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A modern record of one of the rarest European mosses, *Ptychomitrium incurvum* (*Ptychomitriaceae*), in Eastern Pyrenees, France

Abstract

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A new Eastern Pyrenean (Pyrénées-Atlantique department, France) record of the very rare species *Ptychomitrium incurvum* (Schwägr.) Spruce (*Ptychomitriaceae*) is mentioned. It is a national extension of the small known European area of this species. The new locality is briefly described and compared with the data of literature.

Key words: floristic, bryophyte, Pyrénées-Orientales.

Introduction

Ongoing bryological surveys in the Pyrénées-Orientales department (France) have already yielded several remarkable species. Among the most noticeable are *Jamesoniella undulifolia* (Nees) Müll.Frib. (Hugonnot 2012), *Hygrohypnum styriacum* (Limpr.) Broth. (Hugonnot 2013a), *Bryum valparaisense* Thér. (Hugonnot 2013b), *Tayloria splachnoides* (Schleich. ex Schwägr.) Hook. (Hugonnot 2009) or *Geocalyx graveolens* (Schrad.) Nees (Hugonnot 2014). *Ptychomitrium incurvum* (Schwägr.) Spruce was recently observed in the Pyrénées-Orientales (France) and, being a very rare element of the European bryoflora, deserved to be mentioned.

The Amphiatlantic distribution of *Ptychomitrium incurvum* has been reviewed and mapped by Frahm (2013a). It is widespread in Eastern North America, from Canada (Southern Ontario) to Texas. The political occurrence of the species in North America was updated in Reese (2007). Most of known occurrences are concentrated in Southern United States whereas it is rare in the North. In Canada the species is considered Extinct, the only record dating back from 1828 (Ireland & Ley 1992). *P. incurvum* is also recorded in South America (Ecuador), following Reese (2007). In Europe, it is of much more restricted occurrence in South-Western Alps. It is recorded in Southern Switzerland (Tessin) (http://www.nism.uzh.ch/map/map_en.php) (Amann 1918) and Northern Italy (Piemont and Lombardia) (Aleffi & al. 2008). In the Pyrenees, it was previously known in Spain,

from one record in Navarra and three from France, in Pyrénées-Atlantiques and Hautes-Pyrénées departments (Frahm 2013a; Husnot 1892-1894). It is considered Regionally Extinct in Spain (Casas & al. 2009; Brugués & al. 2014), and its status in France was uncertain. In Europe, the only modern records are those of Frahm, who observed the species in Tessin (Fig. 1).

In the present note, the new locality of *P. incurvum* is briefly described and compared with literature data.

All the samples were collected by the author and are deposited in the private herbarium of V. Hugonnot. Nomenclature of liverworts and mosses follows, respectively, Ros & al. (2007) and Ros & al. (2013).

New locality data

FRANCE. Pyrénées-Orientales, Vallespir, Saint-Laurent-de-Cerdans, South-West of Puig de Sant Miquel, 820 m, 42° 21' 5,8" N; 2° 37' 11,1" E, *Hugonnot 12 may 2015* (Herbarium Hugonnot).



Fig. 1. European map of *Ptychomitrium incurvum* (Schwägr.) Spruce (star : Pyrénées-Orientales record).

The collected material was made of deep glossy green-blackish small rounded cushions, the largest tufts reaching 0,5 cm high, with strongly crisped and obtuse-entire leaves (Fig. 2). The leaves were characteristically concave at the apex, often feebly cucullate. Male buds were located at the base of perichaetium, just below seta (gonioautoicous). Sporophytes were plentiful, with mitrate calyptra (though at the period of record most of them were fallen off).

P. incurvum was observed on small granite blocks (not in crevices but on the surface) along a path. Surroundings are dominated by ancient acidophilic chesnut groves. Approximately 5 widely spaced tufts were observed growing on two blocks distant from several meters. Immediate associates were sparse and included isolated individuals or small tufts of *Ptychostomum capillare* (Hedw.) Holyoak & N. Pedersen, *Grimmia longirostris* Hook., *Lophozia excisa* (Dicks.) Dumort., *Orthotrichum anomalum* Hedw., *Ptychomitrium polyphyllum* (Dicks. ex Sw.) Bruch & Schimp. and *Schistidium confertum* (Funck) Bruch & Schimp.

Climate

The climate of Vallespir is difficult to characterize because of variability, mostly influenced by altitude. Vallespir is the most rainy region of all Pyrénées-Orientales. Total annual rainfall reaches 1100 mm/year. The summers are warm but the drought period is mostly less than one month. Storms are very frequent from May to August and certainly play an important role for summer growth of bryophytes. Average annual temperature stands near 12 °C. The winter temperatures can go down very low in this region.

Discussion

The recognition of *Ptychomitrium incurvum* offers no special difficulties even in the field, thanks to the combination of a striking glossy green-blackish colour, the crisped and contorted leaves and the occurrence on rocks. *Ptychomitrium polyphyllum* is locally associated with *P. incurvum* but is a very distinct plant, being much more robust and having leaves with dentate margins (they are entire in *P. incurvum*). *Ptychomitrium nigrescens* (Kunze) Wijk & Margad. is of comparable size, but has acute and plane leaves (they are obtuse and cucullate in *P. incurvum*) and longer seta (2-3 mm in *P. incurvum* against 5 mm in *P. nigrescens*). *P. nigrescens* is a very rare species in France, not recorded in Pyrénées-Orientales, but only in Var. Illustrations and descriptions of *Ptychomitrium incurvum* are provided in Limpricht (1890), Crum & Anderson (1981), Cortini Pedrotti (C), Reese (2007), Brugués & Ruiz (2015) and they do not seem to show any appreciable morphological variation.

Ptychomitrium incurvum is one of the rarest moss species of Europe (Frahm 2013a) and it is still rather incompletely known. It generally grows on acidic rocks (granite, schist, etc.) (Reese 2007; Frahm 2013a), but also on calcareous ones (Limpricht 1890) so that it is considered indifferent (Augier 1966; Crum & Anderson 1981; Reese 2007). It likes dry and hot microhabitats, somehow paradoxically, shows an affinity towards humid climate. Violent and frequent summer storms in Vallespir probably allow the species to be wetted a large part of the year. Though mostly reported as growing in natural habitat, it has been

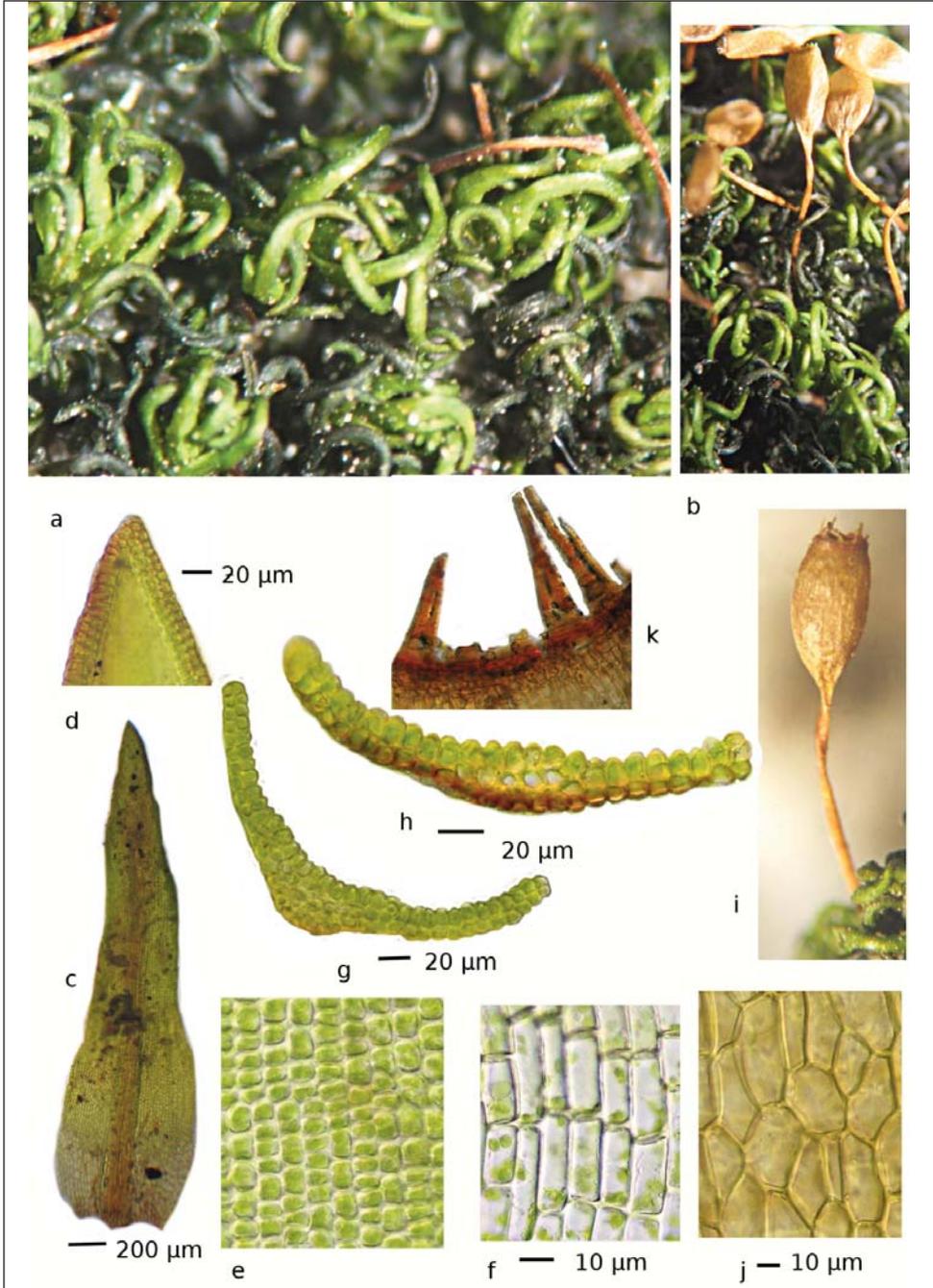


Fig. 2. *Ptychomitrium incurvum* (Schwägr.) Spruce: a, b: habit; c: vegetative leaf; d: apex of the vegetative leaf; e: areolation at mid-leaf; f: areolation at leaf base; g, h: transverse section through leaf; i: sporophyte; j: exothecium areolation; k: rim of capsula showing remnants of peristome.

mentioned on artificial substrates too, including walls (Augier 1966) or tombstone (Cosepac 2002). It was additionally described colonizing rocks along a forest path (Frahm 2013a), which is also the case for the population of Pyrénées-Orientales. It suggests that the species tolerates a certain degree of artificialization. The base of trees or logs have also been mentioned as occasional potential substrates (Crum & Anderson 1981).

Sporophytes are always seen in *P. incurvum*. It is a gonioautoicous species which freely produces capsules. Hence production of spores is certainly not a limit to the spread of the species. This, combined with the occurrence in man-made habitats, suggest a certain dynamism of the species. Two days were spent in vain searching for potential source populations following the discovery of *P. incurvum* in Vallespir. Only five tufts could be spotted. It seems that the other European populations are also very small (Frahm 2013a). The rarity of the plant in Europe is puzzling and may relate to phytogeographic history. Vallespir region in the Oriental part of the Pyrenees hosts a remarkable assemblage of Southern Alps species (Insubrian species in Frahm 2013b). *Fabronia ciliaris* (Brid.) Brid., *Syntrichia fragilis* (Taylor) Ochyra, *Frullania riparia* Lehm. or *Campylopus oerstedianus* (Müll.Hal.) Mitt. are among the most noticeable species. For such species, recent long distance dispersal from Eastern North American sources is unlikely. It is unlikely too for *P. incurvum* since at least three small widely separated western European populations are recorded. A parallel evolution from a common and more or less ancient widespread ancestor population has been hypothesized (Herzog 1926; Frahm 2013a). A competing hypothesis would be that of rare ancient dispersal events from North American sources followed by subsequent independent evolution. Surely the origin and evolution of the disjunction of *P. incurvum* invite further study using molecular tools.

P. incurvum is clearly at risk of extinction in Europe. Modern observations are rare and isolated, and the known populations are made of a few individuals. The conservation status of the species appears somewhat obscure due to the lack of adequate knowledge (DD in Switzerland, Italy; RE in Spain; unknown status in France) but *P. incurvum* is included as a candidate for the future Red List of Europe (Hodgetts 2015). It was not observed recently in South-Western France, Spain nor Italy. In North America, the species seems to be much more abundant and globally not threatened. Yet, in Ontario, at the Northern border of the known range, *P. incurvum* could never be refound in spite of intensive research (Cosepac 2002).

In the future, *P. incurvum* should be the subject of targeted surveys in Southern France but also in Spain and Italy.

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