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Updated checklist of the Bryophytes from the Sierra Nevada Mountains (S of Spain)

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Abstract – A revised and updated checklist of the bryophytes of the Sierra Nevada Mountains (Southern Spain) is presented, based on a compilation of bibliographic records, a revision of herbarium specimens and extensive field work. The Sierra Nevada, which occupies around 2000 km^2, is the southernmost mountain range in continental Europe. It has a wide diversity of habitats due to its range of altitude, a variable landscape, geological substrata and soil, hydrological resources, climate, etc. It is therefore of great botanical interest within the Mediterranean Region. A total of 395 taxa are currently accepted in the area: 2 Anthocerophyta, 69 Marchantiophyta and 324 Bryophyta (excluding infraspecific taxa, there are 2 species of hornworts, 68 species of liverworts and 309 species of mosses). The total number of species represents 21.8% of the European, 24.2% of the Mediterranean and 35.3% of the Iberian bryoflora. In addition, a total of 35 taxa are considered to be doubtfully present in the area, and 34 are excluded from the final list. Among the accepted species, three are included in the category of Critically Endangered in the Spanish Red List of threatened bryophytes, one is Endangered, 19 are Vulnerable, and one is considered Extinct in the studied area. The main threats for bryophytes in the area are analyzed. The original material of *Bryum perremotifolium* Thér., from the Sierra Nevada, is lectotypified and reidentified as *Bryum schleicheri.*

Updated catalogue / Mosses / Liverworts / Hornworts / High Mountain / Mediterranean

INTRODUCTION

During the XIXth century, the Spanish Sierra Nevada Mountains attracted the attention of numerous botanists due to their phytogeograhical singularity and originality, so that many publications exist that include short lists of bryophytes from this area (Bory de Saint-Vincent, 1820; Boissier, 1839-1845; Willkomm, 1845; Kunze, 1846; Müller, 1848-1849, 1854; Schimper, 1860, 1876; Colmeiro, 1867, 1889; Geheeb, 1874). Of particular interest is the publication of Höhnel (1895) which increased the number of known taxa at that time from 110 to 199.

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From the beginning of the XXth century to the present three stages can be distinguished regarding bryological studies in the area. The first one comprises a steady flow of floristic works mainly made by non-Spanish European botanists, which increased by 76 the number of catalogued taxa (Warnstorf, 1911; Casares Gil, 1914, 1915, 1919, 1932; Thériot, 1932; Allorge, 1935, 1937; Ade & Koppe, 1942; Allorge & Allorge, 1946; Cortés Latorre, 1951; Allorge & Richards, 1956; Allorge & Jovet-Ast, 1958; Rungby, 1962; Koppe, 1964). The second stage is marked by the large number of bryosociological or floristic studies made mainly by Spanish botanists, which added another 84 taxa (Aguilar *et al*., 1972; Casas, 1972, 1975a, 1975b, 1986; Gil García & Varo Alcalá, 1973; Zafra & Varo, 1975; Esteve *et al*., 1975; Frahm, 1976; Jovet-Ast & Bischler, 1976; Acón, 1981; Gil García & Guerra Montes, 1981; Gil & Varo, 1981, 1982; Guerra & Gil, 1981; Brugués *et al*., 1982; Varo & Gil, 1982; Zafra, 1982; Gil & León, 1984; Guerra, 1985; Zafra & Varo, 1984; Casas *et al*., 1985; Gil & Martínez, 1985; Gil & Ruiz, 1985; Varo *et al*., 1987-1988). The final stage is characterized mostly by taxonomic revisions at generic level, although these only added 26 new records (Fuertes & Acón, 1988; Casas *et al*., 1989, 1992, 1996; Dia, 1991; Viera & Reinoso, 1993, 1994; Fuertes & Munín, 1994; Lara, 1994; Guerra *et al*., 1995; Casas, 1997, 1999, 2000, 2006; Fuertes, 1998; Gómez-Menor *et al*., 1999; Fuertes & Acón, 2000; Casas *et al*., 2001; Infante & Heras, 2001; Brugués *et al*., 2002, 2003; Fuertes *et al*., 2003, 2004, 2005; Oliván *et al*., 2005, 2007; Gallego, 2006; Guerra, 2006a, 2006b; Puche, 2006, 2013a, 2013b; Ros & Werner, 2006; Soria *et al*., 2006; Cros *et al*., 2010; Guerra, 2010a; Guerra *et al*., 2010; Guerra & Ederra, 2013; Pisa *et al*., 2013; Fuertes & Oliván, 2014a). The compilation of Rams *et al.* (2001) is noteworthy as the first bibliographic checklist for the Spanish Sierra Nevada. This was a preliminary step in preparation for the present study, which represents the formal publication of the main contents of the Ph.D. research work of the first author (Rams Sánchez, 2007). Other publications containing data from that research are Rams *et al.* (2004, 2005, 2006, 2014 in press), Blockeel *et al.* (2006, 2008), Rams & Ros (2006), Ros *et al.* (2007a), and Werner *et al.* (2013). Also, some collections from the present study have been used in research with wider objectives, for example in obtaining DNA sequencing data (Werner *et al*., 2004; Köckinger *et al*., 2010; Stech *et al*., 2011).

There are several papers that compile formerly published data for the area or contain references to previously reported species. This is the case with Amo y Mora (1870), Casares Gil (1925), Allorge (1927, 1928), Guerra (1984), Gil (1988), Varo & Zafra (1990), Varo *et al.* (1992), Infante & Heras (2012a), and some of the treatments for the Iberian Bryophyte Flora: Álvaro (2006), Cano (2006), Brugués *et al.* (2007a, 2007b), Fuertes (2010), Guerra & Gallego (2010), Brugués & Ruiz (2013a, 2013b), Cros (2013), and Oliván & Fuertes (2014).

The Sierra Nevada mountain range is located in southern Spain. It lies approximately 40 km to the north of the Mediterranean coastline (Fig. 1): between 36°42' and 37°15'N latitude, and 2°35' and 3°39' W longitude. It occupies around 2000 km^2 in the provinces of Granada and Almeria (Andalusia), with elevations between 400 and 3482 m a.s.l. (Mulhacén is the highest peak in the Iberian Peninsula, and the highest in Europe after the Alps), offering a great diversity of habitats for a large number of species. The Sierra Nevada is situated within the Mediterranean macrobioclimate (Rivas-Martínez, 1996) with a dry period of at least two consecutive months, when the precipitation in mm is less than twice the temperature in °C. Maximum annual precipitation is estimated to be 1000-1300 mm above 2900 m a.s.l., and less than 450 mm below 1000 m a.s.l. The average maximum temperature is 39.8°C (concentrated during the months of

Fig. 1. Location of the studied area.

July and August), while the coldest month is usually February with mean minimum values of around –15.8°C and estimated to be below –35°C on the summits (Delgado Calvo-Flores *et al*., 2001). The study area includes territories from the Betic and Murcian-Almerian biogeographic provinces (Rivas-Martínez *et al*., 2004).

Geologically, the Sierra Nevada mainly contains a core composed of Paleozoic micaschists, a peripheral zone composed of Mesozoic limestone and sparse quaternary deposits derived from the surroundings hills (Meléndez Hevia, 2004).

Regarding vascular plants, this area not only includes a high number of species (about 2000, or 30% of the species present in mainland Spain, despite being only the 0.4% of its total area), but also many endemics, particularly in the highest altitudinal zone (Delgado Calvo-Flores *et al*., 2001). High mountain pastures can be found above 2800 m a.s.l.; shrub communities with creeping *Juniperus* L. and several *Genista* L. taxa dominate from about 1800 to 2800 m; both calcicoluos and silicicolous *Quercus rotundifolia* Lam. forests are abundant between 700 and 1900 m; *Quercus pyrenaica* Willd. forests, much reduced in size, are present between 1100(1200) and 1800(1900) m; *Pinus pinaster* subsp. *acutisquama* (Boiss.) Rivas Mart., Molero Mesa & F. Valle and *Juniperus phoenicea* L. communities develop on dolomites; *Salix* L. sp. pl. and *Alnus glutinosa* (L.) Gaertn. groves develop along watercourses. Some of the communities of these vascular plants are of particular interest for their relationship with bryophytes. Such is the case with the high mountain pastures on siliceous soil, where the ecological conditions favour the presence of several species of the genus *Sphagnum* L. (Molero Mesa *et al*., 1992; Blanca *et al*., 2001; Delgado Calvo-Flores *et al*., 2001).

Due to its special geographical situation, which is at the cross-roads of different migration flows, the Sierra Nevada is an isolated range that is thought to have provided a refuge for alpine species during the last glacial period (Blanca *et al*., 2001; Delgado Calvo-Flores *et al*., 2001). Since 1986 this area has been designated a Biosphere Reserve by UNESCO in the Man and Biosphere program; in 1989 it became a Natural Park, and in 1999 it was designated as a National Park.

MATERIAL AND METHODS

Sampling

The study area was extensively sampled between 2002 and 2005. Samples collected during field trips by other bryologists from the study area in 1998, 1999 and 2000 were also studied. Maps were used to select the areas that were considered likely to be the most interesting for bryophytes, and exact locations were chosen in the field. Although the sampling effort was distributed over the whole area, the highlands received special attention. The sigmatist methodology of sampling (Braun-Blanquet, 1979) was used and a total of 585 relevées were made. The samples are deposited at MUB Herbarium.

Studied localities

A total of 177 localities were prospected (Annex I). For each one the following information is given: locality number, name, province, municipality, altitude (m a.s.l.) and 1 km^2 UTM coordinate. To differentiate localities included in the same 1 km^2 grid, as is the case with the majority of grids in the highlands (78, 88, 89, 91, 92, 96, 98, 100 and 104), alphabetic letters are appended to the number.

Presentation of the catalogue

The present catalogue includes the results of the sampling described above and all those reports of bryophytes from the Sierra Nevada Mountains known up to the date of submission of this manuscript. The following herbaria have been consulted in searching for materials collected in this area: B, BCB, BM, C, DUIS, FH, FI, GDA, HUJ, LISU, MA, MGC, MUB, PC, and W. We made a special effort to revise at least one specimen of the species not found in our samples, in order to confirm/reject the presence of the species in the study area. We have also revised the identity of samples of other species.

The taxonomy and nomenclature of Anthocerophyta and Marchantiophyta follow Grolle & Long (2000), complemented by Ros *et al.* (2007b). Ros *et al.* (2013) is followed for Bryophyta, with some exceptions based on recent publications such as those related to the genera *Barbula s.l.* (Kučera *et al.*, 2013) and *Bartramia* (Damayanti *et al.*, 2012). The synonymy follows Ros *et al.* (2013), and in most cases coincides with that published previously for the study area by Rams *et al.* (2001). The abundance of each taxon in the studied area was estimated using the following scale (based on Huarte Irurzun, 2001): very rare (present only in one locality), rare (present in 2-10 localities), frequent (present in 11-25 localities), common (present in 26-50 localities), and very common (present in more than 50 localities).

If a record has been included in several publications, only the first is indicated here. Herbarium specimens of previously published or unpublished records that we have revised are indicated by the herbarium number followed by an exclamation mark in bold (**!**). Records included in the unpublished Ph.D. of Gil García (1976) and Degree Dissertation of Martínez Gonzálvez (1983) are only accepted if they have been included in a valid publication (indicated by the word "*in*" before the valid literature reference) or if the specimen was found in a

herbarium and revised. In both cases, the locality is given. Other data contained in both these works but have not been subsequently included in a formal publication are not considered as adequately published and are therefore not accepted here.

The names of taxa are arranged alphabetically within the three divisions (hornworts, liverworts and mosses). Accepted names are given in ***italics and bold***, while doubtful taxa that appear in the literature are shown only in *italics* and are marked with an asterisk (*). Excluded taxa are marked with two asterisks (**). One taxon is considered extinct in the area and it is marked in *italics*.

After the name of the taxon, the following information is provided in the stated order: numbers of sampled localities according to the list given in Annex I; references from original records and herbarium references if specimens were revised; unpublished herbarium material if any, identified in brackets by the herbarium reference followed by the locality; altitudinal range based on our new collections and published data; estimation of abundance; IUCN threat category according to the Spanish Red List of threatened bryophytes (Brugués & González-Mancebo, 2012) if designated. Taxonomic problems are discussed where relevant, and notes added for other important considerations, for instance if the taxon has not been found since 1950.

In case of misidentifications, the taxon name used in the original publication is indicated by the word "*sub*".

Revision of the identification of many samples was made by specialists in particular genera or taxonomical groups. The reviewer's name and the revised species' name are indicated in Annex II.

RESULTS

ANTHOCEROPHYTA

Anthoceros punctatus L. — **109**. 1856 m. Very rare.

Phaeoceros laevis (L.) Prosk. — **155**. Jovet-Ast & Bischler (1976). 1000-1450 m. Rare.

MARCHANTIOPHYTA

Aneura pinguis (L.) Dumort. — **55**. Kunze (1846); Brugués *et al.* (2002). 1200-3100 m. Rare.

Anthelia juratzkana (Limpr.) Trevis. — Kunze (1846); Allorge & Richards (1956); Brugués *et al.* (2002). 2700-2980 m. Rare. The first report of a taxon of *Anthelia* from the Sierra Nevada Mountains (Kunze, 1846) was as *Jungermannia julacea* var. *nivalis* Flotow *ex* Limpr. *nom. inval.* (*sub Jungermannia julacea* var. *nivalis* Hampe). According to Schuster (1988), *Anthelia nivalis* (F. Weber & D. Mohr) Lindb. is a *nomen dubium*, which may correspond to *A. juratzkana* (Limpr.) Trevis *p.p.* or to *A. julacea* (L.) Dumort. *p.p.* We assume that Kunze (*l.c.*) and Schuster (*l.c.*) refer to the same taxon and therefore it could belong to either of these two species. Nevertheless, Casares Gil (1919) interpreted the report of Kunze (*l.c.*) as corresponding with *A. juratzkana*, and this interpretation was

followed in subsequent compilations for the Sierra Nevada. It is necessary to revise the specimen studied by Kunze (*l.c.*) to know to which species it corresponds. Most probably it belongs to *A. juratzkana* because this is the species later reported by Allorge & Richards (1956) and Brugués *et al.* (2002).

Asterella gracilis (F. Weber) Underw. — Zafra & Varo (1975); Gil García (1976) *in* Casas (1986): GDA 12086**!**; Gil García & Guerra Montes (1981) *sub Mannia triandra*; Brugués *et al.* (2002). 2500-3100 m. Rare. VU.

Athalamia hyalina (Sommerf.) S. Hatt. — Allorge & Allorge (1946); Jovet-Ast & Bischler (1976); Gil & León (1984): GDA 15562**!**, GDA 15564**!** 1280-2079 m. Rare.

Athalamia spathysii (Lindenb.) S. Hatt. — **44**, **121**. Casares Gil (1914, 1915); Allorge & Jovet-Ast (1958); Jovet-Ast & Bischler (1976). 1162-1277 m. Rare.

Barbilophozia hatcheri (A. Evans) Loeske — Zafra & Varo (1975); Casas (1986). 2550 m. Rare.

Calypogeia azurea Stotler & Crotz — Gil García & Varo Alcalá (1973). 2500 m. Very rare. The report of this species by Casas (1986), GDA 11192**!**, was reidentified as *Calypogeia* sp.

Calypogeia fissa (L.) Raddi — Gil García (1976) *in* Gil & Varo (1982). 2880 m. Very rare.

Cephalozia bicuspidata (L.) Dumort. — Gil García & Varo Alcalá (1973); Gil & Martínez (1985); [GDA 33488**!**: río San Juan]. 1300-2880 m. Rare.

Cephaloziella baumgartneri Schiffn. — Jovet-Ast & Bischler (1976). 400-1150 m. Very rare.

Cephaloziella divaricata (Sm.) Schiffn. — Jovet-Ast & Bischler (1976). 2550 m. Very rare. The specimen GDA 28172**!** named *Cephaloziella divaricata* was reidentified as *Cephaloziella* sp., because it is impossible to determine its sexual condition in the absence of perianths and sexual organs. According to Schumacker & Váňa (2005), in the absence of these characters, it is not possible to distinguish between *C. divaricata* and *C. stellulifera*.

Cephaloziella hampeana (Nees) Schiffn. *ex* Loeske — Brugués *et al.* (2002). 2860-3100 m. Very rare.

Cephaloziella integerrima (Lindb.) Warnst.— **112**. 1278 m. Very rare. CR. This is the second report in the Iberian Peninsula. Until now it was known only from Navarra province in the north of the Iberian Peninsula (Miguel Velasco de, 1989).

Cephaloziella stellulifera (Taylor) Schiffn. — Jovet-Ast & Bischler (1976); Brugués *et al.* (2002). 1250-2800 m. Rare.

Chiloscyphus pallescens (Ehrh. *ex* Hoffm.) Dumort. — Gil García & Varo Alcalá (1973). 2500 m. Very rare.

Chiloscyphus polyanthos (L.) Corda — **13**, **23**, **25**, **32**, **46**, **54**, **89-c**, **102**, **106**, **109**, **154**. Kunze (1846); Casares Gil (1914); Casas (1975b); Gil & Varo (1981, 1982); Varo & Gil (1982); Gil & Martínez (1985). 1279-3044 m. Common.

Conocephalum conicum (L.) Underw. — **25**. Casas (1986): MUB 1695**!** 1308 m. Rare.

Corsinia coriandrina (Spreng.) Lindb. — Casares Gil (1919); Casas *et al.* (1992). 1000 m. Rare.

***Diplophyllum albicans* (L.) Dum. — Excluded from the area. See *Diplophyllum taxifolium*.

Diplophyllum taxifolium (Wahlenb.) Dumort. — Gil García (1976) *sub Diplophyllum albicans in* Rams *et al.* (2005): GDA 10075**!** 2880 m. Very rare.

Fossombronia angulosa (Dicks.) Raddi — **154**. 1279 m. Very rare.

Fossombronia caespitiformis De Not. *ex* Rabenh. subsp. ***caespitiformis*** — Koppe (1964); Zafra & Varo (1975); Jovet-Ast & Bischler (1976); [S B39069**!**: N side of Sierra de Lújar below Peñón del Fraile]. 500-2500 m. Rare.

Fossombronia pusilla (L.) Dumort. — **119**. Jovet-Ast & Bischler (1976); Martínez Gonzálvez (1983): río Chico, GDA 13182**!** 1150-1974 m. Rare.

**Frullania tamarisci* (L.) Dumort. — Doubtfully present in the area. The only mention of this species is in the unpublished Degree Dissertation of Martínez Gonzálvez (1983) but no herbarium specimen has been traced. Although it is a widespread species in the Iberian Peninsula (Casas *et al.*, 2009) its presence in the Sierra Nevada needs to be confirmed.

Jungermannia atrovirens Dumort. — Martínez Gonzálvez (1983): barranco del río Hornillo, GDA 13186**!**; barranco de Poqueira, GDA 27113**!** 1800-1900 m. Rare.

Jungermannia exsertifolia subsp. ***cordifolia*** (Dumort.) Váňa — **42**, **74**. Kunze (1846); Casares Gil (1914); Aguilar *et al.* (1972); Gil García & Varo Alcalá (1973); Gil & Varo (1981); Casas (1975a); Gil García (1976): Cañada de Siete Lagunas, GDA 12102**!**; Brugués *et al.* (2002). 2450-3000 m. Frequent. Kunze (1846) used the name *Jungermannia cordifolia* var. *laxa* Hampe. As this name has not been compiled in any of the nomenclatural reference works and Kunze (*l.c.*) writes "mss." after the name of Hampe, it seems to be a *nom. inval.* according to article 32.1 of Melbourne ICBN.

Jungermannia gracillima Sm. — Brugués *et al.* (2002). 3100 m. Very rare.

Jungermannia hyalina Lyell — Gil García & Varo Alcalá (1973); Gil & Martínez (1985). 1700-2880 m. Rare.

Jungermannia leiantha Grolle — Gil García (1976) *in* Guerra & Gil (1981); Gil & Martínez (1985). 1800-1900 m. Rare.

Jungermannia pumila With. — **42**, **106**. Casares Gil (1914); Aguilar *et al.* (1972); Jovet-Ast & Bischler (1976); Gil García (1976) *in* Casas (1986); Gil & Varo (1981, 1982); Brugués *et al.* (2002). 2880 m. Rare.

Jungermannia sphaerocarpa Hook. — Aguilar *et al.* (1972); Gil García & Varo Alcalá (1973); Martínez Gonzálvez (1983) *in* Gil & Martínez (1985). 1900-2600 m. Rare.

Leiocolea heterocolpos (Thed.) H. Buch — Gil García (1976) *in* Guerra & Gil (1981); Brugués *et al.* (2002). 2390-2890 m. Rare. VU.

Leiocolea turbinata (Raddi) H. Buch — Casas (1975b); Gil García (1976) *in* Gil & Varo (1982); Martínez Gonzálvez (1983): entre 'Venta Chiquito' y el río San Juan, GDA 13183**!** 1200-1300 m. Rare.

Lophocolea bidentata (L.) Dumort. — Martínez Gonzálvez (1983): próximo a Trevélez, GDA 13179**!** No altitude data given. Very rare.

Lophocolea fragrans (Moris & De Not.) Gottsche, Lindenb. & Nees — Martínez Gonzálvez (1983) *sub Lophocolea cuspidata* (Nees) Limpr.: barranco del río Hornillo, GDA 33506**!**, GDA 13189**!** 1700 m. Very rare.

Lophozia sudetica (Nees *ex* Huebener) Grolle — Gil García (1976) *in* Guerra & Gil (1981); Brugués *et al.* (2002). 2880 m. Rare.

Lophozia ventricosa (Dicks.) Dumort. — **51**, **96-a**. Gil García & Varo Alcalá (1973); Gil & Varo (1982). 2400-2898 m. Rare.

Lunularia cruciata (L.) Dumort. *ex* Lindb. — **12**, **29**, **39**, **55**, **56**, **72**, **112**, **123**, **153**, **154**. Willkomm (1845); Kunze (1846); Casares Gil (1914); Ade & Koppe (1942); Allorge & Allorge (1946); Koppe (1964); Jovet-Ast & Bischler (1976). 630-1910 m. Frequent.

Mannia androgyna (L.) A. Evans — **39**, **121**. Casares Gil (1915); Jovet-Ast & Bischler (1976); Casas (1986): MUB 1706**!**; Casas *et al*. (1996). 890-1277 m. Rare.

***Mannia triandra* (Scop.) Grolle — Excluded from the area. Casas *et al*. (2009) excluded this species from Spain, and Brugués *et al*. (2011) pointed out that the two reports of Gil García & Guerra Montes (1981) are the result of a nomenclatural error, as they used *Mannia triandra* as a synonym of *Marchantia ludwigii* Schwägr., whereas this name is generally accepted to be synonymous with *Asterella gracilis*. See *Asterella gracilis*.

***Marchantia paleacea* Bertol. — Excluded from the area. See *Marchantia polymorpha*.

Marchantia polymorpha L. subsp. ***ruderalis*** Bischl. & Boisselier — **35**, **55**, **154**. Boissier (1839-1845); Allorge & Allorge (1946); Casas (1972); Gil García (1976) *sub Marchantia paleacea*: río Genil, GDA 12365**!**; Gil & Varo (1982); Gil & Martínez (1985); Dia (1991); Viera & Reinoso (1993); Brugués *et al*. (2002); [MUB 42272**!**: camping de Trevélez]. 1200-1750 m. Frequent. Following the criterium of Bischler-Causse & Boisselier-Dubayle (1991), where no subspecies of *Marchantia polymorpha* is specified in any known source we assume that subsp. *ruderalis* is at hand.

***Nardia compressa* (Hook.) Gray — Excluded from the area. The works of Casares Gil (1915), Allorge (1928) and Esteve *et al*. (1975) state that this species was reported by *Willkomm* (*sine loco*). Nevertheless, it is not included in the publications based on the collections of this author (Willkomm, 1845; Kunze, 1846; Viera & Reinoso, 1993), nor in the compilations of Colmeiro (1867, 1889) and Gil García (1976), nor is it recorded in later papers.

Pedinophyllum interruptum (Nees) Kaal. — Casas (1986): GDA 21651**!** 1800 m. Very rare.

Pellia endiviifolia (Dicks.) Dumort. — **13**, **48**, **83**, **84**, **123**, **138**, **141**, **154**. Casas (1972); Gil García (1976) *in* Gil & Varo (1982); Martínez Gonzálvez (1983) *in* Gil & Martínez (1985); Gil & Martínez (1985). 544-1411 m. Frequent.

Pellia epiphylla (L.) Corda — Boissier (1839-1845); Willkomm (1845); Kunze (1846); Gil García & Varo Alcalá (1973); Gil & Varo (1982); Casas (1975a); Jovet-Ast & Bischler (1976); Varo & Gil (1982); Gil & Martínez (1985). 1200-2900 m. Common. It was not possible to identify with full confidence the specimens of *Pellia* collected on acidic substrates in course of the sampling for this work. They were found in sterile state in localities 13, 23, 25, 34, 46, 55, 74, 106, 108, 112, 128, 153, 154.

Plagiochila asplenioides (L.) Dumort. — Casares Gil (1914, 1915, 1919); Jovet-Ast & Bischler (1976); Martínez Gonzálvez (1983): barranco próximo al cruce de Bayárcal, GDA 13188**!**; Gil & Martínez (1985). 1700-2390 m. Frequent. Due to the nomenclatural and taxonomic problems associated with the *Plagiochila asplenioides-porelloides* complex (Söderström *et al*., 2002), it is not possible, without a full revision of all the reports, to know the distribution and abundance of the two species in the study area.

Plagiochila porelloides (Torr. *ex* Nees) Lindenb. — **35**. 1750 m. Very rare.

Porella cordaeana (Huebener) Moore — **34**. Allorge (1935): S B39572**!**; Aguilar *et al*. (1972); Zafra & Varo (1975); Jovet-Ast & Bischler (1976); Gil & Varo (1981); Martínez Gonzálvez (1983): río Laroles, GDA 13193**!**; Gil & Martínez (1985); Brugués *et al*. (2002). 1649 m. Frequent.

Porella platyphylla (L.) Pfeiff. — **36**, **51**, **59**, **61**, **69**, **80**, **101**, **102**, **128**. Colmeiro (1867); Allorge & Allorge (1946); Zafra & Varo (1975); Jovet-Ast & Bischler (1976). 1763-3100 m. Frequent.

Preissia quadrata (Scop.) Nees — **89-c**, **106**. Ade & Koppe (1942); Allorge & Jovet-Ast (1958); Dia (1991); Casas *et al*. (1992); Brugués *et al*. (2002). 1800-3200 m. Rare.

Radula complanata (L.) Dumort. — Jovet-Ast & Bischler (1976). 2550 m. Very rare.

Reboulia hemisphaerica (L.) Raddi — **1**, **2**, **4**, **35**, **36**, **37**, **44**, **48**, **51**, **53**, **55**, **69**, **71**, **90**, **108**, **111**, **136**, **143**, **148**. Casares Gil (1914); Ade & Koppe (1942); Allorge & Allorge (1946); Casas (1972); Jovet-Ast & Bischler (1976); Gil & León (1984); Dia (1991). 1162-2930 m. Common.

Riccardia chamedryfolia (With.) Grolle — Gil García & Varo Alcalá (1973); Jovet-Ast & Bischler (1976); Gil & Martínez (1985). 1710-2700 m. Rare.

Riccardia multifida (L.) Gray — **154**. Jovet-Ast & Bischler (1976); Gil & Martínez (1985); Casas (1986). 1279 m. Rare.

Riccia beyrichiana Hampe *ex* Lehm. — Jovet-Ast & Bischler (1976). 1250-1450 m. Very rare.

Riccia bifurca Hoffm. — [GDA 9507**!**: barranco de Valdeinfierno]. 2800 m. Very rare.

Riccia cavernosa Hoffm. — Jovet-Ast & Bischler (1976). 1200 m. Very rare.

Riccia ciliata Hoffm. — Jovet-Ast & Bischler (1976). 1450 m. Very rare.

Riccia ciliifera Link *ex* Lindenb. — Casas (1986). 2600 m. Very rare.

Riccia crozalsii Levier — **66**, **95**. Jovet-Ast & Bischler (1976); Brugués *et al*. (2002). 2450-3040 m. Rare.

Riccia gougetiana Durieu & Mont. var. ***gougetiana*** — **27**, **37**. 1100-1733 m. Rare.

Riccia gougetiana var. ***armatissima*** Lev. *ex* Müll. Frib. — Jovet-Ast & Bischler (1976); Casas (1986): MUB 1734**!**; [GDA 33436**!**: El Charcón]; [GDA 5490**!**: Valle del río Genil]. 1200-1300 m. Rare.

Riccia lamellosa Raddi — Jovet-Ast & Bischler (1976); Viera & Reinoso (1993). 1150-1240 m. Rare.

Riccia sorocarpa Bisch. — **31**, **66**, **86**, **90**, **91-d**, **121**. Jovet-Ast & Bischler (1976); Brugués *et al*. (2002). 1277-3126 m. Frequent.

Riccia subbifurca Warnst. *ex* Croz. — Brugués *et al*. (2002). 2850-2980 m. Very rare.

Riccia trabutiana Steph. — Jovet-Ast & Bischler (1976). 1240 m. Very rare.

**Scapania curta* (Mart.) Dumort. — Doubtfully present in the area. The material on which this report is based (Gil García, 1976 *in* Gil & Varo, 1982) has not been traced. According to Casas *et al*. (2009), in the Iberian Peninsula, it is only known from the lowlands to montane areas in the northern half.

Scapania irrigua (Nees) Nees — Gil García (1976) *in* Guerra & Gil (1981). 2600 m. Very rare.

**Scapania nemorea* (L.) Grolle — Doubtfully present in the area. No herbarium specimen has been traced for the only published records from the Sierra Nevada (Colmeiro, 1867). Casas *et al*. (2009) include the Sierra Nevada within the distribuion area of the species in the Iberian Peninsula, but because of the unreliability of Colmeiro's data (Cortés Latorre, 1950) and the lack of subsequent records, we consider it doubtful.

Scapania scandica (Arnell & H. Buch) Macvicar — **96-a**. Brugués *et al.* (2002). 2898 m. Rare.

Scapania undulata (L.) Dumort. — **66**, **106**. Aguilar *et al.* (1972); Gil García & Varo Alcalá (1973); Gil & Varo (1981); Gil García (1976) *in* Gil & Varo (1981); Martínez Gonzálvez (1983): Dehesa del Camarate, GDA 13191**!**; Gil & Martínez (1985); Casas (1986); Brugués *et al.* (2002); [MUB 918**!**: Laguna de Aguas Verdes]. 1900-3100 m. Frequent.

Southbya nigrella (De Not.) Henriq. — Jovet-Ast & Bischler (1976). 400-1240 m. Very rare.

Southbya tophacea (Spruce) Spruce — Martínez Gonzálvez (1983): entre 'Venta Chiquito' y el río San Juan, GDA 13187**!**; [GDA 15390**!**: Fuente Agrilla de Güéjar-Sierra]. 500-1180 m. Rare.

Targionia hypophylla L. — **1**, **5**, **26**, **39**, **44**, **55**, **121**, **123**, **154**, **157**. Casares Gil (1914); Ade & Koppe (1942); Allorge & Allorge (1946); Allorge & Jovet-Ast (1958); Jovet-Ast & Bischler (1976). 614-1639 m. Common.

Targionia lorbeeriana Müll. Frib. — Zafra & Varo (1975). 2500 m. Very rare.

BRYOPHYTA

**Abietinella abietina* (Hedw.) M. Fleisch. — Doubtfully present in the area. No herbarium specimen has been traced for the only published records from the Sierra Nevada (Colmeiro, 1867). Because of the unreliability of the data (Cortés Latorre, 1950) and the lack of subsequent records, we consider it doubtful. This was also the opinion of Cros (1993).

Acaulon triquetrum (Spruce) Müll. Hal. — **116**, **138**, **139**. 544-846 m. Rare.

Aloina aloides (Koch *ex* Schultz) Kindb. — **2**, **3**, **12**, **29**, **39**, **117**, **129**, **131**, **132**, **137**, **138**, **139**, **140**, **145**, **149**. Ade & Koppe (1942). 460-1315 m. Frequent.

Aloina ambigua (Bruch & Schimp.) Limpr. — **8**, **14**, **138**, **139**, **140**, **149**, **158**. Warnstorf (1911); Rungby (1962). 460-1300 m. Rare.

Aloina bifrons (De Not.) Delgad. — **138**, **139**. 544-575 m. Rare.

Aloina rigida (Hedw.) Limpr. — **116**, **123**, **124**, **131**, **132**, **138**, **139**, **140**, **151**. Ade & Koppe (1942). 445-846 m. Rare.

Amblyodon dealbatus (Hedw.) P. Beauv. — **91-b**. Boissier (1839-1845); Schimper (1876). 2800-3000 m. Rare. VU.

Amblystegium serpens (Hedw.) Schimp. — **18**, **55**, **153**. Colmeiro (1867); Warnstorf (1911). 1000-1500 m. Rare.

Amphidium lapponicum (Hedw.) Schimp. — **52**, **89-c**, **102**. Brugués *et al.* (2002). 2520-2950 m. Rare.

Amphidium mougeotii (Schimp.) Schimp. — **36**, **42**, **51**, **61**, **80**, **89-c**, **91-b**, **102**, **106**, **128**, **135**, **154**. Höhnel (1895); Casares Gil (1915); Allorge (1937); Allorge & Richards (1956); Gil García & Varo Alcalá (1973); Casas (1975a); Zafra & Varo (1975): MUB**!** *ex* MGC 2276; Martínez Gonzálvez (1983) *in* Gil & Martínez (1985); Brugués *et al.* (2002). 1279-3044 m. Frequent.

Anacolia menziesii (Turner) Paris — **1**, **2**, **36**. Cano (2010). 1200-1763 m. Rare.

Anacolia webbii (Mont.) Schimp. – Geheeb (1874); Schimper (1876); Höhnel (1895); Warnstorf (1911); Casares Gil (1915); Ade & Koppe (1942); Allorge & Allorge (1946): PC 79669**!**; Martínez Gonzálvez (1983): Vereda de la Estrella, GDA 13242**!**; Casas *et al.* (1985). 1000-2000 m. Rare.

***Andreaea frigida* Huebener — Excluded from the area. See *Schistidium occidentale*.

****Andreaea rothii*** F. Weber & D. Mohr — Excluded from the area. See *Schistidium occidentale*.

Anomobryum julaceum (Schrad. *ex* P. Gaertn., B. Mey. & Scherb.) Schimp. — Casas (1986): GDA 7713**!**, GDA 10076**!**, MUB**!** *ex* MGC-2273. 1300 m. Very rare.

Antitrichia californica Sull. — **23**, **36**, **55**, **141**. Höhnel (1895); Warnstorf (1911); Casares Gil (1915); Ade & Koppe (1942); Allorge & Allorge (1946); Casas (1975b); Casas *et al*. (1985); Cros *et al*. (2010); [MUB 42268**!**: Haza del Panizo, carretera del Dornajo a Güéjar-Sierra]. 1000-1763 m. Rare.

Antitrichia curtipendula (Hedw.) Brid. — Fuertes & Oliván (2014a). 1278 m. Very rare.

Atrichum undulatum (Hedw.) P. Beauv. — **119**, **122**. Colmeiro (1867); Martínez Gonzálvez (1983): barranco del Río Hornillo, GDA 13277**!**; Gil & Martínez (1985). 1414-1990 m. Rare.

Aulacomnium androgynum (Hedw.) Schwägr. — **42**. Casares Gil (1914, 1915); Martínez Gonzálvez (1983): río Alhorí, GDA 13247**!** 2714 m. Rare.

Aulacomnium palustre (Hedw.) Schwägr. — **47**, **66**. Bory de Saint-Vincent (1820); Colmeiro (1867); Höhnel (1895); Casares Gil (1915); Thériot (1932); Gil García & Varo Alcalá (1973). 2000-2900 m. Rare.

Barbula unguiculata Hedw. — **3**, **4**, **7**, **11**, **12**, **16**, **33**, **39**, **44**, **48**, **49**, **55**, **56**, **72**, **73**, **79**, **83**, **112**, **116**, **117**, **123**, **125**, **131**, **132**, **134**, **137**, **138**, **139**, **140**, **143**, **146**, **148**, **151**, **152**, **153**. Colmeiro (1867); Höhnel (1895); Ade & Koppe (1942); Esteve *et al*. (1975). 445-2113 m. Common.

Bartramia ithyphylla Brid. — **28**, **32**, **51**, **53**, **61**, **62**, **66**, **75**, **76**, **86**, **90**, **91-b**, **91-c**, **96-a**, **98-a**, **98-b**, **100-a**, **100-c**, **101**, **102**, **106**, **118**, **128**. Schimper (1876); Höhnel (1895); Casares Gil (1915); Thériot (1932); Ade & Koppe (1942); Allorge & Allorge (1946); Gil García & Varo Alcalá (1973); Zafra & Varo (1975); Brugués *et al*. (2002). 1500-3343 m. Common.

Bartramia pomiformis Hedw. — **4**, **13**, **17**, **42**, **44**, **51**, **55**. Colmeiro (1867); Geheeb (1874); Warnstorf (1911); Ade & Koppe (1942); Allorge & Allorge (1946); Casas (1975b); Martínez Gonzálvez (1983): GDA 13249**!** 1000-2714 m. Frequent.

Bartramia rosamrosiae Damayanti, J. Muñoz, J.-P. Frahm & D. Quandt — **44**, **136**, **157**. Ade & Koppe (1942); Allorge & Allorge (1946); Casas *et al*. (1992): S B105759**!** 1162-1750 m. Rare. Damayanti *et al*. (2012) described the new species *Bartramia rosamrosiae* to accommodate the Mediterranean and western North American populations of what had been traditionally treated as *B. stricta* Brid.

Blindia acuta (Hedw.) Bruch & Schimp. — **91-b**, **102**. Gil García (1976) *in* Guerra & Gil (1981); Brugués *et al*. (2002). 1740-3044 m. Rare.

****Brachymenium commutatum** (Müll. Hal.) A. Jaeger — Excluded from the area. Ros *et al*. (2007a) clarified the identity of the reports of this species in the Sierra Nevada resulting in its exclusion from the list of European mosses. See *Ptychostomum imbricatulum*.

Brachytheciastrum collinum (Schleich. *ex* Müll. Hal.) Ignatov & Huttunen — **28**, **31**, **32**, **33**, **53**, **61**, **65**, **66**, **76**, **78-b**, **86**, **91-b**, **91-c**, **92-a**, **93**, **94**, **96-a**, **96-c**, **98-a**, **100-a**, **100-c**, **101**, **103**, **104-a**, **104-c**, **128**, **148**. Höhnel (1895); Allorge (1937); Zafra & Varo (1975); Brugués *et al*. (2002). 1850-3475 m. Common.

Brachytheciastrum dieckii (Röll) Ignatov & Huttunen — **23**, **24**, **33**, **49**, **51**, **52**, **53**, **55**, **59**, **61**, **80**, **82**, **83**, **128**, **136**, **141**, **155**. Brugués *et al*. (2002). 970-2710 m. Frequent.

Brachytheciastrum velutinum (Hedw.) Ignatov & Huttunen var. ***velutinum*** — **2**, **4**, **13**, **15**, **17**, **18**, **23**, **24**, **30**, **32**, **35**, **37**, **42**, **43**, **44**, **49**, **51**, **55**, **56**, **61**, **69**, **73**, **84**, **91-b**, **100-a**, **101**, **102**, **105**, **106**, **112**, **118**, **127**, **128**, **146**, **148**, **152**. Colmeiro (1867); Höhnel (1895); Casares Gil (1915); Ade & Koppe (1942); Allorge & Allorge (1946): PC 79686**!**; Casas (1972); Zafra & Varo (1975); Martínez Gonzálvez (1983): barranco del Río Alcázar, GDA 13266**!**; Gil & León (1984). 1150-3200 m. Common.

Brachytheciastrum velutinum var. ***salicinum*** (Schimp.) Mönk. — **13**, **17**, **18**, **32**, **33**, **100-a**, **119**, **126**. Schimper (1860); Casares (1914); Gil García & Varo Alcalá (1973); Martínez Gonzálvez (1983): barranco del río Pasillo, GDA 13267**!** 1100-3200 m. Frequent. The identity of the report of *Hypnum velutinum* var. *sericeum* "Mull. Hal." (Schimper, 1860) from the Sierra Nevada was considered problematic by Rams *et al*. (2001), and the question remains unresolved. We agree with Höhnel (1895) that it could be interpreted as a "fo. *sericeum*" of *Brachytheciastrum velutinum*.

Brachythecium albicans (Hedw.) Schimp. — **23**, **32**, **50**, **80**, **112**, **119**, **148**. Colmeiro (1867); Geheeb (1874); Warnstorf (1911); Casares Gil (1915); Allorge & Allorge (1946); Zafra & Varo (1975). 1278-2600 m. Rare. Warnstorf (1911) reported *Brachythecium albicans* var. *julaceum* Warnst., but this taxon is not included in any taxonomic or nomenclatural work of reference. Its taxonomic value is consequently doubtful.

***Brachythecium campestre* (Müll. Hal.) Schimp. – Excluded from the area. See *Brachythecium rivulare*.

Brachythecium glareosum (Bruch *ex* Spruce) Schimp. — **13**, **18**, **23**, **24**, **30**, **35**, **36**, **49**, **55**, **56**, **61**, **73**, **98-b**, **106**, **112**, **128**, **148**. Höhnel (1895); Ade & Koppe (1942); Allorge & Allorge (1946). 1200-2880 m. Frequent.

Brachythecium mildeanum (Schimp.) Schimp. — **76**. Gil García & Varo Alcalá (1973). 2500-2898 m. Rare. VU.

Brachythecium rivulare Schimp. — **13**, **23**, **25**, **32**, **34**, **39**, **46**, **47**, **50**, **54**, **55**, **74**, **89-a**, **89-c**, **90**, **91-b**, **99**, **102**, **104-a**, **106**, **108**, **109**, **111**, **119**, **125**, **126**, **141**, **142**, **153**, **154**. Höhnel (1895); Warnstorf (1911); Allorge & Allorge (1946) *sub Brachythecium campestre*: PC 79680**!**; Gil García & Varo Alcalá (1973); Gil & Varo (1981, 1982); Varo & Gil (1982); Gil & Martínez (1985); Brugués *et al*. (2002). 890-3200 m. Common.

Brachythecium rutabulum (Hedw.) Schimp. — **18**, **23**, **38**, **55**, **56**, **61**, **79**, **112**, **119**, **122**, **128**, **155**. Colmeiro (1867); Höhnel (1895); Gil & Martínez (1985). 1200-2800 m. Frequent.

Brachythecium salebrosum (Hoffm. *ex* F. Weber & D. Mohr) Schimp. — Höhnel (1895); Zafra & Varo (1975); Gil & Martínez (1985); Brugués *et al*. (2002); [MA-Musci 3492-b**!**: Sierra Nevada, *sine loco*]. 1300-3100 m. Rare.

Bryoerythrophyllum recurvirostrum (Hedw.) P.C. Chen — **4**, **35**, **79**, **91-b**, **134**. Boissier (1839-1845); Höhnel (1895); Ade & Koppe (1942). 1227-3000 m. Rare.

Bryum argenteum Hedw. — **3**, **4**, **5**, **6**, **9**, **10**, **15**, **18**, **19**, **26**, **27**, **38**, **39**, **41**, **44**, **45**, **47**, **48**, **49**, **51**, **55**, **61**, **71**, **72**, **73**, **74**, **111**, **119**, **121**, **122**, **123**, **124**, **127**, **128**, **131**, **132**, **136**, **138**, **139**, **140**, **142**, **144**, **148**, **150**, **151**, **154**, **156**, **158**. Boissier (1839-1845); Höhnel (1895); Casares Gil (1915); Zafra & Varo (1975); Martínez Gonzálvez (1983): Soportújar, río Chico, GDA 13235**!**; Gil & León (1984): GDA 22317**!**; Brugués *et al*. (2002); Pisa *et al*. (2013). 410-2725 m. Very common.

Bryum canariense Brid. — **4**. Höhnel (1895); Koppe (1964). 980-1277 m. Rare.

Bryum dichotomum Hedw. — **4**, **5**, **6**, **7**, **38**, **44**, **45**, **50**, **71**, **90**, **111**, **112**, **113**, **116**, **123**, **124**, **131**, **132**, **138**, **140**, **142**, **144**, **150**. Ade & Koppe (1942); Brugués *et al.* (2002). 410-2887 m. Frequent.

Bryum elegans Nees — **51**, **69**, **80**. Ade & Koppe (1942); Guerra *et al.* (2010). 1278-2400 m. Rare.

Bryum gemmilucens R. Wilczek & Demaret — **4**, **144**. 410-1227 m. Rare.

Bryum gemmiparum De Not. — **55**, **154**. Allorge & Allorge (1946); Gil García & Varo Alcalá (1973); Guerra *et al.* (2008). 1200-2900 m. Rare.

Bryum kunzei Hornsch. — Zafra & Varo (1975); Guerra *et al.* (2010); [GDA 28362**!**: Corral del Veleta]. 2500-3050 m. Rare.

Bryum radiculosum Brid. — **29**, **123**. Höhnel (1895); Koppe (1964). 630-1320 m. Rare.

Bryum schleicheri DC. *in* Lam. & DC. — **23**, **32**, **42**, **90**, **91-d**. Boissier (1839-1845); Schimper (1876); Höhnel (1895); Casares Gil (1915); Thériot (1932): type of *Bryum perremotifolium* Thér., PC 79697**!**; Aguilar *et al.* (1972); Gil García & Varo Alcalá (1973); Casas (1975a, 1975b); Gil & Varo (1981, 1982); Brugués *et al.* (2002); Guerra *et al.* (2010). [MA-Musci 3515**!** *sub Brum lacustre* Brid.: Sierra Nevada, *sine loco*]. 1543-3050 m. Frequent. Höhnel (1895) and Casares Gil (1915) reported *Bryum schleicheri* var. *angustatum* Schimp., but this taxon is not included in any taxonomic or nomenclatural work of reference. Its taxonomic value is consequently doubtful.

Bryum subapiculatum Hampe — **112**. 1278 m. Very rare.

Bryum turbinatum (Hedw.) Turner — Colmeiro (1889); Allorge & Allorge (1946): PC25982**!** 400-2880 m. Rare.

Bryum valparaisense Thér. — **144**. Blockeel *et al.* (2008); Guerra *et al.* (2010). 410-1177 m. Rare.

Bryum weigelii Spreng. — Casares Gil (1914); Brugués *et al.* (2002); Guerra *et al.* (2010); [GDA 28271**!**: Cañada de Siete Lagunas]. 2500-2880 m. Rare.

Calliergonella cuspidata (Hedw.) Loeske — **13**, **23**, **25**, **119**. Bory de Saint-Vincent (1820); Colmeiro (1867); Casares Gil (1915); Martínez Gonzálvez (1983) *in* Gil & Martínez (1985); Casas (1986). 1300-2370 m. Frequent.

Campyliadelphus chrysophyllus (Brid.) R.S. Chopra — Höhnel (1895). 2700 m. Very rare. The material on which this report is based has not been traced. Nevertheless, this is a relatively common species reported from other areas of Granada province and other localities in southern Spain. According to Casas *et al.* (2006), in the Iberian Peninsula and Balearic Islands, it grows in both lowland and montane areas.

***Campylium protensum* (Brid.) Kindb. — Excluded from the area. See *Campylium stellatum*.

Campylium stellatum (Hedw.) Lange & C.E.O. Jensen — Gil García (1976) *sub Campylium protensum*: río Alcázar, GDA10080**!** 2200 m. Very rare.

**Campylophyllum halleri* (Hedw.) M. Fleisch. — Doubtfully present in the area. No herbarium specimen has been traced for the only published record from the Sierra Nevada (Colmeiro, 1867). Because of the unreliability of the data (Cortés Latorre, 1950) and the lack of subsequent records, we consider it doubtful. In the Iberian Peninsula it is known from montane areas and high mountains in the northern part (Fernández Ordoñez, 1981; Fuertes & Álvarez, 1982; Casas *et al.*, 2006).

Campylostelium pitardii (Corb.) E. Maier — **9**, **12**, **117**, **151**. Koppe (1964); Casas *et al.* (1985). 400-1320 m. Rare.

****Ceratodon conicus** (Hampe) Lindb. — Excluded from the area. See *Ceratodon purpureus* subsp. *purpureus*.

Ceratodon purpureus (Hedw.) Brid. subsp. ***purpureus*** — **18**, **19**, **23**, **28**, **31**, **32**, **33**, **38**, **41**, **46**, **47**, **48**, **50**, **56**, **60**, **65**, **68**, **71**, **78-b**, **79**, **96-a**, **102**, **103**, **106**, **111**, **148**, **149**, **150**. Boissier (1839-1845); Geheeb (1874); Höhnel (1895); Casares Gil (1915); Ade & Koppe (1942); Martínez Gonzálvez (1983) *sub Ceratodon conicus*: cerca del río Maitena, GDA13198**!**; Brugués *et al.* (2002). 1185-3116 m. Common.

Cheilothela chloropus (Brid.) Broth. — **161**. Koppe (1964); [GDA 22332**!**: Los Cahorros]. 1200-1320 m. Rare.

****Cinclidotus fontinaloides** (Hedw.) P. Beauv. — Excluded from the area. See *Schistidium rivulare*.

Cinclidotus riparius (Host *ex* Brid.) Arn. — Kunze (1846); Colmeiro (1889); Viera & Reinoso (1994). 2800 m. Rare.

****Climacium dendroides** (Hedw.) F. Weber & D. Mohr — Excluded from the area. The only mention of this species in the Sierra Nevada is in the unpublished Ph.D. of Gil García (1976) and no herbarium specimen has been traced. Nor is the record confirmed in the studies of the Climaciaceae for the Iberian Bryophyte Flora (Fuertes & Oliván, 2014b).

***Conostomum tetragonum** (Hedw.) Lindb. — Doubtfully present in the area. There exist two reports collected by Schimper, one in the Barranco de San Juan and other in Picacho del Veleta (Schimper, 1860) that could not be confirmed. A sample from the Sierra Nevada identified as *Conostomum tetragonum* (MA-Musci 12548**!**) was found without further data. It was reidentified as *Philonotis capillaris* Lindb. After some historical inquiries, we concluded that this sample was not the one used by Schimper (*l.c.*). Although Guerra (2010b) does not mention the presence of the species in the Sierra Nevada, in our opinion it still needs to be confirmed by a study of Schimper's specimens. Its presence in the Iberian Peninsula has been confirmed from the Pyrenees and Cantabrian mountains (Guerra, 2010b).

***Coscinodon cribrosus** (Hedw.) Spruce — Doubtfully present in the area. No herbarium specimen has been traced for the only published record from the Sierra Nevada (Warnstorf, 1911). In the Iberian Peninsula it is known from montane areas and high mountains, mainly in the northeast and southwest (Casas *et al*., 2006).

***Cratoneuron curvicaule** (Jur.) G. Roth — Doubtfully present in the area. No herbarium specimen has been traced for the only published record from the Sierra Nevada and in whole Spain (Höhnel, 1895). Casas *et al.* (2006) elimated it from the Spanish catalogue, but Ros *et al.* (2013) retained it as doubtful.

Cratoneuron filicinum (Hedw.) Spruce — **12**, **13**, **23**, **25**, **72**, **79**, **83**, **84**, **89-c**, **91-b**, **106**, **125**, **142**, **146**. Colmeiro (1867); Warnstorf (1911): BM 918127**!**; Casares Gil (1915); Ade & Koppe (1942); Allorge & Allorge (1946); Gil & Varo (1982); Varo & Gil (1982); Gil & Martínez (1985); Gil & Ruiz (1985). 600-3000 m. Common.

Crossidium aberrans Holz. & E.B. Bartram — **129**, **139**. 603-1315 m. Rare.

Crossidium crassinerve (De Not.) Jur. — **8**, **29**, **39**, **116**, **124**, **131**, **132**, **138**, **139**, **140**, **145**, **151**. Allorge & Richards (1956). 445-1043 m. Frequent.

Crossidium squamiferum (Viv.) Jur. — **2**, **3**, **5**, **8**, **9**, **14**, **16**, **24**, **26**, **50**, **64**, **113**, **116**, **117**, **124**, **131**, **132**, **138**, **139**, **140**, **141**, **151**, **160**. Schimper (1860); Höhnel (1895); Warnstorf (1911); Casares Gil (1915); Ade & Koppe (1942); Allorge & Richards (1956); Koppe (1964); Gil & León (1984). 400-2000 m. Common.

Ctenidium molluscum (Hedw.) Mitt. — **35**. 1750 m. Very rare.

Cynodontium bruntonii (Sm.) Bruch & Schimp. — **51**, **62**. Geheeb (1874); Warnstorf (1911); Casares Gil (1915); Casares Gil (1915, 1932); Zafra & Varo (1975); Werner *et al*. (2013). 1200-2880 m. Rare.

**Dialytrichia mucronata* (Brid.) Broth. — Doubtfully present. No herbarium specimen has been traced for the published records from the Sierra Nevada (Warnstorf, 1911; Gil García 1976 *in* Casas *et al*., 1985). Lara (2006) was also unable to revise material. In the Iberian Peninsula it shows a tendency to colonize areas of oceanic influence (Lara, *l.c.*).

Dichodontium palustre (Dicks.) M. Stech — Höhnel (1895); Martínez Gonzálvez (1983): barranco del Río Hornillo, GDA 25969**!** 1500-2600 m. Rare.

Dichodontium pellucidum (Hedw.) Schimp. — **89-c**, **90**, **106**. Colmeiro (1867); Gil García & Varo Alcalá (1973); Gil García (1976) *in* Gil & Varo (1981); Gil García (1976) *in* Casas (1986); Brugués *et al*. (2002). 1300-2950 m. Frequent.

Dicranella howei Renauld & Cardot — **4**, **9**, **18**, **112**, **140**, **144**, **160**. 400-1600 m. Rare.

Dicranella varia (Hedw.) Schimp. — **84**, **125**, **146**, **151**. Höhnel (1895); Puche (2013a). 600-2800 m. Rare.

**Dicranum scoparium* Hedw. — Doubtfully present in the area. No herbarium specimen has been traced for the published records from the Sierra Nevada (Höhnel, 1895; Gil García & Varo Alcalá, 1973). The species is not accepted as present in Granada province in the treatment of the genus for the Iberian Bryophyte Flora (Brugués & Ruiz, 2013c).

Didymodon acutus (Brid.) K. Saito — **3**, **9**, **50**, **123**, **124**, **131**, **139**, **140**, **145**, **149**. Koppe (1964). 460-1720 m. Frequent.

Didymodon australasiae (Hook. & Grev.) R.H. Zander — **4**, **6**, **10**, **11**, **12**, **18**, **24**, **26**, **29**, **37**, **44**, **48**, **49**, **55**, **61**, **71**, **93**, **100-a**, **116**, **121**, **123**, **124**, **129**, **131**, **132**, **137**, **138**, **139**, **140**, **149**, **154**, **159**. Guerra & Ros (1987): GDA 28207**!** 445-3200 m. Common.

Didymodon fallax (Hedw.) R.H. Zander — **16**, **47**, **73**, **84**, **113**, **117**, **125**, **129**, **138**. Höhnel (1895); Casares Gil (1915); Ade & Koppe (1942); Allorge & Allorge (1946); Koppe (1964); Gil & León (1984). 544-3000 m. Frequent.

Didymodon ferrugineus (Schimp. *ex* Besch.) M.O. Hill — **136**. 1750 m. Very rare.

Didymodon insulanus (De Not.) M.O. Hill — **1**, **2**, **4**, **12**, **13**, **15**, **18**, **23**, **24**, **33**, **35**, **36**, **37**, **38**, **43**, **48**, **50**, **55**, **56**, **57**, **58**, **61**, **70**, **71**, **80**, **83**, **84**, **91-a**, **96-b**, **99**, **108**, **112**, **116**, **119**, **136**, **146**, **148**, **149**, **150**, **151**, **152**, **154**, **155**, **157**, **158**. Allorge & Allorge (1946); Zafra & Varo (1975); Gil & Martínez (1985). 480-3143 m. Very common.

Didymodon luridus Hornsch. — **2**, **3**, **4**, **12**, **16**, **39**, **49**, **50**, **58**, **79**, **116**, **123**, **131**, **139**, **140**, **146**, **151**, **153**. Gil & León (1984). 445-2113 m. Frequent.

Didymodon rigidulus Hedw. — **3**, **8**, **12**, **14**, **15**, **28**, **29**, **48**, **64**, **83**, **113**, **116**, **117**, **123**, **129**, **131**, **132**, **137**, **138**, **139**, **140**, **145**, **148**, **149**, **159**, **160**. Höhnel (1895); Koppe (1964). 400-2418 m. Common.

Didymodon sicculus M.J. Cano, Ros, García-Zamora & J. Guerra — **39**, **131**, **144**. 410-890 m. Rare.

Didymodon tophaceus (Brid.) Lisa — **83**, **123**, **125**, **138**, **141**, **144**, **146**, **153**. Höhnel (1895); Ade & Koppe (1942); Allorge & Allorge (1946); Gil & León (1984). 410-2079 m. Frequent.

Didymodon vinealis (Brid.) R.H. Zander — **1**, **2**, **3**, **4**, **5**, **6**, **7**, **8**, **9**, **10**, **11**, **12**, **15**, **16**, **18**, **19**, **20**, **21**, **24**, **25**, **26**, **27**, **29**, **30**, **33**, **36**, **37**, **39**, **44**, **49**, **50**, **55**, **56**, **71**, **82**, **83**, **84**, **101**, **112**, **113**, **121**, **123**, **124**, **129**, **131**, **132**, **133**, **134**, **138**, **139**, **141**, **142**, **148**,

149, **151**, **152**, **153**, **154**. Höhnel (1895); Casares Gil (1915); Rungby (1962); Koppe (1964); Casas (1986): MUB 1685**!** 544-3100 m. Very common.

Distichium capillaceum (Hedw.) Bruch & Schimp. — **89-c**, **91-b**, **96-a**, **100-c**. Boissier (1839-1845); Kunze (1846); Höhnel (1895); Casares Gil (1914, 1932); Casas (1975a); Zafra & Varo (1975); Gil & León (1984); Brugués *et al*. (2002); Puche (2013b). 1500-3185 m. Frequent.

Distichium inclinatum (Hedw.) Bruch & Schimp. — Thériot (1932): PC 79716**!**; Gil García (1976) *in* Guerra & Gil (1981). 2890-3030 m. Rare. VU.

Ditrichum flexicaule (Schwägr.) Hampe — Höhnel (1895); Casares Gil (1915); Ade & Koppe (1942); Gil & León (1984); Casas *et al*. (1992). 1800-2000 m. Rare.

Drepanocladus aduncus (Hedw.) Warnst. — **42**. Brugués *et al*. (2002); Fuertes *et al*. (2003). 2714-3100 m. Rare.

Encalypta microstoma Bals.-Criv. & De Not. — **51**, **128**. Rams *et al*. (2005). 2400-2725 m. Rare. VU.

Encalypta rhaptocarpa Schwägr. var. ***rhaptocarpa*** — **33**, **134**. Höhnel (1895). 1601-2000 m. Rare.

**Encalypta rhaptocarpa* var. *leptodon* Lindb. — Doubtfully present in the area. The only report is that of Höhnel (1895). Because of the disputed taxonomic status of this taxon (Hill *et al*., 2006) and the fact that many authors do not recognize it, its distriburion and the accuracy of the reports from the study area are uncertain.

Encalypta streptocarpa Hedw. — Gil & León (1984); Brugués *et al*. (2002). 1600-2079 m. Rare.

Encalypta vulgaris Hedw. — **2**, **4**, **5**, **7**, **9**, **11**, **12**, **18**, **19**, **24**, **25**, **26**, **33**, **36**, **37**, **38**, **41**, **44**, **45**, **47**, **49**, **51**, **55**, **58**, **62**, **71**, **73**, **74**, **91-b**, **94**, **101**, **104-c**, **119**, **145**, **148**, **150**, **154**, **157**. Colmeiro (1867); Geheeb (1874); Höhnel (1895); Warnstorf (1911); Ade & Koppe (1942); Allorge & Allorge (1946); Koppe (1964); Zafra & Varo (1975); Gil & León (1984). 933-3150 m. Common.

Entosthodon attenuatus (Dicks.) Bryhn — Ade & Koppe (1942); Casas *et al*. (1996). No altitude data given. Rare.

Entosthodon convexus (Spruce) Brugués — Casas *et al*. (1996). No altitude data given. Very rare.

Entosthodon muhlenbergii (Turner) Fife — Warnstorf (1911); Ade & Koppe (1942); [S B64959**!**: Maitena]. 1000-2200 m. Rare. VU.

Entosthodon pulchellus (H. Philib.) Brugués — **6**, **10**, **44**, **121**, **123**, **131**, **132**, **137**, **154**, **158**. Allorge & Allorge (1946): PC 79720**!**; Casas (1986); Cros *et al*. (2010). 480-1650 m. Frequent.

Epipterygium tozeri (Grev.) Lindb. — **112**. 1278 m. Very rare.

Eucladium verticillatum (With.) Bruch & Schimp. — **22**, **83**. Boissier (1839-1845); Kunze (1846); Höhnel (1895); Warnstorf (1911); Casares Gil (1915); Ade & Koppe (1942); Allorge & Allorge (1946); Gil & Varo (1982); Casas (1986); Dia (1991). 600-1560 m. Frequent.

Eurhynchiastrum pulchellum (Hedw.) Ignatov & Huttunen var. ***pulchellum*** — **4**, **33**, **35**, **43**, **69**, **82**, **86**, **87**, **104-c**, **136**, **152**. Thériot (1932); Zafra & Varo (1975). 900-3366 m. Frequent.

Eurhynchiastrum pulchellum var. ***diversifolium*** (Schimp.) Ochyra & Żarnowiec — Höhnel (1895); Casares Gil (1915); Brugués *et al*. (2002). 2200-3000 m. Rare.

**Eurhynchiastrum pulchellum* var. *praecox* (Hedw.) Ochyra & Żarnowiec — Doubtfully present in the area. The only report from the Sierra Nevada is that of Höhnel (1895). Because of the disputed taxonomic status of this

taxon (Smith, 2004) and the fact that many authors do not recognize it, its distribution and the accuracy of the reports from the study are uncertain.

****Fabronia ciliaris*** (Brid.) Brid. – Excluded from the area. See *Fabronia pusilla*.

Fabronia pusilla Raddi – **24**, **50**, **157**. Allorge & Allorge (1946) *sub Fabronia ciliaris*: PC 79718**!**; Koppe (1964); Casas *et al*. (1985). 980-1720 m. Rare.

****Fissidens adianthoides*** Hedw. – Excluded from the area. The report of this species in the catalogue for Granada province by Esteve *et al*. (1975) is due to erroneous data concerning *F. taxifolius* published by Colmeiro (1867), which were attributed to a supposed *F. adianthoides*.

Fissidens bryoides Hedw. – **4**, **15**, **91-a**, **91-b**, **103**, **106**, **157**. Martínez Gonzálvez (1983): río Chico, GDA 13197**!** 1000-3177 m. Rare.

Fissidens crassipes Wilson *ex* Bruch & Schimp. subsp. *crassipes* – Doubtfully present in the area. The only mention of this species for the Sierra Nevada is in the unpublished Ph.D. thesis of Gil García (1976) but no herbarium specimen has been traced. Although *Fissidens crassipes* is a frequent species in the western part of the Iberian Peninsula (Casas *et al*., 2006) and has been reported from Granada province by Guerra & Ederra (2013), its presence in the Sierra Nevada still requires confirmation.

Fissidens crispus Mont. – Guerra & Ederra (2013). 1250 m. Very rare.

Fissidens dubius P. Beauv. – Höhnel (1895); Warnstorf (1911); [GDA 22534**!**: Los Alayos]. 1580-1800 m. Rare.

Fissidens grandifrons Brid. – Gil & Varo (1981); Gil & Ruiz (1985). 870-1370 m. Rare.

Fissidens rufulus Bruch & Schimp. – **50**. Guerra & Ederra (2013). 1650 m. Rare.

Fissidens taxifolius Hedw. subsp. ***taxifolius*** – **18**, **23**, **35**, **55**, **81**, **112**, **154**. Colmeiro (1867); Höhnel (1895); Martínez Gonzálvez (1983) *in* Gil & Martínez (1985); Dia (1991). 1200-2334 m. Frequent.

Fissidens taxifolius subsp. *pallidicaulis* (Mitt.) Mönk. – Doubtfully present in the area. Varo & Gil (1982) published two records of this taxon, mentioned previously in Gil García (1976), but no herbarium specimen has been traced. Therefore the presence of the taxon in the study area requires confirmation.

Fissidens viridulus (Sw. *ex* anon.) Wahlenb. var. ***viridulus*** – **1**, **2**, **12**, **29**, **44**, **99**, **112**, **121**, **145**, **154**. Koppe (1964); Zafra & Varo (1975). 861-1741 m. Frequent.

Fontinalis antipyretica Hedw. subsp. ***antipyretica*** – **13**, **25**, **31**, **35**, **46**, **47**, **78-a**, **142**. Bory de Saint-Vincent (1820); Boissier (1839-1845); Höhnel (1895); Casares Gil (1915); Esteve *et al*. (1975); Gil & Varo (1981); Casas (1986). 1308-2880 m. Frequent.

Fontinalis antipyretica subsp. *gracilis* (Lindb.) Kindb. – Doubtfully present in the area. The only mention of the presence of this taxon in the Sierra Nevada is in the unpublished Ph.D. thesis of Gil García (1976) but no herbarium specimen has been traced. Therefore its presence requires confirmation.

Fontinalis hypnoides var. ***duriaei*** (Schimp.) Kindb. – Casas (1972). No altitude data given. Very rare.

Fontinalis squamosa Hedw. – **23**. 1543 m. Very rare.

Funaria hygrometrica Hedw. – **3**, **4**, **7**, **16**, **23**, **39**, **44**, **46**, **48**, **65**, **71**, **74**, **79**, **90**, **111**, **112**, **123**, **131**, **132**, **139**, **140**, **142**, **144**, **153**, **154**. Colmeiro (1867); Ade & Koppe (1942); Allorge & Allorge (1946): PC 79719**!**; Casas (1986). 410-2861 m. Very common.

Grimmia alpestris (F. Weber & D. Mohr) Schleich. – **51**, **52**, **53**, **91-d**. Schimper (1860): BM 868024**!** *ex* Herb. Musc. W. Wilson; Höhnel (1895); Ade & Koppe (1942); Brugués *et al*. (2002). 2300-3087 m. Frequent.

Grimmia anodon Bruch & Schimp. – **15**, **73**, **149**. Colmeiro (1867); Höhnel (1895); Esteve *et al*. (1975); Brugués *et al*. (2002). 1300-1744 m. Rare.

Grimmia atrata Miel. *ex* Hornsch. – Casas (1986): GDA 7876**!** 2600 m. Very rare. VU.

Grimmia caespiticia (Brid.) Jur. – **101**. Brugués *et al*. (2002). 3100 m. Rare.

Grimmia crinita Brid. – **139**, **140**. 445-556 m. Rare.

Grimmia crinitoleucophaea Cardot – **50**. 1600-1720 m. Very rare.

Grimmia decipiens (Schultz) Lindb. – Ade & Koppe (1942); Zafra & Varo (1984). 2000 m. Rare.

Grimmia dissimulata E. Maier – **6**, **9**, **12**, **50**, **83**, **84**. 1600-1720 m. Rare.

***Grimmia donniana* Sm. – Excluded from the area. This name appears in the catalogue for Granada province by Esteve *et al*. (1975), where three reports are mentioned, all of which are erroneous for different reasons. 1) Schimper (1876) never cited *G. donniana* from Sierra Nevada. The only species from this genus collected by *Schimper* in the locality mentioned in Esteve *et al*. (1975), el Panderón del Veleta, is *G. montana*; 2) Höhnel (1895) did not report *G. donniana* from Barranco de Trevélez, but *G. alpestris*; 3) Zafra & Varo (1975) reported it from Peñones de San Francisco, but no herbarium specimen has been traced. According to J. Muñoz (pers. comm.) all reports of this species from the Iberian Peninsula are erroneous.

Grimmia funalis (Schwägr.) Bruch & Schimp. – Allorge (1935): PC 34125**!** 2550 m. Very rare.

Grimmia laevigata (Brid.) Brid. – **4**, **21**, **24**, **26**, **37**, **44**, **50**, **61**, **111**, **121**, **157**. Höhnel (1895); Casares Gil (1915); Allorge & Allorge (1946): PC 79721**!**; Zafra & Varo (1975). 950-3000 m. Frequent.

Grimmia lisae De Not. – **44**. Höhnel (1895); Casares Gil (1915). 900-2000 m. Rare.

Grimmia meridionalis (Müll. Hal.) E. Maier – **5**, **24**, **36**, **57**, **142**, **157**. Müller (1848-1849). 1186-1763. Rare.

Grimmia mollis Bruch & Schimp. – **75**. Höhnel (1895); Allorge & Richards (1956). 2800-2900 m. Rare. VU. One syntype of *Grimmia mollis* var. *aquatica* Schimp. originates from the Sierra Nevada, but no herbarium specimen has been traced. Muñoz & Pando (2000) were also unable to revise material. Most of the specialized works consulted by us do not assign any taxonomic value to this variety.

Grimmia montana Bruch & Schimp. – **32**, **33**, **50**, **61**, **69**, **86**, **88-a**, **114**, **118**, **126**. Schimper (1876); Höhnel (1895); Casares Gil (1915). 1600-3158 m. Frequent.

**Grimmia muehlenbeckii* Schimp. – Doubtfully present in the area. No herbarium specimen has been traced for the only published record from the Sierra Nevada (Höhnel, 1895). In the Iberian Peninsula it is known from montane areas and high mountains in the north (Casas *et al*., 2006).

Grimmia orbicularis Bruch *ex* Wilson – **4**, **8**, **9**, **12**, **16**, **18**, **24**, **39**, **50**, **58**, **73**, **113**, **117**, **131**, **133**, **140**. Allorge & Richards (1956). 460-1744 m. Frequent.

Grimmia ovalis (Hedw.) Lindb. – **13**, **23**, **24**, **26**, **33**, **34**, **37**, **47**, **50**, **54**, **59**, **69**, **91-d**, **114**, **128**. Höhnel (1895); Warnstorf (1911); Casares Gil (1915); Zafra & Varo (1975); Casas (1986). 1000-3088 m. Frequent. The report of Höhnel (1895) of *Grimmia commutata* Hueb. was misinterpreted by Esteve *et al*. (1975), who erroneously treated *G. affinis* Hornsch. as a synonym of *G. commutata*.

Grimmia pulvinata (Hedw.) Sm. – **4**, **5**, **6**, **7**, **9**, **11**, **12**, **13**, **15**, **16**, **17**, **18**, **19**, **21**, **23**, **24**, **26**, **27**, **30**, **33**, **34**, **38**, **37**, **39**, **44**, **46**, **48**, **49**, **50**, **55**, **56**, **57**, **58**, **71**, **73**, **83**, **108**, **112**, **113**, **117**, **119**, **126**, **129**, **136**, **141**, **142**, **145**, **146**, **148**, **149**, **150**, **152**, **153**, **154**, **157**. Geheeb (1874); Höhnel (1895); Ade & Koppe (1942); Casas (1975, 1986). 802-2415 m. Very common.

**Grimmia ramondii* (Lam. & DC.) Margad. – Doubtfully present in the area. No herbarium specimen has been traced for the only published record from the Sierra Nevada (Höhnel, 1895). In the Iberian Peninsula it is known from montane areas and high mountains in the northern half (Casas *et al*., 2006).

Grimmia reflexidens Müll. Hal. – **53**, **60**, **61**. Brugués *et al*. (2002). 2127-2680 m. Rare.

Grimmia tergestina Tomm. *ex* Bruch & Schimp. – Ade & Koppe (1942); Zafra (1982); [MA-Musci 14860**!**: Güéjar-Sierra, Convento de San Jerónimo]. 1600-1720 m. Rare.

Grimmia torquata Drumm. – **32**, **51**, **53**, **61**. Allorge (1935); Ade & Koppe (1942); Zafra & Varo (1975); Casas (1986); Fuertes & Acón (1988); Brugués *et al*. (2002); Cros *et al*. (2010). 1983-2550 m. Rare.

Grimmia trichophylla Grev. – **4**, **23**, **25**, **51**, **71**, **111**, **136**. Höhnel (1895); Ade & Koppe (1942); Allorge & Allorge (1946); Varo *et al*. (1987-88). 1185-2450 m. Frequent. We follow the criterium of Maier (2010) in treating *G. dissimulata, G. lisae*, *G. meridionalis* and *G. trichophylla* as distinct species.

Gymnostomum aeruginosum Sm. – **79**, **89-c**, **91-b**, **91-d**, **106**, **108**. Boissier (1839-1845); Schimper (1876); Thériot (1932); Gil & Varo (1982); Varo & Gil (1982); Martínez Gonzálvez (1983) *in* Guerra (2006a); Gil & León (1984); Gil & Martínez (1985); Brugués *et al*. (2002). 1300-3050 m. Frequent.

Gymnostomum calcareum Nees & Hornsch. – **84**, **89-c**, **91-b**. Warnstorf (1911); Casares Gil (1915); Koppe (1964); Gil & León (1984); Guerra (2006a). 1200-3000 m. Rare.

Gymnostomum viridulum Brid. – **89-c**, **131**, **134**, **140**, **151**. Casas *et al*. (1985): PC 79724**!** 445-2950 m. Rare.

Hedwigia ciliata (Hedw.) P. Beauv. var. ***ciliata*** – Colmeiro (1867); Casas *et al*. (1996). 1300-1650 m. Rare.

Hedwigia ciliata var. ***leucophaea*** Bruch & Schimp. – **27, 161**. Höhnel (1895); Allorge & Allorge (1946): PC 79727**!** 1100-1700 m. Rare.

Hedwigia stellata Hedenäs – Warnstorf (1911); Casas *et al*. (1996): BM 918109**!** *ex* Herb. R.J. Shuttleworth; [MUB 42266**!**: Haza del Panizo, carretera del Dornajo a Güéjar-Sierra]. 1800-3000 m. Rare.

**Heterocladium dimorphum* (Brid.) Schimp. – Doubtfully present in the area. Casares Gil (1914, 1915) reported this species from the Sierra Nevada but no herbarium specimen has been traced. Casas *et al*. (2006) stated that in the Iberian Penisula it was distributed in the Pyrenees, the north eastern part, and the Sierra Nevada, but its presence in the latter remains unconfirmed.

Homalothecium aureum (Spruce) H. Robinson – **1**, **2**, **4**, **7**, **9**, **11**, **12**, **13**, **15**, **16**, **17**, **18**, **23**, **30**, **36**, **43**, **44**, **49**, **50**, **51**, **55**, **56**, **58**, **71**, **73**, **84**, **112**, **113**, **115**, **136**, **142**, **145**, **146**, **149**, **150**. Colmeiro (1867); Höhnel (1895); Casares Gil (1915); Allorge & Allorge (1946); Koppe (1964); Gil & León (1984); Casas (2006): MUB 15740**!** 897-2450 m. Common.

Homalothecium lutescens (Hedw.) H. Robinson var. ***lutescens*** – Höhnel (1895); Casares Gil (1915). 2900 m. Rare. The report of Allorge & Allorge (1946) has been revised (PC 79700**!**) and reidentified as *Homalothecium sericeum*. This is a common taxon in neighbouring areas of the Sierra Nevada and other parts of the Iberian Peninsula (Casas, 1986; García-Zamora *et al*., 1998); therefore in spite of the age and paucity of the reports from the Sierra Nevada, we accept it for the area.

Homalothecium lutescens var. ***fallax*** H. Philib. *ex* Schimp. – Acón (1981). 1830-2550 m. Very rare.

Homalothecium philippeanum (Spruce) Schimp. – Höhnel (1895). 1500 m. Very rare. Like *Homalothecium lutescens* var. *lutescens*, this is a common species in the Iberian Peninsula and neighbouring areas; we do not consider its presence in the Sierra Nevada as doubtful.

Homalothecium sericeum (Hedw.) Schimp. – **13**, **16**, **18**, **24**, **36**, **37**, **51**, **52**, **59**, **61**, **73**, **84**, **136**, **152**, **157**. Boissier (1839-1845); Colmeiro (1867); Höhnel (1895); Warnstorf (1911): BM 918126**!**; Ade & Koppe (1942); Allorge & Allorge (1946) *sub Homalothecium lutescens*: PC 79700**!**; Zafra & Varo (1975); Martínez Gonzálvez (1983) *in* Gil & Martínez (1985); Gil & León (1984); Guerra (1985). 1053-2520 m. Frequent.

Hygroamblystegium varium (Hedw.) Mönk. subsp. ***varium*** – Casares Gil (1914). 1300 m. Very rare. This species may have been overlooked in the studied area due to identification problems.

Hygrohypnum duriusculum (De Not.) D.W. Jamieson – **42**, **78-a**, **89-a**, **96-b**, **106**. Höhnel (1895); Thériot (1932); Allorge & Richards (1956); Gil García (1976) *in* Gil & Varo (1981); Gil García (1976) *in* Casas (1986); Casas *et al*. (1989); Brugués *et al*. (2002). 2370-3050 m. Frequent.

***Hygrohypnum eugyrium* (Schimp.) Broth. – Excluded from the area. The only mention of this species in the Sierra Nevada is in the unpublished Ph.D. of Gil García (1976) but no herbarium specimen has been traced. It was not included in the revision of the genus *Hygrohypnum* in the Iberian Peninsula by Oliván *et al*. (2007), who considered it to be extinct in the only locality confirmed by them in the north of Spain (Asturias).

Hygrohypnum luridum (Hedw.) Jenn. – **83**. Ade & Koppe (1942); Gil García (1976) *in* Gil & Varo (1981); Brugués *et al*. (2002). 970-2730 m. Rare.

Hygrohypnum molle (Hedw.) Loeske – **32**, **90**, **104-a**. Colmeiro (1867); Höhnel (1895); Casas *et al*. (1989); Casas *et al*. (1992). 1600 m. Rare. VU.

Hygrohypnum ochraceum (Turner *ex* Wilson) Loeske – Gil García (1976) *in* Gil & Varo (1981); Oliván *et al*. (2007). 2730-2900 m. Rare.

Hygrohypnum styriacum (Limpr.) Broth. – **91-b**. Blockeel *et al*. (2006). 3000 m. Very rare.

Hymenoloma crispulum (Hedw.) Ochyra – **90**. Höhnel (1895); Gil García & Varo Alcalá (1973); Zafra & Varo (1975); Brugués *et al*. (2002); Werner *et al*. (2013); [GDA 10082**!**: Laguna de las Yeguas]. 2500-2980 m. Rare.

Hymenoloma mulahaceni (Höhn.) Ochyra – **86**, **93**. Höhnel (1895): FH**!**, lectotype of *Oreoweisia mulahacenii* Höhn.; Werner *et al*. (2013). 3079-3482 m. Rare. Casares Gil (1915) reported this species from Barranco del Infierno but later Casares Gil (1932) changed his mind and reidentified the specimen as *Cynodontium bruntonii*. Unfortunately, it has not been possible to locate this specimen. Based on newly collected specimens Werner *et al*. (*l.c.*) conducted a combined morphological and molecular taxonomic study that resulted in the reistatement of this forgotten species.

Hypnum cupressiforme Hedw. var. ***cupressiforme*** – **13**, **23**, **24**, **34**, **43**, **55**, **61**, **82**, **148**. Höhnel (1895); Zafra & Varo (1975). 1200-3000 m. Frequent.

**Hypnum cupressiforme* var. *filiforme* Brid. – Doubtfully present in the area. No herbarium specimen has been traced for the only published record from the Sierra Nevada (Höhnel, 1895). Because of the disputed taxonomic status of this taxon (Hill *et al*., 2006) and the fact that many authors do not recognize it, its distribution and the accuracy of the reports from the study area are uncertain.

Hypnum cupressiforme var. ***resupinatum*** (Taylor) Schimp. – [GDA 28195**!**: Vereda de la Estrella]. 1200 m. Very rare.

Hypnum cupressiforme var. ***subjulaceum*** Molendo – Höhnel (1895); Warnstorf (1911). 600-1600 m. Rare. The lack of further reports may be the result of the dificulties in identification of the *Hypnum cupressiforme* complex, since many authors do not assign records to infraspecific taxa.

Hypnum revolutum (Mitt.) Lindb. var. ***revolutum*** – Brugués *et al*. (2002). 2980 m. Very rare.

Hypnum revolutum var. ***dolomiticum*** (Milde) Mönk. – Höhnel (1895) *sub Hypnum alcazabae* Höhn. 2800 m. Very rare. The report of Höhnel corresponds to the type specimen of *Hypnum alcazabae*, synonymized by Ando (1976) with *H. revolutum* var. *dolomiticum*.

Imbribryum alpinum (Huds. *ex* With.) N. Pedersen – **31**, **32**, **35**, **36**, **46**, **47**, **54**, **55**, **61**, **66**, **68**, **75**, **78-b**, **79**, **80**, **81**, **86**, **90**, **95**, **101**, **102**, **104-a**, **108**, **111**, **114**, **119**, **128**, **130**, **141**. Bory de Saint-Vincent (1820); Colmeiro (1867); Geheeb (1874); Höhnel (1895); Casares Gil (1915); Ade & Koppe (1942); Allorge & Allorge (1946); Allorge & Richards (1956): PC 25980**!**; Aguilar *et al*. (1972); Gil García & Varo Alcalá (1973); Martínez Gonzálvez (1983) *sub Pohlia annotina*: cruce del Río Pasillo y del Puerto de la Ragua, GDA 13233**!**; Dia (1991); Brugués *et al*. (2002). 991-3126 m. Common.

Imbribryum mildeanum (Jur.) J.R. Spence – Brugués *et al*. (2002); Guerra *et al*. (2010). 2500-3100 m. Rare. VU.

Isopterygiopsis pulchella (Hedw.) Z. Iwats. – **89-c**, **102**, **103**. Zafra & Varo (1975); Brugués *et al*. (2002) *sub Pseudotaxiphyllum elegans*: BCB 5256**!** 2950-3116 m. Rare.

Isothecium alopecuroides (Lam. *ex* Dubois) Isov. – Colmeiro (1867); Ade & Koppe (1942). Rare. No herbarium specimen has been traced for the published records for the Sierra Nevada. In the Iberian Peninsula this species is known from montane areas and high mountains in the northern half of the region, and in Mallorca and some areas in the south (Casas *et al*., 2006); therefore we do not consider its presence in the Sierra Nevada to be doubtful.

Isothecium myosuroides Brid. – **36**. 1763 m. Very rare.

***Kiaeria falcata* (Hedw.) I. Hagen – Excluded from the area. Gil García & Varo Alcalá (1973) reported this species from the Sierra Nevada but it was excluded from the Spanish flora by Brugués & Ruiz (2012) in their revision of the genus.

Kindbergia praelonga (Hedw.) Ochyra – **25**, **32**, **42**, **55**, **89-c**. Colmeiro (1867); Allorge & Allorge (1946); Gil & Varo (1982); Varo & Gil (1982); Martínez Gonzálvez (1983) *in* Gil & Martínez (1985); Brugués *et al*. (2002). 1000-2950 m. Frequent.

Leptobarbula berica (De Not.) Schimp. – **50**. 1720 m. Very rare.

Leptodictyum riparium (Hedw.) Warnst. – Gil & Martínez (1985). 1300-2390 m. Rare.

Lescuraea incurvata (Hedw.) E. Lawton – **28**, **53**, **80**, **86**, **88-a**, **90**, **91-b**, **91-c**, **100-a**, **102**, **104-c**. Boissier (1839-1845); Höhnel (1895); Casares Gil (1915); Zafra & Varo (1975); Brugués *et al*. (2002). 2339-3343 m. Frequent.

Lescuraea patens Lindb. – **75**, **78-b**, **89-b**, **96-b**, **101**, **128**. 2710-3200 m. Rare.

**Lescuraea radicosa* (Mitt.) Mönk. – Doubtfully present in the area. Allorge & Allorge (1946) reported the species from the Sierra Nevada but no herbarium specimen has been traced. Casas *et al*. (2006) stated that in the Iberian Penisula it is distributed in the Pyrenees and the Sierra Nevada, but its presence in the latter remains unconfirmed.

Leskea polycarpa Hedw. – **51**. Gil García (1976): río Seco, GDA 10094**!**; Brugués *et al*. (2002); [GDA 10084**!**: barranco de San Juan]. 2400-3100 m. Rare.

Leucodon sciuroides (Hedw.) Schwägr. – **36**. Geheeb (1874); Höhnel (1895); Stech *et al*. (2011). 1300-2100 m. Rare. The specimen sampled in this work, MUB 18450, was used by Stech *et al*. (2011) for phylogenetic studies in the genus *Leucodon*.

Meesia triquetra (L. *ex* Jolycl.) Ångstr. – Extinct in the area. Colmeiro (1867) reported the species from two localities in the Sierra Nevada. The samples on which these reports are based have been revised and their identification confirmed (MA-Musci 12418**!**, MA-Musci 12534**!**). Nevertheless, the intensivde searche for the species in both of its localities during the sampling carried out for this work (Agua Agrilla de Pórtugos and Dehesa de Camarate) have proved to be fruitless. Sérgio *et al*. (1994) and also Infante & Heras (2001, 2012b) state that the species has not been found since the XIXth century, and so can be considered extinct in this area, as well as in Guadarrama (central Spain). Two populations are extant in Spain (one in the Pyrenees and the other in the Sierra de Gredos) and the IUCN category attributed to Spanish populations is Critically Endangered (Infante & Heras, 2012b).

Microbryum curvicollum (Hedw.) R.H. Zander – **11**. 1305 m. Very rare.

Microbryum davallianum (Sm.) R.H. Zander – Koppe (1964); [GDA 25068**!**: Cañada de Siete Lagunas]. 1320-2800 m. Rare.

Microbryum starkeanum (Hedw.) R.H. Zander – **3**, **4**, **26**, **39**, **121**, **123**, **124**, **131**, **132**, **137**, **138**, **139**, **151**, **158**. Koppe (1964). 480-1639 m. Frequent.

Microeurhynchium pumilum (Wilson) Ignatov & Vanderp. – **154**. [GDA 13269**!**: río Bermejo de Pórtugos]. 1279 m. Rare.

**Mielichhoferia mielichhoferiana* (Funck) Loeske – Doubtfully present in the area. No herbarium specimen has been traced for the published record from the Sierra Nevada (Warnstorf, 1911). Álvaro (2010) was also unable to revise material. Since the substrates at its reported locality in the Sierra Nevada (in the neighborhood of Güéjar-Sierra) have high levels of heavy metals (Delgado Calvo-Flores *et al*., 2001) and this species is associated with soils rich in copper (Hartman, 1969; instead of, Shaw *et al*., 1992; instead of, Frey *et al*., 2006), its presence in the Sierra Nevada is plausible (Álvaro, *l.c.*).

Mnium hornum Hedw. – Martínez Gonzálvez (1983): barranco del Río Hornillo, GDA 13241**!** 1800 m. Very rare.

Mnium marginatum (With) P. Beauv. – **89-c**. Thériot (1932); Brugués *et al*. (2002). 2950-3000 m. Rare.

Myurella julacea (Schwägr.) Schimp. – **91-b**, **118**. Rams *et al*. (2005). 2500-3000 m. Rare.

Neckera menziesii Drumm. – Casas (1975b); Zafra (1982); Casas *et al*. (1985): MUB**!** *ex* MGC 2264. 1500-2000 m. Rare.

Nogopterium gracile (Hedw.) Crosby & W.R. Buck – **84**. Höhnel (1895); Allorge & Allorge (1946): PC 79770**!** 1200-1600 m. Rare.

Oncophorus virens (Hedw.) Brid. – **91-b**, **102**, **106**, **107**. Boissier (1839-1845); Kunze (1846); Schimper (1876); Höhnel (1895); Thériot (1932); Gil García & Varo Alcalá (1973); Viera & Reinoso (1994); Brugués *et al*. (2002). 2500-3100 m. Frequent.

Orthothecium intricatum (Hartm.) Schimp. – Brugués *et al*. (2002) *sub Rhynchostegiella durieui*: BCB 52562**!** 3150 m. Very rare.

Orthotrichum acuminatum H. Philib. – **13**, **17**, **23**, **38**, **55**, **58**, **136**. 1200-1952 m. Rare.

Orthotrichum affine Schrad. *ex* Brid. – **73**. Casares Gil (1914); Ade & Koppe (1942). 1580-1895 m. Rare.

Orthotrichum alpestre Bruch & Schimp. – **51**. Zafra (1982). 2400-2450 m. Rare.

Orthotrichum anomalum Hedw. – **5**, **23**, **34**, **51**, **55**, **61**, **73**, **80**, **113**. Warnstorf (1911). 1000-2400 m. Rare.

Orthotrichum cupulatum Hoffm. *ex* Brid. var. ***cupulatum*** – **44**, **61**, **73**. Boissier (1839-1845); Müller (1854); Colmeiro (1889); Höhnel (1895); Casares Gil (1914) *sub Orthotrichum urnigerum*: MA-Musci 9755**!**, MA-Musci 8437**!**; Ade & Koppe (1942); Allorge & Allorge (1946); Koppe (1964); Casas (1975a); Fuertes (1998). 900-2127 m. Frequent.

Orthotrichum cupulatum var. ***bistratosum*** Schiffner – **83**. [PC 79740**!** *sub Orthotrichum urnigerum* var. *fuscum* Vent.: Peñones de S. Francisco]. 970-2500 m. Rare.

Orthotrichum diaphanum Schrad. *ex* Brid. – **18**, **24**, **25**, **48**, **55**, **58**, **64**, **71**, **73**, **84**, **115**, **120**, **137**, **141**, **146**, **149**, **155**. 1000-1660 m. Frequent.

Orthotrichum ibericum F. Lara & Mazimpaka – Lara (1994). 1100 m. Very rare.

Orthotrichum lyellii Hook. & Taylor – **18**, **38**, **48**, **58**, **115**, **137**, **141**, **146**, **149**, **152**, **155**. 1000-1952 m. Frequent.

Orthotrichum macrocephalum F. Lara, Garilleti & Mazimpaka – **18**, **25**, **55**, **71**, **84**, **120**, **137**, **141**, **149**, **155**. 1000-1500 m. Rare.

***Orthotrichum patens* Bruch *ex* Brid. – Excluded from the area. No herbarium specimen has been traced for the only published record from the Sierra Nevada (Colmeiro, 1867). Nor was it included in the revision of this species in the Iberian Peninsula (Lara *et al*., 2008, 2012), where only two populations in the north were confirmed (Navarra and Asturias provinces).

Orthotrichum pumilum Sw. *ex* anon. – **17**, **18**, **25**, **120**, **137**. 1000-1710 m. Rare.

***Orthotrichum rivulare* Turner – Excluded from the area. The only mention of this species is in the unpublished Ph.D. of Gil García (1976) but no herbarium specimen has been traced. According to Lara *et al*. (2006) the Iberian distribution of the species is restricted to the mountains of the northwestern part.

Orthotrichum rupestre Schleich. *ex* Schwägr. – **13**, **17**, **23**, **24**, **26**, **34**, **35**, **51**, **55**, **58**, **59**, **61**, **73**, **82**, **111**, **115**, **121**, **128**, **141**, **148**, **149**. Boissier (1839-1845); Höhnel (1895); Warnstorf (1911); Casares Gil (1915); Ade & Koppe (1942); Allorge & Allorge (1946); Casas (1975a, 1975b); Zafra & Varo (1975). 1000-2900 m. Common. The taxonomic value of the taxon *O. sturmii* var. *nudum* M. Fleisch. & Warnst., reported from the Sierra Nevada, remains unclear. It seems to fall within the morphological variability of *O. rupestre* (R. Garilleti, pers. comm.).

Orthotrichum schimperi Hammar – **38**, **18**, **64**, **120**, **146**, **149**, **152**. Casares Gil (1914, 1915). 1150-1952 m. Rare.

Orthotrichum speciosum Nees – Höhnel (1895); Casares Gil (1915); Casas (1975a). 1370-2200 m. Rare.

Orthotrichum tenellum Bruch *ex* Brid. – **13**, **15**, **18**, **23**, **55**, **63**, **73**, **83**, **120**, **137**, **141**, **146**. 970-1895 m. Frequent.

***Orthotrichum urnigerum* Myrin – Excluded from the area. See under *Orthotrichum cupulatum* var. *cupulatum* and var. *bistratosum*.

Oxyrrhynchium hians (Hedw.) Loeske – **35**, **36**, **48**, **55**, **83**, **91-a**, **138**, **153**, **154**. Warnstorf (1911); Ade & Koppe (1942); Allorge & Allorge (1946). 544-3143 m. Frequent.

Oxyrrhynchium schleicheri (R. Hedw.) Röll – **23**, **25**, **35**. Brugués *et al*. (2002). 1308-1850 m. Rare.

Oxyrrhynchium speciosum (Brid.) Warnst. – **12**, **23**, **25**, **55**, **62**, **99**, **112**, **154**, **155**. 897-2239 m. Rare.

Oxystegus tenuirostris (Hook. & Taylor) A.J.E. Sm. – **86**, **90**, **154**. Gil García (1976) *in* Guerra & Gil (1981); Brugués *et al*. (2002); Köckinger *et al*. (2010). 1200-3126 m. Rare.

Palustriella commutata (Hedw.) Ochyra – **83**, **84**, **125**, **138**, **141**. Boissier (1839-1845); Kunze (1846); Geheeb (1874); Warnstorf (1911); Casares Gil (1914); Gil García (1976) *in* Gil & Varo (1981, 1982); Martínez Gonzálvez (1983) *in* Gil & Martínez (1985); Gil & Ruiz (1985); Dia (1991); Brugués *et al*. (2002). 544-2800 m. Frequent.

Palustriella decipiens (De Not.) Ochyra – Höhnel (1895); Gil García & Varo Alcalá (1973); Gil García (1976) *in* Gil & Varo (1981): MUB**!** *ex* MGC 2288; Gil & Varo (1982). 2500-2890 m. Rare.

Palustriella falcata (Brid.) Hedenäs – **32**, **42**, **66**, **83**, **89-c**, **91-b**, **91-d**, **102**. Kunze (1846); Schimper (1876); Höhnel (1895); Casares Gil (1915); Thériot (1932); Gil & Varo (1982); Martínez Gonzálvez (1983) *in* Gil & Martínez (1985); Brugués *et al*. (2002); Fuertes *et al*. (2005). 970-3100 m. Frequent.

***Paraleucobryum longifolium* (Hedw.) Loeske – Excluded from the area. No herbarium specimen has been traced for the only published record from the Sierra Nevada (Höhnel, 1895). Heras & Infante (2013) were also unable to revise material. In the Iberian Peninsula it is distributed in the Pyrenees, the Cantabrian range, the northern part of the Iberian and Central Ranges.

Philonotis capillaris Lindb. – **86**, **89-b**, **91-d**, **114**. Allorge & Allorge (1946); Brugués *et al*. (2002); [MA-Musci 12548**!**: Sierra Nevada]. 2830-3126 m. Rare.

Philonotis caespitosa Jur. – **66**, **75**, **91-a**, **101**. Warnstorf (1911); Brugués *et al*. (2002). 1000-3200 m. Rare.

Philonotis calcarea (Bruch & Schimp.) Schimp. – **13**, **83**, **126**, **141**. Allorge & Allorge (1946); Gil & Varo (1981); Gil & Ruiz (1985); Dia (1991). 970-3100 m. Frequent.

Philonotis fontana (Hedw.) Brid. – **25**, **46**, **47**, **61**, **89-b**, **89-c**, **91-a**, **91-b**, **100-b**, **102**, **106**, **111**, **112**, **114**, **119**, **126**, **142**. Bory de Saint-Vincent (1820); Boissier (1839-1845); Colmeiro (1867); Höhnel (1895); Warnstorf (1911); Thériot (1932); Aguilar *et al*. (1972); Gil García & Varo Alcalá (1973); Martínez Gonzálvez (1983) *in* Gil & Martínez (1985); Viera & Reinoso (1994); Brugués *et al*. (2002). 1000-3143 m. Common.

***Philonotis hastata* (Duby) Wijk & Margad. – Excluded from the area. Rams *et al*. (2001) compiled information about this taxon in the area.

Philonotis marchica (Hedw.) Brid. – **138**, **153**, **154**. Martínez Gonzálvez (1983): Río Chico, próximo al río Genil, GDA 13254**!**; Brugués *et al*. (2002). 544-2350 m. Rare.

**Philonotis rigida* Brid. – Doubtfully present in the area. No herbarium specimen has been traced for the only published records from the Sierra Nevada (Colmeiro, 1867). Because of the unreliability of these data (Cortés Latorre, 1950) and the lack of subsequent records, we consider it doubtful.

Philonotis seriata Mitt. – **25**, **32**, **35**, **42**, **53**, **56**, **61**, **65**, **66**, **67**, **74**, **75**, **76**, **78-a**, **78-b**, **81**, **89-a**, **89-b**, **90**, **91-b**, **96-a**, **102**, **104-a**, **106**, **126**, **128**. Höhnel (1895); Casares Gil (1915); Thériot (1932); Ade & Koppe (1942); Allorge & Allorge (1946); Aguilar *et al*. (1972); Gil García & Varo Alcalá (1973); Zafra & Varo (1975); Frahm (1976) *sub Philonotis hastata*; Gil & Varo (1981, 1982); Brugués *et al*. (2002); Casas (2006). 1308-3390 m. Common.

Philonotis tomentella Molendo – **23**, **31**, **47**, **54**, **81**, **86**, **90**, **91-a**, **91-b**, **91-d**, **101**, **102**, **106**, **112**, **114**, **119**, **128**, **135**, **147**. Höhnel (1895); Warnstorf (1911); Brugués *et al*. (2002). 1000-3200 m. Frequent.

Plagiomnium affine (Blandow *ex* Funck) T.J. Kop. – **23**, **32**, **25**. 1530-1980 m. Rare.

Plagiomnium cuspidatum (Hedw.) T.J. Kop. – **155**. Gil García (1976) *in* Casas (1986). 1226-1300 m. Rare.

Plagiomnium elatum (Bruch & Schimp.) T.J. Kop. – **55**, **154**. 1200-2450 m. Rare.

***Plagiomnium medium* (Bruch & Schimp.) T.J. Kop. – Excluded from the area. See *Plagiomnium rostratum*.

Plagiomnium rostratum (Schrad.) T.J. Kop. – **25**, **55**, **32**. Casas (1972); Gil & Varo (1981); Guerra & Gil (1981) *sub Plagiomnium medium*; Varo & Gil (1982); Gil & Martínez (1985); Casas (1986); Gómez-Menor *et al*. (1999) *sub Plagiomnium elatum*: MUB 4264**!**; Fuertes (2012). 1000-2450 m. Frequent.

Plagiomnium undulatum (Hedw.) T.J. Kop. – **13**, **23**, **35**, **55**, **119**. Colmeiro (1867); Warnstorf (1911); Gil García (1976) *in* Gil & Martínez (1985); Gil García (1976) *in* Varo & Gil (1982); Martínez Gonzálvez (1983) *in* Gil & Martínez (1985). 600-2000 m. Frequent.

Plagiothecium denticulatum (Hedw.) Schimp. var. ***denticulatum*** – **75**, **103**. Casas (1986); Brugués *et al*. (2002). 2600-3116 m. Rare.

Plagiothecium nemorale (Mitt.) A. Jaeger – Gil García & Varo Alcalá (1973); Zafra & Varo (1975). 2500 m. Rare.

Plagiothecium succulentum (Wilson) Lindb. – **13**, **32**. Martínez Gonzálvez (1983): barranco del río Hornillo, GDA 13274**!** 1393-1983 m. Rare.

**Plasteurhynchium striatulum* (Spruce) M. Fleisch. – Doubtfully present in the area. The only mention of this species is in the unpublished Ph.D. of Gil García (1976) but no herbarium specimen has been traced. It grows in montane areas in the northern half of the Iberian Peninsula, more rarely in the south and the Balearic Islands (Guerra & Varo, 1981; Casas *et al*., 2006). Its presence in the Sierra Nevada requires confirmation.

Pogonatum aloides (Hedw.) P. Beauv. – **62**. Geheeb (1874); Höhnel (1895); Casas (1975b); Martínez Gonzálvez (1983): Dehesa del Camarate, GDA 13275**!** 1300-2239 m. Rare.

Pogonatum nanum (Hedw.) P. Beauv. – Colmeiro (1867); Casas *et al*. (1992). 1200-1500 m. Rare.

Pohlia andalusica (Höhn.) Broth. – **86**, **87**, **90**, **91-a**, **91-d**, **101**. Höhnel (1895): FH**!** *ex* Herb. Schiffner, type of *Webera andalusica* Höhn.; Brugués *et al*. (2002, 2003). 2750-3366 m. Rare. VU.

Pohlia annotina (Hedw.) Lindb. – **42**, **76**, **92-a**, **96-b**, **110**, **119**. Höhnel (1895). 1974-3150 m. Rare.

***Pohlia atropurpurea* (Wahlenb.) H. Lindb. – Excluded from the area. Geheeb (1874) reported this species from the Sierra Nevada based on material collected by *Fritze*. In his revision of the genus for the Iberian Bryophyte Flora, Guerra (2010a) reports that the collections of *Fritze* at B disappeared during World War II, and he excludes the species from Spain, as no other Spanish reports could be confirmed.

Pohlia bolanderi (Lesq.) Broth. – **53**, **66**, **76**, **78-b**, **86**, **90**, **91-b**, **91-d**, **95**, **96-a**, **98-a**, **100-a**, **100-b**, **100-c**, **101**, **104-a**, **104-c**, **114**. Casares Gil (1913) *sub Webera andalusica* Höhn.: PC 79780**!** *ex* Herb. Dismier; Allorge & Allorge (1946) *sub Webera carinata* Limpr.: PC 79776**!**; Allorge & Richards (1956) *sub Pohlia carinata* (Brid.) Möll.: PC 79777**!**; Zafra & Varo (1975) *sub Pohlia drummondii* var. *carinata* (Boul.) Podp.: GDA 7749**!**; Gil García (1976) *in* Casas (1997) *sub Pohlia andalusica*: MA-Musci 18344**!** *ex* IBA 1276; Rams *et al*. (2004); [GDA 29034**!**: barranco del Guarnón]. 2300-3250 m. Frequent. VU. Guerra (2010a) treated the taxon present in the Sierra Nevada as *P. bolanderi* var. *seriata* A.J. Shaw. However, Shaw (2009) stated that this taxon has no taxonomic value.

Pohlia camptotrachela (Renauld & Cardot) Broth. – **61**, **62**, **104-b**. Guerra (2010a). 2127-3150 m. Rare.

Pohlia cruda (Hedw.) Lindb. – **17**, **23**, **28**, **31**, **32**, **33**, **36**, **37**, **43**, **51**, **59**, **61**, **62**, **66**, **75**, **76**, **78-b**, **81**, **82**, **86**, **88-a**, **89-c**, **90**, **91-a**, **91-c**, **91-d**, **93**, **96-b**, **96-c**, **98-a**, **100-a**, **100-c**, **101**, **103**, **104-c**, **108**, **111**, **118**, **119**, **128**, **135**, **136**, **148**. Höhnel (1895); Casares Gil (1915); Gil García (1976): Cañada de Siete Lagunas, GDA 7747**!**; Martínez Gonzálvez (1983): río Chico, GDA 13232**!**; Gil & Martínez (1985); Casas (1986): GDA 7748**!**; Brugués *et al*. (2002). 1400-3475 m. Very common.

**Pohlia drummondii* (Müll. Hal.) A.L. Andrews – Doubtfully present in the area. Guerra (2010b) excluded the species in the Sierra Nevada. It was reported by Brugués *et al.* (2002) but the specimen was missidentified. There are two reports from the area by Höhnel (1895) as *Webera commutata* Schimp., from Cerro de Caballo and Loma de Maitena, but until now no herbarium specimen has been traced. Previous authors working in the area have considered these reports as belonging to *Pohlia drummondii*, following the criterium of Index Muscorum (Wijk *et al.*, 1967, 1969) and database of Tropicos at MOBOT, where *Webera commutata* Schimp. is considered the basionym of *Pohlia commutata* (Schimp.) Lindb., and both names were synonymized by Andrews (1933-1940) with *P. drummondii*. Nevertheless in the taxonomical studies of Shaw (1981, 2009) about the genus *Pohlia*, this author considers *Webera commutata* and *Pohlia commutata* to be two different taxa, the first one, synonymous of *P. filum* (Schimp.) Martensson and the second one of *P. drummondii*. Until the specimens of Höhnel are revised it is not possible to know to which *Pohlia* species belong these specimens.

Pohlia elongata Hedw. var. ***elongata*** – **76**. Höhnel (1895); Casas (1975a) *sub P. longicollis*: GDA 7750**!** 2900-3000 m. Rare.

**Pohlia elongata* var. *greenii* (Brid.) A.J. Shaw – Doubtfully present in the area. The only report of its presence in the Sierra Nevada is by Höhnel (1895). Because of the morphological variability of *Pohlia elongata* (Smith, 2004) and the fact that many authors do not recognize the infraspecific taxa, its

distribution and the accuracy of reports from the the study area are uncertain.

Pohlia lescuriana (Sull.) Ochi – **61**. 2127 m. Very rare. VU.

**Pohlia longicolla* (Hedw.) Lindb. – Doubtfully present in the area. No herbarium specimen has been traced for the published records for the Sierra Nevada (Gil García & Varo Alcalá, 1973; Zafra & Varo, 1975). Guerra (2010a) considered that in the Iberian Peninsula the species is only present in the Pyrenees and did not mention these records.

Pohlia ludwigii* (Spreng. *ex* Schwägr.) Broth. – Excluded from the area. Thériot (1932) described *Bryum perremotifolium* Thér. from plants collected by Maire in the Sierra Nevada (Laguna de las Yeguas). Loeske (1932-1933) synonymized this name with *Mniobryum ludwigii* (Spreng. *ex* Schwägr.) Loeske. After study of the original material we reidentified it as *Bryum schleicheri*. Therefore we propose a formal synonymization and designate a lectotype as follows: *Bryum perremotifolium* Thér. *in* Cavanillesia 5: 38. 1 f. 3. 1932. Type: [Spain] Bords de la Laguna de las Yeguas, 19-VII-1925 *Maire* (lectotype, designated here, PC79697**!**) = ***Bryum schleicheri DC. *in* Lam. & DC. *in* Fl. Franç., éd. 3, 6: 226.1815 ***syn. nov***.

Pohlia melanodon (Brid.) A.J. Shaw – **13**, **25**, **123**, **141**, **146**, **152**, **155**. Colmeiro (1867); Höhnel (1895); Casares Gil (1915); Allorge & Allorge (1946): PC 79731**!**; Zafra & Varo (1975); Martínez Gonzálvez (1983): río Chico, GDA 13240**!** 630-1650 m. Frequent.

Pohlia nutans (Hedw.) Lindb. – **42**, **96-b**. [GDA 28188**!**: Laguna Larga]. 2714-3020 m. Rare.

**Pohlia obtusifolia* (Vill. *ex* Brid.) L.F. Koch – Doubtfully present in the area. Ade & Koppe (1942) reported this species from the Sierra Nevada *sub Webera cucullata* (Schwägr.) Schimp. but no herbarium specimen has been traced. Guerra (2010a) and Guerra & Martínez-Abaigar (2012) were not aware of this report and considered the species to be present in the Iberian Peninsula only in La Rioja and doubtfully in the Pyrenees.

Pohlia wahlenbergii (F. Weber & D. Mohr) A.L. Andrews var. ***wahlenbergii*** – **39**, **65**, **74**, **84**, **89-c**, **91-b**, **91-d**, **106**, **125**, **126**, **154**. Höhnel (1895); Allorge & Allorge (1946); Martínez Gonzálvez (1983): barranco de Poqueira, GDA 13230**!**; Martínez Gonzálvez (1983) *in* Gil & Martínez (1985); Dia (1991); Casas (2006): MUB 15768**!**; Guerra (2010a). 890-3100 m. Frequent.

Pohlia wahlenbergii var. ***glacialis*** (Brid.) E.F. Warb. – Höhnel (1895); Allorge & Richards (1956): PC 79732**!** 2880 m. Rare.

Polytrichastrum alpinum (Hedw.) G.L. Sm. – Boissier (1839-1845); Allorge & Richards (1956): PC 79762**!** 2600-3300 m. Rare.

***Polytrichastrum sexangulare* (Brid.) G.L. Sm. – Excluded from the area. Casares Gil (1915) and Brugués *et al*. (1982) explained the historical confusion over this taxon in the Sierra Nevada.

Polytrichum commune Hedw. – Gil García & Varo Alcalá (1973): GDA 10898**!**; [PC 79763**!**: Laguna de las Yeguas]. 2500-2900 m. Rare.

Polytrichum juniperinum Hedw. – **31**, **35**, **42**, **50**, **53**, **59**, **66**, **67**, **75**, **76**, **78-b**, **89-b**, **90**, **91-b**, **91-d**, **95**, **96-a**, **98-a**, **100-b**, **101**, **102**, **104-a**, **106**, **107**, **114**, **128**, **148**. Boissier (1839-1845); Colmeiro (1867); Schimper (1876): BM 918121**!** *ex* Herb. Hampe; Höhnel (1895); Warnstorf (1911); Casares Gil (1915); Thériot (1932): PC 79766**!**; Allorge & Richards (1956): PC 79765**!**; Gil García & Varo Alcalá (1973); Casas (1975a): GDA 10909**!**; Zafra & Varo

(1975); Brugués *et al*. (1982): BM 918122**!** *ex* Herb. Hampe; Viera & Reinoso (1994); Brugués *et al*. (2002). 1000-3115 m. Common.

Polytrichum piliferum Hedw. – **86**, **91-b**, **96-a**, **101**, **102**. Zafra & Varo (1975); Brugués *et al*. (2002). 2898-3126 m. Rare.

***Polytrichum strictum* Menzies *ex* Brid. – Excluded from the area. Casares Gil (1915) and Brugués *et al*. (1982) explained the historical confusion over this taxon in the Sierra Nevada.

Pottiopsis caespitosa (Brid.) Blockeel & A.J.E. Sm. – **151**. 600 m. Very rare.

Pseudocrossidium hornschuchianaum (Schultz) R.H. Zander – **3**, **4**, **6**, **7**, **10**, **11**, **12**, **18**, **27**, **36**, **37**, **44**, **49**, **55**, **70**, **71**, **72**, **73**, **116**, **123**, **124**, **129**, **131**, **133**, **134**, **138**, **139**, **140**, **141**, **142**, **145**, **150**. Warnstorf (1911). 445-1910 m. Common.

Pseudocrossidium revolutum (Brid.) R.H. Zander – Höhnel (1895); Allorge & Richards (1956); Koppe (1964). 1000-1660 m. Rare. This species is widespread in the Iberian Peninsula (Casas *et al*., 2006) and was reported in the vicinity of the Sierra Nevada by García-Zamora *et al*. (1998).

Pseudoleskeella catenulata (Brid. *ex* Schrad.) Kindb. – **88-b**. 3250 m. Very rare.

Pseudoleskeella rupestris (Berggr.) Hedenäs & L. Söderstr. – **28**. 2418 m. Very rare.

Pseudoleskeella tectorum (Funck *ex* Brid.) Kindb. *ex* Broth. – **69**, **87**. 2326-3366 m. Rare.

***Pseudorhynchostegiella duriaei* (Mont.) P. Allorge & Perss. – Excluded from the area. See *Orthothecium intricatum*.

Pseudotaxiphyllum elegans (Brid.) Z. Iwats. – **61**. 2127 m. Very rare. The report of Brugués *et al*. (2002) has been reidentified as *Isopterygiopsis pulchella*.

Pseudotaxiphyllum laetevirens (Dixon & Luisier *ex* F. Koppe & Düll) Hedenäs – **51**. Rams *et al*. (2014 in press). 2400 m. Very rare. VU.

Pterigynandrum filiforme Hedw. – **51**, **61**, **69**, **128**. Allorge (1937); Ade & Koppe (1942); Allorge & Allorge (1946); Zafra & Varo (1975). 1754-2707 m. Rare.

Pterygoneurum ovatum (Hedw.) Dixon – **19**, **124**, **132**, **138**. Casas (1975a): GDA 10954**!**; Guerra *et al*. (1995). 544-2000 m. Rare.

Ptychostomum archangelicum (Bruch & Schimp.) J.R. Spence – **91-b**. Boissier (1839-1845); Gil García & Varo Alcalá (1973); Brugués *et al*. (2002). 2000-3000 m. Rare.

Ptychostomum boreale (F. Weber & D. Mohr) Ochyra & Bednarek-Ochyra – **66**, **89-c**, **91-a**, **106**, **125**, **126**. Boissier (1839-1845); Kunze (1846); Höhnel (1895); Casares Gil (1914, 1915); Thériot (1932); Ade & Koppe (1942); Gil García & Varo Alcalá (1973); Zafra & Varo (1975); Martínez Gonzálvez (1983) *in* Gil & Martínez (1985); Viera & Reinoso (1994); Brugués *et al*. (2002). 1300-3285 m. Frequent.

Ptychostomum capillare (Hedw.) Holyoak & N. Pedersen – **4**, **9**, **10**, **11**, **12**, **13**, **15**, **16**, **18**, **21**, **23**, **24**, **26**, **29**, **32**, **34**, **36**, **44**, **46**, **48**, **49**, **51**, **53**, **54**, **55**, **56**, **57**, **59**, **61**, **65**, **67**, **70**, **71**, **73**, **79**, **81**, **84**, **90**, **91-a**, **91-b**, **94**, **96-a**, **100-a**, **101**, **104-a**, **112**, **113**, **114**, **117**, **119**, **123**, **132**, **134**, **135**, **136**, **140**, **146**, **150**, **152**, **153**, **154**, **155**. Geheeb (1874); Höhnel (1895); Warnstorf (1911); Casares Gil (1914, 1915); Allorge & Allorge (1946): PC 79691**!**; Aguilar *et al*. (1972); Gil García & Varo Alcalá (1973); Zafra & Varo (1975); Gil & León (1984); Gil & Martínez (1985); Casas (1986); Brugués *et al*. (2002). 445-3285 m. Very common.

**Ptychostomum cernuum* (Hedw.) Hornsch. – Doubtfully present in the area. The only report of this species in the Sierra Nevada is that of Schimper (1876). Although Guerra *et al.* (2010) do not mention this species in the

Sierra Nevada, in our opinion this needs to be confirmed by a study of Schimper's specimens. In the Iberian Peninsula there are confirmed records from northern Spain (Guerra *et al.*, *l.c.*).

Ptychostomum compactum Hornsch. var. ***compactum*** – **53**. Schimper (1876); Höhnel (1895). 2449 m. Rare.

**Ptychostomum creberrimum* (Taylor) J.R. Spence & H.P. Ramsay – Doubtfully present in the area. It has been reported from other sites in Granada province by Guerra *et al.* (2010) but the only report of this species in Sierra Nevada, by Dia (1991), still needs to be confirmed.

Ptychostomum donianum (Grev.) Holyoak & N. Pedersen – **13**, **23**, **68**, **81**, **92-a**, **112**. Höhnel (1895); Casares Gil (1915); Ade & Koppe (1942); Allorge & Allorge (1946). 1278-3150 m. Rare.

Ptychostomum imbricatulum (Müll. Hal.) Holyoak & N. Pedersen – **3**, **6**, **21**, **31**, **32**, **33**, **39**, **45**, **52**, **53**, **56**, **60**, **65**, **66**, **67**, **72**, **76**, **77**, **78-b**, **85**, **86**, **87**, **89-c**, **91-a**, **91-b**, **91-c**, **91-d**, **94**, **95**, **96-a**, **96-b**, **96-c**, **98-a**, **98-c**, **100-b**, **100-c**, **101**, **102**, **103**, **104-b**, **104-c**, **105**, **106**, **110**, **114**, **126**, **132**, **139**, **140**, **142**, **148**, **151**, **152**. Schimper (1860); Colmeiro (1867); Höhnel (1895); Warnstorf (1911); Thériot (1932): type of *Brachymenium commutatum* var. *hispanicum* Thér., PC 79678**!**; Ade & Koppe (1942); Allorge & Allorge (1946); Gil & León (1984); Gil & Martínez (1985); Brugués *et al*. (2002) *sub Brachymenium commutatum*: BCB 52429**!**, BCB 52432**!**; Brugués *et al.* (2003) *sub Brachymenium commutatum*: BCB 52434**!**, BCB 52435**!** 445-3475 m. Very common.

Ptychostomum moravicum (Podp.) Ros & Mazimpaka – **35**, **47**, **104-c**. Höhnel (1895); Zafra & Varo (1975). 1750-3250 m. Rare.

Ptychostomum pallens (Sw.) J.R. Spence – Boissier (1839-1845); Höhnel (1895); Ade & Koppe (1942); Brugués *et al.* (2002). 1600-3100 m. Rare.

Ptychostomum pseudotriquetrum (Hedw.) J.R. Spence & H.P. Ramsay var. ***pseudotriquetrum*** – **1**, **23**, **25**, **32**, **35**, **42**, **46**, **47**, **54**, **55**, **56**, **65**, **66**, **67**, **75**, **78-b**, **81**, **83**, **86**, **88-b**, **89-b**, **89-c**, **90**, **91-b**, **96-a**, **102**, **104-a**, **104-c**, **106**, **107**, **108**, **109**, **111**, **112**, **114**, **125**, **126**, **128**, **135**, **136**, **147**, **148**, **154**. Boissier (1839-1845); Kunze (1846): BM 918125**!** *ex* Herb. Hampe, Höhnel (1895); Warnstorf (1911): BM 918124**!**; Ade & Koppe (1942); Allorge & Allorge (1946); Gil García (1976) *in* Varo & Gil (1982); Gil & Varo (1982); Varo & Gil (1982); Martínez Gonzálvez (1983) *in* Gil & Martínez (1985); Gil & Martínez (1985); Casas (1986); Viera & Reinoso (1994); Brugués *et al.* (2002). 600-3250 m. Very common.

Ptychostomum pseudotriquetrum var. ***bimum*** (Schreb.) Holyoak & N. Pedersen – Colmeiro (1867); Höhnel (1895); [BM 918103**!** *ex* Herb. R.J. Shuttleworth: en el Picacho]. 1300-2500 m. Rare.

Ptychostomum torquescens (Bruch & Schimp.) Ros & Mazimpaka – **12**, **39**, **48**, **49**, **91-a**, **91-b**, **94**, **111**, **130**, **144**. Ade & Koppe (1942); Casas (1986). 410-3143 m. Frequent.

Racomitrium aciculare (Hedw.) Brid. – Colmeiro (1867, 1889); Gil García & Varo Alcalá (1973); Casas *et al*. (1992). 2500-2600 m. Rare. *R. aciculare* var. *angustifolium* Höhn. was described by Höhnel (1895) upon plants collected in the Sierra Nevada. As the type specimen has not been found (Bednarek-Ochyra, 2006), its identity remains unresolved.

**Racomitrium aquaticum* (Brid. *ex* Schrad.) Brid. – Doubtfully present in the area. Höhnel (1895) and Casares Gil (1915) reported the species from the Sierra Nevada but no herbarium specimen has been traced. Casas *et al.*

(2006) included the Sierra Nevada in the distribution area of the species. Its presence still needs to be confirmed.

**Racomitrium fasciculare* (Hedw.) Brid. – Doubtfully present in the area. No herbarium specimen has been traced for the only published record from the Sierra Nevada (Höhnel, 1895). Casas *et al*. (2006) included the Sierra Nevada in the distribution area of the species. Its presence still needs to be confirmed.

Racomitrium macounii Kindb. subsp. ***macounii*** – **75**. Casares Gil (1914); Gil García & Varo Alcalá (1973) *sub Racomitrium heterostichum* subsp. *sudeticum* (Funck) Dixon. 2500 m. Rare. VU.

Racomitrium sudeticum (Funck) Bruch & Schimp. – Casas *et al*. (1992). 2800 m. Very rare.

***Rhizomnium magnifolium* (Horik.) T.J. Kop. – Excluded from the area. The only mention of this species in the Sierra Nevada is in the unpublished Ph.D. of Gil García (1976) *sub Mnium punctatum* fo. *elatum* (Schimp.) Mönk. but no herbarium specimen has been traced. In the revision of the Mniaceae in the Iberian Bryophyte Flora, Fuertes (2010) only confirmed its presence in the mountain systems of the northern part of the Iberian Peninsula. According to Koponen (1980) it is usually mistaken for *Rhizomnium punctatum* and *R. pseudopunctatum*.

***Rhizomnium pseudopunctatum* (Bruch & Schimp.) T.J. Kop. – Excluded from the area. This species has been reported from the Sierra Nevada in several papers (Gil García & Varo Alcalá, 1973; Casas, 1975; Gil & Varo, 1982; Varo & Gil, 1982). Fuertes & Acón (2000) found three specimens from the Sierra Nevada, but revised them as *Rhizomnium punctatum*. The species has been rejected from the Iberian Bryophyte Flora (Fuertes & Acón, 2000; Fuertes *et al*., 2001).

Rhizomnium punctatum (Hedw.) T.J. Kop. – **23**, **25**, **32**, **35**, **46**, **47**, **54**, **55**, **74**, **90**, **98-b**, **102**, **106**, **109**, **119**, **128**. Boissier (1839-1845); Colmeiro (1867); Höhnel (1895); Casares Gil (1915); Thériot (1932); Martínez Gonzálvez (1983) *in* Gil & Martínez (1985); Casas (1986); Dia (1991); Fuertes & Acón (2000); Brugués *et al*. (2002). 1200-3044 m. Common. The identity of the report by Bory de Saint-Vincent (1820) *sub Mnium serpyllifolium* L. remains unclear. Although this illegitime name (*Mnium serpyllifolium* L. *ex* J. St. Hil. *nom. illeg. incl. spec. prior*.) is a synonymous of *Rhizomnium punctatum* (Koponen, 1980), Cortés Latorre (1956) studied the herbarium sheet and observed that it included at least *R. punctatum* and *Plagiomnium undulatum*. We have not been able to locate this herbarium sheet in any of the herbaria consulted, and consequently the report of Bory de Saint-Vincent in the Sierra Nevada still cannot be assigned to any species.

**Rhynchostegiella curviseta* (Brid.) Limpr. – Doubtfully present in the area. The only mention of this species is in the unpublished Ph.D. of Gil García (1976) but no herbarium specimen has been traced. Although it is widespread in the northern half of the Iberian Peninsula and the Balearic Islands and rare in the south (Casas *et al*., 2006) its presence in the Sierra Nevada still awaits confirmation.

Rhynchostegiella tenella (Dicks.) Limpr. – **12**, **154**. Ade & Koppe (1942). 897-1279 m. Rare.

**Rhynchostegiella teneriffae* (Mont.) Dirkse & Bouman – Doubtfully present in the area. The only mention of this species is in the unpublished Ph.D. of Gil García (1976) but no herbarium specimen has been traced. It is

widely distributed in the northern and northeastern parts of the Iberian Peninsula, rare in the south and the Balearic Islands (Casas *et al*., 2006).

Rhynchostegium confertum (Dicks.) Schimp. – Höhnel (1895). 2000 m. Very rare. It is widespread in the Iberian Peninsula (Casas *et al*., 2006) and it has been reported in the vicinity of the Sierra Nevada by García-Zamora *et al*. (1998).

Rhynchostegium megapolitanum (Blandow *ex* F. Weber & D. Mohr) Schimp. – **4**, **12**, **15**, **18**, **29**, **49**, **50**, **55**, **57**, **113**. Warnstorf (1911); Allorge & Allorge (1946); Koppe (1964); Esteve *et al*. (1975). 861-1800 m. Frequent.

Rhynchostegium riparioides (Hedw.) Cardot – **12**, **13**, **23**, **25**, **32**, **35**, **39**, **46**, **50**, **54**, **55**, **-79**, **83**, **84**, **111**, **130**, **152**, **153**. Boissier (1839-1845); Warnstorf (1911); Ade & Koppe (1942); Allorge & Allorge (1946); Casas (1972); Gil García (1976) *in* Varo & Gil (1982); Gil & Varo (1981); Varo & Gil (1982); Gil & Martínez (1985); Gil & Ruiz (1985); Dia (1991). 600-2950 m. Common.

***Rhytidiadelphus squarrosus* (Hedw.) Warnst. – Excluded from the area. No herbarium specimen has been traced for the only published record from the Sierra Nevada (Colmeiro, 1867), collected by *Clemente* in Lagunillas. Because of the unreliability of the original publication (Cortés Latorre, 1950), the lack of any sunsequent reports, and the apparent restriction of the species in the Iberian Peninsula to montane areas and high mountains in the north (Casas *et al*., 2006), we reject the record from the Sierra Nevada area.

Sanionia uncinata (Hedw.) Loeske – **53**, **66**, **75**, **76**, **91-b**, **100-b**, **102**, **106**. Höhnel (1895); Thériot (1932); Gil García (1976) *in* Fuertes *et al*. (2004): GDA 9509**!**; Brugués *et al*. (2002). 2200-3044 m. Rare.

Sarmentypnum exannulatum (Schimp.) Hedenäs – **66**, **75**, **78-b**, **90**, **96-a**, **102**, **106**, **107**, **114**. Höhnel (1895); Casares Gil (1915); Thériot (1932); Allorge & Richards (1956); Gil García & Varo Alcalá (1973); Gil & Varo (1982); Brugués *et al*. (2002). 2300-3050 m. Frequent.

Schistidium agassizii Sull. & Lesq. – **67**, **102**. Höhnel (1895); Casares Gil (1915); Brugués *et al*. (2002). 2850-2880 m. Rare.

Schistidium apocarpum (Hedw.) Bruch & Schimp. – Colmeiro (1867); Höhnel (1895); Warnstorf (1911); Casares Gil (1915); Ade & Koppe (1942); Casas (1975a). 1600-2900 m. Rare. All these reports were published before the taxonomic revision of Blom (1996), so they should be revised in order to establish to which of the currently accepted species they correspond.

**Schistidium atrofuscum* (Schimp.) Limpr. – Doubtfully present in the area. The only report from the Sierra Nevada is that of Höhnel (1895). It grows in montane areas of the Iberian Peninsula (Casas *et al*., 2006).

Schistidium confertum (Funck) Bruch & Schimp. – **36**, **47**, **51**, **73**, **80**, **101**. Colmeiro (1867); Höhnel (1895); Warnstorf (1911); Zafra & Varo (1975). 1744-3100 m. Rare.

Schistidium crassipilum H.H. Blom – **50**. 1600-1720 m. Very rare.

Schistidium flaccidum (De Not.) Ochyra – **5**, **23**, **24**, **26**, **32**, **33**, **34**, **36**, **37**, **51**, **61**, **74**, **98-b**, **108**, **111**, **112**, **119**, **126**, **135**, **136**, **148**, **150**, **152**, **157**. Höhnel (1895); Zafra & Varo (1975). 1190-3010 m. Frequent.

Schistidium helveticum (Schkuhr) Deguchi – **30**, **55**, **60**. 1200-2680 m. Rare.

Schistidium occidentale (E. Lawton) S.P. Churchill – **101**, **114**. Gil García (1976) *in* Gil García & Guerra Montes (1981) *sub Andreaea rothii* subsp. *frigida*: GDA 9281**!**; Casas (1986) *sub Andreaea rothii*: GDA 7593**!**; Casas *et al*. (2001); Brugués *et al*. (2002). 2800-3200 m. Rare. CR.

Schistidium rivulare (Brid.) Podp. – **89-b**, **90**, **91-b**, **101**, **106**. Casares Gil (1914); Ade & Koppe (1942); Allorge & Richards (1956); Gil García & Varo Alcalá (1973); Gil García (1976) *sub Cinclidotus fontinaloides*: Campos de Otero, GDA 10933**!**; Gil & Varo (1981); Casas (1986) *sub Cinclidotus fontinaloides*: GDA 7921**!**; Brugués *et al*. (2002). 1600-3200 m. Frequent.

Sciuro-hypnum glaciale (Schimp.) Ignatov & Huttunen – **53**, **86**, **91-a**, **91-b**. Gil García & Varo Alcalá (1973); Zafra & Varo (1975). 2499-3158 m. Rare. VU.

Sciuro-hypnum populeum (Hedw.) Ignatov & Huttunen – Boissier (1839-1845); Zafra & Varo (1975). 1090-1950 m. Rare.

Scleropodium touretii (Brid.) L.F. Koch – **4**, **9**, **12**, **13**, **16**, **43**, **51**, **55**, **84**, **112**, **136**, **145**, **149**, **150**, **154**. Höhnel (1895); Warnstorf (1911); Casares Gil (1915); Allorge & Allorge (1946): PC 79772**!**; Martínez Gonzálvez (1983): barranco del río Válor, GDA 13272**!** 925-2450 m. Frequent.

Scorpidium cossonii (Schimp.) Hedenäs – Brugués *et al*. (2002). 2980 m. Very rare. This report was not mentioned in the revision of the genus *Scorpidium* in the Iberian Peninsula by Fuertes *et al*. (2005), or in the treatment for the Iberian Bryophyte Flora (Oliván & Fuertes, 2014). Nevertheless, its identity is not doubtful.

Scorpiurium circinatum (Bruch) M. Fleisch. & Loeske – [GDA 22430**!**: Los Cahorros]. 1600 m. Very rare.

Seligeria acutifolia Lindb. – **84**. 1200 m. Very rare.

Sphagnum auriculatum Schimp. – **66**. 2450 m. Very rare.

Sphagnum subnitens Russow & Warnst. – Aguilar *et al*. (1972); Gil García & Varo Alcalá (1973); Casas (1975b); Fuertes & Munín (1994). 2500-2700 m. Rare.

Sphagnum subsecundum Nees – Aguilar *et al*. (1972); Gil García & Varo Alcalá (1973); Casas (1975b). 2500-2700 m. Rare.

Sphagnum teres (Schimp.) Ångstr. – **66**. Casares Gil (1914); Aguilar *et al*. (1972); Gil García & Varo Alcalá (1973); Casas (1975b). 2450-2600 m. Rare.

Straminergon stramineum (Dicks. *ex* Brid.) Hedenäs – **66**. Allorge & Allorge (1946); Gil García & Varo Alcalá (1973); Oliván *et al*. (2005). 2225-2500 m. Rare.

Streblotrichum convolutum (Hedw.) P. Beauv. – Höhnel (1895); Martínez Gonzálvez (1983): cruce del Río Pasillo y del Puerto de la Ragua, GDA 13213**!** 900-1700 m. Rare. *Barbula* sect. *Convolutae*, typified by *B. convoluta* Hedw., has traditionally been recognized to include species of *Barbula s.l.* However Kučera *et al*. (2013) demonstrated from molecular data that it should be segregated at generic level under the name *Streblotrichum* P. Beauv.

Syntrichia calcicola J.J. Amann – **9**, **12**. 933-1050 m. Rare.

Syntrichia caninervis Mitt. – **16**, **72**, **134**. Koppe (1964). 1053-1945 m. Rare.

Syntrichia laevipila Brid. – **12**, **13**, **73**, **84**, **146**. 897-1580 m. Rare.

Syntrichia minor (Bizot) M.T. Gallego, J. Guerra, M.J. Cano, Ros & Sánchez-Moya – **148**. 1850 m. Very rare.

Syntrichia montana Nees var. ***montana*** – **9**, **18**, **45**, **47**, **49**, **50**, **55**, **70**, **82**, **97**, **104-c**, **128**, **149**, **154**, **157**. Höhnel (1895); Warnstorf (1911); Casares Gil (1915); Koppe (1964); Casas (1972). 980-3250 m. Frequent.

Syntrichia montana var. ***calva*** (Durieu & Sagot *ex* Bruch & Schimp.) J.J. Amann – Gallego (2006). 800 m. Very rare.

Syntrichia norvegica F. Weber – **31**, **53**, **66**, **75**, **78-b**, **88-a**, **90**, **92-a**, **96-b**, **98-a**, **101**, **102**, **103**. Casares Gil (1914); Zafra & Varo (1975): GDA 10982**!**; Brugués *et al*. (2002); Gallego (2006). 2450-3227 m. Frequent.

Syntrichia princeps (De Not.) Mitt. – **1**, **2**, **4**, **12**, **13**, **15**, **16**, **17**, **18**, **19**, **23**, **24**, **28**, **32**, **49**, **56**, **58**, **71**, **73**, **103**, **141**, **146**, **153**. Schimper (1876). 950-3116 m. Frequent.

Syntrichia ruralis (Hedw.) F. Weber & D. Mohr – **1**, **2**, **5**, **6**, **7**, **10**, **11**, **13**, **15**, **18**, **19**, **23**, **24**, **25**, **26**, **27**, **28**, **30**, **31**, **32**, **33**, **36**, **37**, **38**, **40**, **41**, **46**, **47**, **49**, **50**, **51**, **53**, **54**, **55**, **56**, **59**, **60**, **61**, **65**, **66**, **69**, **71**, **73**, **74**, **77**, **78-b**, **80**, **82**, **85**, **87**, **88-a**, **88-b**, **91-c**, **91-d**, **94**, **96-c**, **98-c**, **100-a**, **104-b**, **105**, **108**, **111**, **118**, **119**, **121**, **126**, **127**, **128**, **133**, **135**, **136**, **142**, **143**, **148**, **150**, **153**. Boissier (1839-1845); Höhnel (1895); Warnstorf (1911); Ade & Koppe (1942); Allorge & Allorge (1946); Cortés Latorre (1951); Casas (1975b); Zafra & Varo (1975); Brugués *et al*. (2002). 1000-3475 m. Very common.

Syntrichia subpapillosissima (Bizot & R.B. Pierrot *ex* W.A. Kramer) M.T. Gallego & J. Guerra – **19**, **43**, **47**, **55**, **94**. Gallego (2006). 1200-3060 m. Rare.

Syntrichia virescens (De Not.) Ochyra – **13**, **15**, **44**, **46**, **61**, **73**, **86**, **93**, **104-c**. 1162-3158 m. Rare.

***Tetraphis pellucida* Hedw. – Excluded from the area. No herbarium specimen has been traced for the only published records from the Sierra Nevada (Colmeiro, 1867), collected by *Clemente* in Pórtugos and Trevélez. Neither could Cros (2007) revise them. Moreover, intense searches for the species in both of its localities during the sampling carried out for this work have proved to be fruitless. The poor reliability of the original publication is also relevant (Cortés Latorre, 1950).

Thamnobryum alopecurum (Hedw.) Gangulee var. ***alopecurum*** – **154**. Zafra & Varo (1975); Martínez Gonzálvez (1983): río Laroles, GDA 13258**!**; Gil & Martínez (1985). 1279-2200 m. Rare.

Thamnobryum alopecurum var. ***maderense*** (Kindb.) M. Stech, Ros & O. Werner – Casas (1986) *sub Thamnobryum alopecurum*: GDA 11147**!** 2550 m. Very rare.

Timmia bavarica Hessl. – **89-c**. [GDA 28205**!**: Cerro de Los Machos.] 2950-3200 m. Rare.

Timmiella anomala (Bruch & Schimp.) Limpr. – Warnstorf (1911): B 54021**!** *ex* Herb. Warnstorf; Casas (1986); Soria *et al*. (2006): LISU 194664**!** 1000-2000 m. Rare. CR.

Timmiella barbuloides (Brid.) Mönk. – Warnstorf (1911); Casas (1972); [MUB 42269**!**: junto a carretera A-395 frente a Cenes de la Vega]. 600-1600 m. Rare.

Tortella alpicola Dixon – **97**, **104-c**. Rams *et al*. (2006). 3070-3150 m. Rare. EN.

Tortella flavovirens (Bruch) Broth. – **3**. 1198 m. Very rare.

Tortella fragilis (Hook. & Wilson) Limpr. – **91-b**, **102**, **107**. Gil García & Varo Alcalá (1973). 2500-3044 m. Rare.

Tortella humilis (Hedw.) Jenn. – **13**, **49**, **113**. Schimper (1860); Höhnel (1895); Warnstorf (1911); Gil & León (1984). 1360-2000 m. Rare.

Tortella inclinata (R. Hedw.) Limpr. – Koppe (1964); [GDA 22436**!**: El Dornajo]. 980-2000 m. Rare.

Tortella nitida (Lindb.) Broth. – **12**. Koppe (1964); [GDA 24803**!**: Los Cahorros]. 950-1600 m. Rare.

Tortella squarrosa (Brid.) Limpr. – **1**, **2**, **4**, **5**, **6**, **7**, **9**, **10**, **11**, **12**, **16**, **18**, **24**, **27**, **44**, **58**, **71**, **84**, **113**, **117**, **145**, **146**, **157**. Höhnel (1895); Allorge & Allorge (1946); Koppe (1964); Zafra & Varo (1975). 795-2000 m. Common.

Tortella tortuosa (Hedw.) Limpr. var. ***tortuosa*** – **30**, **40**, **51**, **69**, **73**, **80**, **94**, **104-a**, **118**, **128**, **133**, **134**. Höhnel (1895); Casares Gil (1915); Ade & Koppe (1942); Koppe (1964); Casas (1972); Casas (1975b): MA-Musci 13757**!**; Zafra & Varo (1975); Gil & León (1984); Brugués *et al*. (2002). 980-3060 m. Frequent.

Tortella tortuosa var. ***fragilifolia*** (Jur.) Limpr. – **9**, **72**, **82**, **127**, **128**, **135**. Puche (2006). 1130-2725 m. Rare.

Tortula acaulon (With.) R.H. Zander – **4**, **6**, **7**, **19**, **26**, **33**, **38**, **44**, **47**, **48**, **118**, **119**, **122**, **125**, **137**,**143**, **148**, **149**, **150**. 1000-2780 m. Frequent.

Tortula atrovirens (Sm.) Lindb. – **3**, **5**, **6**, **7**, **9**, **14**, **16**, **19**, **20**, **26**, **44**, **49**, **50**, **64**, **71**, **112**, **117**, **121**, **139**, **140**, **142**, **143**, **151**, **154**, **157**, **160**. Martínez Gonzálvez (1983): Vereda de la Estrella, GDA 13206**!** 400-1660 m. Common.

Tortula bolanderi (Lesq. & James) M. Howe – **149**. Rams *et al*. (2005). 1300 m. Very rare.

Tortula brevissima Schiffn. – **117**. 802 m. Very rare.

Tortula cuneifolia (Dicks.) Turner – **112**, **121**, **137**, **151**. Colmeiro (1867); Ade & Koppe (1942). 600-1278 m. Rare.

Tortula hoppeana (Schultz) Ochyra – **31**, **47**, **53**, **54**, **67**, **75**, **76**, **78-b**, **86**, **89-b**, **90**, **91-b**, **91-d**, **95**, **96-a**, **96-b**, **98-a**, **98-b**, **98-c**, **100-b**, **100-c**, **101**, **102**, **103**, **104-a**, **104-b**, **106**, **128**. Boissier (1839-1845); Schimper (1876); Höhnel (1895); Thériot (1932); Allorge & Allorge (1946); Allorge & Richards (1956); Gil García & Varo Alcalá (1973); Brugués *et al*. (2002). 1800-3400 m. Common.

Tortula inermis (Brid.) Mont. – **5**, **6**, **9**, **10**, **12**, **16**, **18**, **19**, **25**, **26**, **27**, **-39**, **71**, **112**, **113**, **133**, **134**, **139**,**146**. Höhnel (1895); Warnstorf (1911); Ade & Koppe (1942); Koppe (1964). 556-3100 m. Common.

Tortula israelis Bizot & F. Bilewsky – **12**, **117**, **149**, **154**. 802-1300 m. Rare.

Tortula lindbergii Kindb. *ex* Broth. – **4**, **6**, **7**, **10**, **18**, **19**, **71**, **124**, **132**, **140**, **150**, **151**. Gil García & Varo Alcalá (1973); Zafra & Varo (1975). 460-2880 m. Frequent.

Tortula marginata (Bruch & Schimp.) Spruce – Höhnel (1895). 2200 m. Very rare. In spite of being a very old report, the presence of the species in the Sierra Nevada is considered likely because it is widely distributed in the Mediterranean region and its presence has been confirmed in other nearby areas (Cano, 2006).

Tortula muralis Hedw. var. ***muralis*** – **4**, **6**, **9**, **12**, **15**, **16**, **25**, **29**, **39**, **48**, **55**, **56**, **83**, **84**, **113**, **117**, **123**, **131**, **132**, **141**, **146**, **153**, **159**. Müller (1854); Colmeiro (1867); Geheeb (1874); Höhnel (1895); Ade & Koppe (1942); Koppe (1964). 580-1320 m. Common.

Tortula muralis var. ***aestiva*** Brid. *ex* Hedw. – Gil & León (1984). 2000 m. Very rare.

Tortula protobryoides R.H. Zander – **48**. 1411 m. Very rare.

Tortula revolvens (Schimp.) G. Roth – **8**, **131**, **132**, **138**, **139**. 544-981 m. Rare.

Tortula subulata Hedw. – **2**, **4**, **6**, **7**, **10**, **13**, **15**, **17**, **18**, **21**, **26**, **28**, **30**, **32**, **33**, **34**, **35**, **36**, **38**, **39**, **43**, **44**, **45**, **46**, **47**, **48**, **49**, **50**, **51**, **52**, **53**, **54**, **55**, **56**, **57**, **59**, **61**, **62**, **64**, **65**, **66**, **69**, **71**, **72**, **73**, **74**, **79**, **80**, **88-a**, **101**, **108**, **112**, **113**, **114**, **118**, **119**, **122**, **125**, **126**, **128**, **135**, **136**, **141**, **143**, **148**, **149**, **150**, **152**, **155**. Kunze (1846); Colmeiro (1867); Geheeb (1874); Höhnel (1895); Warnstorf (1911); Casares Gil (1915); Ade & Koppe (1942); Allorge & Allorge

(1946); Zafra & Varo (1975); Gil & León (1984); Casas (1986); Brugués *et al*. (2002). 900-3100 m. Very common.

Tortula vahliana (Schultz) Mont. – **16**, **123**, **131**, **132**, **138**, **154**, **158**. 480-1262 m. Rare.

Tortula viridifolia (Mitt.) Blockeel & A.J.E. Sm. – **24**, **55**, **71**. Ros & Werner (2006). 1200-1507 m. Rare. VU.

Tortula wilsonii (Hook.) R.H. Zander – **49**, **149**. 1300-1360 m. Rare.

***Trichodon cylindricus* (Hedw.) Schimp. – Excluded from the area. The only mention of this species in the Sierra Nevada is in the unpublished Ph.D. of Gil García (1976) but no herbarium specimen has been traced. It was not included in the study of the genus *Trichodon* for the Iberian Bryophyte Flora (Puche, 2013c).

Trichostomum crispulum Bruch – **9**, **30**, **83**, **84**, **88-a**, **100-a**, **140**, **151**. Höhnel (1895); Casares Gil (1915); Ade & Koppe (1942). 460-3200 m. Frequent.

***Warnstorfia fluitans* (Hedw.) Loeske – Excluded from the area. It was reported by Colmeiro (1867) and Allorge & Richards (1956). No collections from the area have been traced in herbaria or in the sampling carried out for this work. It was not included in the revision of the genus *Warnstorfia* in the Iberian Peninsula by Fuertes *et al*. (2006) and Oliván & Fuertes (2014).

Weissia brachycarpa (Nees & Hornsch.) Jur. – **4**, **73**, **157**. Guerra (2006b). 1190-1744 m. Rare.

Weissia condensa (Voit) Lindb. – **17**, **64**, **73**, **121**. Höhnel (1895); Koppe (1964). 1100-2000 m. Rare.

Weissia controversa Hedw. var. ***controversa*** – **2**, **4**, **10**, **11**, **13**, **18**, **20**, **24**, **34**, **35**, **36**, **43**, **44**, **48**, **54**, **55**, **62**, **73**, **81**, **112**, **118**, **119**, **122**, **148**, **157**. Höhnel (1895); Ade & Koppe (1942); Zafra & Varo (1975); Gil & León (1984); Brugués *et al*. (2002). 1162-2780 m. Common.

Weissia controversa var. ***crispata*** (Nees & Hornsch.) Nyholm – **18**, **90**. Höhnel (1895); Warnstorf (1911); Gil & León (1984). 1000-2930 m. Rare.

**Weissia squarrosa* (Nees & Hornsch.) Müll. Hal. – Doubtfully present in the area. The only report of this species from the area is that of Ade & Koppe (1942) but no herbarium specimen has been traced. Guerra (2006b) was also unable to revise material, and confirmed the presence of the species only in the northeast of the Iberian Peninsula, while Casas *et al*. (2006) extended its distribution to Menorca Island.

Weissia wimmeriana (Sendtn.) Bruch & Schimp. – **66**, **69**, **91-b**, **101**. Werner *et al*. (2004b). 2326-3122 m. Rare. VU.

Zygodon rupestris Schimp. *ex* Lorentz – **112**. 1278 m. Very rare.

DISCUSSION

Flora Analysis

A total of 395 taxa are here catalogued from the Spanish Sierra Nevada Mountains: 2 Anthocerophyta, 69 Marchantiophyta and 324 Bryophyta (excluding infraspecific taxa, there are 2 species of hornworts, 68 species of liverworts and 309 species of mosses). It adds 77 new taxa to the previous checklist of the Sierra

Nevada by Rams *et al.* (2001), primarily belonging to the families Pottiaceae (28 species), Orthotrichaceae (8 species) and Grimmiaceae (5 species). A total of 280 taxa (70.9%) were found during the sampling carried out for this work, whereas 115 taxa (29.1%) formerly reported in the literature and accepted by us as valid records for the area were not refound: 47 of them have been confirmed through the revision of herbarium specimens and 68 are accepted since they are present in neighbouring areas or are common in the Iberian Peninsula. Thirty-four taxa reported formerly in the literature are excluded and 35 taxa are considered doubtful for the study area. The total number of species represents 21.8% of the European, 24.2% of the Mediterranean and 35.3% of the Iberian bryoflora.

An analysis of the floristic catalogue reveals that the hornworts and liverworts have a very limited presence, representing 0.5% and 17.4% respectively of the total, whereas mosses represent 82.1% (Table 1). These data agree with those observed in other climatically similar areas in the SE of Iberian Peninsula (Filabres, Cabrera, Alhamilla and Cabo de Gata Sierras in Almeria province), where the percentages published by García-Zamora *et al.* (1998) are 0.0% hornworts, 15.7% liverworts, and 84.3% mosses. The fact that no hornworts were found in the mountains of Almeria is probably due to the fact that they are dryer than the Sierra Nevada (Capel-Molina, 1986). Comparison with the percentages of bryophyte groups observed in other high European mountains such as the Pyrenees and the Alps (Thouvenot, 2002 and Köckinger *et al.*, 2008, respectively) shows that the percentage of liverworts is about 5-7% lower in the typically Mediterranean mountains of the Sierra Nevada and Almeria, while the percentage of mosses is higher. The climatic conditions of these two important European mountain ranges, with no or very limited Mediterranean influence, favour the development of liverworts, as many of them (especially those with foliose gametophyte) require a higher level of humidity than mosses (Frahm, 2010). The percentage values of these two mountain ranges differ slightly from those given for Europe as a whole by Grolle & Long (2000) and Hill *et al.* (2006), where the percentages are 0.5% hornworts, 25.9% liverworts and 73.6% mosses. They are also similar to those observed in the Mediterranean area in general (Ros *et al.*, 2007b, 2013), where hornworts represent 0.4%, liverworts 24.5%, and mosses 75.1%. The data in the Mediterranean basin might be expected to be closer to those of the Sierra Nevada, but it should be noted that Ros *et al.* (*l.c.*) included not only areas with a Mediterranean climate, but entire countries bordering the Mediterranean Sea. Finally, comparison with the data for the whole Iberian Peninsula (0.5% hornworts, 26.2% liverworts and 73.3% mosses) shows a similarity with the European and Mediterranean data, again probably due to the great diversity and extent of the Peninsula, which includes a large area with a Mediterranean climate, but also a fringe in the north and northwest with a Eurosiberian climate (Rivas-Martínez, 1999).

Among hepatics, foliose species represent 56.5% and thallose 43.5%. Among mosses there is a clear dominance of acrocarpic species (74.2% of the total number of mosses) over pleurocarpous species, which represent only 25.8%.

As regards the relative abundance of taxa in the studied area, 78 taxa (19.8%) are *very rare*, 202 taxa (51.1%) are *rare*, 74 (18.7%) are *frequent*, 30 (7.6%) are *common*, and only 11 (2.8 %) are *very common*. These data indicate that 70.9% of the catalogued taxa are *rare* and *very rare*, and 29.9% are *frequent*, *common* and *very common*.

Analysis of the moss catalogue reveals several genera that are especially well represented locally. The most diverse genus is *Grimmia*, with 21 species

Table 1. Percentage values of the number of taxa belonging to each bryophyte group.

	Hornworts (%)	*Liverworts (%)*	*Mosses (%)*	*References*
The Sierra Nevada Mountains (S Spain)	0.5	17.4	82.1	–
Filabres, Cabrera, Alhamilla and Cabo de Gata Sierras (SE Spain)	0.0	15.7	84.3	García-Zamora *et al*. (1998)
The Pyrenees	0.4	22.5	77.1	Thouvenot (2002)
The Alps	0.3	23.3	76.4	Köckinger *et al*. (2008)
Europe	0.5	25.9	73.6	Grolle & Long (2000), Hill *et al*. (2006)
Mediterranean area	0.4	24.5	75.1	Ros *et al*. (2007b, 2013)
Iberian Peninsula	0.5	26.2	73.3	Casas *et al*. (2006), Sérgio *et al*. (2006)

followed by the predominantly terricolous *Tortula*, with 17 species. *Orthotrichum* is represented by 14 species and the genera *Bryum s.s*. and *Pohlia* include 11 species. Three genera present 10 species: the terricolous *Didymodon*, *Syntrichia,* and *Ptychostomum* (formerly included in *Bryum s.l.*). The genus *Philonotis*, represented by 7 species and *Hygrohypnum* with 5 species are also worth mention. The two most diverse genera among the liverworts are *Riccia*, with 11 species, and *Jungermannia* with 6 species.

We consider that the present knowledge of the bryoflora of the Sierra Nevada is not yet complete and requires targeted searches to locate new taxa, especially of liverworts.

Conservation and threats

From a conservation point of view, the Sierra Nevada harbours a high number of taxa catalogued as threatened and that merit conservation priority. The present data suggest significant modifications to the list given in Infante & Heras (2012a). Three species are considered Critically Endangered in the Red List of Spain (Brugués & González-Mancebo, 2012): *Schistidium occidentale*, known in Europe only from the Sierra Nevada (Rams *et al*., 2012a), *Timmiella anomala*, whose only confirmed locality in the Iberian Peninsula is in this mountain range (Soria *et al*., 2006), and *Cephaloziella integerrima*, previously known in the Iberian Peninsula only from the north. One species is considered Endangered: *Tortella alpicola*, known in Europe only from the Sierra Nevada, Tenerife Island (Canary Islands) and Western Europe (Rams *et al*., 2012b). Other 19 species are considered Vulnerable, notable among them being: *Pohlia bolanderi*, whose presence in Europe is restricted to localities in the Sierra Nevada, the Pyrenees and Spanish Central Range (Guerra, 2010a), and *Pseudotaxiphyllum laetevirens*, an Atlantic species relatively abundant in Madeira and the Azores, but only known in the Iberian Peninsula in a small number of localities (Rams *et al*., 2014 in press). Finally, one species, *Meesia triquetra*, is considered regionally extinct.

Other interesting species present in the Sierra Nevada have a restricted distribution or are rare in the Mediterranean area, but are not included at present in the Spanish Red List, nor in the European Red List (Schumacker & Martiny, 1995, updated in the web site of the ECCB: http://www.bio.ntnu.no/ECCB). Notable among them are: *Aloina bifrons*, *Amphidium lapponicum*, *Anacolia menziesii*, *Bryum valparaisense*, *Didymodon ferrugineus*, *Encalypta microstoma*, *Fontinalis squamosa*, *Hygrohypnum styriacum*, *Hymenoloma mulahaceni* and *Tortula bolanderi*.

Hallingback (2003) listed the main anthropogenic threats for bryophytes in general. Among them, in Sierra Nevada the following ones are the most relevant: destruction and fragmentation of their habitats, whether in the form of urban development, road construction, piping of river channels, use of non-native species for reforestation, intensive agriculture, greenhouses, grazing, etc.; pollution emission, a less palpable threat with unpredictable long-term effects, since it is able to affect areas very remote from the place of emission; and eutrophication of soils and waters, a very obvious fact, due to excessive use of fertilizers and uncontrolled discharges. There are also threats from natural causes such as fire, drought, water erosion or displacement of scree. For the particular case of bryophytes of Sierra Nevada some of the proposed measures for vascular plants by Blanca *et al.* (1998) could be implemented, which are: 1) to ensure the implementation of existing legislation on plant protection in the National and Natural Parks of the Sierra Nevada, especially with respect to urban planning, new tourist infrastructure, and agricultural activities; 2) to maintain the water regime and control water pollution; 3) to implement fire prevention measures; 4) to recover and restore habitats of threatened species; 5) to monitor the most endangered species through the use of appropriate surveys; 6) to promote the maintenance of *in vitro* cultures in somatoplasm banks; and 7) to promote research into the genetic variation of wild populations.

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Annex I. Prospected localities of the Sierra Nevada Mountains

1. Barranco de la Dehesa del Almirez (Granada, Lugros), 1200 m. 30SVG7922.
2. Near Cerro de La Casilla (Granada, Lugros), 1218 m. 30SVG8022.
3. Near Casa de la Piedra (Granada, Quéntar), 1198 m. 30SVG6521.
4. Near Arroyo del Fresno (Granada, Lugros), 1227 m. 30SVG7720.
5. Outside Lugros (Granada, Lugros), 1222 m. 30SVG7820.
6. Near Haza de la Cabaña (Granada, Lugros), 1268 m. 30SVG8120.
7. Cogollos de Guadix reservoir (Granada, Cogollos de Guadix), 1200 m. 30SVG8518.
8. Quéntar reservoir, Cortijo de los Prados (Granada, Quéntar), 981-1043 m. 30SVG6017.
9. Quéntar reservoir, Tajo del Castillejo (Granada, Quéntar), 1050-1130 m. 30SVG6117.
10. Santa Constanza mines (I) (Granada, Cogollos de Guadix), 1283 m. 30SVG8417.
11. Santa Constanza mines (II) (Granada, Jérez del Marquesado), 1305 m. 30SVG8517.
12. Outside Quéntar, Aguas Blancas river (Granada, Quéntar), 895-965 m. 30SVG5916.
13. Dehesa del Camarate, Alhama river (Granada, Lugros), 1393 m. 30SVG7716.
14. Outside Lancha del Genil (Granada, Granada), 780 m. 30SVG5013.
15. Barranco de La Pradera (Granada, Jérez del Marquesado), 1536 m. 30SVG8313.
16. Canales reservoir (Granada, Güéjar-Sierra), 1054 m. 30SVG5712.
17. Near Puntal de Los Chorreros (Granada, Güéjar-Sierra), 1710 m. 30SVG6612.
18. Near forestry house El Posterillo (Granada, Jérez del Marquesado), 1500 m. 30SVG8312.
19. Outside Aldeire, Rambla Benéjar (I) (Granada, Aldeire), 1333 m. 30SVG9312.
20. Near Rambla del Castañar (Granada, Dólar), 1501 m. 30SVG9912.
21. Barranco de Las Viñas (Granada, Dólar), 1419 m. 30SWG0012.
22. Huétor-Vega village (Granada, Huétor-Vega), 725 m. 30SVG4911.
23. Barranco del río Alhorí (I) (Granada, Jérez del Marquesado), 1543 m. 30SVG8211.
24. Barranco de la Mina de Don Diego (I) (Granada, Aldeire), 1507 m. 30SVG9211.
25. Outside Aldeire, Rambla Benéjar (II) (Granada, Aldeire), 1308 m. 30SVG9311.
26. Loma del Tesoro (Granada, Aldeire), 1639 m. 30SVG9511.
27. Near El Charcón (Granada, Güéjar-Sierra), 1100 m. 30SVG6310.
28. Refuge Piedra Partida (Granada, Güéjar-Sierra), 2418 m. 30SVG7410.
29. Ouside Abla, Ermita de los Santos (Almería, Abla), 861 m. 30SWG2010.
30. Barranco de Las Víboras (Granada, Güéjar-Sierra), 1660 m. 30SVG6009.
31. Near Covatillas (Granada, Güéjar-Sierra), 2532 m. 30SVG7509.
32. Barranco del río Alhorí (II) (Granada, Jérez del Marquesado), 1983 m. 30SVG8009.
33. Refuge Ballesteros (Granada, Jérez del Marquesado), 1946-1982 m. 30SVG8109.
34. Recreational area "Lanteira" (Granada, Lanteira), 1649 m. 30SVG8809.
35. Barranco del río Gallego (I) (Granada, Aldeire), 1750 m. 30SVG9009.
36. Barranco de Benabre (Granada, Aldeire), 1763 m. 30SVG9109.
37. Barranco de la Mina de Don Diego (II) (Granada, Aldeire), 1733 m. 30SVG9209.
38. Barranco de Arroyo Chico (Almería, Ferreira), 1952 m. 30SVG9609.
39. Near El Castillejo, Abrucena river (Almería, Abla), 900 m. 30SWG1809.
40. Near El Dornajo (Granada, Monachil), 2000 m. 30SVG6008.
41. Collado de Las Sabinas (I) (Granada, Güéjar-Sierra), 2200 m. 30SVG6208.
42. Lavaderos de La Reina (Granada, Güéjar-Sierra), 2714 m. 30SVG7508.
43. Barranco del río Gallego (II) (Granada, Aldeire), 1800 m. 30SVG9008.
44. Barranco de San Martín (Almería, Abrucena), 1162 m. 30SWG1508.
45. Collado de Las Sabinas (II) (Granada, Monachil), 2200 m. 30SVG6207.
46. Recreational area Puerto de La Ragua (I) (Almería, Bayárcal), 2000 m. 30SVG9707.

47. Recreational area Puerto de La Ragua (II) (Granada, Ferreira), 2000 m. 30SVG9807.
48. Near Cortijo de Lotrines (Almería, Abrucena), 1411 m. 30SWG1807.
49. Near Cortijo Paredes (Almería, Abrucena), 1360 m. 30SWG1907.
50. Near Convento de San Jerónimo, Monachil river (Granada, Monachil), 1600-1720 m. 30SVG6006.
51. Peñones de San Francisco (I) (Granada, Güéjar-Sierra), 2400-2450 m. 30SVG6406.
52. Peñones de San Francisco (II) (Granada, Güéjar-Sierra), 2520 m. 30SVG6506.
53. Hoya de La Mora (Granada, Güéjar-Sierra), 2499 m. 30SVG6606.
54. Near Arroyo de Palancón (Almería, Bayárcal), 2128 m. 30SVG9806.
55. Recreational area Las Rozas (Almería, Abrucena), 1200 m. 30SWG1506.
56. Barranco de Los Cortijillos (Almería, Abrucena), 1499 m. 30SWG1706.
57. Llanos del Serval (Almería, Abrucena), 1404 m. 30SWG1906.
58. Cumbres Verdes-Fuente del Hervidero (Granada, Monachil), 1200 m. 30SVG5205.
59. Peñones de San Francisco (III) (Granada, Güéjar-Sierra), 2500 m. 30SVG6505.
60. Near Cauchiles (Granada, Monachil), 2680 m. 30SVG6605.
61. Near Pico Chullo (Almería, Bayárcal), 2127 m. 30SVG9905.
62. Upper part of Barranco de Los Tejos (Almería, Laujar de Andarax), 2239 m. 30SWG0605.
63. Near Cerro Trevenque (I) (Granada, Monachil), 1580 m. 30SVG5504.
64. Near Cerro Trevenque (II) (Granada, Monachil), 1660 m. 30SVG5704.
65. Slopes of ski resort Pradollano (I) (Granada, Monachil), 2508 m. 30SVG6504.
66. Barranco del río San Juan (Granada, Monachil), 2450 m. 30SVG6604.
67. Near Puntal de Vacares (Granada, Trevélez), 2850 m. 30SVG7404.
68. Gabiarra mines (Almería, Laujar de Andarax), 2311 m. 30SWG0604.
69. Near Cerro del Almirez (Almería, Laujar de Andarax), 2326 m. 30SWG0904.
70. Near Santillana (I) (Almería, Las Tres Villas), 1310 m. 30SWG2304.
71. Near Santillana (II) (Almería, Las Tres Villas), 1185-1240 m. 30SWG2404.
72. Near Cerro Trevenque (III) (Granada, Dílar), 1910 m. 30SVG5703.
73. Near Cerro Trevenque (IV) (Granada, Monachil), 1744-1895 m. 30SVG5803.
74. Slopes of ski resort Pradollano (II) (Granada, Monachil), 2553-2618 m. 30SVG6503.
75. Upper part of Barranco del río San Juan (I) (Granada, Güéjar-Sierra), 2800-2857 m. 30SVG6603.
76. Upper part of Barranco del río San Juan (II) (Granada, Güéjar-Sierra), 2788-2898 m. 30SVG6703.
77. Near Puntal de Las Calderetas (I) (Granada, Trevélez), 3040 m. 30SVG7303.
78-a. Barranco de Las Calderetas (I) (Granada, Trevélez), 2750 m. 30SVG7403.
78-b. Lagunas de Las Calderetas (Granada, Trevélez), 2900 m. 30SVG7403.
79. Upper part of Barranco del Horcajo (Almería, Laujar de Andarax), 2113 m. 30SWG0803.
80. Loma del Peñón de las Dos Sombras (Almería, Laujar de Andarax), 2339 m. 30SWG1203.
81. Near Torrecillas del Pelado (Almería, Fondón), 2334 m. 30SWG1303.
82. Loma de La Polarda (Almería, Ohanes), 2310 m. 30SWG1803.
83. Barranco de Dílar (Granada, Dílar), 970 m. 30SVG5102.
84. Barranco de Rambla Seca (Granada, Dílar), 1200 m. 30SVG5202.
85. Slopes of ski resort Pradollano (III) (Granada, Monachil), 2735 m. 30SVG6502.
86. Near Veleta (I) (Granada, Dílar), 3126-3158 m. 30SVG6702.
87. La Alcazaba summit (Granada, Trevélez), 3366 m. 30SVG7202.
88-a. Near Puntal de Las Calderetas (II) (Granada, Trevélez), 3050-3100 m. 30SVG7302.
88-b. SW slope of La Alcazaba (Granada, Trevélez), 3250 m. 30SVG7302.
89-a. Barranco de Las Calderetas (II) (Granada, Trevélez), 2700 m. 30SVG7402.
89-b. S slope of La Alcazaba (I) (Granada, Trevélez), 3100 m. 30SVG7402.
89-c. Tajos del Goterón (I) (Granada, Trevélez), 2950 m. 30SVG7402.

90. Laguna de Las Yeguas reservoir (Granada, Dílar), 2861-2930 m. 30SVG6601.
91-a. Near Veleta (II) (Granada, Monachil), 3143-3285 m. 30SVG6701.
91-b. Upper part of Barranco del río Guarnón (Granada, Güéjar-Sierra), 3000 m. 30SVG6701.
91-c. Veleta summit (Granada, Monachil), 3343-3390 m. 30SVG6701.
91-d. Corral del Veleta (Granada, Güéjar-Sierra), 3050-3100 m. 30SVG6701.
92-a. Loma del Cerro de los Machos (Granada, Capileira), 3150-3227 m. 30SVG6801.
92-b. Crestones de Río Seco (I) (Granada, Capileira), 3130 m. 30SVG6801.
93. Crestones de Río Seco (II) (Granada, Güéjar-Sierra), 3079 m. 30SVG6901.
94. Laguna de La Caldera (Granada, Capileira), 3060 m. 30SVG7001.
95. Laguna del Majano (Granada, Capileira), 3040 m. 30SVG7101.
96-a. Laguna de La Mosca (Granada, Güéjar-Sierra), 2898 m. 30SVG7201.
96-b. Laguna Altera (Granada, Trevélez), 3120 m. 30SVG7201.
96-c. Mulhacén summit (Granada, Capileira), 3475 m. 30SVG7201.
97. Loma de Culo Perro (I) (Granada, Trevélez), 3070 m. 30SVG7301.
98-a. Tajos del Goterón (II) (Granada, Trevélez), 3080 m. 30SVG7401.
98-b. Loma de Culo Perro (II) (Granada, Trevélez), 2857-3010 m. 30SVG7401.
98-c. S slope of La Alcazaba (II) (Granada, Trevélez), 2950 m. 30SVG7401.
99. Near Piedras del Reloj (Almería, Paterna del Río), 1741 m. 30SWG0501.
100a. Refuge La Carihuela (Granada, Dílar), 3200 m. 30SVG6600.
100b. Lagunillos de La Virgen (Granada, Dílar), 2850 m. 30SVG6600.
100c. Tajos de La Virgen (Granada, Dílar), 3185 m. 30SVG6600.
101. Near El (III) (Granada, Capileira), 3050-3200 m. 30SVG6700.
102. Laguna de Aguas Verdes (Granada, Capileira), 2880-3044 m. 30SVG6800.
103. Raspones de Río Seco (Granada, Capileira), 3116 m. 30SVG6900.
104a. Lagunillos del Majano (Granada, Capileira), 2950 m. 30SVG7100.
104b. W slope of Mulhacén (Granada, Capileira), 3150-3250 m. 30SVG7100.
104c. Collado de La Mosca (Granada, Capileira), 3150 m. 30SVG7100.
105. E slope of Mulhacén (I) (Granada, Trevélez), 3200 m. 30SVG7200.
106. Cañada de Siete Lagunas (Granada, Trevélez), 2880 m. 30SVG7300.
107. Laguna Hondera y Chorreras Negras (Granada, Trevélez), 2897 m. 30SVG7400.
108. Recreational area Las Chorreras del río Yégen (Granada, Alpujarra de la Sierra), 1900 m. 30SVG8800.
109. Barranco de Válor (Granada, Válor), 1856 m. 30SVG9000.
110. E slope of Mulhacén (II) (Granada, Trevélez), 3150 m. 30SVF7299.
111. Barranco del Riachuelo (Granada, Alpujarra de la Sierra), 2120 m. 30SVF8599.
112. Barranco de Las Amoladeras (Almería, Paterna del Río), 1278 m. 30SWF0499.
113. Near canteras de El Aguadero (I) (Granada, Padul), 1020-1071 m. 30SVF4798.
114. Laguna del Peñón Negro (Granada, Trevélez), 2830 m. 30SVF7398.
115. Near Barranco de Bayárcal (I) (Almería, Nevada), 1400 m. 30SVF9998.
116. Path between Canjáyar and Ohanes (I) (Almería, Canjáyar), 846 m. 30SWF2398.
117. Near querries El Aguadero (II) (Granada, Padul), 802 m. 30SVF4697.
118. Loma del Tanto (Granada, Trevélez), 2780-2810 m. 30SVF7397.
119. Near Acequia del Espino (Granada, Bérchules), 1974 m. 30SVF8197.
120. Near Barranco de Bayárcal (II) (Almería, Nevada), 1240 m. 30SVF9997.
121. Ouside Paterna del Río (Almería, Paterna del Río), 1277 m. 30SWF0397.
122. Near Rambla de Milhombres (I) (Almería, Paterna del Río), 1414 m. 30SWF0697.
123. Barranco de Jalí (Almería, Canjáyar), 630 m. 30SWF2297.
124. Path between Canjáyar and Ohanes (II) (Almería, Ohanes), 682-726 m. 30SWF2397.
125. Fuente Fría (Granada, Dúrcal), 1916 m. 30SVF5696.
126. Rinconada de Nigüelas (Granada, Nigüelas), 2415 m. 30SVF5996.
127. Alto del Chorrillo (Granada, Capileira), 2725 m. 30SVF7296.

128. Near Mirador de Trevélez (Granada, Trevélez), 2480-2710 m. 30SVF7396.
129. Near Rambla de Milhombres (II) (Almería, Paterna del Río), 1315 m. 30SWF0696.
130. Recreational area El Nacimiento (Almería, Laujar de Andarax), 991 m. 30SWF1096.
131. Outside Canjáyar, 1 km westwards (Almería, Canjáyar), 632 m. 30SWF2296.
132. Canjáyar village (Almería, Canjáyar), 600-642 m. 30SWF2396.
133. Near Canal de la Sevillana (Granada, Nigüelas), 1701 m. 30SVF5395.
134. Loma del Perro (Granada, Nigüelas), 1601 m. 30SVF5495.
135. Near La Umbría (Granada, Nigüelas), 2200 m. 30SVF5895.
136. Near Acequia de Mecina (Granada, Alpujarra de la Sierra), 1750 m. 30SVF8595.
137. Barranco de La Salud (Almería, Nevada), 1000 m. 30SVF9795.
138. Outside Canjáyar, Chico river (Almería, Canjáyar), 544 m. 30SWF2395.
139. Outside Canjáyar, Pago del Tejar (Almería, Canjáyar), 0556-603 m. 30SWF2495.
140. Outside Canjáyar, Pago de Carniceretas (Almería, Rágol), 460 m. 30SWF2695.
141. Barranco del río Torrente (I) (Granada, Nigüelas), 1195 m. 30SVF5494.
142. Barranco de Trevélez (Granada, Trevélez), 1400 m. 30SVF7694.
143. Tajos de Cucharero (Granada, Alpujarra de la Sierra), 1630 m. 30SVF8494.
144. Outside Rágol, Andarax river (Almería, Rágol), 410 m. 30SWF2894.
145. Outside Nigüelas, Torrente river (Granada, Nigüelas), 940 m. 30SVF5293.
146. Barranco del río Torrente (II) (Granada, Nigüelas), 1150 m. 30SVF5493.
147. Loma de Piedra Blanca (Granada, Pórtugos), 2470 m. 30SVF7193.
148. Barranco del Cairo (Granada, Bérchules), 1850 m. 30SVF8093.
149. Near Barranco de Los Alisos (Granada, Trevélez), 1300 m. 30SVF7691.
150. Alto de Juviles (Granada, Juviles), 1678 m. 30SVF8191.
151. Barranco de Ugíjar (Granada, Ugíjar), 600 m. 30SVF9491.
152. Fuente de La Rosa (Granada, Soportújar), 1680 m. 30SVF6390.
153. Barranco del Tejar (Granada, Capileira), 1350 m. 30SVF6890.
154. Pórtugos village and Chorreras de Fuente Agria (Granada, Pórtugos), 1268-1300 m. 30SVF7288.
155. Outside Busquístar, Las Lindes (Granada, Busquístar), 1226 m. 30SVF7388.
156. Outside Béznar (Granada, Lecrín), 560 m. 30SVF5187.
157. Outside Busquístar, Alto de la Lomilla (Granada, Busquístar), 1186 m. 30SVF7387.
158. Béznar reservoir (Granada, El Pinar), 480 m. 30SVF5285.
159. Outside bottling facility of Lanjarón (Granada, Lanjarón), 580 m. 30SVF5485.
160. Outside Órgiva, 2 km eastwards (Granada, Órgiva), 400 m. 30SVF6483.
161. Near Bubión (Granada, Bubión), 1200 m. 30SVF6888.

Annex II. Species whose identification has been confirmed and reviewer's name

B. Allen: *Fontinalis squamosa.*

H.H. Blom: *Schistidium crassipilum.*

H.H. Blom and J. Muñoz: *Schistidium helveticum.*

M. Brugués: *Scorpidium cossonii.*

C. Casas: *Orthothecium intricatum.*

E. Fuertes: *Mnium marginatum, Plagiomnium elatum.*

M.T. Gallego: *Syntrichia calcicola, Syntrichia princeps, Syntrichia virescens.*

R. Garilleti: *Orthotrichum macrocephalum, Orthotrichum pumilum.*

J. Guerra: *Bryum turbinatum.*

J. Guerra and A. Ederra: *Gymnostomum aeruginosum.*

L. Hedenäs: *Brachytheciastrum dieckii, Brachythecium mildeanum, Drepanocladus aduncus, Hypnum cupressiforme* var. *cupressiforme, Isothecium myosuroides, Palustriella falcata, Pseudotaxiphyllum elegans, Pseudotaxiphyllum laetevirens, Sciuro-hypnum glaciale.*

L. Hedenäs and M.S. Ignatov: *Isopterygiopsis pulchella.*

D.T. Holyoak: *Bryum subapiculatum, Bryum valparaisense.*

M. Infante: *Cephaloziella integerrima, Barbilophozia hatcheri*, *Scapania scandica.*

J.A. Jiménez: *Didymodon ferrugineus.*

F. Lara: *Orthotrichum alpestre, Orthotrichum cupulatum* var. *bistratosum.*

F. Lara and R. Medina: *Orthotrichum rupestre.*

F. Lara and R. Garilleti: *Orthotrichum schimperi.*

J. Muñoz: *Grimmia caespiticia, Grimmia crinitoleucophaea, Grimmia montana, Grimmia orbicularis, Grimmia ovalis, Grimmia pulvinata, Grimmia reflexidens, Grimmia tergestina, Grimmia torquata, Lescuraea patens, Leskea polycarpa, Pseudoleskeella catenulata, Pseudoleskeella rupestris, Pseudoleskeella tectorum, Racomitrium macounii* subsp. *macounii, Racomitrium sudeticum, Sphagnum auriculatum.*

J. Muñoz and K. Cezón: *Grimmia dissimulata, Grimmia lisae, Grimmia meridionalis, Grimmia trichophylla.*

G. Oliván: *Campylium stellatum.*

C. Sérgio: *Pogonatum nanum.*

A.J. Shaw: *Pohlia bolanderi, Pohlia lescuriana, Pohlia melanodon, Pohlia wahlenbergii* var. *wahlenbergii.*

J. Spence: *Ptychostomum compactum* var. *compactum.*