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MANNIA TRIANDRA IN THE TRANSDANUBIAN MOUNTAIN RANGE (HUNGARY)

Cs. Németh[1] and B. Papp[2]

[1]*H–2900 Komárom, Jedlik Á. u. 3/C, Hungary; nemetcsaba@gmail.com*
[2]*Department of Botany, Hungarian Natural History Museum, H–1476 Budapest, Pf. 222, Hungary; pappbea@bot.nhmus.hu*

During recent field trips in the Vértes and Bakony Mts, respectively, nine new localities of *Mannia triandra* were discovered. This is a species listed in the EC Habitat Directives and is protected in Hungary, where the new findings redraw its distribution and add new knowledge on the species' habitat requirements. Conservationally, we evaluate its threat status as endangered (EN) in our country.

Key words: habitats, red-listed species, species listed in EC Habitat Directives, threat status

INTRODUCTION

Mannia triandra is a disjunct circumpolar species with subcontinental-subarctic-subalpine character. In Europe it is a montane, subalpine element, mainly occurring in the Alps, but also found in the lower regions of central and southern Europe as well, such as in Albania, Austria, Bosnia and Herzegovina, Bulgaria, Croatia, Czech Republic, France, Germany, Hungary, Italy, Macedonia, Montenegro, Poland, Romania, Slovakia, Slovenia, Spain, Switzerland and Ukraine (Kučera and Váňa 2003, Sabovljević and Natcheva 2006). In Asia it occurs in the central and northeastern parts of the continent (China, Japan, Russia) and in the New World in North America (Canada, USA) and Greenland. It is a short-lived shuttle species (Orbán 1984); in Hungary following spore dispersal during early spring, its small blue-green thalli usually disappear.

In Hungary, *Mannia triandra* was first reported from the Bükk Mts (Northern Mountain Range) (Siller 1979); as being a species listed in the EC Habitat Directives, and it is also included in the Hungarian National Biodiversity Monitoring System (Papp *et al.* 2006). Recent surveys in the frame of this project at the previously known locality and its surroundings

have proven the presence of two small populations of *Mannia triandra* in the Bükk Mts (PAPP 2008, PAPP *et al.* 2010).

In the past years several field trips were carried out by the first author into woodland habitats of the Vértes and Bakony Mts (Transdanubian Mountain Range) to clarify the actual distribution of *Sorbus* species in these areas. For this purpose almost all calcareous rock outcrops were visited and as part of the surveys, bryophytes were also collected in these unique habitats. This exploratory work has led to the discovery of several new localities of *Mannia triandra*. The general location has attracted many botanists in the past: the valleys with their conspicuously rich flora (especially with a number of glacial relicts), where the species turned up, were favourite collecting sites and research areas of Ádám Boros (BOROS 1915–1971) and László Vajda (VAJDA 1933–1978), two outstanding Hungarian bryologists. Since the publication of the monographic work of BOROS (1968), many new bryofloristical data from these areas were gathered, although with a many-year gap, these findings had not been published until very recently (NÉMETH 2007, 2008).

METHODS

The field trips were carried out between 2005 and 2011 mainly by the first author. Almost all calcareous rock outcrops were visited in the Vértes and Bakony Mts, respectively (Transdanubian Mountain Range), and bryophytes were sampled in these unique habitats.

The records of enumeration are composed of date, geographical coordinates, altitude above sea level, and collecting number of the first author. Voucher specimens were deposited in the bryological collection of the Hungarian Natural History Museum, Budapest (BP) and the private herbarium of the first author.

The nomenclature of the bryophytes and vascular plants follows PAPP *et al.* (2010) and KIRÁLY (2009), the threat status of the bryophytes and vascular species are based on the work of PAPP *et al.* (2010) and KIRÁLY (2007).

Abbreviations used in the text: **CR** = critically endangered; **EN** = endangered; **VU** = vulnerable; **NT** = near threatened; **DD** = data deficient (no recent data); **IND** = indicator of high nature conservation value of the habitat.

RESULTS AND DISCUSSION

Based on previous records, only one old (SILLER 1979) and two recently listed localities with small populations of *Mannia triandra* were known from the Bükk Mts (Northern Mountain Range) (PAPP 2008, PAPP *et al.* 2010). With the newly discovered nine occurrences in the Transdanubian Mountain Range, the known Hungarian localities of the species increased to eleven (Fig. 1).

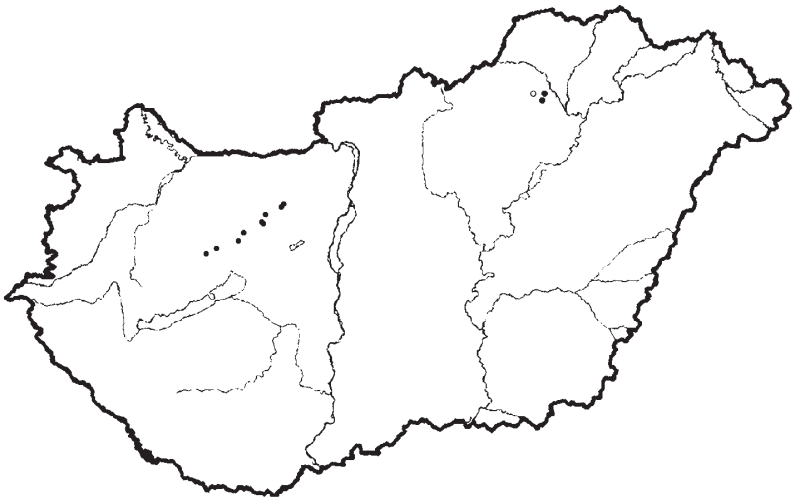


Fig. 1. Distribution of *Mannia triandra* in Hungary; ○ = old occurrence, before 1980; ● = recently recorded occurrences (original)

The new occurrences are as follows:

Bakony Mts – Hajmáskér: Tobán-hegy (26.03.2011, 47.20291° N, 17.95037° E, alt. *ca* 340 m, 3573/15). – Isztimér: Burok-völgy (in front of the entrance of Bükkös-völgy) (26.03.2006, 47.27013° N, 18.13387° E, alt. *ca* 300 m, 1531/6). – Márkó: Esztergáli-völgy (13.01.2007, 47.16993° N, 17.83650° E, alt. *ca* 375 m, 2051/5); (15.03.2011, 47.16996° N, 17.83660° E, alt. *ca* 385 m, 3570/1). – Várpalota: Vár-völgy (24.06.2006, 47.22791° N, 18.10064° E, alt. *ca* 303 m, 1674/2).

Vértes Mts – Csákberény: Ugró-völgy at Szentegyházi-hegy (21.05.2005, 47°22'05.0" N, 18°19'12.9" E, alt. *ca* 365 m, 781/2); (06.02.2011, 47.36785° N, 18.32028° E, alt. *ca* 353 m, 3509/1); Csákberény: Ugró-völgyi barlang cave (06.02.2011, 47.36946° N, 18.31621° E, alt. *ca* 338 m, 3510/5). – Gánt (Kápolnapuszta): Juh-völgy (21.05.2005, 47° 23'40,8" N, 18°20'09,7", alt. *ca* 379 m, 667/11); (02.04.2011, 47.39481° N, 18.33589°, alt. *ca* 379 m,

3588/15); Gánt (Vérteskozma): Fáni-völgy (Boglári-oldal) (26.02.2011, 47°27'13.8" N, 18° 26'58.6" E, alt. *ca* 306 m, 3539/2). – Vértesboglár: Fáni-völgy (Macska-gödör) (26.02.2011, 47.45930° N, 18.45671° E, alt. *ca* 264 m, 3533/6).

According to our current knowledge about the ecology of the species in Hungary, it occurs in humid, cool microhabitats on north-facing calcareous rocks (on limestone in the Bükk Mts, and on dolomite in the Bakony and Vértes Mts) in rock crevices, on soil at the base of near vertical rock walls, on humus with dolomite fragments accumulated between surface roots of small *Fagus sylvatica* and *Fraxinus ornus* trees.

Each of the new localities of *Mannia triandra* is especially rich in vascular plants that are remarkable from phytogeographical point of view, including *Primula auricula*, *Carduus glaucus* or *Allium victorialis*, regarded as glacial relicts in Hungary (see also below). At all habitats of *Mannia triandra* other rare, calciphilous alpine-boreal mosses and liverworts can be found as well.

In the surroundings of *Mannia triandra* we recorded the following phytogeographically interesting, threatened bryophytes.

Anomodon rostratus (Hedw.) Schimp. – NT, IND – (Burok-völgy, Fáni-völgy, Tobán-hegy, Vár-völgy).

Athalamia hyalina (Sommerf.) S. Hatt. – EN – (Burok-völgy, Tobán-hegy).

Cololejeunea calcarea (Lib.) Schiffn. – NT, IND – (Burok-völgy, Fáni-völgy, Ugró-völgy, Vár-völgy).

Cololejeunea rossettiana (C. Massal.) Schiffn. – NT, IND – (Burok-völgy, Vár-völgy).

Conardia compacta (Müll. Hal.) H. Rob. – DD – (Burok-völgy, Fáni-völgy, Juh-völgy, Tobán-hegy, Vár-völgy).

Distichium capillaceum (Hedw.) Bruch et Schimp. – NT, IND – (Burok-völgy, Esztergáli-völgy, Fáni-völgy, Juh-völgy, Tobán-hegy, Ugró-völgy, Vár-völgy).

Leiocolea collaris (Nees.) Schljakov – VU – (Burok-völgy, Esztergáli-völgy, Fáni-völgy, Juh-völgy, Tobán-hegy, Ugró-völgy, Vár-völgy).

Myurella julacea (Schwägr.) Schimp. – NT, IND – (Burok-völgy, Fáni-völgy, Juh-völgy, Tobán-hegy, Ugró-völgy, Vár-völgy).

Neckera crispa Hedw. – NT, IND – (Burok-völgy, Esztergáli-völgy, Fáni-völgy, Juh-völgy, Tobán-hegy, Ugró-völgy, Vár-völgy).

Orthothecium intricatum (Hartm.) Schimp. – NT, IND – (Burok-völgy, Esztergáli-völgy, Fáni-völgy, Juh-völgy, Tobán-hegy, Ugró-völgy, Vár-völgy).

Pedinophyllum interruptum (Nees) Kaal. – NT, IND – (Burok-völgy, Esztergáli-völgy, Fáni-völgy, Juh-völgy, Tobán-hegy, Ugró-völgy, Vár-völgy).

Plagiobryum zierii (Hedw.) Lindb. – VU – (Burok-völgy, Esztergáli-völgy, Fáni-völgy, Ugró-völgy, Vár-völgy).

Plagiopus oederianus (Sw.) H. A. Crum et L. E. Anderson – VU – (Burok-völgy, Esztergáli-völgy, Fáni-völgy, Vár-völgy).
Preissia quadrata (Scop.) Nees – EN – (Burok-völgy, Fáni-völgy, Tobán-hegy, Ugró-völgy).
Scapania aspera M. Bernet et Bernet – VU – (Burok-völgy, Fáni-völgy, Vár-völgy).
Scapania calcicola (Arnell et J. Perss.) Ingham – VU – (Burok-völgy, Juh-völgy, Ugró-völgy).

Some of the phytogeographically interesting, rare, threatened vascular plants that we found in the surroundings of *Mannia triandra*.

Allium victorialis L. – EN – (Burok-völgy, Esztergáli-völgy).
Aquilegia vulgaris L. – VU – (Burok-völgy, Fáni-völgy, Juh-völgy, Tobán-hegy, Ugró-völgy, Vár-völgy).
Asplenium viride Huds. – EN – (Burok-völgy, Esztergáli-völgy, Tobán-hegy).
Carduus crassifolius Willd. subsp. *glaucus* (Baumg.) Kazmi – EN – (Fáni-völgy, Ugró-völgy, Vár-völgy).
Moehringia muscosa L. – NT – (Burok-völgy, Fáni-völgy, Tobán-hegy, Vár-völgy).
Primula auricula L. – EN – (Burok-völgy, Esztergáli-völgy, Fáni-völgy, Tobán-hegy).
Ranunculus nemorosus DC. – NT – (Burok-völgy, Esztergáli-völgy, Fáni-völgy, Juh-völgy, Tobán-hegy, Ugró-völgy).
Sorbus pseudobakonyensis Kárpáti – EN – (Fáni-völgy – endemic to the Vértes Mts).
Sorbus pseudolatifolia Boros – EN – (Fáni-völgy – endemic to the Vértes Mts).
Sorbus redliana Kárpáti – VU – (Burok-völgy, Vár-völgy – endemic to the Bakony Mts).
Sorbus simonkaiana Kárpáti – VU – (Juh-völgy – endemic to the Vértes Mts).
Sorbus tobani Cs. Németh – CR – (Tobán-hegy – endemic to the Bakony Mts).
Sorbus ulmifolia Kárpáti – CR – (Fáni-völgy – endemic to the Vértes Mts).
Viola collina Bess. – NT – (Burok-völgy, Esztergáli-völgy, Fáni-völgy, Juh-völgy, Tobán-hegy, Ugró-völgy, Vár-völgy).

Nature conservation aspects

Mannia triandra is a rare species according to the RDB (ECCB 1995), included in the EC Habitat Directives. It is a protected species in Hungary. According to the red list of Hungarian bryophytes it is regarded as an endangered (EN) species (PAPP *et al.* 2010). All populations, i.e. the recently reported ones from the Bükk Mts, as well as the newly discovered ones in the Bakony and Vértes Mts, are found in protected areas. The new findings are a substantial addition to the range of distribution of the species in Hungary, and made it possible to provide an updated evaluation of the threat status as given below using the IUCN red list criteria (IUCN 2001, 2003*a*, *b*)

with the application guidelines for bryophytes (HALLINGBÄCK *et al.* 1998). The main criterion used is B (current distribution, number of localities), but criteria C and D (small, fragmented populations or high fluctuation in population size) are also considered.

Criterion B: The species has been recently recorded in nine new populations from four 10 km by 10 km squares. With its previous data from the Bükk Mts this means altogether five squares. It corresponds to the endangered (EN) category.

Criteria C and D: The population size is usually smaller than 50 individuals. The largest known populations can be found on the hills Tobán-hegy and Szentegyházi-hegy; the latter site was recently visited and the population size was estimated on 17.04.2011. 110 patches of 1–2 cm in diameter, which are probably growing from the same prothallium and can be regarded as individuals, were detected. This also corresponds to the endangered (EN) category.

As a consequence the threat status of the species remains endangered (EN) in our country.

For the better knowledge on the ecology and any threats that might affect the species, it is advised to establish a monitoring program aiming at the newly discovered localities, especially on those, which have the largest populations. The life strategy of this species is short-lived shuttle: in Hungary it appears in the spring, produces spores, then it dies during the dry season. Population size thus can be very variable from year to year, because the presence of the species is strongly connected with the weather conditions, as the time and quantity of rains. Therefore, only long-term investigations can provide adequate scientific basis for nature conservation efforts to protect this species.

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