphagnum* que es troben a la Vall Ferrera i a la Vall de Cardós. *Treb. Soc. Catalana Biologia. Arx. Secc. Ci.* 26: 79-86.
- CASAS, C. (1986a). Brioteca Hispánica. *Acta Bot. Malacitana.* 11: 83-112.
- CASAS C. (1986b). Briofits del Montseny. En: Terradas J. & J. Miralles (eds.), El patrimoni biològic del Montseny. Catàlegs de flora i fauna 1: 31-39. Barcelona, Servei de Parcs Naturals. Diputació de Barcelona.
- CASAS, C. (1992). Nota briològica. Una nova localitat de *Conostomum tetragonum* (Hedw.) Lindb. als Pirineus. *Orsis* 7: 149-150.
- CASAS, C. (1993a). Brioteca Hispánica. *Bol. Soc. Española Briol.* 1: 2-11.
- CASAS, C. (1993b). Brioteca Hispánica. *Bol. Soc. Española Briol.* 2: 2-12.
- CASAS, C. (1993c). Brioteca Hispánica 1991. *Bol. Soc. Española Briol.* 3: 2-7.
- CASAS, C. (1997a). Brioteca Hispánica 1995-1996. *Bol. Soc. Española Briol.* 10: 9-15.

- CASAS, C. (1997b). Nota briològica. *Pohlia andalusica* (Höhn.) Broth., una novetat per a la brioflora dels Pirineus. *Orsis* 12: 163-164.
- CASAS, C. (1999). *Neckera besseri*, *Homalia lusitanica* i *Homalia trichomanoides* (molses) als Països Catalans. *Orsis* 14: 31-37.
- CASAS, C. (2000). Algunes molses noves o rares per la brioflora catalana. *Acta Bot. Barcinon.* 46: 89-95.
- CASAS, C. (2001). Les espècies del gènere *Schistidium* Bruch & Schimp. dels Països Catalans. *Orsis* 16: 9-28.
- CASAS, C. (2002). Brioteca Hispànica 1997-1999. *Bol. Soc. Española Briol.* 20-21: 11-21.
- CASAS, C. (2004). *Brachythecium turgidum* (Hartm.) Kindb. in the Parc Nacional d'Aigüestortes i Estany de Sant Maurici: New to the Spanish bryoflora. *Braun-Blanquetia* 34: 9-10.
- CASAS, C. & M. BRUGUÉS (1981). Contribució de Ramon de Bolòs (1852-1914) a la briologia catalana. *Butll. Inst. Catalana Hist. Nat.* 46: 95-98.
- CASAS, C. & M. BRUGUÉS (1983). Addicions a la brioflora de les comarques tarragonines. *Collect. Bot. (Barcelona)* 14: 235-241.
- CASAS, C. & M. BRUGUÉS (1995). Nota briològica. Dues aportacions de J. Vives a la briologia catalana. *Orsis* 10: 123-125.
- CASAS, C., M. BRUGUÉS & R.M. CROS (1994). Els esfagnes de les mulleres del Parc Nacional d'Aigüestortes i Estany de Sant Maurici. *La investigació al Parc Nacional d'Aigüestortes i Estany de Sant Maurici. III Jornades sobre Recerca 1994*: 81-90. Lleida.
- CASAS, C., M. BRUGUÉS & R.M. CROS (2008). Some interesting hepatics from the Pyrenees. *Cryptog., Bryol.* 29: 199-202.
- CASAS, C., M. BRUGUÉS & R.M. CROS & C. SÉRGIO (1985a). *Cartografia de Briòfits: Península Ibèrica i les illes Balears, Canàries, Açores i Madeira*. 1: 1-50. Institut d'Estudis Catalans & Universitat Autònoma de Barcelona. Barcelona.
- CASAS, C., M. BRUGUÉS & R.M. CROS & C. SÉRGIO (1989). *Cartografia de Briòfits: Península Ibèrica i les illes Balears, Canàries, Açores i Madeira*. 2: 51-100. Institut d'Estudis Catalans & Universitat Autònoma de Barcelona. Barcelona.
- CASAS, C., M. BRUGUÉS, R. M. CROS & C. SÉRGIO (1992). *Cartografia de Briòfits: Península Ibèrica i les illes Balears, Canàries, Açores i Madeira*. 3: 101-150. Institut d'Estudis Catalans. Barcelona.
- CASAS, C., M. BRUGUÉS & R.M. CROS & C. SÉRGIO (1996). *Cartografia de Briòfits: Península Ibèrica i les illes Balears, Canàries, Açores i Madeira*. 4: 151-200. Institut d'Estudis Catalans. Barcelona.
- CASAS, C., M. BRUGUÉS & J. PEÑUELAS (1983). Briòfits de l'Alt Empordà. *Ann. Inst. Est. Empordanesos* 16: 13-32.
- CASAS, C., R.M. CROS, M. BRUGUÉS (1993). Notes briològiques. *Crossidium laevipilum* Thèr. & Trab. a la comarca de la Terra Alta (Tarragona). *Orsis* 8: 143-146.
- CASAS, C., R.M. CROS, M. BRUGUÉS (1998a). La brioflora de la península del cap de Creus. *Acta Bot. Barcinon.* 45: 157-172.
- CASAS, C., R.M. CROS, M. BRUGUÉS, E. RUIZ, C. SÉRGIO, A. BARRÓN & F. LLORET (2006). Aportacions a la brioflora del Pirineu. *Bol. Soc. Esp. Briol.* 28: 73-86.
- CASAS, C., R.M. CROS, M. BRUGUÉS (1998b). *Les espècies del gènere Andreaea del Parc Nacional d'Aigüestortes i Estany de Sant Maurici*. IV Jornades sobre recerca al Parc Nacional d'Aigüestortes i Estany de Sant Maurici, Octubre 1997. Espot. p. 127-136.
- CASAS, C., R.M. CROS, M. BRUGUÉS, C. SÉRGIO & J. FONT (1998c). Els briòfits de les basses de l'Albera, Alt Empordà. *Butll. Inst. Catalana Hist. Nat.* 66: 73-80.
- CASAS, C., R.M. CROS, M. BRUGUÉS, C. SÉRGIO & M. SIM SIM (1985b). Estudi de la brioflora dels Ports de Beseit. *Orsis* 1: 13-31.
- CASAS, C. & J. GIRBAL (1998). *Campyllum elodes* (Linb.) Kindb. a la península Ibèrica. *Orsis* 13: 51-54.
- CASAS, C. & M. INFANTE (1998). Aportacions al conocimiento del género *Lophozia* en la península Ibérica. *Orsis* 13: 43-50.
- CASAS, C., F. LLORET & R. PÉREZ (1985c). Addicions a la brioflora del Montseny. *Orsis* 1: 9-12.

- CASAS, C. & J. PEÑUELAS (1985). Bryological notes. *Dichelyma falcatum* (Hedw.) Myr., a glacial relict, new to Southern Europe. *J. Bryol.* 13: 591-592.
- CASAS, C., C. SÉRGIO, R.M. CROS & M. BRUGUÉS (1986). *Acaulon dertosense*, sp. nov., musgo terrícola de los olivares del Baix Ebre (Cataluña). *Anales Jard. Bot. Madrid* 42: 299-301.
- CASAS, C. & PH. ZUTTERE (1989). *Dades per a la brioflora de Sant Llorenç del Munt*. I Trobada d'Estudiosos de Sant Llorenç del Munt i l'Obac, 1989: 21-23. Diputació de Barcelona.
- CASAS DE PUIG, C. (1952). Una excursión briológica al valle de Nuria. *Collect. Bot. (Barcelona)* 3: 199-206.
- CASAS DE PUIG, C. (1954). Adiciones a la brioflora catalana. *Collect. Bot. (Barcelona)* 4: 231-234.
- CASAS DE PUIG, C. (1957). Aportaciones a la flora briológica de los Pirineos. *Collect. Bot. (Barcelona)* 5: 419-424.
- CASAS DE PUIG, C. (1958a). *Exormotheca pustulosa* Mitt. en Port-Bou. *Rev. Bryol. Lichénol.* 27: 17-18.
- CASAS DE PUIG, C. (1958b). La flora briológica del Cap de Creus. *Pharm. Mediterranea* 2: 440-459.
- CASAS DE PUIG, C. (1970). *Oedipodiella australis* (Wag. et Dix.) Dix. var. *catalaunica* P. de la V. en Vall Ferrera. *Acta Phytotax. Barcinon.* 6: 13-15.
- CASAS DE PUIG, C. (1972). Nueva aportación al estudio de los *Sphagnum* en Cataluña. *Actes IVème Congrès International d'Études Pyrénéennes* 2: 77-82.
- CASAS DE PUIG, C. (1974). *Eurhynchium striatum* (Hedw.) Schimp. ssp. *zetterstedtii* (Stoerm.) Podp. en los abetales del Pirineo Central. *Anales Inst. Bot. A.J. Cavanilles* 31: 49-53.
- CASAS DE PUIG, C. (1975a). Brioteca Hispánica 1970. *Acta Phytotax. Barcinon.* 15: 27-33.
- CASAS DE PUIG, C. (1975b). Consideraciones sobre el área de distribución y ecología de *Tortula desertorum* Broth. en España. *Acta Phytotax. Barcinon.* 15: 3-13.
- CASAS DE PUIG, C., P. SERÓ, M. UBACH & J. VIVES (1956). Flora briológica de las comarcas barcelonesas. *Collect. Bot. (Barcelona)* 5: 119-141.
- CASAS SICART, C. (1960). Aportaciones a la flora briológica de Cataluña. Catálogo de las hepáticas y musgos del Montseny. *Anales Inst. Bot. Cavanilles* 17: 21-174.
- CASAS SICART, C. (1986). Catálogo de los briófitos de la vertiente española del Pirineo central y de Andorra. *Collect. Bot. (Barcelona)* 16: 255-321.
- CASAS SICART, C. (1993). Una antiga contribució a la brioflora catalana: recol·leccions de P. Font i Quer i els seus col·laboradors (1911-1919). *Butll. Inst. Catalana Hist. Nat.* 61: 33-39.
- CASAS SICART, C. (1999). *Espècies de briòfits desaparegudes o en greu perill d'extinció al Montseny*. III i IV Trobades d'Estudiosos del Montseny (Barcelona): 27-31. Diputació de Barcelona, Servei de Parcs Naturals.
- CASSOLA, F. (2016). *Marmota marmota*. *The IUCN Red List of Threatened Species* 2016: e.T12835A510082.<http://dx.doi.org/10.2305/IUCN.UK.2016-2.RLTS.T12835A510082.en>.
- COROMINAS XIFRA, M. (2003). *Estudi tipològic dels prats secs mediterranis calcícoles de l'ordre Thero-Brachypodietalia a les comarques gironines i primers assajos sobre el banc de llavors*. Tesis de Llicenciatura. Universitat de Girona.
- CROS, R.M. (2001). Nuevas citas de *Campylopus oerstedianus* y *C. brevopilus* para la Flora española. *Bol. Soc. Española Briol.* 18-19: 73-75.
- CROS, R.M. (2003). *Mannia fragrans* (Balbis) Frye & L. Clark (= *Grimaldia fragrans* (Balbis) Corda) en la Península Ibérica. *Bol. Soc. Española Briol.* 22-23: 23-25.
- CROS, R.M., M. BRUGUÉS, E. RUIZ & X. OLIVER (2012). *Mannia fragrans* (Balb.) Frye & L. Clark. In Garilleti, R. & B. Albertos 2012 (coord.). *Atlas y Libro Rojo de los Briófitos amenazados de España*: 184-185. Organismo Autónomo Parques Nacionales. Madrid.
- CROS, R.M., M. BRUGUÉS, E. RUIZ, L. SÁEZ, A. BARRÓN & A. PÉREZ-HAASE (2010). Els briòfits de les Planes de Son i la Mata de València. En: Germain, J. [cur.]. *Els sistemes naturals de les Planes de Son i la mata de València*. *Treb. Inst. Catalana Hist. Nat.* 16: 229-253. Barcelona.
- CROS, R.M., M. BRUGUÉS & L. SÁEZ (2004). Els Briòfits de la Vall d'Alinyà. En: J. Germain i Otzet (ed.) *Els Sistemes Naturals de la Vall d'Alinyà*. *Treb. Inst. Catalana Hist. Nat.* 14: 223-235.
- CROS I MATAS, R.M. (1981). *Calypogeia arguta* i *Zygodon forsteri*, espècies noves per a la brioflora catalana. *Folia Bot. Miscellanea* 2: 19-20.

- CROS I MATAS, R.M. (1983). *Tayloria serrata* (Hedw.) B.S.G. a la Cerdanya. *Collect. Bot. (Barcelona)* 14: 261-263.
- CROS I MATAS, R.M. (1985). *Flora briològica del Montnegre*. Institut d'Estudis Catalans. Arxius de la Secció de Ciències 78: 1-287.
- DIRKSE, G.M. & M. BRUGUÉS (2010). *Entosthodon kroonkurk* (Bryophyta: Funariaceae), a new species from the Iberian Peninsula and Macaronesia. *J. Bryol.* 32: 133-139.
- EDERRA, A. (2006). *Cinclidotus*. En: Guerra J., Cano M.J. & Ros R.M. (eds.). *Flora Briofítica Ibérica Volumen III*, pp. 257-264. Universidad de Murcia-Sociedad Española de Briología, Murcia.
- EDERRA, A. (2010). Catosciaceae. En: Guerra, J., Brugués, M., Cano, M.J. & Cros, R.M. (eds.). *Flora Briofítica Ibérica Volumen IV*, pp. 244-245. Universidad de Murcia-Sociedad Española de Briología, Murcia.
- EDERRA, A. & J. GUERRA (2005). *Cinclidotus vivesii* sp. nov. (Musci, Pottiaceae) from the Iberian Peninsula. *Nova Hedwigia* 81: 471-475.
- ESSL, F. & P.W. LAMBTON (2009). Alien Bryophytes and Lichens of Europe. En: DAISIE, *Handbook of Alien Species in Europe*, Chapter 3: 29-41. Springer Science + Business Media B.V.
- FUERTES, E. & M. ACÓN (1999). Revisión y corología del género *Mnium* Hedw. (*Mniaceae*, Musci) en la Península Ibérica. *Stud. Bot.* 18: 69-99.
- FUERTES, E. & E. MUNÍN (1994). Revisión y corología de *Sphagnum nemoreum* Scop., *S. subnitens* Russ. & Warnst. y *S. rubellum* Wils. (sección *Acutifolia* Wils.) en España. *Cryptog., Bryol.-Lichénol.* 15: 19-34.
- FUERTES, E., G. OLIVÁN, & M. ACÓN (2006). *Warnstorfia* (Bryopsida, Calliergonaceae) in the Iberian Peninsula. *Cryptog., Bryol.* 27: 225-239
- FUERTES, E., G. OLIVÁN, M. ACÓN, M. & C. LEÓN (2010). Notula chorologica Iberica (Bryophyta). *Bot. Complut.* 34: 31-40.
- GALLEGO, M.T. (2005). A taxonomic study of the genus *Syntrichia* Brid. (Pottiaceae, Musci) in the Mediterranean region and Macaronesia. *J. Hattori Bot. Lab.* 98: 47-122.
- GALLEGO, M.T. (2006). *Syntrichia* (Pottiaceae). En: Guerra J., Cano M.J. & Ros R.M. (eds.). *Flora Briofítica Ibérica Volumen III*, pp. 120-143. Universidad de Murcia-Sociedad Española de Briología, Murcia.
- GARILLETI, R. & B. ALBERTOS (2012). Bases de conocimiento y marco metodológico del *Atlas y Libro Rojo de los Briófitos de España*. En Garilleti, R. & B. Albertos 2012 (coord.). *Atlas y Libro Rojo de los Briófitos amenazados de España*: 10-17. Organismo Autónomo Parques Nacionales. Madrid, 288 p.
- GARILLETI, R., F. LARA, B. ALBERTOS & V. MAZIMPAKA (1999). *Orthotrichum scanicum* Grönv. (Orthotrichaceae, Musci) new to the Iberian Peninsula. *Nova Hedwigia* 69: 429-432.
- GARILLETI, R., F. LARA & V. MAZIMPAKA (2002). New differential characters for *Orthotrichum rogeri* Brid. (Orthotrichaceae, Musci). *Nova Hedwigia* 75: 207-216.
- GAUTHIER, R. (1991). Découverte de *Sphagnum fuscum* (Schimp.) Kliggr. et de *Sphagnum warnstorffii* Russow en Espagne. *Cryptog., Bryol.-Lichénol.* 13: 7-14.
- GEHEEB, A. (1879). Notes sur quelques mousses rares ou peu connues. *Rev. Bryol.* 6: 14-15.
- GLENNY, D., A.J. FIFE, P.J. BROWNSEY, M.A.M. RENNER, J.E. BRAGGINS, J.E. BEEVER & R. HITCHMOUGH (2011). Threatened and uncommon bryophytes of New Zealand (2010 revision). *New Zealand J. Bot.* 49: 305-327.
- GONZÁLEZ-MANCEBO, J.M., G.M. DIRKSE, J. PATIÑO, F. ROMAGUERA, O. WERNER, R.M. ROS & J.L. MARTÍN (2012). Applying the IUCN Red List criteria to small-sized plants on oceanic islands: conservation implications for threatened bryophytes in the Canary Islands. *Biodiversity Conserv.* 21: 3613-3636.
- GONZÁLEZ-SAMPÉRIZ, P., B.L. VALERO-GARCÉS, A. MORENO, M. MORELLÓN, A. NAVAS, J. MACHÍN & A. DELGADO-HUERTAS (2008). Vegetation changes and hydrological fluctuations in the Central Ebro Basin (NE Spain) since the Late Glacial period: Saline lake records. *Palaeoecology* 259: 157-181.
- GORRO CAELLES, M.M. (2005). *Especificitat de la brioflora epífita de Quercus pubescens i Fagus sylvatica a la vall de Gréixer (Parc Natural del Cadí-Moixeró)*. Diploma d'Estudis Avançats. Universitat de Barcelona.

- GRANZOW DE LA CERDA, I. (1988). Distribución de las especies del género *Anomodon* (Hedw.) Hook. & Tayl. (Musci) en la región occidental. *Fontqueria* 16: 9-24.
- GUERRA, J. (2006a). *Leptophascum*. En: Guerra J., Cano M.J. & Ros R.M. (eds.). *Flora Briofítica Ibérica* Volumen III, pp. 20-22. Universidad de Murcia-Sociedad Española de Briología, Murcia.
- GUERRA, J. (2006b). *Gymnostomum*. En: Guerra J., Cano M.J. & Ros R.M. (eds.). *Flora Briofítica Ibérica* Volumen III, pp. 32-39. Universidad de Murcia-Sociedad Española de Briología, Murcia.
- GUERRA, J. (2006c). *Weissia*. En: Guerra J., Cano M.J. & Ros R.M. (eds.). *Flora Briofítica Ibérica* Volumen III, pp. 63-71. Universidad de Murcia-Sociedad Española de Briología, Murcia.
- GUERRA, J. (2007). *Pohlia* section *Cacodon* (*Mielichhoferiaceae*, Bryophyta) with axillary bulbils in the Iberian Peninsula. *Anales Jard. Bot. Madrid* 64: 55-62.
- GUERRA, J. (2010). *Pohlia* Hedw. En: J. Guerra, M. Brugués, M.J. Cano & R.M. Cros (Eds.). *Flora Briofítica Ibérica* Volumen IV, pp. 183-206. Sociedad Española de Briología, Murcia.
- GUERRA, J. (2018). *Herzogiella* Broth. En: Guerra, J., Cano, M.J. & Brugués, M. (eds.). *Flora Briofítica Ibérica*. Vol. VI. pp. 298-302. Universidad de Murcia-Sociedad Española de Briología. Murcia.
- GUERRA, J. & M. BRUGUÉS (2014). *Conardia compacta* (Drumm.) H. Rob. (*Amblystegiaceae*) en la Península Ibérica. *Bol. Soc. Española Briol.* 42-43: 53-58.
- GUERRA, J. & M.J. CANO (2013). *Anoetangium aestivum* (Hedw.) Mitt. (*Pottiaceae*) rediscovered in the Iberian Peninsula. *Anales Biol.* 40-41: 47-48.
- GUERRA, J. M.J. CANO, M.T. GALLEGRO, J.D. ORGAZ & J.A. JIMÉNEZ (2010a). Novedades corológicas para la flora briofítica ibérica. IV. *Anales de Biol.* 32: 95-99.
- GUERRA, J. M.J. CANO, J.D. ORGAZ & D. RÍOS (2015). Novedades corológicas para la flora briofítica ibérica. VI. *Anales Biol.* 37: 39-41.
- GUERRA, J. & A. EDERRA (2015). *Fissidens*. En: Brugués, M. & J. Guerra (eds.). *Flora Briofítica Ibérica* Volumen, pp. 153-187. Universidad de Murcia-Sociedad Española de Briología, Murcia.
- GUERRA, J.; M.T. GALLEGRO; J.A. JIMÉNEZ & M.J. CANO (2010b). *Bryum* Hedw. En: J. Guerra, M. Brugués, M.J. Cano & R.M. Cros (Eds.). *Flora Briofítica Ibérica* Volumen 4 pp. 105-182. Sociedad Española de Briología, Murcia.
- GUERRA, J., J.F. JIMÉNEZ-MARTÍNEZ, M.J. CANO & M. BRUGUÉS (2008). Molecular and morphological evidence on the status of *Bryum mildeanum* Jur. and records revision in the Iberian Peninsula. *J. Bryol.* 30: 297-302.
- GUERRA, J. & R.M. ROS (1987). Revisión de la sección *Asteriscium* del género *Didymodon* (*Pottiaceae*, Musci) (= *Trichostomopsis*) en la Península Ibérica. *Cryptog., Bryol. Lichénol.* 8: 47-68.
- HALLINGBÄCK, T., N. HODGETTS, G. RAEYMAEKERS, R. SCHUMACKER, C. SÉRGIO, L. SÖDERSTRÖM, N. STEWART, & J. VÁNA (1998). Guidelines for application of the revised IUCN threat categories to bryophytes. *Lindbergia* 23: 6-12.
- HASSEL, K., M.O. KYRKJEEIDE, N. YOUSEFI, T. PRESTØ, H.K. STENØIEN, J. SHAW & K.I. FLATBERG (2018). *Sphagnum divinum* (sp. nov.) and *S. medium* Limpr. and their relationship to *S. magellanicum* Brid. *J. Bryol.* 40: 197-222.
- HERAS, P. & M. INFANTE (2015). *Cynodontium*. En: Brugués, M. & J. Guerra (eds.). *Flora Briofítica Ibérica* Volumen II, pp. 6-85. Universidad de Murcia-Sociedad Española de Briología, Murcia.
- HERAS, P., M. INFANTE, C. CASAS, R.M. CROS & M. BRUGUÉS (2004). Contribución a la brioflora del Pirineo aragonés. *Bol. Soc. Esp. Briol.* 25: 25-31.
- HERNÁNDEZ, H.M. & M. NAVARRO (2007). A new method to estimate areas of occupancy using herbarium data. *Biodivers. Conserv.* 16: 2457-2470.
- HILL, M.O., T.H. BLACKSTOCK, D.G. LONG & G.P. ROTHERO (2008). *A Checklist and Census Catalogue of British and Irish Bryophytes: Updated 2008*. British Bryological Society.
- HODGETTS, N.G. (2011). A revised Red List of bryophytes in Britain. *Field Bryol.* 103: 40-49.
- HODGETTS, N.G. (2016a). European working list of liverworts Ver. 4.0 (26.02.2016). http://eccbbryo.nhmus.hu/IUCN_ECCB.

- HODGETTS, N.G. (2016b). European working list of mosses Ver. 6.0 (26.02.2016). http://eccbbryo.nhmus.hu/IUCN_ECCB.
- HUGONNOT, V. (2010). Towards an improved understanding of the taxonomy of *Riccia ciliata* Hoffm. (Marchantiopsida: Ricciaceae). *J. Bryol.* 32(4): 300-302.
- HUGONNOT, V., L. CHAVOUTIER, F. PÉPIN & T.H. VERGNE (2018). *Les bryophytes des Pyrénées-Orientales*. Naturalia Publications.
- HUGONNOT, V. & J. LAGRANDE (2018). *Pohlia flexuosa* Hook. En: Ellis, L.T. et al. New National and Regional Bryophyte Records, 54. *J. Bryol.* 40: 86-87.
- HUSNOT, T. (1876). Guide du Bryologue dans les Pyrénées. *Rev. Bryol.* 3: 7-11, 69-71.
- HUSNOT, T. (1884-1890). *Muscologia Gallica. Descriptions et figures des mousses de France et des contrées voisines*. Paris, 458 p. + CXXV planches.
- INFANTE, M. & P. HERAS (2007). *Briófitos (musgos y hepáticas) del Parque Natural de la Sierra y los Cañones de Guara*. Fundació Pública Institut d'Estudis Ilerdens de la Diputació de Lleida. Lleida.
- INFANTE, M. & P. HERAS (2012). Red preliminar de Áreas Importantes para los Briófitos (IBrA). En: Garilleti, R. & B. Albertos (Coords.). *Atlas de los briófitos amenazados de España*. Universitat de València. <http://www.uv.es/abraesp>. Publicado en línea el 30/05/2012.]
- INFANTE, M., J. G. SEGARRA & P. HERAS (2002). Preliminary checklist of the bryophytes of Aragón (Spain). *Fl. Medit.* 12: 183-259.
- INFANTE SÁNCHEZ, M. (2015). *Catalogue des bryophytes de la région Midi-Pyrénées 2015*. Conservatoire botanique National des Pyrénées et Midi-Pyrénées, 115 p.
- INFANTE SÁNCHEZ, M. & P. HERAS PÉREZ (1998). Notas sobre la presencia del género *Buxbaumia* (Musci) en la Península Ibérica. *Estud. Mus. Ci. Nat. Alava* 13: 35-38.
- INFANTE SÁNCHEZ, M. & P. HERAS PÉREZ (2003). *Briófitos (musgos y hepáticas) de Aragón. Lista Roja de los briófitos de Aragón*. Diputación General de Aragón. Departamento de Medio Ambiente.
- INFANTE SÁNCHEZ, M., G. CORRIOL & E. HAMDI (2015). *La liste rouge d'espèces menacées de bryophytes en Midi-Pyrénées selon la méthodologie UICN*. Version finale. Conservatoire botanique National des Pyrénées et Midi-Pyrénées, 69 p.
- INGERPUU, N., K. VELLAK & L. EHRLRICH (2018). Revised Red Data List of Estonian bryophytes. *Folia Cryptog. Estonica* 55: 97-104.
- IUCN (2003). Guidelines for Application of IUCN Red List Categories and Criteria at Regional Levels: Version 3.0. Gland, Switzerland and Cambridge.
- IUCN (2012a). Red List Categories and Criteria: Version 3.1. Second edition. Gland, Switzerland and Cambridge.
- IUCN (2012b). Guidelines for Application of IUCN Red List Criteria at Regional and National Levels: Version 4.0. Gland, Switzerland and Cambridge, UK: IUCN.
- IUCN (2017). Guidelines for Using the IUCN Red List Categories and Criteria: Version 13. Standards and Petitions Subcommittee. Gland, Switzerland and Cambridge.
- JIMÉNEZ, J.A., R.M. ROS, M.J. CANO & J. GUERRA (2003). *Didymodon nicholsonii* Culm. (Pottiaceae, Musci): new taxonomical, chorological and ecological data. *Cryptog., Bryol.* 24: 277-281.
- JIMÉNEZ, M.N., R.M. ROS & J. GUERRA (1990). Notas breves. *Phascum vlassovii* Laz. (Pottiaceae, Musci) en Europa. *Anales Jard. Bot. Madrid* 47: 234-235.
- JOVER BENJUMEA, M. (2007). *El poblament vegetal del massís del Montgri, les illes Medes i l'antic estany de Sobrestany*. Tesis de Llicenciatura. Universitat de Girona.
- JOVER BENJUMEA, M. (2016). *La flora de briòfits dels prats mediterranis de les Gavarres*. Universitat de Girona. <http://www.gavarres.cat/documents/noticia/noticia278.pdf> [accessed 2 June 2018]
- JOVER, M., A. RUHÍ, E. CHAPPUIS, D. ESCORIZA, J. SALA, D. BOIX, S. GASCÓN & E. GACIA (2013). Estans de l'Albera i basses dels secans de Lleida: quines característiques ambientals determinen les seves comunitats i la seva biodiversitat? *Ann. Inst. Estud. Empordanesos* 44: 253-271.
- KÖCKINGER, H. & L. HEDENÄS (2017). A farewell to *Tortella bambergeri* (Pottiaceae) as understood over the last decades. *J. Bryol.* 39: 213-225.
- KÖCKINGER, H. & J. KUČERA (2007). *Barbula amplexifolia* (Mitt.) Jaeger in Europe. *J. Bryol.* 29: 33-40.

- KÖCKINGER H., C. SCHRÖCK, R. KRISAI & H.G. ZECHMEISTER (2017). *Checklist of Austrian Bryophytes*. <http://cvl.univie.ac.at/projekte/moose/> (accessed 20 Sept. 2017).
- KUČERA, J., J. VANA & Z. HRADÍLEK (2012). Bryophyte flora of the Czech Republic: updated checklist and Red List and a brief analysis. *Preslia* 84: 813–850.
- LARA, F. & R. GARILLETI (2014). *Orthotrichum*. En: Guerra, J., Cano, M.J. & Brugués, M. (eds.). *Flora Briofítica Ibérica Volumen V*, pp. 50-135; Universidad de Murcia-Sociedad Española de Briología.
- LARA F., R. GARILLETI, B. GOFFINET, I. DRAPER, R. MEDINA, B. VIGALONDO & V. MAZIMPAKA (2016). *Lewinskya*, a new genus to accommodate the phaneroporous and monoicous taxa of *Orthotrichum* (Bryophyta, *Orthotrichaceae*). *Cryptog., Bryol.* 37(4): 361-382.
- LARA, F. R. GARILLETI & V. MAZIMPAKA (2000). *Orthotrichum hispanicum* sp. nov. (Bryopsida, *Orthotrichaceae*), from eastern Spain. *J. Bryol.* 22: 263-267.
- LAZARE, J.-J., Y. CANTENOT, S. RIBA-MAZAS., A. DARQUISTAD & J. PUJOS (2005). Additions à la flore d'Andorre. *J. Bot. Soc. France* 29 : 77-85.
- LLIMONA, X., E. BALLESTEROS, M. BRUGUÉS, F.A. COMÍN, R.M. CROS, J. MOLERO, J. ROMERO, X. TOMÀS & F. TORRELLA (1985). *Els briòfits. Història Natural dels Països Catalans* vol. 4: 349-434. Enciclopèdia Catalana. Barcelona.
- LLORET, F. (1989). Briófitos del alto valle del Ter. *Orsis* 4: 11-45.
- LLORET, F. (1990). Colonización de excrementos de bóvido por *Tayloria tenuis* (With.) Schimp. *Anales Jard. Bot. Madrid* 46(2): 469-476.
- LLORET, F. (1991). Population dynamics of the coprophilous moss *Tayloria tenuis* in a Pyrenean forest. *Ecography* 14: 1-8.
- LLORET MAYA, F. (1986). *Tortula sinensis* (C. Müll) Broth, y *Tortula fragilis* Tayl., novedades para la brioflora de la Península Ibérica. *Anales Jard. Bot. Madrid* 42: 303-308.
- LONG, D., L.L. FORREST, J.C. VILLARREAL, B.J. CRANDALL-STOTLER (2016). Taxonomic changes in Marchantiaceae, Corsiniaceae and Cleveaceae (Marchantiidae, Marchantiophyta). *Phytotaxa* 252: 77-80.
- LUCENÓ, M., C. CERREJÓN, S. GUERRA-CÁRDENAS, J.I. MÁRQUEZ-CORRO, V. PINEDA-LABELLA, S. MARTÍN-BRAVO, M. INFANTE & J. MUÑOZ 2017. A Contribution to the Knowledge of Bryophytes from Sierra de Gredos (Central Spain) including a Reevaluation of Their National Conservation Status. *Cryptog., Bryol.* 38: 281-302.
- MANOBENS I RIGOL, R.M. (1984). Aportaciones al conocimiento de la brioflora de los Pirineos. *Anales Biol.* 2: 327-333.
- MANOBENS I RIGOL, R.M. (1985). *Brioflora de la Vall d'Àssua (Serra d'Altars-Montsent de Pallars)*. Tesis de Llicenciatura. Universitat de Barcelona.
- MANOBENS I RIGOL, R.M. & C. CASAS SICART (1985). *Mielichhoferia elongata* (Musci), espècie nova per a la brioflora ibèrica, i altres aportacions. *Collect. Bot. (Barcelona)* 16: 323-326.
- MARTINČIČ, A. (2016). Updated Red List of bryophytes of Slovenia. *Hacquetia* 15: 107-126.
- MASIP, R. (1978). El Montgrí: nota briològica. *Anales Secc. Ci. Col. Univ. Girona* 3: 17-23.
- MIGUEL VELASCO, A.M., A. EDERRA INDURAIN, I. ÁLVARO MARTÍN. & V. CANALÍS HERNÁNDEZ (1995). *Athalamia hyalina* (Sommerf.) Hatt. (Hepaticae) en el Pirineo español. *Anales Jard. Bot. Madrid* 53: 123.
- MORER, J. (1879). *Apuntes para el estudio de la flora y fauna de la comarca de Camprodon*. En: J. Morer & A. Gali (ed.) *Historia de Camprodon*. Barcelona.
- MÜLLER F. (2014). *Bartramia aprica* - the correct name for the Mediterranean and western North American species historically recognized as "*Bartramia stricta*". *Herzogia* 27: 211-214.
- MUNÍN, E. (1995). Mapas de distribución de algunas especies de *Sphagnum* L. Sección *Acutifolia* Wils., en España. *Bot. Complutensis* 20: 139-146.
- MUÑOZ, J. (1998). A taxonomic revision of *Grimmia* subgenus *Orthogrimmia* (Musci, *Grimmiaceae*). *Ann. Missouri Bot. Garden* 85.

- MUÑOZ, J., K. CEZÓN & H. HESPANHOL (2015b). *Racomitrium*. En: Brugués, M. & J. Guerra (eds.). *Flora Briofítica Ibérica* Volumen II, pp. 261-289. Universidad de Murcia-Sociedad Española de Briología, Murcia.
- MUÑOZ, J., K. CEZÓN, H. HESPANHOL & D. QUANDT (2015a). *Grimmia* Hedw. En: Brugués, M. & Guerra, J. (eds.). *Flora Briofítica Ibérica* Volumen II, pp. 210-261. Universidad de Murcia-Sociedad Española de Briología. Murcia.
- NAVARRO, P., N. MARCOS, & D. MANSO (1997). *Rhizomnium magnifolium* (Horik.) T. Kop. in the Iberian Peninsula. *Anales Jard. Bot. Madrid* 55: 461-462.
- OLIVÁN G. & E. FUERTES (2018). *Hygrohypnum* Lindb. En: Guerra, J., Cano, M.J. & Brugués, M. (eds.). *Flora Briofítica Ibérica* Volumen VI, pp. 88-99. Universidad de Murcia-Sociedad Española de Briología. Murcia.
- OLIVÁN, G., E. FUERTES & M. ACÓN (2005). *Straminergon* and *Calliergon* (Calliergonaceae, Bryopsida) in the Iberian Peninsula. *Lazaroa* 26: 17-33.
- ORGAZ, J.D. (2012a). *Brachythecium cirrosus* (Schwägr.) Schimp. En Garilleti, R. & B. Albertos (coords.). *Atlas de los briófitos amenazados de España*. Universitat de València.
- ORGAZ, J.D. (2012b). *Brachythecium laetum* (Brid.) Schimp. En Garilleti, R. & B. Albertos (coords.). *Atlas de los briófitos amenazados de España*. Universitat de València.
- ORGAZ, J.D. (2018). *Brachythecium* Schimp. En: Guerra, J., Cano, M.J. & Brugués, M. (eds.). *Flora Briofítica Ibérica* Volumen VI, pp. 148-186. Universidad de Murcia-Sociedad Española de Briología. Murcia.
- ORGAZ, J.D., M.J. CANO & J. GUERRA (2009). Nuevos datos sobre la distribución, morfología y hábitat de *Brachythecium mildeanum* (Schimp.) Schimp. (Brachytheciaceae, Bryophyta) en la Península Ibérica. *Anales Biol.* 31: 37-41.
- ORGAZ, J.D., M.J. CANO & J. GUERRA (2012a). A taxonomic study of genus *Brachythecium* Schimp. (Brachytheciaceae, Bryophyta) in the Mediterranean region. *Nova Hedwigia* 95: 295-318.
- ORGAZ, J.D., M.J. CANO & J. GUERRA (2012b). Typification, taxonomy and distribution of *Brachythecium erythrorrhizon* Schimp. (Brachytheciaceae, Bryophyta) in the Mediterranean Region. *Nova Hedwigia* 95: 227-231.
- PAPP B., P. ERZBERGER, P. ÓDOR, ZS. HOCK, P., SZÖVÉNYI, E. SZURDOKI & Z. TÓTH (2010). Updated checklist and red list of Hungarian bryophytes. *Stud. Bot. Hung.* 41: 31-59.
- PASCUAL GARSABALL, R., C. PEDROCCHI-RIUS & G. GARCÍA PÉREZ (2017). Nova citació d'*Entosthodon duriaei* (Funariaceae) a Catalunya. *Butll. Inst. Catalana Hist. Nat.* 81: 175-176.
- PEÑUELAS, J. (1984). *Octodicerias fontanum* a Catalunya. *Folia Bot. Misc.* 4: 35-36.
- PEÑUELAS, J. (1987). La brioflora lacustre. Algunos datos de los lagos pirenaicos. *Anales Jard. Bot. Madrid* 44: 31-39.
- PEÑUELAS, J., V. CANALÍS & C. CASAS (1985). Aportació al coneixement de la brioflora aquàtica de l'alta muntanya pirinenca. *Collect. Bot. (Barcelona)* 16: 51-57.
- PÉREZ-HAASE, A., E. CARRILLO, E. BATRIU & J.M. NINOT (2011). Diversitat de comunitats vegetals a les molles de la Val d'Aran (Pirineus centrals). *Acta Bot. Barcinon.* 53: 61-112.
- PUCHE, F. (1990). El género *Seligeria* B.S.G. (Musci) en la Península Ibérica. *Anales Jard. Bot. Madrid* 46(2): 405-412.
- PUCHE, F. (2015a). *Ditrichum*. En: Brugués, M. & J. Guerra (eds.). *Flora Briofítica Ibérica* Volumen II, pp. 44-53. Universidad de Murcia-Sociedad Española de Briología, Murcia.
- PUCHE, F. (2015b). *Trichodon*. En: Brugués, M. & J. Guerra (eds.). *Flora Briofítica Ibérica* Volumen II, pp. 53-54. Universidad de Murcia-Sociedad Española de Briología, Murcia.
- PUCHE, F. (2015c). *Dicranella*. En: Brugués, M. & J. Guerra (eds.). *Flora Briofítica Ibérica* Volumen II, pp. 90-101. Universidad de Murcia-Sociedad Española de Briología, Murcia.
- PUCHE, F. (2015d). *Seligeria*. En: Brugués, M. & J. Guerra (eds.). *Flora Briofítica Ibérica* Volumen II, pp. 196-206. Universidad de Murcia-Sociedad Española de Briología, Murcia.
- PUCHE, F. & J.G. SEGARRA-MORAGUES (2013). *Riella bialata* Trab. (Riellaceae, Marchantiophyta): a new addition to the European liverwort flora. *Cryptog., Bryol.* 34: 341-352.

- PYŠEK, P., D.M. RICHARDSON, M. REJMÁNEK, G.L. WEBSTER, M. WILLIAMSON & J. KIRSCHNER (2004). Alien plants in checklists and floras: towards better communication between taxonomists and ecologists. *Taxon* 53: 131–143.
- RÍOS, D, M. T. GALLEGO & J. GUERRA (2018). *Hypnum*. En: J. Guerra, M. J., Cano & M. Brugués (eds.). *Flora Briofítica Ibérica Volumen VI*, pp. 336-367. Universidad de Murcia-Sociedad Española de Briología, Murcia.
- ROS, R.M., V. MAZIMPAKA, U. ABOU-SALAMA, M. ALEFFI, T.L. BLOCKEEL, M. BRUGUÉS, R.M. CROS, M.G. DIA, G.M. DIRKSE, I. DRAPER, W. EL-SAADAWI, A. ERDAĀ, A. GANEVA, R. GABRIEL, J.M. GONZÁLEZ-MANCEBO, C. GRANGER, I. HERRNSTADT, V. HUGONNOT, K. KHALIL, H. KÜRSCHNER, A. LOSADA-LIMA, L. LUÍS, S. MIFSUD, M. PRIVITERA, M. PUGLISI, M. SABOVLJEVIČ, C. SÉRGIO, H. M. SHABBARA, M. SIM-SIM, A. SOTIAUX, R. TACCHI, A. VANDERPOORTEN & O. WERNER (2013). Mosses of the Mediterranean, an annotated checklist. *Cryptog., Bryol.*, 34: 99-283.
- RUIZ, E. & M. BRUGUÉS (2011). Distribución de las Secciones Revolutohypnum Mönk., Hamulosa Schimp. y Pseudostereodon (Broth.) Ando del género *Hypnum* Hedw. en la Península Ibérica e Islas Baleares. *Bol. Soc. Esp. Briol.* 37: 25-34.
- RUIZ, E., P. AYMERICH, M. BRUGUÉS & L. SÁEZ (2018a). Aportaciones al conocimiento de la flora briológica de la Sierra del Cadí-Moixeró (Barcelona y Lérida). *Bol. Soc. Esp. Briol.* 50: 17-25.
- RUIZ, E., P. AYMERICH, L. SÁEZ & M. BRUGUÉS (2018b). *Cyrtomnium hymenophylloides* (Huebener) T.J.Kop. En: Ellis L.T. *et al.* New National and Regional Bryophyte Records, 56. *J. Bryol.* 40: 275-276.
- RUIZ, E., P. AYMERICH, L. SÁEZ & M. BRUGUÉS (2018c). *Cratoneuron curvicaule* (Jur.) G. Roth En: Ellis L.T. *et al.* New National and Regional Bryophyte Records, 57. *J. Bryol.* (in press.).
- SÁEZ, L., P. AYMERICH & C. BLANCHÉ (2010). Llibre Vermell de les plantes vasculares endèmiques i amenaçades de Catalunya. Argania editio. Barcelona.
- SÁEZ, L., M. INFANTE & M. BRUGUÉS (2011). Two new liverworts for the bryophyte flora of Spain. *Cryptog., Bryol.* 32: 135-137.
- SÁEZ, L., E. RUIZ & M. BRUGUÉS (2018a). Additions, corrections and comments to the Red List of bryophytes from mainland Spain and the Balearic Islands. *Med. Bot.* 40: 3-20.
- SÁEZ, L., E. RUIZ, I. GRANZOW & M. BRUGUÉS (2018b). The Bryophyte Flora of the Montseny Massif (Northeastern Iberian Peninsula): Conservation Issues and an Updated Check-List. *Cryptog., Bryol.* 39: 3-46.
- SCHNYDER N., A. BERGAMINI, H. HOFMANN, N. MÜLLER, C. SCHUBIGER-BOSSARD & E. URMI (2004). *Rote Liste der gefährdeten Moose der Schweiz*. Bundesamt für Umwelt, Wald und Landschaft, Bern, & Forschungsstelle für Umweltbeobachtung, Rapperswil.
- SANZ i MAGRANÉ, M.M. (1984). Contribució al coneixement dels briòfits de la capçalera del riu Ges (Vidrà): Estudis florístics i Estudi fenològic de l'espècie *Anomodon viticulosus* (Hedw.) Hook. & Tayl; Tesis de Llicenciatura. Universitat de Barcelona.
- SANZ i MAGRANÉ, M.M. & C. CASAS i SICART (1983). *Anomodon rostratus* (Hedw.) Schimp. novetat per a la brioflora catalana i altres espècies notables. *Collect. Bot. (Barcelona)* 14: 579-585.
- SEGARRA-MORAGUES, J.G., F. PUCHE, M. SABOVLJEVIČ, M. INFANTE & P. HERAS (2014). Taxonomic revision of *Riella* subgenus *Trabutiella* (Riellaceae, Sphaerocarpaceae). *Phytotaxa* 159: 131–174
- SEGUÍ, J.M., M. FLOR-ARNAU & J. CAMBRA SÁNCHEZ (2007). Noves aportacions al coneixement de la flora hidrofítica de Catalunya. *Butll. Inst. Catalana Hist. Nat.* 74: 91-94.
- SÉRGIO, C.; M. BRUGUÉS, R.M. CROS, C. CASAS, C. GARCIA (2007). The 2006 Red List and an updated checklist of bryophytes of the Iberian Peninsula (Portugal, Spain and Andorra). *Lindbergia* 31: 109-125.
- SÉRGIO, C., C. VIEIRA, I. SILVA, M. BRUGUÉS, R. CROS & S. STOW (2010). Update on the distribution, ecology and conservation of *Fissidens fontanus* in Portugal. *Field Bryol.* 101: 8-12.
- SERÓ NAVÁS, P. (1945). Unas hepáticas de los alrededores de Bohí (Pirineo de Lérida). *Anales Jard. Bot. Madrid* 6: 472-476.

- SHIMAMURA, M. (2016). *Marchantia polymorpha*: Taxonomy, Phylogeny and Morphology of a Model System. *Plant Cell Physiol.* 57: 230–256.
- SIM-SIM, M., F. LLORET & R. GROLLE (1999). First reference of *Frullania cesatiana* De Not. (*Frullaniaceae*, Hepaticae) to Spain and France. *Nova Hedwigia* 68: 217- 224.
- SÖDERSTRÖM, L. (1992). Invasions and range expansions and contractions of bryophytes. En: Bates J.W., Farmer A.M. (eds.) *Bryophytes and lichens in a changing environment*. Clarendon, Oxford. 131–158.
- SÖDERSTRÖM, L., A. HAGBORG, M.V. KONRAT, S. BARTHOLOMEW-BEGAN, D. BELL, L. BRISCOE, E. BROWN, D. C. CARGILL, D. P. D. COSTA, B. J. CRANDALL-STOTLER, E. D. COOPER, G. DAUPHIN, J. ENGEL, K. FELDBERG, D. GLENNY, S.R. GRADSTEIN, X. HE, J. HENTSCHER, A. L. ILKIU-BORGES, T. KATAGIRI, N. A. KONSTANTINOVA, J. LARRAÍN, D. LONG, M. NEBEL, T. PÓCS, F. PUCHE, E. REINER-DREHWALD, M. RENNER, A. SASS-GYARMATI, A. SCHÄFER-VERWIMP, J.G. SEGARRA-MORAGUES, R.E. STOTLER, P. SUKKHARAK, B. THIERS, J. URIBE, J. VÁNA, M. WIGGINTON, L. ZHANG & R.-L. ZHU (2016). World checklist of hornworts and liverworts. *Phytokeys* 59: 1-828.
- SOTIAUX, A. & R. SCHUMACKER (2002). Catalogue des hépatiques d'Andorre. *Lejeunia* 170: 1-42.
- SOTIAUX, A. & A. VANDERPOORTEN (2017). A checklist of the bryophytes of Andorra. *J. Bryol.* 39: 353-367.
- STEFANUT, S. & I. GOIA (2012). Checklist and Red List of Bryophytes of Romania. *Nova Hedwigia* 95: 59-104.
- SUÁREZ, G.M. & J. MUÑOZ (2015). *Schistidium*. En: Brugués, M. & J. Guerra (eds.). *Flora Briofítica Ibérica* Volumen II, pp. 290-325. Universidad de Murcia-Sociedad Española de Briología, Murcia.
- THIERS, B. (2018) [continuously update]. *Index Herbariorum: A global directory of public herbaria and associated staff*. – New York Botanical Garden's Virtual Herbarium. <http://sweetgum.nybg.org/ih/>
- THOUVENOT, L. (2005). *Pallavicinia lyellii* (Hook.) Carruth. et *Kurzia sylvatica* (A. Evans) Grolle (Hepaticae), nouveaux pour la Catalogne. *Cryptog., Bryol.* 26: 301-312.
- THOUVENOT, L. (2008). *Entosthodon mouretii* (Funariaceae, Musci), nouveau pour la bryoflore de France. *Cryptog., Bryol.* 29: 195-197.
- THOUVENOT, L. (2015). *Riccia huebeneriana* Lindenb. En: Ellis, L.T. *et al.* New National and Regional Bryophyte Records, 45. *J. Bryol.* 37: 319.
- VAYREDA, E. (1882). *Catàlech de la flora de la Vall de Nuria*. Associació d'Excursions Catalana. Barcelona.
- VIVES I CODINA, J. (1979). Nou increment a la brioflora dels Països Catalans. *Butll. Inst. Catalana Hist. Nat.* 44: 129-130.
- ZETTERSTEDT, J.E. (1865). Pyreneernas Mossvegetation. *Kongl. Svenska Vetensk. Acad. Handl.* 5: 1-51.

Recepción del manuscrito: 02-10-2018

Aceptación: 15-04-2019

RESEÑA DE LA XXVI REUNIÓN DE BRIOLOGÍA

La vigésimo sexta reunión de la SEB se celebró en Cantabria, con base en Reinosa, entre los días 17 y 19 de octubre de 2018, con la asistencia final de 10 participantes, aunque diversos contratiempos de última hora impidieron la asistencia de otras seis personas. Entre los participantes, procedentes de diversos centros (universidades de Santiago de Compostela, A Coruña, Central de Barcelona y Pablo de Olavide en Sevilla, Museo de Ciencias Naturales de Álava, Real Jardín Botánico de Madrid, así como algún botánico profesional independiente) hubo muchas caras nuevas, la mayoría provenientes del Norte peninsular.

Aunque Cantabria ya había sido escenario de dos reuniones briológicas previas (XIV y XV en 1994 y 96 respectivamente), además de otros trabajos y de prospecciones más accidentales, este territorio continúa proporcionando sorpresas. Las localidades prospectadas se extendieron desde el nivel del mar hasta los más de 2.000 m de altitud del Pico Tres Mares, lo que ha propiciado la visita de una gran variedad de hábitats.

A pesar de las en principio poco halagüeñas previsiones meteorológicas, el tiempo finalmente acompañó en buena medida, con un primer precioso día soleado en las zonas altas, y el resto con algo de lluvia y algunas nieblas que no impidieron nuestra actividad.

Los organizadores de estas jornadas (Patxi Heras y Marta Infante) agradecen el apoyo de Jesús Varas (Gobierno de Cantabria) en la planificación de los muestreos y la obtención de permisos de recolección, así como la atención dispensada por el Hotel Vejo de Reinosa como centro de nuestra reunión.

Las localidades prospectadas fueron numerosas, pero pueden muchas pueden englobarse en las siguientes nueve:

1. Cantabria. Hermandad de Campoo de Suso. **Sierra de Peña Labra**, en los alrededores de la estación Invernal de Alto Campoo, **entre el Collado de la Fuente del Chivo y el Pico Tres Mares**, entre 2.028 - 2.085 m s.n.m. 17 de Octubre de 2018. Laderas y crestas rocosas en alternancia de conglomerados, areniscas y lutitas del Bundsandstein (Triásico Inferior).
2. Cantabria. Hermandad de Campoo de Suso. **Sierra de Peña Labra**, en los alrededores de la **estación Invernal de Alto Campoo**, bajo Los Piedrucos. a 1.830 m s.n.m. 17 de Octubre de 2018. Hábitats hidoturbosos en regatillos, con *Erica tetralix*, *Calluna vulgaris*, *Carex echinata*, *Juncus squarrosus*, *Caltha palustris*, *Parnassia palustris*, ... y pastos silicícolas con *Nardus stricta*, en alternancia de areniscas y lutitas del Bundsandstein (Triásico Inferior).
3. Cantabria. Hermandad de Campoo de Suso, Fontibre, **Nacimiento del río Ebro**, a 900 m s.n.m. 17 de Octubre de 2018. Arbolado (fresneda) sobre calizas y dolomías del Triásico Medio - Superior.

4. Cantabria. Valdeolea, **Collado de Somahoz**, Fuente Arenosa, entre 1.183 - 1.193 m s.n.m. 17 de Octubre de 2018. Áreas hidroturbosas en puntos manantíos y bordes de regatos y mosaico de argomal – brezal de *Ulex gallii*, con *Erica vagans*, *E. cinerea*, *Calluna vulgaris*, *Genista anglica*, ..., con bloques rocosos de conglomerado dispersos, en coluviones sobre conglomerados del Bundsandstein (Triásico Inferior).
5. Cantabria. Riente, Uceda, **Bosque de Uceda**, río Bayones junto a la Casa del Tío Mero, en torno a 230 m s.n.m. 18 de Octubre de 2018. Robledal de *Quercus robur* con haya en fondo de valle con río, sobre lutitas rojas y areniscas del Cretácico Inferior.
6. Cantabria. Los Tojos, **arroyo Cambilla**, a ± 2 km al SW de El Paulinar, 573 m s.n.m. 18 de Octubre de 2018. Hayedo en fondo de barranco con arroyo, sobre calizas y dolomías del Jurásico Inferior.
7. Cantabria. Campo de Yuso, Lanchares, **arroyo Lanchares**, a 915 m s.n.m. 19 de Octubre de 2018. Robledal ácido de *Quercus robur* con alguna haya en fondo de barranco con arroyo, y hábitat hidroturboso minerotrófico con *Eriophorum latifolium*, *Schoenus nigricans*, *Carex* spp., en lutitas rojas y areniscas del Cretácico Inferior.
8. Cantabria. **Santillana del Mar**, Ubiarco, **ensenada de Santa Justa**, 20 m s.n.m. 19 de Octubre de 2018. Roquedos de acantilados marinos de calcarenitas del Cretácico Superior.
9. Cantabria. **Santillana del Mar**, Ubiarco, a $\pm 0'7$ km al W de Ubiarco, a 40 - 50 m s.n.m. 19 de Octubre de 2018. Pistas agrícolas entre maizales y bosque mixto cantábrico (robledal de *Quercus robur* con laurel y castaño) con *Smilax aspera*, *Rosa sempervirens*, *Rubia peregrina*, ... , sobre calizas y dolomías del Cretácico Inferior.

La tarde del día 18, se presentaron un total de 4 comunicaciones científicas, cuyos resúmenes presentamos a continuación. También el día 18, se celebró la Asamblea General de la Sociedad Española de Briología.

¡Gracias a todos los participantes por su cordialidad y entusiasmo!

Patxi Heras & Marta Infante
Museo de Ciencias Naturales de Álava / Bazzania S.C.

RESÚMENES DE LAS COMUNICACIONES CIENTÍFICAS PRESENTADAS EN LA XXVI REUNIÓN DE BRIOLOGÍA

INTRODUCCIÓN AL CATÁLOGO BRIOLÓGICO DE LA SIERRA DE GREDOS

Modesto Luceño¹ & Jesús Muñoz²

¹Universidad Pablo de Olavide, Sevilla; ²Real Jardín Botánico de Madrid

A pesar de su cercanía a ciudades como Madrid y Salamanca, la brioflora gredense sigue siendo relativamente mal conocida. En la presente comunicación informamos de las exploraciones y colectas llevadas a cabo durante los últimos cinco años, que han arrojado una importante cantidad de novedades, algunas de ellas de notable relevancia. Entre otros resultados destacamos que el catálogo que estamos a punto de finalizar duplica el número de táxones conocidos hasta el momento, situándose en torno a los 400. Otra interesante conclusión es la presencia de numerosas especies ártico-alpinas que habitan las áreas de fuerte innivación y que hasta el momento solo se tenía constancia de su presencia en otras altas cordilleras ibéricas como Pirineos, Cordillera Cantábrica o Sierra Nevada. Además –algo también esperable–, los táxones oceánicos y eurosiberianos están mucho mejor representados de lo que se estimaba hasta el momento; este es el caso de especies como *Douinia ovata* o *Schistostega pennata*, entre otros. Finalmente, resulta interesante decir que un género eminentemente orófilo y silicícola, como es el caso de *Andreaea*, está representado en la sierra por ocho de las nueve especies que habitan en el territorio peninsular, mientras que en otra de las altas montañas ibéricas con sustratos ácidos, como Sierra Nevada, está completamente ausente.

THE BRYOPHYTE ATLAS OF THE PYRENEES

Patxi Heras^{1,2} & Marta Infante^{1,2,3}

¹Museo de Ciencias Naturales de Álava; ²Bazzania S.C.; ³Conservatoire botanique national des Pyrénées et de Midi-Pyrénées

The Pyrenees are a mountain chain which extends 440 km from West to East, and 30–150 km from North to South, in latitude 42°–43.3° N. Its highest point is Aneto summit (3.404 m), but it contains more than a hundred peaks over 3.000 m, a fact that distinguishes it from the rest of chains in Southern Europe, excepting the Alps. Its territory, almost 44.000 km², extends over France, Spain and Andorra; showing a great geological diversity and constituting the limit between two large bioclimatic regions, the temperate and the mediterranean. The bryophyte checklist (Infante & Heras 2013) compiles data from more than 700 publications, edited as early as 1781, gathering the bryological activity in more than 230 years. It includes 1.069 taxons, from 1.780 estimated for Europe. There is a scarce difference in figures for northern and southern versants, although they are different in composition. The Pyrenees constitute an area of extraordinary bryological richness. The Atlas of the Flora of the Pyrenees (<http://www.atlasflorapyrenaea.org/florapyrenaea/index.jsp>) was developed in the POCTEFA

2007-2013 project (Interreg European Union). So far, this online resource includes just the vascular plants. Inside the new POCTEFA 2014-2020, Florapyr Project plans the inclusion of bryophytes to this Atlas. Each species will count with its distribution map, its biological file with different sections (altitudinal range, habitat, taxonomic remarks...) and images.

EXPERIMENTACIÓN PARA LA RESTAURACIÓN DE HÁBITATS DOMINADOS POR SPHAGNUM EN LOS PIRINEOS CENTRALES

Jaume Espuny¹, Pérez-Haase A.^{1,2}, Anadon-Rosell A.^{1,3}, Pladevall E.¹, Batriu E.¹, Carrillo E.¹ & Ninot, J.M.¹

¹Universidad de Barcelona; ²Centro de Estudios Avanzados de Blanes (CEAB-CSIC);

³University of Greifswald (Alemania)

Existe un conocimiento notable sobre la restauración de turberas en zonas templadas y boreales, pero éste es escaso en el caso de los sistemas turbosos que se encuentran en el sur de Europa. Por este motivo, hemos abordado un análisis experimental sobre la respuesta de tres especies de briófitos (*Sphagnum teres*, *S. magellanicum* y *S. capillifolium*). Estas tres especies contribuyen de forma importante en la formación de distintos Hábitats de Interés Comunitario como son los mires de transición y los abombamientos ombrotroficados. Utilizamos fragmentos de caulidio y capítulos bajo condiciones controladas en el laboratorio en un experimento factorial en el que combinamos tres niveles de agua, cinco tipos de sustrato diferentes y la interacción entre las especies seleccionadas. La supervivencia de las tres especies se vio significativamente afectada por el tipo de sustrato y por el nivel del agua. En las especies más ombrotófilas (*S. magellanicum* y *S. capillifolium*) el crecimiento se vio afectado por el sustrato mientras que para la especie más minerotrófica (*S. teres*) el crecimiento se vio significativamente afectado por el nivel del agua. Estos resultados respaldan parcialmente las preferencias ecológicas asumidas para las especies analizadas, sugiriendo que el nicho ecológico de dichas especies es más amplio que el observado en su hábitat natural y que la interacción entre las especies in situ podría ser un factor clave en su distribución.

BRIÓFITOS FÓSILES EN TURBERAS OMBROTRÓFICAS DEL NORTE DE LA PENÍNSULA IBÉRICA

Martín Souto & Xabier Pontevedra-Pombal

Universidad de Santiago de Compostela

Las turberas ombrotroficadas son ecosistemas raros a nivel mundial, en la Península Ibérica están restringidas al sector norte, principalmente a las sierras septentrionales en el noroeste y zonas puntuales en la Cordillera Cantábrica. El almacenamiento constante de turba en estos ecosistemas los convierte en un modelo ideal para el estudio de las comunidades vegetales pasadas. En estas turberas los briófitos constituyen una parte importante de la cobertura vegetal por lo que los estudios paleoecológicos basados en microfósiles vegetales, como los restos de briofitos, tienen un papel importante en la reconstrucción de los cambios hidrológicos del

pasado. Los musgos fósiles pueden ser utilizados como señales para detectar cambios climáticos pasados, ya que la aparición de ciertos taxones en las comunidades fósiles estudiadas puede reflejar condiciones ambientales especiales. Se presenta el estudio de los restos fósiles de briófitos en cuatro testigos de turba: Serra do Xistral, Galicia (Borralleiras de Cal Grande, Pena da Cadela, Chao de Veiga Mol) y Montes de Ordunte, País Vasco (Zalama), con unas edades basales que oscilan entre 5500 y 8000 a. cal. AP. La extracción de macrofósiles vegetales de las muestras de turba se llevó a cabo de acuerdo con Mauquoy *et al.* (2010) y las identificaciones se realizaron mediante estudios comparativos con material procedente de colecciones de referencia a partir de vegetación actual de turberas y referencias bibliográficas. Los restos de briófitos más abundantes fueron filidios y caulidios aislados. Dependiendo del grado de degradación de las muestras fue posible su identificación a nivel de especie en la mayoría de los casos. Se han caracterizado e identificado los macrorrestos vegetales de 17 taxones de briófitos y a partir del material estudiado se elaboró una clave dicotómica y una serie de ilustraciones de los taxones identificados.

ANUNCIOS

IAB-iMOSS-SEB CONFERENCE: 9-12 JULY, 2019. ROYAL BOTANIC GARDEN (CSIC), MADRID, SPAIN

The Symposium will consist of a three-day scientific programme, and speakers are warmly invited to submit papers on all scientific aspects of bryology. We will address diverse topics including conservation, biogeography, ecology, genetics, phylogenetics and physiology together with newer areas like genomics, environmental DNA studies and invasive species.

In addition to the scientific program, we will be hosting and catering to a lively social program that includes a Banquet in the Garden, and a 1- or 3-days post-symposium field excursion to bryological interesting areas around Madrid.

As a pre-conference event, on July Sun 7th and Mon 8th July 2019, the IUCN Bryophyte Specialist Group (BSG), together with Matt von Konrat (IAB Council), are organizing a 2-day training workshop on IUCN red-listing methodology, mainly targeted at BSG members, but open to other bryologists if places are available.

Spain has a large and active bryological community, and we are very pleased to be hosting this important meeting, during which we will celebrate IAB's 50th and SEB's 30th birthday parties!

XXII SYMPOSIUM OF CRYPTOGAMIC BOTANY: 24-26 JULY, 2019. UNIVERSITY OF LISBON, LISBON, PORTUGAL

This biennial symposium will gather experts on fungi, algae, lichens, bryophytes and ferns to discuss up-to-date science on cryptogamic systematics, physiology and ecophysiology,

application and technology, and urban, tropical and global change ecology. We strongly encourage the participation of those working in cryptogamic botany, including researchers and university students, private and public practitioners, to promote the exchange of technical and scientific knowledge in this area.

The Symposium will be organized back to back with the 15th European Ecological Federation (EEF) Congress that will take place the following week. This Symposium is organized by the University of Lisbon, Faculty of Sciences, Centre for Ecology, Evolution and Environmental Changes.es.

PERSONALIA

El Dr. Ricardo Garilleti ha obtenido una plaza de Catedrático de Universidad en la Universidad de Valencia.

El Dr. Francisco Lara García ha obtenido una plaza de Catedrático de Universidad en la Universidad Autónoma de Madrid.

NUEVOS SOCIOS

Jörn Hentschel, Manuel Pimentel, Jaume Espuny, Martín Souto, Elvira Sahuquillo.

REVISORES DEL BOLETÍN DE LA SOCIEDAD ESPAÑOLA DE BRIOLOGÍA 51

Belén Albertos, Emilio Laguna, Patxi Heras, Marta Infante.

SUSCRIPCIONES / SUBSCRIPTIONS

La pertenencia a la Sociedad Española de Briología da derecho a recibir de forma gratuita los Boletines de la Sociedad, así como a disfrutar del resto de beneficios previstos en los Estatutos. La cuota anual es de 30€ para miembros ordinarios, 12€ para miembros estudiantes y miembros en situación de paro laboral, y 50€ para instituciones. Puede suscribirse a la Sociedad rellenando el formulario incluido en la página web correspondiente y enviándolo a la Secretaría de la Sociedad:

<https://www.briologia.es/suscripciones.html>

Marta Infante Sánchez.

Museo de Ciencias Naturales de Álava., C/ Siervas de Jesús 24. 01001 Vitoria, ÁLAVA. Teléfono / Fax: 945-181924 / 945-181923.

E-mail: bazzania@arrakis.es.

El pago de la cuota puede hacerse por domiciliación bancaria indicando los datos de su cuenta en el formulario, por PayPal, o bien por transferencia directa a la cuenta de la Sociedad:

Banco Bilbao Vizcaya Argentaria

Av. Gasteiz 74

01008 Vitoria (España)

Número de Cuenta: 0182 0702 31 0011006395

Titular: Sociedad Española de Briología

IBAN o Número Internacional de Cuenta Bancaria: ES29 0182 0702 3100 1100 6395

BIC o Código Bancario Internacional: BBVAESMMXXX

The membership of the Society entitles you to receive for free the periodical publication of the Society (*Boletín de la Sociedad Española de Briología*), as well as to enjoy the rest of the Society's services in accordance with its Statutes. The annual fee is 30€ for ordinary members, 12€ for students and unemployed members, and 50€ for institutions. You can subscribe to the Society by filling in the form included in the webpage and sending it to the Secretary of the Society, Marta Infante Sánchez, **see above**.

Fees can be paid by standing order (please fill the details of your bank account in the form), by PayPal, or by direct transfer to the Society's account (see above).

PROTECCIÓN DE DATOS Y POLÍTICA DE PRIVACIDAD

Tras la entrada en vigor del Reglamento (UE) 2016/679 del Parlamento Europeo y del Consejo de 27 de abril de 2016 relativo a la protección de las personas físicas en lo que respecta al tratamiento de datos personales y a la libre circulación de estos datos (RGPD), y en cumplimiento de la misma, la Sociedad Española de Briología ha establecido su Política de Privacidad de Datos, cuyo texto se ofrece a continuación.

POLITICA DE PRIVACIDAD DE DATOS DE LA SOCIEDAD ESPAÑOLA DE BRIOLOGÍA

Responsable, identidad:

Sociedad Española de Briología (SEB). – NIF: G312264765 Inscrita en el Registro Nacional de Asociaciones, Sección 1ª, número Nacional 84135

Información y consentimiento:

Mediante la lectura de la presente Política de Privacidad, el Usuario queda informado sobre la forma en que Sociedad Española de Briología (SEB) recaba, trata y protege los datos de carácter personal que le son facilitados.

El Usuario debe leer con atención esta Política de Privacidad, que ha sido redactada de forma clara y sencilla, para facilitar su comprensión, y determinar libre y voluntariamente si desea facilitar sus datos personales, o los de terceros, a la Sociedad Española de Briología (SEB).

Obligatoriedad de facilitar los datos:

Los datos solicitados en el formulario de inscripción accesible desde el sitio web son obligatorios para cumplir con las finalidades establecidas (contacto, pago de cuotas y envío de los boletines editados por la Sociedad Española de Briología - SEB). Por lo tanto, si no se facilitan los mismos o no se facilitan correctamente no podrán atenderse las mismas.

¿Con que finalidad se tratarán los datos personales del usuario y durante cuánto tiempo?

En función de las solicitudes del Usuario, los datos personales recabados serán tratados por Sociedad Española de Briología - SEB conforme a las siguientes finalidades:

- Registro de socios.
- Envío de información y documentación técnica.
- Gestión contable de la sociedad.
- Proporcionar información sobre la sociedad y sus actividades.
- Gestión de comunicaciones con administraciones públicas, en los casos previstos por la Ley.

Los datos del Usuario serán conservados durante el plazo necesario para el cumplimiento de cada finalidad o hasta que el Usuario solicite su baja a Sociedad Española de Briología - SEB, se oponga o revoque su consentimiento.

¿Qué datos del usuario tratará Sociedad Española de Briología - SEB?

Sociedad Española de Briología - SEB podrá tratar las siguientes categorías de datos, en función de la solicitud realizada por el Usuario:

Datos identificativos: nombre y apellidos, NIF, dirección postal, teléfonos, e-mail.

Datos bancarios: para la domiciliación de pagos.

Responsabilidad del Usuario

El usuario:

- Garantiza que es mayor de 18 años y que los datos que facilita a Sociedad Española de Briología - SEB son verdaderos, exactos, completos y actualizados. A estos efectos, el usuario responde de la veracidad de todos los datos que comunique y mantendrá convenientemente actualizada la información facilitada, de tal forma que responda a su situación real.

- Será responsable de las informaciones falsas o inexactas que proporcione y de los daños y perjuicios, directos o indirectos, que ello cause a Sociedad Española de Briología - SEB o a terceros.

Ejercicio de Derecho

El Usuario puede enviar un escrito a Sociedad Española de Briología - SEB, Museo de Ciencias Naturales de Álava C/ Siervas de Jesús, 24 01001 Vitoria-Gasteiz, o bien por medio de un correo electrónico a la dirección bazzania@arrakis.es, en ambos casos, con la Referencia "Protección de Datos", en cualquier momento y de manera gratuita, para ejercitar DERECHOS DE ACCESO, RECTIFICACION, CANCELACION O SUPRESION, OPOSICION, LIMITACION AL TRATAMIENTO Y PORTABILIDAD. Ello no afectará a la licitud de los tratamientos efectuados con anterioridad.

Medidas de Seguridad

Sociedad Española de Briología - SEB tratará los datos del Usuario en todo momento de forma absolutamente confidencial y guardando el preceptivo deber de secreto respecto de los mismos, de conformidad con lo previsto en la normativa de aplicación, adoptando al efecto las medidas de índole técnica y organizativas necesarias que garanticen la seguridad de sus datos y eviten su alteración, pérdida, tratamiento o acceso no autorizado, habida cuenta del estado de la tecnología, la naturaleza de los datos almacenados y los riesgos a que están expuestos. Los datos no se cederán a terceros salvo en los casos en que exista una obligación legal.

SOCIEDAD ESPAÑOLA DE BRIOLOGÍA - PRIVACY POLICY

Responsible, identity:

Sociedad Española de Briología - SEB / Spanish Bryological Society (SEB). NIF: G31226264765
Registered in the National Registry of Associations, Section 1, National number 84135.

Information and consent:

By reading this Privacy Policy, the User is informed about the way in which Sociedad Española de Briología (SEB) / Spanish Bryological Society (SEB) collects, treats and protects the personal data provided.

The User must carefully read this Privacy Policy, which has been drafted in a clear and simple manner, to facilitate its understanding, and freely and voluntarily determine whether he wishes to provide his personal data, or those of third parties, to the Sociedad Española de Briología - SEB / Spanish Bryological Society (SEB).

The obligation to provide data:

The data requested in the registration form accessible from the website are mandatory to comply with the purposes established (contact, payment of fees and sending of the bulletins published by the Spanish Bryological Society (SEB)). Therefore, if they are not provided or are not provided correctly, they cannot be provided.

For what purpose will the user's personal data be processed and for how long?

According to the User's requests, the personal data collected will be processed by Sociedad Española de Briología – SEB / Spanish Bryological Society (SEB) in accordance with the following purposes:

- Registration of members.
- Sending of information and technical documentation.
- Accounting management of the society.
- To provide information about the society and its activities.
- Management of communications with public administrations, in the cases provided for by law.

The User's data will be kept for the period of time necessary for the fulfilment of each purpose or until the User requests his or her cancellation from Sociedad Española de Briología – SEB / Spanish Bryological Society (SEB), opposes or revokes his or her consent.

What user data will be processed by the Sociedad Española de Briología - SEB / Spanish Bryology Society - SEB?

Sociedad Española de Briología - SEB / Spanish Bryological Society (SEB) may process the following categories of data, depending on the request made by the User:

Identifying information: name and surname, NIF, postal address, telephone numbers, e-mail address.

Bank details: for direct debit of payments.

User Responsibility

The user:

You warrant that you are over 18 years of age and that the information you provide to Sociedad Española de Briología – SEB / Spanish Bryological Society (SEB) is true, accurate, complete and up to date. To this end, the user is responsible for the truthfulness of all the data he or she provides and will keep the information provided up to date in such a way that it corresponds to his or her real situation.

It will be responsible for any false or inaccurate information provided and for any direct or indirect damages caused to Sociedad Española de Briología - SEB or to third parties.

Practice of Law

The User may send a letter to Sociedad Española de Briología – SEB / Spanish Bryological Society (SEB), Museo de Ciencias Naturales de Alava C/ Siervas de Jesús, 24 01001 Vitoria-Gasteiz, or by e-mail to bazzania@arrakis.es, in both cases, with the Reference "Data Protection", at any time and free of charge, to exercise the RIGHTS OF ACCESS, RECTIFICATION, CANCELLATION OR DELETION, OPPOSITION, LIMITATION OF PROCESSING AND PORTABILITY. This shall not affect the lawfulness of previous processing operations.

Safety Precautions

Sociedad Española de Briología – SEB / Spanish Bryological Society (SEB) will treat the User's data at all times in an absolutely confidential manner and keeping the mandatory duty of secrecy with respect to them, in accordance with the provisions of the applicable regulations, adopting the necessary technical and organisational measures to guarantee the security of their data and prevent their alteration, loss, unauthorised processing or access, taking into account the state of technology, the nature of the data stored and the risks to which they are exposed. The data will not be passed on to third parties unless there is a legal obligation to do so.

NORMAS DE PUBLICACIÓN*

El Boletín de la Sociedad Española de Briología (BSEB) publica artículos originales sobre todos los aspectos de la Briología. A continuación, se describen las Normas básicas de publicación. Para cualquier otro aspecto no mencionado específicamente, se recomienda consultar un fascículo reciente del BSEB.

Todos los manuscritos son revisados por el panel de revisores del BSEB. Los manuscritos deben enviarse como archivos adjuntos a la dirección electrónica de la Secretaría de la SEB. Se puede enviar un solo archivo con las Figuras y Tablas incluidas en el texto, o varios archivos por separado. En todo caso, el texto y las Tablas deben escribirse con Microsoft Word, con márgenes adecuados (por ejemplo, 2.5 cm), interlineado generoso (1.5 líneas) y un tipo de letra de uso habitual (Arial, Times New Roman) de 12 puntos.

Los manuscritos comenzarán con el título, los nombres completos de los autores, sus direcciones postales y la dirección electrónica de, al menos, el autor encargado de la correspondencia. Después se incluirá un **Resumen** en español y un **Abstract** en inglés, así como las palabras clave en los dos idiomas. A continuación, el manuscrito se estructurará en las secciones apropiadas en función de su naturaleza, y se concluirá con los Agradecimientos y las Referencias Bibliográficas. Las secciones principales del manuscrito se escribirán en mayúscula y negrita. Los objetivos del trabajo se describirán preferiblemente en el último párrafo de la Introducción. Cada Tabla y Figura se acompañará de su leyenda respectiva, bien en el texto o en archivos separados. En lo posible, todas las leyendas serán autoexplicativas. En el texto, las Figuras se mencionarán como “Figura 1” y las Tablas como “Tabla 1”. En las leyendas, tanto “Figura 1.” como “Tabla 1.” se escribirán en negrita. Se prefiere el uso de las palabras “taxon” y “táxones” en el texto, frente a “taxón” y “taxones”. Los números se escribirán siempre en cifras a partir de 10 (inclusive), y los números del 0 al 9 se escribirán en letras salvo cuando se usen con unidades o en porcentajes (por ejemplo: dos localidades, 12 especies, 5 mm, 4%). En lo posible, se evitará comenzar una frase con un número. Se prefiere la utilización de unidades del Sistema Internacional en formato de potencia negativa (por ejemplo, $\text{g m}^{-2} \text{ año}^{-1}$), no con barras ($\text{g/m}^2/\text{año}$).

En las listas de táxones de los trabajos florísticos, los nombres de los táxones se escribirán en letra cursiva y negrita, y los de los autores en negrita. Únicamente se aportarán los detalles de la recolección de especímenes (recolectores, fecha de recolección, etc.) cuando estos datos sean relevantes para los objetivos del manuscrito. En el resto de los casos, solamente se incluirá una lista numerada de localidades de recolección, con los datos geográficos y ecológicos apropiados, y a cada taxon se le asignarán sus localidades correspondientes de la lista de táxones.

En el texto, las referencias bibliográficas se citarán según los siguientes ejemplos: “Como estableció Casas (1959)...”, “Como se ha establecido previamente (Casas, 1959; Sérgio & Casas, 1990; Casas *et al.*, 1995)...”. En la sección de Referencias bibliográficas, las referencias se citarán según los siguientes modelos:

- Artículos en revistas

CASAS, C. (1991). New checklist of Spanish mosses. *Orsis* 6: 3-26.

GROLLE, R. & D.G. LONG (2000). An annotated check-list of the Hepaticae and Anthocerotae of Europe and Macaronesia. *J. Bryol.* 22: 103-140.

* If needed, “Instructions for authors” will be available upon request from the SEB Secretary.

- Libros

CASAS, C., M. BRUGUÉS, R.M. CROS & C. SÉRGIO (2006). *Handbook of mosses of the Iberian Peninsula and the Balearic Islands*. Institut d'Estudis Catalans. Barcelona.

GUERRA, J. & R.M. CROS (coords.) (2006). *Flora Briofítica Ibérica Vol. III*. Universidad de Murcia y Sociedad Española de Briología. Murcia.

- Capítulos de libros

BATES, J.W. (2000). Mineral nutrition, substratum ecology, and pollution. En: Shaw, A. J. & B. Goffinet (eds.), *Bryophyte Biology*, pp. 248-311. Cambridge University Press. Cambridge.

PUCHE, F. (2006). *Tortella* (Lindb.) Limpr. En: Guerra, J. & R. M. Cros (coords.), *Flora Briofítica Ibérica Vol. III*, pp. 49-60. Universidad de Murcia y Sociedad Española de Briología. Murcia.

- Tesis Doctorales

EDERRA, A. (1982). *Flora briofítica de los hayedos navarros*. Tesis Doctoral. Universidad de Navarra.

La lista de referencias bibliográficas se ordenará alfabéticamente por los apellidos del primer autor y los subsiguientes autores. Para aquellos trabajos en que coincidan los autores de varios trabajos, se seguirá el criterio cronológico.

Las pruebas de los manuscritos se enviarán por correo electrónico, para su comprobación, al autor encargado de la correspondencia. Las pruebas corregidas se deberán devolver urgentemente por el mismo medio. Una vez publicado el volumen correspondiente, se distribuirán separatas, tanto en papel como un archivo pdf, a los autores encargados de la correspondencia.

Los respectivos autores son los responsables de los derechos de explotación de los trabajos publicados.