

Some interesting bryophyte records from Sierra Nevada (southern Spain)

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Abstract – Some bryophyte records from the Sierra Nevada (Spain) represent an interesting extension of their known distribution range. We refer to the liverwort *Diplophyllum taxifolium* (Wahlenb.) Dumort. and the mosses *Encalypta microstoma* Bals.-Criv. & De Not. and *Myurella julacea* (Schwägr.) Schimp., which are montane species with an arctic-alpine distribution and are known from other high mountain systems. *Tortula bolanderi* (Lesq.) M. Howe, with a Mediterranean distribution, is reported for the first time in peninsular Spain.

bryophytes / Sierra Nevada / *Diplophyllum taxifolium* / *Encalypta microstoma* / *Myurella julacea* / *Tortula bolanderi* / distribution

Résumé – Quatre espèces récoltées dans la Sierra Neva (Espagne) présentent une extension intéressante de leur distribution connue : *Diplophyllum taxifolium* (Walhenb.) Dumort., *Encalypta microstoma* Bals.-Criv. & De Not. et *Myurella julacea* (Schwägr.) Schimp. qui sont des espèces de montagne avec une distribution arctique-alpine et sont connues d'autres systèmes de haute montagne ; et *Tortula bolanderi* (Lesq.) M. Howe, dont la distribution est méditerranéenne, récolté pour la première fois en Espagne péninsulaire.

bryophytes / Sierra Nevada / *Diplophyllum taxifolium* / *Encalypta microstoma* / *Myurella julacea* / *Tortula bolanderi* / distribution

INTRODUCTION

The Sierra Nevada mountain range occupies around 2000 km² and is located in southern Spain, where it lies parallel to the Mediterranean coastline, approximately 40 km to the North. Due to this special geographical situation, a crossing point of different migration paths, the Sierra Nevada is considered to be an isolated range that provided a refuge for alpine species during the last glacial period (Blanca *et al.*, 2002; Delgado Calvo-Flores *et al.*, 2001). It contains the highest peak in peninsular Spain, Mulhacén (3482 m), the next highest being Aneto peak (3404 m) in the Pyrenees.

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The Sierra Nevada has attracted the attention of numerous botanists since the beginning of the XIXth century, and consequently there are a good number of publications related more or less exclusively to bryophytes (Rams *et al.*, 2001). However it cannot be said that its bryoflora is completely known. In the last four years the number of taxa cited in the area has increased from 378 to 398 (Casas *et al.*, 2001a; Brugués *et al.*, 2002, 2003; Rams *et al.*, 2004; Werner *et al.*, 2004).

There is a group of bryophyte species that is found in Spain only in the Sierra Nevada and Pyrenees (Casas, 1997; Brugués *et al.*, 2002): the mosses *Amphidium lapponicum* (Hedw.) Schimp., *Brachythecium collinum* (Schleich. ex Müll. Hal.) Schimp., *Bryum weigelii* Spreng., *Grimmia mollis* Bruch & Schimp., *Hygrohypnum molle* (Hedw.) Loeske, *Oncophorus virens* (Hedw.) Brid., *Pohlia andalusica* (Höhn.) Broth. and the liverworts *Anthelia juratzkana* (Limpr.) Trevis. and *Scapania scandica* (Arnell & H. Buch) Macvicar. To this list can be added *Weissia wimmeriana* (Sendtn.) Bruch & Schimp., recently reported from Sierra Nevada by Werner *et al.* (2004).

Sierra Nevada was included in 1986 by the UNESCO in the Man and Biosphere program as a Biosphere Reserve. In 1989 it became a Natural Park and, more recently, in 1999, it was designated as a National Park. All these protection features lead us to believe that the richness of its bryophyte flora is no longer endangered.

METHODOLOGY

Since 1998, but more intensively since 2002, as part of the Ph.D. research work of the first author, several field expeditions were carried out in Sierra Nevada, mainly in spring and summer. Herbarium material (GDA) has also been checked in order to locate unpublished records and to revise some other reports.

RESULTS AND DISCUSSION

Three local records and a new Spanish site have been found in Sierra Nevada, increasing the number of known taxa in this range to 402. The liverwort *Diplophyllum taxifolium* (Wahlenb.) Dumort. and the mosses *Encalypta microstoma* Bals.-Criv. & De Not. and *Myurella julacea* (Schwägr.) Schimp. are specially interesting since they are montane species with an arctic-alpine distribution which were previously known in Spain from the more northerly mountain systems. In addition, *Tortula bolanderi* (Lesq.) M. Howe is a new report for peninsular Spain (Fig. 1).

***Diplophyllum taxifolium* (Wahlenb.) Dumort.** — This species has been found misidentified during a revision of GDA herbarium material. In Hill *et al.* (1991) it is noted that this taxon is often overlooked because of confusion with *D. albicans* (L.) Dumort. This is indeed the case: the specimen was labelled as *D. albicans* despite the lack of a conspicuous vitta of elongate cells in middle of the ventral lobe, which is characteristic of this species. Besides this character, the 2-celled

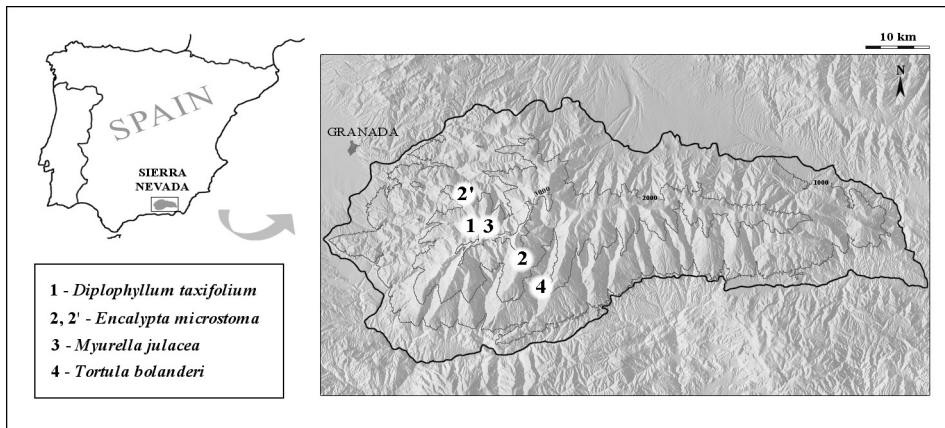


Fig. 1. Study area and localities of the studied species.

gemmae, the dioicous condition, the absence of fungal hyphae in stem cells and the alpine location of the sample allowed to identify the species (Infante, *pers. comm.*).

Diplophyllum taxifolium is considered a circumpolar element, with an arctic-alpine distribution (Dierßen, 2001). It is known from the mountainous regions of Europe, from Turkey and the Pyrenees north to Scandinavia and Svalbard, becoming commoner northwards (Hill *et al.*, 1991). In Spain it has been cited from the Pyrenees (Casas, 1986), from the Central System in the Béjar Sierra (Elías, 1989) and from the Iberian System in Moncayo Massif (Casas *et al.*, 1984) and from the Peak of Urbión (Martínez-Abaigar *et al.*, 1997). The report from the Basque Country (Casares Gil, 1919) is considered doubtful because the specimen was collected in a locality very near the coast (Infante, 1988; Infante, 2000). In Portugal was also reported from Serra da Estrela (Sérgio & Váña, 1994).

According to Schumacker & Váña (2000) the status of this species in Europe is “not threatened”.

SPAIN: Granada, Sierra Nevada, Laguna de las Yeguas, 30SVG6601, 2880 m, talud silíceo en borde de arroyo, VIII-1973, Gil (GDA 10075)

***Encalypta microstoma* Bals.-Criv. & De Not.** — This species is closely related to *E. ciliata* Hedw, and the two species can be differentiated by a number of characters: the calyptra in *E. ciliata* is generally pale-golden or pale-brown throughout with a broad cylinder, while in *E. microstoma* it is dark brown with a narrower cylinder. There are also differences in the length of the rostrum, which is generally 1/3 the overall length of the calyptra in *E. ciliata*, but usually only 1/4 the total length in *E. microstoma*. A well developed peristome with dark orange teeth is characteristic of *E. ciliata*, but it is absent or fragmentary with hyaline teeth in *E. microstoma* (Horton, 1983). Some aberrant forms of *E. vulgaris* have been found by Sérgio & Garcia (2003) that present narrowly cylindrical or tapered slightly distally and contracted in the upper part to a minute mouth capsules like in *E. microstoma*. Nevertheless these forms cannot be mistaken with *E. microstoma* if the calyptra are present. In the former species the calyptra are fringed while in *E. vulgaris* they are erose or entire.

This species has a circumpolar distribution, and is present in subalpine-alpine-boreal areas (Dierßen, 2001). It is an endemic of central and southern Europe and is restricted to montane regions, from the Atlantic and Oriental Pyrenees and the Massif Central in France, through the Swiss, Austrian, Northern Italian Alps to the High Tatras of Slovakia, and somewhat disjunct in the Rila Mountains of Bulgaria and the Caucasus Mountains (Horton, 1983). In Spain it was known previously only from the Pyrenees (Casas *et al.*, 2001b).

According to Schumacker & Martiny (1995) its status in Europe is “rare”.

SPAIN: Granada, Sierra Nevada, alrededores de El Alto del Chorrillo, 30SVF7396, 2707 m, hendidura de roca silícea; 19-IX-2002, Rams (MUB 15703). Sierra Nevada, Peñones de San Francisco, 30SVG6406, 2400 m, fisura de roca silícea, 21-VI-2002, Guerra (MUB 14205)

***Myurella julacea* (Schwägr.) Schimp.** — This species differs from the other European species of the genus, *M. tenerrima* (Brid.) Lindb., in several characters. The colour of the plant is bluish-green in *M. julacea* and pale or yellowish-green in *M. tenerrima*; the leaves in *M. julacea* are densely imbricate and hardly different when dry and moist, in *M. tenerrima* less closely imbricate when dry and somewhat spreading when moist; the leaf margins in *M. tenerrima* are crenulate-denticulate throughout, in *M. julacea* crenulate towards the apex but mostly spiculate-dentate from projecting cells below; the apiculus in *M. tenerrima* is reflexed and more than 100 µm long, in *M. julacea* erect and less than 75 µm long, and sometimes lacking (Ochyra & Bednarek-Ochyra, 1991; Smith, 1978).

This is a circumpolar species with a Southern Hemisphere disjunction and subarctic-subalpine distribution. It occurs in Iceland, all the mountains of Europe, Crimea, Turkey, Caucasus, Asia, N. America, Greenland and Antarctica (Dierßen, 2001; Hill *et al.*, 1994). In Spain it was previously known from the Cantabrian Range, the Iberian System and the Pyrenees (Casas *et al.*, 1985).

According to Sérgio *et al.* (1994a) its status is “not threatened” in Spain.

SPAIN: Granada, Sierra Nevada, Corral del Veleta, 30SVG6701, 3000 m, borreguil, suelo entre roca silícea, 16-IX-2000, Ros (MUB 15653-15654)

***Tortula bolanderi* (Lesq.) M. Howe** — According to Blockeel (1995), *T. inermis* (Brid.) Mont. shows affinity to *T. bolanderi*, because the leaves in both species share a similar look and shape, but *T. inermis* has larger upper leaf cells, more strongly recurved leaf margins and is autoicous. The sporophytes, although uncommon, are useful for distinguishing the species, because in *T. bolanderi* the basal membrane of the peristome is low and in *T. inermis* it is high. *Tortula bolanderi* and *T. inermis* were placed by Zander (1993) in the genus *Syntrichia* Brid., although after morphological and molecular studies they were retained in the genus *Tortula* Hedw. (Gallego, 2002; Werner *et al.* 2003; Cano, 2004). The Spanish material fits very well with the characteristics given for the species, not only in North America but also in Europe. The newly found specimen was observed to contain only female plants and it lacks sporophytes, although it shows the typical vegetative reproduction of the species, by rhizoidal tubers.

Tortula bolanderi is a Mediterranean species reported from N. America (Anderson *et al.*, 1990), the Canary Islands (Losada-Lima *et al.*, 2001), Madeira (Düll, 1992; Sérgio *et al.*, 1994b), France (Crundwell & Whitehouse, 1976), Italy (Blockeel, 1995) and Morocco (Ros *et al.*, 2000).

According to Schumaker & Martiny (1995) its status in Europe is “vulnerable”.

SPAIN: Granada, Sierra Nevada, 4 km al E de Trevélez, 30SVF7691, 1300 m, suelo ácido en ladera, 17-IV-1998, *Ros & Werner* (MUB 17401)

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