Article

Borziana 4: 95-102
https://doi.org/10.7320/Borziana.004.095
Version of Record published online on 6 July 2023

Vincent Hugonnot & Florine Pépin

# *Mannia triandra* (*Aytoniaceae*, *Marchantiophyta*) in Mallorca (Balearic Islands), a species newly recorded in Spain

**Abstract**

Hugonnot, V. & Pépin, F.: *Mannia triandra* (*Aytoniaceae*, *Marchantiophyta*) in Mallorca (Balearic Islands), a species newly recorded in Spain. — Borziana 4: 95-102. 2023. — ISSN: 2724-5020 online.

The arcto-montane thalloid liverwort *Mannia triandra* is reported for the first time in Spain, on the Balearic Island of Mallorca. The species was discovered in December 2022 at a unique location in the famous and bryologically celebrated Serra de Tramuntana. The specimens from Mallorca and their ecological environment are described. Diagnostic characters are discussed and a comparison is made with other *Marchantiales* species with which confusion is possible. A key to Mediterranean *Mannia* and *Asterella* without spores is provided.

*Key words*: thalloid liverwort, *Mannia*, Serra de Tramuntana.

## Introduction

*Mannia triandra* is an arcto-montane thalloid liverwort that shows a clear preference for Ca-rich substrata. It is recorded in mountainous areas of North America, Asia and Europe. In Europe, *Mannia triandra* is a rare species which is included in many national Red Data Lists. It is provisionally assigned a conservation status of VU (Hodgetts & Lockhart 2020) and is listed in Annex II of the 92/43/ECC directive "Habitats".

Guerra (1982) previously listed *Mannia triandra* in relevés from Malaga Province, Spain, but this report was subsequently rejected and *M. triandra* is not included in the more recent checklist of Spanish liverworts (Sérgio & al. 2007), nor in Hodgetts & Lockhart (2020).

There is a considerable body of literature devoted to the study of Balearic bryophytes (see Casas, 2004). The most recent checklist of the Balearic Islands was published in 2008 (Cros & al 2008.). Since then, a number of chorological additions have been published (Pericàs & Rosselló 2009, 2010; Pericàs & al. 2009, 2016; Pinya & al. 2013; Sáez 2019; Sáez & al. 2021), demonstrating that this group of small islands remains imperfectly known and that bryological exploration is likely to provide new or interesting records.

In the course of a field trip on the largest Balearic Island, Mallorca, in December 2022, the authors have found a previously unknown population of *Mannia triandra.* The aim of the present work is to formally publish this discovery and to describe its ecology and distribution.

## Material and methods

The Mallorcan specimens were first identified in the field, and later confirmed in the laboratory. The keys of Schuster (1992), Schill (2006) and Hugonnot & Chavoutier (2021) were used to verify the diagnostic characters. A comparison of the major morphological characteristics (general appearance of the thallus, anatomy, ventral scales, oil-bodies, sexual structures etc.) was made with material of *Mannia triandra* recently collected in France. The Mallorcan material was also compared with other species, either phylogenetically related or not, likely to be confused with *Mannia triandra*, on the basis of our personal experience. The morphological characteristics provided in the following section is based only upon Mallorcan material.

## Differentiation

The comparison between the representative French material of *Mannia triandra* and the Mallorcan material showed a very good correspondence in almost all the significant characters (Fig. 1). The Mallorcan specimens were without carpocephala, so that spore characters could not be evaluated. *M. triandra* is nevertheless positively identifiable on the basis of gametophyte morphology and sexual pattern alone.

*Mannia triandra* is characterized by (1) delicate odourless emerald-greyish thallus, forming compact rosettes with poorly defined segments; (2) dorsal surface of thallus thin and delicate, soon starting to perforate, the thallus becoming dorsally lacunose in older sectors; (3) lax assimilation tissue, composed of large air empty chambers; (4) antheridia aggregated in a blackish disc of variable form, which is borne terminally and not on the same lobe as the female receptacle (unlike what is observed in paroicous species where antheridia are located behind the female receptacle on the same branch).

Many *Marchantiales* have a rather deceptive general appearance which has led to numerous misidentifications. The overall aspect of *Mannia triandra* is an exception, since, once known, it is an almost unmistakable species, even in the field and without carpocephala. It has nevertheless been confused with other species of the genus *Mannia*, and with unrelated species. The peculiar dorsal tissue of *Mannia triandra* is not shared by any other species in the genus *Mannia* but the distribution of gametangia is the key for positive recognition of this species.

In western Europe, *Mannia androgyna* (L.) A. Evans and *M. californica* (Gottsche ex Underw.) L.C. Wheeler (the former being recorded in the Balearic Islands) have a totally different general appearance. Both species share a xeromorphic thallus (with small air chambers) and never have antheridia aggregated in discrete discs, but borne loosely on the dorsal surface of the leading lobe of the thallus. *Mannia pilosa* (Hornem.) Frye & L. Clark would be quite unexpected in Mallorca on phytogeographical grounds, being an arctic-alpine and high-altitude species. *Mannia pilosa* bears antheridia on reduced latero-ventral branches and has ventral scales without oil-bodies (oil-bodies several in *Mannia triandra*). *Mannia gracilis* (F. Weber) Schill & D.G. Long has a thallus not becoming dorsally lacunose (although the dorsal epidermis is equally thin) and is paroicous (antheridia diffuse, situated immediately behind the female receptacle, on the same branch).

Fig. 1. *Mannia triandra*, Puig de Sa Rateta, Mallorca, Spain (22 December 2022); red arrow: female receptacle; green arrow: male cushion.

*Asterella lindenbergiana* (Corda ex Nees) Arnell and *A. africana* (Mont.) A. Evans are two paroicous, unpleasantly scented species whereas *M. triandra* has no odour. *A. lindenbergiana* is a high altitude late snow-bed species and *A. africana* is a hygrophilous one growing in deep and shaded ravines.

Among the unrelated species, the *Cleveaceae* are generally characterized by epidermal pores with thickened radial walls and appearing stellate (pores never stellate in *Mannia*), but this is at times difficult to demonstrate. *Clevea hyalina* (Sommerf.) Lindb. is dioicous and *C. spathysii* (Lindenb.) Müll.Frib. (recorded in Mallorca), is paroicous. Both *Peltolepis quadrata* (Saut.) Müll.Frib. and *Sauteria alpina* (Nees) Nees have a rather spongiose thallus but both are paroicous.

*Corsinia coriandrina* (Spreng.) Lindb. may be lacunose in older sectors of the thallus and this has caused confusion. *Corsinia* is strongly aromatic and does not have any trace of purple pigments. *C. coriandrina* is an acidophile species (occurring on calcareous substrates only when the soil is Ca-free).

In the Mediterranean, the species of the genus *Mannia* and *Asterella* are frequently observed without mature spores so that a key to sterile material including all the Mediterranean *Mannia* and *Asterella* is provided:

1 – Thallus strongly aromatic (cedar oil); thallus apex bearded by dorsally projecting scales; ventral scales bearing bleached appendages .....***Mannia fragrans* (Balb.) Frye & L.Clark**
1 – Thallus either aromatic or not, or with a strong fishy smell when crushed; thallus apex not bearded; ventral scales appendages purple, not distinctly bleached.....**2**
2 – Thallus thin, with a strong fishy smell when crushed; ventral scales appendages obtuse at apex; paroicous.....***Asterella africana***
2 – Thallus thick, without a fishy smell (but occasionally aromatic); ventral scales appendages subulate at apex; autoicous or paroicous.....**3**
3 – Thallus greyish, delicate, becoming dorsally lacunose; antheridia aggregated in a slightly raised rounded cluster; autoicous.....***Mannia triandra***
3 – Thallus greenish, leathery, not becoming lacunose (or lacunae very indistinct in older sectors); antheridia scattered dorsally on main thallus; paroicous or autoicous .....**4**
4 – Antheridia mostly on the same axes as the gynoecia.....***Mannia androgyna***
4 – Antheridia borne on leading thallus, whereas gynoecia are mostly borne laterally on reduced axes.....***Mannia californica***

**Specimens examined:** Balearic Islands; Mallorca; Escorca, Puig de Sa Rateta; in fissures of calcareous cliffs, SE exposures; 880 m; 39°46’24.31’’N; 2°47’36.04’’E; 22 December 2022; Coll. & Det. V. Hugonnot (private herbarium of the author); Alpes-Maritimes, Saint Vallier de Thiey, col de la Lèque, pelouses rases à *Genista villarsii* sur calcaire dolomitique, 695 m, VH03353 (E and private herbarium of VH); Ardèche, Thueyts, le long de la N102, coulée basaltique ménageant des cavités ombragées, 350 m (private herbarium of VH); Gard, Sainte-Anastasie, vallée du Gardon, le Castellas, replats sur les falaises calcaires, 150 m (private herbarium of VH); Saint, Maurin, gorges du Verdon, tuf sec, 750 m (private herbarium of VH).

## Distribution

In North America, according to Schuster (1992) and Schill (2006) the species is widely distributed from the Eastern USA to Canada. The species has a disjunctive distribution in Asia (China, Japan and Korea) (Gao & Zhang 1981; Yamada & Iwatsuki 2006; Schill 2006; Borovichev & Bakalin 2016).

In Europe the species is known from the Alps and Carpathians (up to 2600 m), but has been found also at lower elevations (to ca 200 m) in Central and Southern Europe. It is recorded from Albania, Austria, Bosnia and Herzegovina, Bulgaria, Croatia, Czechia, France, Germany, Hungary, Italy, Montenegro, North Macedonia, Poland, Romania, Russian Federation (European Russia), Serbia, Slovakia, Slovenia, Sweden, Switzerland, Ukraine and Svalbard (Sabovljević & al. 2019; Söderström & al. 2002; Kučera & Váňa 2003; Schumacker & Váňa 2005; Schill 2006; Sabovljević & Natcheva 2006; Nèmeth & Papp 2011; Müller & al. 2014). Within Russia the species is also known in Siberia (Schill 2006).

**Habitat**

The Mallorcan population occupies an area of approximately 4 m long and 20 cm wide. No more than 20 well-developed rosettes were observed, with several juvenile thalli showing no sexual structures.

The population of *Mannia triandra* occurs in a karstic environment, at 880 m, with a SE exposition (Fig. 2). The bryoflora on the bedrock is very poor, consisting only of isolated cushions of *Tortella mediterranea* Köckinger, Lüth, O. Werner & Ros, and *Trichostomum crispulum* Bruch. *Mannia triandra* has colonised a narrow ledge at the base of small successive calcareous cliffs, unshaded, but growing slightly protected by an overhang behind the ledge. The vascular herbaceous cover of the ledge in direct contact with *Mannia triandra* is dense but composed of few species, mostly *Oeosporangium acrostichum* (Balb.) L. Sáez & Aymerich, *Sedum dasyphyllum* L., *Selaginella denticulata* (L.) Spring, *Crocus cambessedesii* J. Gay and several annual species that were germinating at the time of observation. Accompanying bryophytes species are very sparse and mundane (*Weissia* sp., *Bryum* sp., *Riccia sorocarpa* Bisch.).

The allied vascular vegetation of the surrounding area is a characteristic meso-Mediterranean open matorral with a number of shrub species: *Buxus balearica* Lam., *Cneorum tricoccon* L., *Olea europaea* L., *Pistacia lentiscus* L. and *Quercus ilex* L. *Ampelodesmos mauritanicus* (Poir.) T.Durand & Schinz, *Urginea maritima* L. and *Asphodelus albus* Mill. are the most significant herbaceous plants. This community corresponds to the *Oleo sylvestris-Ceratonion siliquae* Br.-Bl. ex Guinochet & Drouineau 1944 vegetation type (Bolos 1996).

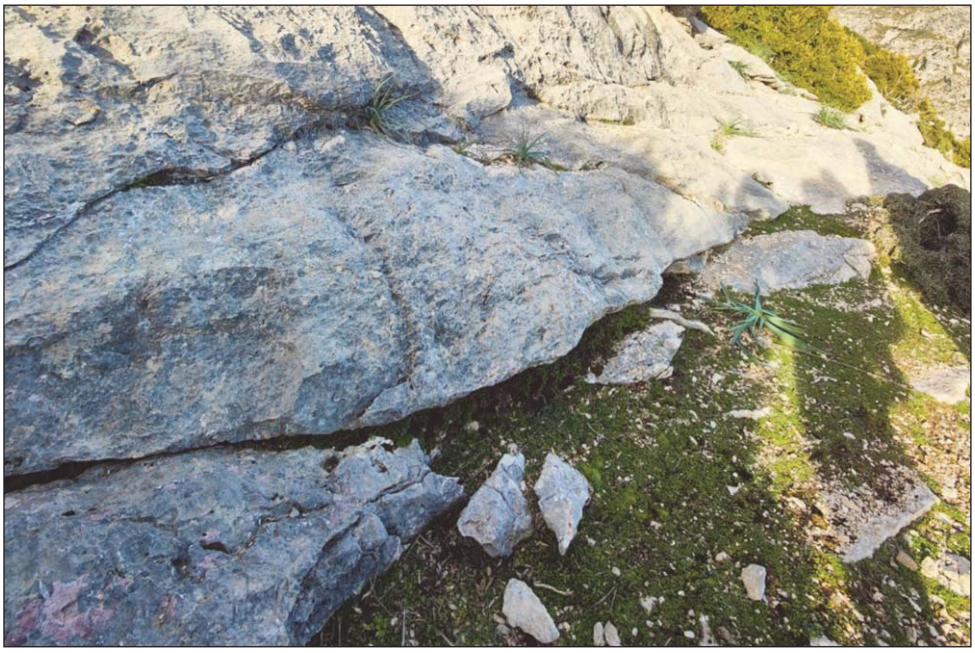

Fig. 2. Habitat of *Mannia triandra* on Puig de Sa Rateta, Mallorca, Spain (22 December 2022).

## Discussion

The arcto-montane *Mannia triandra* is a remarkable addition to the bryoflora of Mallorca and Spain. However, it was not completely unexpected in the context of the French populations known to date, which are at the South-Western margin of the European range of the species. The nearest population is that in the Pyrénées-Orientales (Hugonnot & al. 2017), which is the sole population hitherto recorded in the Pyrenees. It is very isolated from the more numerous populations of the Southern Massif Central and the Southern Alps (Hugonnot & Offerhaus, 2005; pers. obs.). In view of the present extension of range to Mallorca, it seems possible that this pronounced calciphyte might occur in the calcareous range of Central Spain or in North Africa (Morocco particularly), where elevated massifs occur.

Other Boreo-Montane or Arctic-Alpine species are known to occur at isolated sites in the Serra de Tramuntana. *Encalypta spathulata* Müll.Hal., *Isopterygiella pulchella* (Hedw.) Ignatov & Ignatova (Sáez & al. 2006), *Alleniella besseri* (Lobarz.) S. Olsson, Enroth & D. Quandt (Sáez & al. 2021), *Schistidium atrofuscum* (Schimp.) Limpr. (Pericàs 2008), *Hymenostylium recurvirostrum* (Hedw.) Dixon and *Weissia wimmeriana* (Sendtn.) Bruch & Schimp. (Pericàs & Rosselló 2009) are among the most striking examples of cryophilic taxa occurring at outposts in the most elevated range of Mallorca.

The ecological setting of the Mallorcan population is in perfect agreement with reports from nearby countries. It is a typical calcicolous meso-xerophyte of arctic-montane distribution that grows on mesic fine soil in moderately to fully shaded cliff crevices (Siller 1979; Schuster 1992; Müller & al. 2014). Associated bryophytes are markedly calciphile species such as *Gymnostomum* spp., *Eucladium verticillatum* (With.) Bruch & Schimp., etc.

*Mannia triandra* has been detected only at a single location, but it occurs almost certainly in other comparable sites. The Serra de Tramuntana is a mountain range running along a southwest-northeast axis on Mallorca. Its highest summit is Puig Major (1436 m), which is also the highest mountain in the Balearic Islands. Puig Sa Rateta (1113 m) stands out as one of the most elevated summits of the Serra. Like other bryophytes from the highest locations of the Serra (Sáez & al. 2006), *M. triandra* certainly depends on a sufficient supply of water during the growing period (mostly winter). The amount of precipitation can exceed 1300 mm/year in the most elevated part of this mountain range.

From a conservation perspective, no trend can be derived from only one recent observation, but due to the very small extent of the population the species could easily be damaged by goat overgrazing and trampling. The population is situated near a tourist path, so that direct anthropogenic disturbance cannot be excluded either. It is advisable to provisionally assign a VU status to this species in Spain. The known population is located within Paratge Natural de la Serra de Tramuntana, which would facilitate the implementation of conservation actions.

**Acknowledgements**

Tom Blockeel offered many suggestions and corrections that helped us very much to improve this text.

**References**

Bolos, O. 1996: La vegetado de les Illes Balears. – Barcelona.

Borovichev, E. A. & Bakalin, V.A. 2016: On *Mannia triandra* (*Aytoniaceae*, *Marchantiophyta*) in Eastern Asia. – Herzogia **29:** 59-65. https://doi.org/10.13158/heia.29.1.2016.59

Casas, C., Brugués, M., Cros, R. M., Llorenc Saez, F. & Balaguer, P. 2004: Referencias bibliográficas sobre la flora Briofítica de las Islas Baleares. – Bol. Soc. Española Briol. **25:** 33-40.

Cros, R. M., Sáez, L. & Brugués, M. 2008: The bryophytes of the Balearic Islands: an annotated checklist. – J. Bryol. **30:** 74-95. https://doi.org/10.1179/174328208x282427

Gao, C. & Zhang, G.-C. 1981: Flora hepaticarum Chinae boreali-orientalis. – Peking.

Guerra, J. 1982: Estudio briofítico de los macizos serpentínicos de Sierra Bermeja y Sierra de Aguas (Málaga, España). – Acta Bot. Malacitana **7:** 151-172. https://doi.org/10.24310/actabotanicaabmabm.v7i.9784

Hodgetts, N. & Lockhart, N. 2020: Checklist and country status of European bryophytes - update 2020. – Dublin.

Hugonnot, V. & Offerhaus, B. 2005: Nouvelles localités de *Mannia triandra* (Scop.) Grolle - Ecologie et répartition en France. – J. Bot. Soc. Bot. France **29:** 63-68. https://doi.org/10.3406/jobot.2005.1992

Hugonnot, V. & Chavoutier, J. L. 2021: Les Bryophytes de France. Volume 1: Anthocérotes et Hépatiques. – Paris.

Hugonnot, V., Chavoutier, L., Pépin, F. & Vergne, T. 2017: Les bryophytes des Pyrénées-Orientales. – Turriers.

Kučera, J. & Váňa, J. 2003: Check- and red list of bryophytes of the Czech Republic. – Preslia **75:** 193-222.

Müller, F., Günther, K.-F., Hentschel, J. & Long, D. G. 2014: Erstfund von *Mannia triandra* (*Aytoniaceae*, *Hepaticae*) fűr den Harz und Sachsen-Anhalt. – Herzogia **27:** 147-156. https://doi.org/10.13158/heia.27.1.2014.147

Nèmeth, C. & Papp, B. 2011: *Mannia triandra* in the Transdanubian Mountain Range (Hungary). – Stud. Bot. Hungarica **42:** 23-29.

Pericàs, J & Rosselló, J. A. 2010: New bryophytes records for Mallorca (Balearic Islands). II. – *Fl. Montiberica* **45:** 87-88.

Pericàs, J. & Rosselló, J. A. 2009: New and interesting records to the bryophyte flora of the Balearic Islands. – Cryptog. Bryol. **30:** 501-505.

Pericàs, J. 2008: New bryophyte records from the Balearic Islands. – Cryptog., Bryol. **29:** 99-102.

Pericàs, J., Fraga, P., Mascaró, J. & Rosselló, J. A. 2016: New and interesting bryophyte records for Minorca (Balearic Islands, Spain). – Fl. Montiberica **62:** 92-99.

Pericàs, J., Ginés, A. & Rosselló, J.A. 2009: New bryophyte records from Mallorca (Balearic Islands). – Fl. Montiberica **43:** 87-91.

Pinya, S., Suárez-Fernández, J. J., Sáez, L. & Castro, J. M. 2013: Catàleg de Biodiversitat del Paratge Natural de la Serra de Tramuntana. – Biota Balear **3:** 5-143.

Sabovljević, M. & Natcheva, R. 2006: Check-list of the liverworts and hornworts of Southeast Europe. – Phytolog. Balc. **12:** 169-180.

Sabovljević, M., Papp, B., Blockeel, T., Ignatov, M., Hallingbäck, T, Schröck, C. & Söderström, L. 2019: *Mannia triandra* (Europe assessment). The IUCN Red List of Threatened Species 2019: e.T87531813A87777551. [Accessed on 06/1/2023]

Sáez, L., Pinya, S. & Lara, F. 2021: New bryological data for the Balearic Islands. III. – Anal. Biolog. **43:** 1-9.

Sáez, L. 2019: *Pohlia cruda* (Hedw.) Lindb. In Ellis & al. New national and regional bryophyte records, 60. – J. Bryol. **41:** 292-293.

Sáez, L., Casas, C., Cros, R. M. & Brugués, M. 2006: New Bryological Data from the Balearic Islands II. – Cryptog. Bryol. **27:** 387-394.

Schill, D. B. 2006: Taxonomy and phylogeny of the liverwort genus *Mannia* (*Marchantiophyta, Aytoniaceae*). – PhD Thesis, University of Edinburgh, Edinburgh. https://www.era.lib.ed.ac.uk/handle/1842/7463.

Schumacker, R. & Váňa, J. 2005: Identification keys to the liverworts and hornworts of Europe and Macaronesia (distribution and status), 2nd ed. – Poznan.

Schuster, R. M. 1992: The *Hepaticae* and *Anthocerotae* of North America, **6.** – Chicago.

Sérgio, C., Brugués, M., Cros, R. M. & Garcia, C. 2007: The 2006 Red List and an Updated Checklist of Bryophytes of the Iberian Peninsula (Portugal, Spain and Andorra) – Lindbergia **31:** 109-125.

Siller, I. 1979: *Mannia triandra* (Scop.) Grolle in Hungary. – Acta Bot. Sci. Hungaricae **25:** 139-142.

Söderström, L., Urmi, E. & Váňa, J. 2002: Distribution of *Hepaticae* and *Anthocerotae* in Europe and Macaronesia. – Lindbergia **27:** 3-47.

Yamada, K. & Iwatsuki, Z. 2006: Catalog of the hepatics of Japan. – J. Hattori Bot. Lab. **99:** 1-106.

Address of the authors:
Vincent Hugonnot & Florine Pépin,
Le bourg 43380 Blassac, France. E-mail: vincent.hugonnot@wanadoo.fr