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DATA ON THE DISTRIBUTION OF SOME RARE ALPINE-BOREAL BRYOPHYTES IN THE VÉRTES MTS (HUNGARY)

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Unusual assemblage of rare alpine-boreal bryophytes and glacial relict vascular plant species was investigated on steep dolomite north facing rock walls in the southern and eastern Vértes Mts, west-central Hungary. Documentation of the microhabitats revealed the presence of bryophytes *Anomodon rostratus*, *Leiocolea collaris*, *Myurella julacea*, *Orthothecium intricatum*, *Pedinophyllum interruptum*, and *Plagiobryum zierii*.

Key words: distribution maps, rare bryophytes, Vértes Mts

INTRODUCTION

Fieldwork conducted in the Vértes Mts in the past two years, in continuation of ongoing surveys on the distribution of bryophytes, resulted in new floristical data. This effort is part of a network of similar works within the country. Several recent publications have already made important additions to the better knowledge of the actual distribution of bryophytes (PURGER *et al.* 1997, SZÖVÉNYI *et al.* 2001, PAPP and RAJCZY 1996, 1999, 2000, PAPP and ERZBERGER 2000, 2003, PAPP *et al.* 2000, 2003), combining data from new collections and consulting specimens from earlier collections. The present study provides a series of new data on the actual distribution of some rare species at national level.

MATERIAL AND METHODS

Research area

Part of the Transdanubian Mountain Ranges, the Vértes Mts is a SW–NE running smaller range consisting predominantly of Upper Triassic limestone and dolomite. From the approximate line of the villages Csókakő, Kőhányás, and Szárliget it may be divided

into two major parts, the areas north of the line dominated by limestone, and those to the south by dolomite (Fig. 1).

The north facing steep rocky walls of the dolomite areas have preserved a number of glacial relict vascular plants (discussed as the "dolomite-phenomenon", ZÓLYOMI 1942). These microhabitats are also important refugia for alpine-boreal bryophyte species (BOROS 1968). The tops of the rocky outcrops are usually covered by rocky grass communities, in most cases classified as "closed dolomite rocky grassland" (*Festuco pallenti-Brometum pannonici* Zólyomi 1958) with associating *Primula auricula* L. subsp. *hungarica* (Borb.) Soó, *Carduus glaucus* Baumg., *Coronilla vaginalis* Lam., *Polygala amara* L., *Biscutella laevigata* L., *Daphne cneorum* L., *Phyteuma orbiculare* L. The surrounding vegetation contains mixed karstic *Fago-Ornetum* Zólyomi (1950) 1958 on the lithosol or rendzina of the steep mountain sides below the rock walls, *Primulo veris-Tilietum platyphyllae* (Isépy 1968) Borhidi 1996 on dolomite scree, rocky forest with oaks (BÖLÖNI *et al.* 2003), beech forest (*Daphno laureolae-Fagetum* (Isépy 1970) Borhidi in Borhidi and Kevey 1996), with *Carex alba* Scop., *Calamagrostis varia* (Schrad.) Host, *Ranunculus nemorosus* DC., *Aquilegia vulgaris* L., and *Sorbus aria* L., *Sorbus danubialis* (Jáv.) Kárp., *Sorbus ulmifolia* Kárp., and *Sorbus aria s. l.* × *Sorbus torminalis* (L.) Cr. (endemic microspecies) in the canopy layers, *Moehringia muscosa* L., *Draba lasiocarpa* Rochel, and *Viola collina* Bess. in wet places and smaller rock terraces.

The more common bryophytes of the surveyed dolomite rocks and rock forests with wider ecological amplitude include *Ctenidium molluscum* (Hedw.) Mitt., *Distichium capillaceum* (Hedw.) Bruch et Schimp., *Encalypta streptocarpa* Hedw., *Fissidens dubius* P. Beauv., *Gymnostomum aeruginosum* Sm., *Homalothecium sericeum* (Hedw.) Schimp., *Neckera crispa* Hedw., *Plagiochila porelloides* (Nees) Lindenb., *Reboulia hemisphaerica* (L.) Raddi, *Scapania calcicola* (Arnell et J. Perss.) Ingham, and *Tortella tortuosa* (Hedw.) Limpr.

Having ecological requirements similar to the bryophytes above, the rare lichen species *Solorina saccata* (L.) Ach. in all localities is found together with the bryophyte species discussed.

Methods

The fieldwork was planned so that I could systematically survey all potential habitats, rocky mountain sides of northern exposition, which might contain alpine-boreal bryophyte species. The determination of geological coordinates was implemented by Garmin Etrex Legend GPS. The precision of the coordinates is between 5–10 metres. The geographical names follow those of the regional topographical map, scale 1 : 10,000, the map of forestry management plan, scale 1 : 20,000, and the tourist map, scale 1 : 40,000. Processing of the map was rendered with EOV system, using ITR interactive map editor system.

The nomenclature of the bryophytes follows ERZBERGER and PAPP (2004), the nomenclature of the vascular plants follows SIMON (2000), and the nomenclature of the habitats is based on the work of BORHIDI and SÁNTA (1999). Entries of occurrences in the Enumeration below are based on data from the bryophyte collection of the Department

of Botany, Hungarian Natural History Museum (BP), and these are with collector names; records without the indication of collector name are of the author. All voucher specimens are deposited in the bryophyte collection of the above-mentioned herbarium (BP).

RESULTS

Documentation of the bryophytes on steep dolomite north facing rock walls in the Vértes Mts revealed several data of great interest; the species-by-species discussion below is combined with range maps of their approximate distribution in the Vértes Mts.

Legend of the distribution maps: ○ not confirmed occurrence from herbarium specimen; ■ confirmed occurrence from herbarium specimen; ● new occurrence (based on the author's documentation).

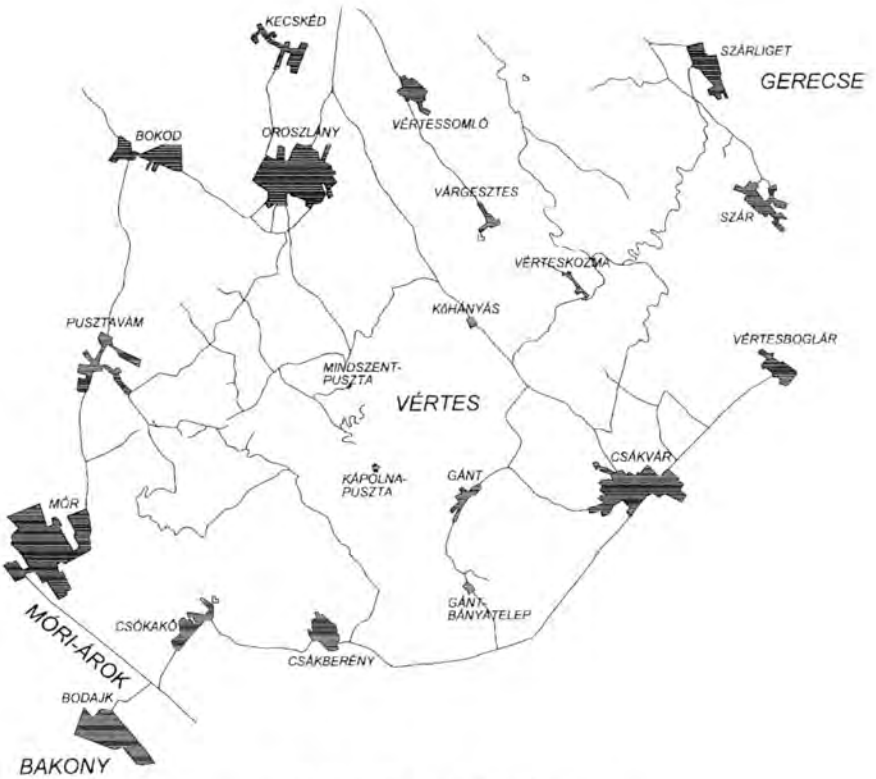

Fig. 1. Map of the Vértes Mts.

Anomodon rostratus (Hedw.) Schimp.
(Fig. 2)

A sub-Mediterranean-alpine element (BOROS 1968); data about its present occurrences in Hungary are reported by PAPP *et al.* (2000) and PAPP and ERZBERGER (2003). The latter work also reported it from the Vértes Mts (Csókakő: Vár-völgy, Csákberény: Ugró-völgy). Additional data by the author with some new localities.

Confirmed occurrence from herbarium specimen: **Csókakő**: Vár-völgy (leg. Á. Boros, 01. 08. 1934); (leg. P. Erzberger, 23.04.2001 (PAPP and ERZBERGER 2003)).

New records of occurrence: **Csákberény**: Gémförtés-völgy (22.05.2005, 47° 21' 14.4" N, 18° 18' 08.4" E, alt. ca 350 m); Kőkapu-völgy (leg. Z. Barina, Cs. Németh, D. Pifkó, D. Schmidt, 25.09.2005, 47° 22' 02.8" N, 18°17'55.1" E, alt. ca 390 m); (19.02.2006, 47° 2' 52.2" N, 18° 18' 13.4" E, alt. ca 360 m); Meszes-völgyi-lyuk (16.04.2005, 47° 21' 49.8" N, 18° 18' 32.1" E, alt. ca 369 m); Ugró-völgy (leg. P. Erzberger, 29.04.2001 (PAPP and ERZBERGER 2003)); **Csókakő**: Kőlyuk-völgy (11.03.2006, 47° 21' 42.3" N, 18° 16' 43.3" E, alt. ca 355 m); **Gánt** (Vérteskozma): Fillér-árok és a Kápolna-völgy találkozása (06.08.2005, 47° 27' 52.8" N, 18° 25' 26.5" E, alt. ca 346 m); **Szár**: Holdvilág-árok (30.04.2005, 47°28'20.2" N, 18° 27' 42.6" E, alt. ca 308 m).

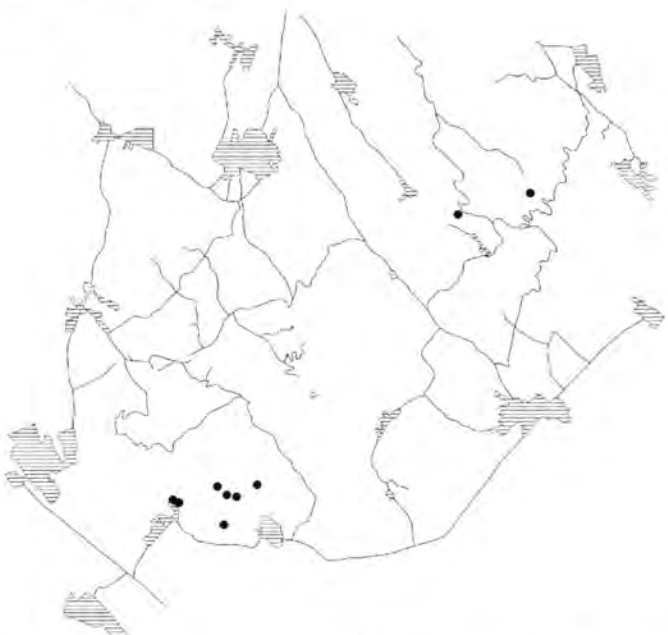

Fig. 2. Distribution of *Anomodon rostratus* (Hedw.) Schimp. in the Vértes Mts (original).

Leiocolea collaris (Nees) Schljakov
(Fig. 3)

A species of alpine character with European and North American distribution (BOROS 1968). In the mountainous areas of Hungary it is rare, previously only known from three localities in close proximity to each other in the (Fáni-völgy, Nagy-Somló-hegy, and Macska-gödör in the Vértes Mts). Apart from these it was found recently from six additional localities of the mountain range, always with very low cover values.

Confirmed occurrence from herbarium specimens: **Vértesboglár**: Fáni-völgy (leg. Á. Boros, 20.04.1946); (08.10.2005, 47° 27' 33.0" N, 18° 27' 26.7" E); (08.10.2005, 47° 27' 35.5" N, 18° 27' 40.8" E); Macska-gödör (leg. Á. Boros et L. Vajda, 24.08.1947); (29.10. 2005, 47° 27' 30.5" N, 18° 27' 19.9" E, alt. ca 308 m).

Not confirmed occurrence from herbarium specimen: **Gánt** (Vérteskozma): Nagy-Somló-hegy (leg. L. Vajda, 05.10.1959).

New records of occurrence: **Csákberény**: Kőkapu-völgy (25.03.2006, 47° 21' 45.8" N, 18° 18' 24.3" E, alt. ca 369 m); Ugró-völgy (10.09.2005, 47° 22' 13.3" N, 18° 18' 53.5" E, alt. ca 392 m); (10. 09. 2005, 47° 22' 14.5" N, 18° 18' 52.1" E, alt. ca 371 m); Ugró-völgy (Szentegyházi-hegy) (21.05.2005 47° 22' 05.0" N, 18° 19' 12.9" E, alt. ca 365 m); Ugró-völgyi-lyuk

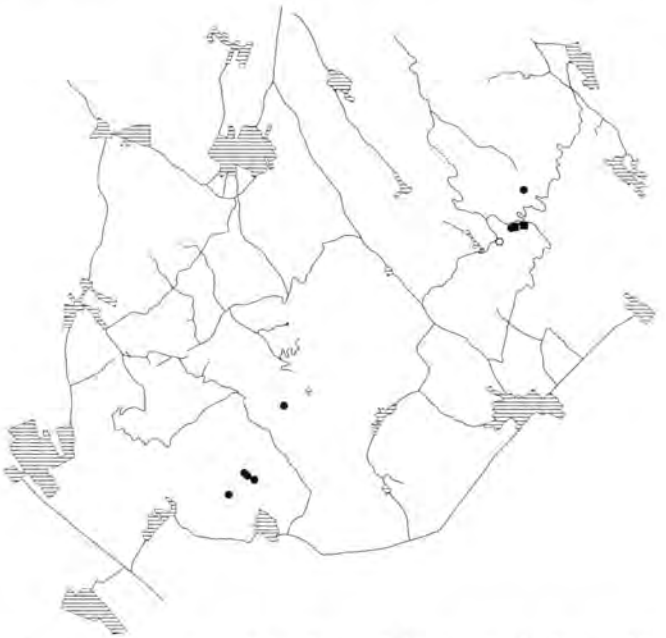

Fig. 3. Distribution of *Leiocolea collaris* (Nees) Schljakov in the Vértes Mts (original).

(22.04. 2005, 47° 22' 09.9" N, 18° 18' 59.7" E, alt. ca 360 m); **Gánt** (Kápolnapuszta): Juh-völgy (21.05.2005, 47° 23' 40.8" N, 18° 20' 09.7" E, alt. ca 397 m); **Szár**: Holdvilág-árok (30.04.2005, 47° 28' 20.2" N, 18° 27' 42.6" E, alt. ca 308 m).

Myurella julacea (Schwägr.) Schimp.
(Fig. 4)

Being a boreal-alpine element, it is a characteristic bryophyte species of the alpine regions of the Carpathians and the Alps (BOROS 1968). In Hungary it occurs sporadically: on dolomite of the Transdanubian Mountain Ranges (ORBÁN and VAJDA 1983), on phyllite (containing lime) in the Kőszeg Mts (PURGER *et al.* 1997), and in the Bükk Mts in radiolarite rock holes (PÉNZESNÉ KÓNYA and ORBÁN 2000). From the Vértes Mts it only has 4 records (Ökör-állás, Fáni-völgy, Pap-irtás, Kőkapu) (BOROS 1968), in the present paper these occurrences (except for Ökör-állás) are confirmed and additional ones are recorded (Macska-gödör, Somos-völgy, Ugró-völgy, Gémförtés-völgy, Kálvária-völgy, Juh-völgy, Boglári-oldal, Strázsa-hegy).

Confirmed occurrence from herbarium specimens: **Csákberény**: Kőkapu-völgy (leg. Á. Boros, 17.04.1949); (16.04.2005, 47° 21' 49.8" N, 18° 18' 32.1" E, alt. ca 369 m, Meszes-völgyi-lyuk név alatt); Pap-irtás É-i letörése (leg. Á. Boros, 26.04.1936); (16.04.2005, 47° 21' 07.1" N, 18° 18' 20.3" E, alt. ca 321 m); **Gánt** (Vérteskozma): Nagy-Somló-hegy (leg. Á. Boros, 27.06.1940, 05.10.1959, 14.05.1961); (13.05.2005, 47° 27' 12.5" N, 18° 26' 52.0" E, alt. ca 336 m, Boglári-oldal név alatt); (25.03.2005, 47° 27' 13.8" N, 18° 26' 58.6" E, alt. ca 306 m, Boglári-oldal név alatt); **Vértesboglár**: Fáni-völgy (leg. Á. Boros, 22.04.1946); (08.10. 2005, 47° 27' 35.8" N, 18° 27' 39.6" E, alt. ca 286 m).

Not confirmed occurrence from herbarium specimen: **Csákvár**: Ökör-állás (leg. Á. Boros, 18.05.1962).

New records of occurrence: **Csákberény**: Gémförtés-völgy (22. 05.2005, 47° 21' 12.9" N, 18° 18' 12.8" E, alt. ca 346 m); Somos-völgy (22.04.2005, 47° 21' 40.5"N, 18° 18' 44.8" E, alt. ca 333 m); Strázsa-hegy (10.09.2005, 47° 21' 24.2" N, 18° 20'b 06.9" E, alt. ca 279 m); Ugró-völgy (16.05.2005, 47° 22' 12.8" N, 18° 18' 52.3" E, alt. ca 406 m); (16.05.2005, 47° 22' 05.0" N, 18° 19' 12.9" E, alt. ca 365 m); (21.05.2005, 47° 22' 22.3" N, 18° 18' 51.4" E, alt. ca 371 m); Ugró-völgy (Szentegyházi-hegy) (16. 05. 2005, 09.09.2006, 47° 22' 05.0" N, 18° 19' 12.9" E, alt. ca 365 m); Ugró-völgyi-lyuk (22. 04.2005, 47° 22' 09.9" N, 18° 18' 59.7" E, alt. ca 360 m); **Csákvár**: Hosszú-hegy–Kálvária-völgy (03.04.2005, 47° 24' 14.6" N, 18° 26' 16.4" E, alt. ca 285 m); **Gánt** (Kápolnapuszta): Juh-völgy (leg. Cs. Németh et Z. Barina, 23.04.2005, 47° 23' 40.8" N, 18° 20' 09.7" E, alt. ca 397 m); (21.05.2005, 47° 23' 26.6" N, 18° 20' 53.3" E, alt. ca 342 m); Macska-gödör, (25.03.2005, 47° 27' 32.4" N, 18° 27' 21.6" E, alt. ca 280 m); (29.10.2005, 47° 27' 30.4" N, 18° 27' 19.3" E, alt. ca 313 m).

Fig. 4. Distribution of *Myurella julacea* (Schwägr.) Schimp. in the Vértes Mts (original).

Orthothecium intricatum (Hartm.) Schimp.
(Fig. 5)

Boreal-alpine element (BOROS 1968), known at national level as a rare bryrophyte. In the Vértes Mts, it only had one record (Fáni-völgy) (BOROS 1968) until very recently.

The systematic fieldwork showed it, in addition to Fáni-völgy, also from Macska-gödör, Boglári-oldal below Nagy-Somló, several localities of Ugró-völgy, Juh-völgy and also from Holdvilág-árok. It occurs at the base and in hollows of shaded rocks.

Confirmed occurrences from herbarium specimens: **Vértesboglár**: Fáni-völgy (leg. Á. Degen, 08.05.1932, det. Á. Latzel); (0810.2005, 47° 27' 35.8" N, 18° 27' 39.6" E, alt. ca 286 m); Macska-gödör (leg. Á. Boros, 01.05.1932, 22.04.1946); (25.03.2005, 47° 27' 32.4" N, 18° 27' 21.6" E, alt. ca 280 m); (29.10.2005, 47° 27' 30.5" N, 18° 27' 19.9" E, alt. ca 308 m).

New records of occurrence: **Csákberény**: Csete-völgy (19.02.2006, 47° 21' 56.1" N, 18° 17' 57.6" E, alt. ca 404 m); Kőkapu-völgy (19.02.2006, 47° 21' 46.0" N, 18° 18' 24.1" E, alt. ca 378 m); Ugró-völgy (21. 05. 2005, 47° 22' 05.0" N, 18° 19' 12.9" E, alt. ca 365 m); (10. 09.2005,

47° 22' 13.3" N, 18° 18' 53.5" E, alt. ca 392 m); (10.09.2005, 47° 22' 14.5" N, 18° 18' 52.1" E, alt. ca 371 m); Ugró-völgyi-lyuk (22.04.2005, 47° 22' 09.9" N, 18° 18' 59.7" E, alt. ca 360 m); **Gánt** (Kápolnapuszta): Juh-völgy (21.05.2005, 47° 23' 40.8" N, 18° 20' 09.7" E, alt. ca 397 m); **Gánt** (Vérteskozma): Boglári-oldal (25.03.2005, 47° 27' 13.8" N, 18° 26' 58.6" E, alt. ca 306 m); **Szár**: Holdvilág-árok (30.04.2005, 47° 28' 20.2" N, 18° 27' 42.6" E, alt. ca 308 m).

Fig. 5. Distribution of *Orthothecium intricatum* (Hartm.) Schimp. in the Vértes Mts (original).

Pedinophyllum interruptum (Nees) Kaal.
(Fig. 6)

Alpine, circumpolar species (BOROS 1968) with its former records from the Vértes Mts, all from Fáni-völgy at Vérteskozma, Vértesboglár, and their surroundings. Recently it was also found in Ugró-völgy as well as Kőkapu-völgy of Csákberény, Kálvária-völgy of Csákvár, Juh-völgy of Gánt, and Holdvilág-árok of Szár.

Confirmed occurrences from herbarium specimens: **Gánt** (Vérteskozma): Nagy-Somló-hegy (leg. Á. Boros, 27.05.1940); (leg. L. Vajda, 05.10.1959); (13.05.2005, 47° 27' 13.8" N, 18° 26' 58.6" E, alt. ca 306 m, Boglári-oldal név alatt); **Vértesboglár**: Fáni-völgy

(leg. Á. Degen, 08.05.1932, det. Á. Latzel); (leg. Á. Boros, 22.04.1946); (leg. L. Vajda, 19.04. 1953); (08.10.2005, 47° 27' 35.8" N, 18° 27' 39.6" E, alt. ca 286 m); (08.10.2005, 47° 27' 31.3" N, 18° 28' 06.1" E, alt. ca 279 m); Macska-gödör (leg. Á. Boros, 24.08.1947); (15.03. 2003, 47° 27' 32.4" N, 18° 27' 21.6" E, alt. ca 280 m).

New records of occurrence: **Csákberény**: Kőkapu-völgy (16.05.2005, 47° 21' 46.6" N, 18° 18' 27.4" E, alt. ca 337 m); Ugró-völgy (21. 05. 2005, 47° 22' 05.0" N, 18° 19' 12.9" E, alt. ca 365 m); (10.09.2005, 47° 22' 13.3" N, 18° 18' 53.5" E, alt. ca 392 m); **Csákvár**: Hosszú-hegy és a Kálvária-völgy között (03.04.2005, 47° 24' 15.7" N, 18° 26' 09.9" E, alt. ca 287 m); **Gánt** (Kápolnapuszta): Juh-völgy (21.05.2005, 47° 23' 40.8" N, 18° 20' 09.7" E, alt. ca 397 m); **Szár**: Holdvilág-árok (30.04.2005, 47° 28' 20.2" N, 18° 27' 42.6" E, alt. ca 308 m).

Fig. 6. Distribution of *Pedinophyllum interruptum* (Nees) Kaal. in the Vértes Mts (original).

Plagiobryum zierii (Hedw.) Lindb.
(Fig. 7)

Boreal-alpine element (BOROS 1968), which constitutes a significant result of the field research reported here. The discovery of new localities of this species is remarkable because it is considered rare even in the limestone alpine regions of the Carpathians (BOROS 1968). Its former records in Hungary are from Bakony Mts (Szúnyog-völgy), from two dolomite locations of

the Vértes Mts (Fáni-völgy, Kőkapu), from andesite in the Mátra Mts (Sas-kő) (BOROS 1968) and the Bükk Mts (Szarvas-kő) (ORBÁN and VAJDA 1983).

In the Vértes Mts it occurs in Holdvilág-árok, Ugró-völgy, Antal-árok and on the northern rocky walls of Csonka-bükk in small patches. It is present in Fáni-völgy and its side-valley, Macska-gödör, also at Boglári-oldal below Nagy-Somló, in Tábor-hegy, in Cseresnyés-völgy, and at one locality below Szentegyházi-hegy of Ugró-völgy (here in somewhat larger population). The record of BOROS (1968) from Kőkapu-völgy could not be confirmed despite repeated search. It occurs in mixed karst forests, on humus with dolomite fragments cumulated between surface roots of small beech trees.

Confirmed occurrences from herbarium specimens: **Gánt** (Vérteskozma): Nagy-Somló-hegy (leg. Á. Boros, 27.05.1940); (13.05.2005, 47° 27' 13.8" N, 18° 26' 58.6" E, alt. ca 306 m, Boglári-oldal név alatt); **Vértesboglár**: Fáni-völgy (leg. Á. Boros, 20.04.1946); (13.05.2005, 47° 27' 33.5" N, 18° 27' 24.5" E, alt. ca 276 m); (08.10.2005, 47° 27' 35.8" N, 18° 27' 39.6" E, alt. ca 286 m).

Not confirmed occurrence from herbarium specimens: **Csákberény**: Kőkapu (leg. Á. Boros, 17.04.1949).

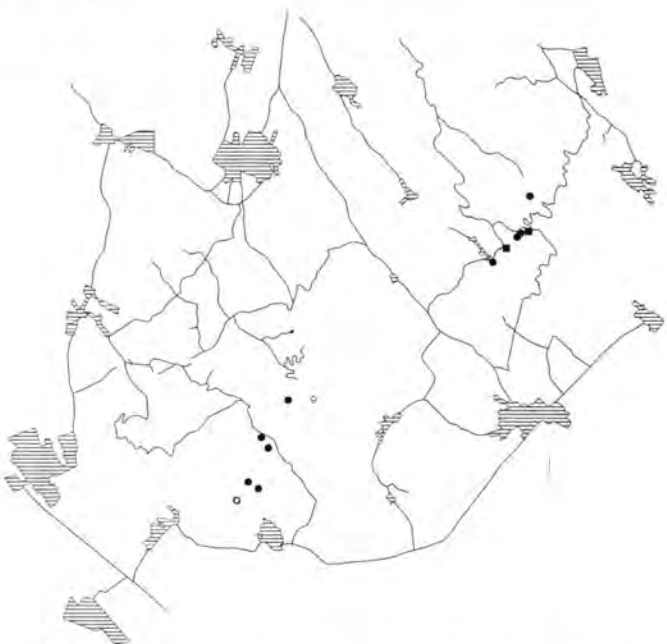

Fig. 7. Distribution of *Plagiobryum zierii* (Hedw.) Lindb. in the Vértes Mts (original).

New records of occurrence: **Csákberény**: Cseresnyés-völgy (14.10.2006, 47° 22' 56.9" N, 18° 19' 31.3" E, alt. ca 408 m); Csonka-bükk (21.10.2006, 47° 23' 10.4" N, 18° 19' 17.9" E, alt. ca 384 m); Ugró-völgy (10.09.2005, 47° 22' 13.3" N, 18° 18' 53.5" E, alt. ca 392 m); Ugró-völgy (Szentegyházi-hegy) (16.05.2005, 09.09.2006, 47° 22' 05.0" N, 18° 19' 12.9" E, alt. ca 365 m); **Gánt** (Kápolnapuszta): Antal-árok (23.10.2006, 47° 23' 58.5" N, 18° 20' 08.4" E, alt. ca 379 m); **Gánt** (Vérteskozma): Tábor-hegy (29.09.2006, 47° 26' 55.8" N, 18° 26' 33.3" E, alt. ca 357 m); **Szár**: Holdvilág-árok (30.04.2005, 47° 28' 20.2"N, 18° 27' 42.6" E, alt. ca 308 m); **Vértesboglár**: Macska-gödör (29.10.2005, 47° 27' 30.5" N, 18° 27' 19.9" E, alt. ca 308 m).

CONCLUSION

Based on our results it is proved that investigating the special habitats of a small region several new data on rarities can be obtained. Data on the recent distribution of rare bryophytes are important nowadays when the preparation of a new red list of bryophytes of Hungary are in progress, and several national and international efforts draw attention to the bryophyte conservation. With the help of the distribution maps of the species the hot spots of rare bryophytes living on shaded, humid limestone rocks can be outlined in the Vértes Mts.

* * *

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