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PLAGIOCHILA PORELLOIDES (TORREY EX NEES) LINDENB. IN MAINLAND PORTUGAL AND MADEIRA ARCHIPELAGO. NEW RECORDS AND THE THREATENED STATUS

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The recent revision of *Plagiochila porelloides* (Torrey ex Nees) Lindenb. herbarium specimens, from both mainland Portugal (LISU, PO and INA herbaria) and Madeira island (MADS and MADJ), allowed an updated cartography for these areas. The data obtained allowed to infer about the conservational status of this leafy liverwort, regarding the IUCN criteria of 1998.

In mainland Portugal *P. porelloides* is presently known in only four provinces and exhibits a fragmented distribution pattern. Based on the revision of herbarium material, on a new record of *P. porelloides* in Madeira Island, and following the IUCN criteria for the definition of a species conservation status, we propose *P. porelloides* as a vulnerable taxon for the Madeira archipelago.

Keywords: *Plagiochila porelloides*, conservation status, Portugal mainland, Madeira archipelago.

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A recente revisão de espécimes de *Plagiochila porelloides* (Torrey ex Nees) Lindenb., de herbários portugueses (LISU, 9PO, INA, MADS e MADJ), permitiu actualizar a cartografia desta espécie em Portugal continental e no arquipélago da Madeira. A partir dos dados recolhidos foi possível inferir acerca do estado de conservação desta hepática folhosa, com base nos critérios da IUCN de 1998.

Em Portugal continental *P. porelloides* está referenciada apenas para quatro províncias, apresentando um padrão de distribuição fragmentado. Da revisão de exemplares de herbário, de inventários recentes efectuados na Madeira e com base nos critérios da IUCN para a avaliação do estatuto de conservação das espécies, propomos para *P. porelloides* a categoria de vulnerável neste arquipélago.

Palavras chave: *Plagiochila porelloides*, estado de conservação, Portugal, Madeira.

INTRODUCTION

The genus *Plagiochila* (Dumort.) Dumort. (Hepaticae) reaches its' highest diversity in the humid tropical and subtropical world regions, and is one of the largest liverwort genus with about 450 species (HEINRICHS *et al.* 2002). In mainland Portugal and Madeira archipelago is represented by 50 % of the total of species referred to Europe and Macaronesia (SIM-SIM *et al.* 2003).

In mainland Portugal it is mainly distributed on areas characterized by the supratemperate, mesomediterranean and supramediterranean bioclimatic belts (RIVAS-MARTINEZ 1987, COSTA *et al.* 1998), where the remains of the ancient caducifolious oak forests, dominated by *Quercus robur* L. or *Quercus pyrenaica* Willd, do exist (FRANCO 1994).

In Madeira Archipelago this species can only be found in the Laurissilva of the Island of Madeira, a World Natural Heritage under the protection of UNESCO, a forest related with the mesotemperate and mesomediterranean belts (JARDIM 2003).

Plagiochila porelloides (Torrey ex Nees) Lindenb. was considered a vulnerable taxon in mainland Portugal (SÉRGIO *et al*. 1994, SÖDERSTRÖM *et al.* 2002) being restricted to few localities of the following provinces: Beira Alta, Beira Litoral, Estremadura, Minho and Trás-os-Montes e Alto Douro (SÉRGIO & CARVALHO 2003).

The first report of this species to Madeira Island was attributed to PERSSON (1939), who referred it to Poiso, followed by HOLMEN & RASMUSSEN (1971) and EGGERS (1982), without any reference to the site of collection. These reports originally referred as *P. asplenioides* (L.) Dum. were subsequently rejected by SÖDERSTRÖM *et al.* (2002) and included in *P. porelloides*. Due to the insufficient knowledge concerning its occurrence, distribution and ecology, the conservation status of *P. porelloides* for Madeira was yet not defined.

In this study it is our goal, to clarify the *P. porelloides* distribution in mainland Portugal and Madeira Archipelago, to obtain adequate information on its ecology and to estimate its conservational status in Madeira Island. To achieve these objectives our investigations were based on bibliographic references as well as on the study of herbarium and recently collected material.

METHODOLOGY

Data were obtained from bibliographic references and recent published data as well as from information concerning the herbarium material reviewed, namely from LISU, INA, PO, MADJ and MADS. The acronyms of herbarium collections followed VITT *et al*. (1985).

For the *Plagiochila* nomenclature the works of GROLLE & LONG (2000), HEINRICHS *et al.* (1998), HEINRICHS *et al.* (2002), RYCROFT *et al.* (2001) and RYCROFT *et al.* (2002) were used.

The occurrence of *P. porelloides* specimens was recorded in 10x10 Km squares (UTM), for mainland Portugal, and in 1x1 km squares (UTM) for the Madeira Island.

RESULTS AND DISCUSSION

Mainland Portugal

In mainland Portugal *P. porelloides* was collected once by Luisier in 1908 at Sintra (INA 27), where it is probably extinct, perhaps due to anthropogenic influence, since no further reports were presented. Tavares collected *P. porelloides* in 1948 (LISU 166490) and 1954 (LISU 155607) in Serra do Gerês and Serra da Estrela, respectively. These collections were followed by the report of Sérgio to Arganil in 1980 (LISU 155883). More recently contributions on the distribution areas in Portugal are focused especially in Serra do Gerês, Sezelhe, and Serra da Estrela (SÉRGIO & SCHUMACKER 1992, GREVEN & MELICK 1994, GARCIA 2001 and SÉRGIO *et al*. 2001).

The revision of herbarium specimens from LISU, PO and INA, allowed an update cartogarphy of this species in Portugal (Figure 1) and demonstrates that it was not found in Sintra, Estremadura, being presently restricted to Minho, Trás-os-Montes e Alto Douro, Beira Alta and Beira Litoral.

In Portugal, *P. porelloides* was mainly recorded on granitic rocks in shady and moist environments in ancient *Quercus pyrenaica* Willd. forests. Here it was found growing with *Hypnum cupressiforme* Hedw., *H. cupressiforme* var. *lacunosum* Brid., *Hedwigia stellata* Hedenäs, *Antitrichia curtipendula* (Hedw.) Brid. and *Dicranum scoparium* Hedw. It was also found on rocky slopes along watercourses in association with *Plagiomnium undulatum* (Hedw.) T. J. Kop., *Thamnobryum alopecurum* (Hedw.) Gangulee, *Lophocolea bidentata* (L.) Dumort., *Porella cordeana* (Huebener) Moore, *Tritomaria quinquedentata* (Huds.) H. Buch, *Cynodonitum brutonni* (Sm.) Bruch & Schimp. and *Rhynchostegium riparioides* (Hedw.) Cardot.

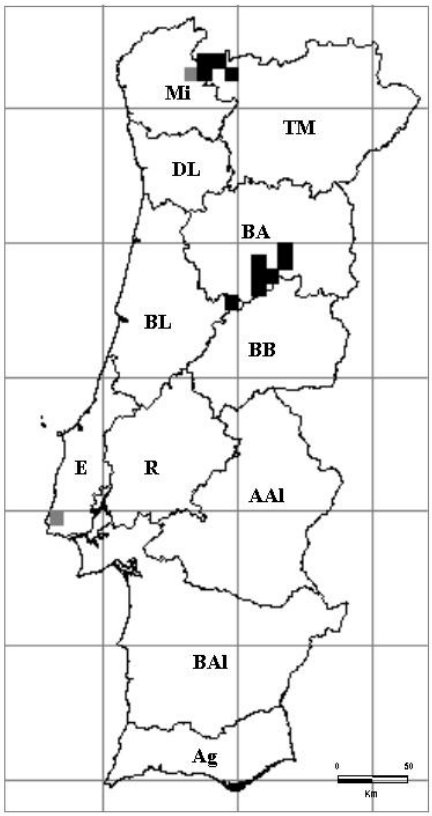

Figure 1. Distribution of *Plagiochila porelloides* in mainland Portugal, using a UTM grid (29S, 10x10 km). Studied specimens:
■ herbarium specimens collected before1950,
■ herbarium specimens collected after 1950.

Madeira Island

Plagiochila porelloides was first collected in Madeira, by Persson in Poiso (PERSSON 1939), followed by Holmen in 1952 (Holmen & Rasmussen, 1971) and Eggers in 1956 (Eggers 1982) without any specific location. M. Nóbrega also collected this species twice in the early 1950's, and finally M. Nóbrega and S. Fontinha made some collections from 1982 until 1993. The revision of the bryophyte herbarium specimens from Madeira Island (MADS, MADJ) lead to the finding of 11 records of *P. porelloides* plants. All samples were initially identified as *P. asplenioides* (L.) Dum., except two, one identified as *Plagiochila* sp., and the other as *P. killarniensis* Pears. Some material, sub *P. aspleniodes,* was revised by L. Söderström, in 1993, and renamed as *P. porelloides*. The others were revised by us and also renamed as *P. porelloides,* following PATON (1999) and SCHUMACKER & VÁÑA (2000).

Recently, during a fieldwork on the slopes of the Madeiran Laurissilva we collected P. *porelloides* at Fajã da Nogueira, Levadinha João de Deus. The

collected material was not fertile but it was readily recognized by its suborbicular and shortly dentate leaves with rounded apex. Later on, this identification was confirmed on the laboratory by the presence of small trigones, small mid-leaf cells and oil bodies segmented (PATON, 1999; SCHUMACKER & VÁÑA, 2000).

The specimen collected was growing on a moist and shady rock along the "levada", forming an isolated and small mat aside populations of other bryophytes such as *Andoa berthelotiana* (Mont.) Ochyra., *Fissidens luisierii* P. Varde, *Thamnobryum alopecurum* var. *maderense* (Kindb.) Stech, Ros & O. Werner, *Porella canariensis* (F. Weber) Underw. and *Plagiochila bifaria* Lindenb. The vascular plants growing in the vicinity were *Clethra arborea* Ait, *Laurus azorica* (Seub.) Franco, *Erica scoparia* spp. *maderincola* D.C. McClint, *Erigeron karwinskianus* D.C., *Hypericum grandifolium* Choisy and *Sibthorpia peregrina* L.

The update cartography of *P. porelloides* indicates that this species is not a frequent one, since it has been collected on few sites of Madeira Laurissilva (figure 2).

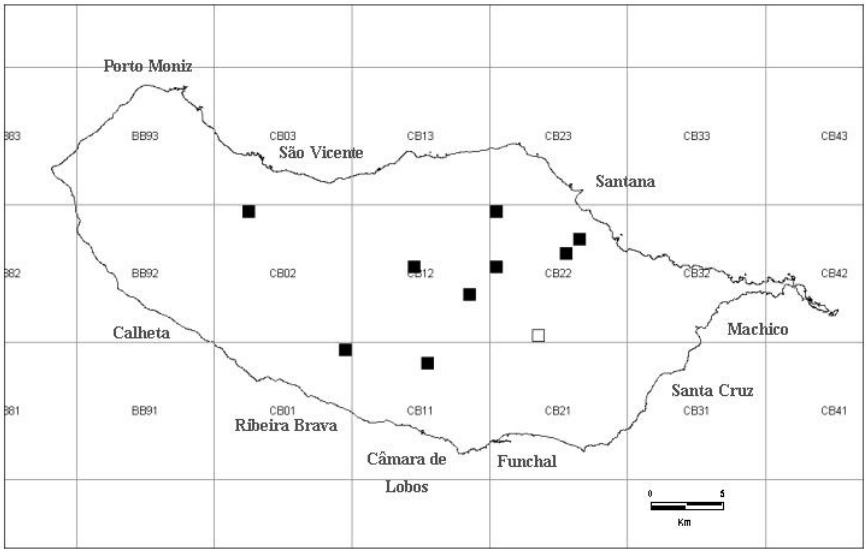

Figure 2. Distribution of *Plagiochila porelloides* in Madeira, using a UTM grid (28S, 1x1 km). Studied specimens: ■ herbarium specimens collected after 1950; bibliographic references reported before 1950 □.

CONCLUSION

Plagiochila porelloides exhibits distinct phytogeographic affinities, namely with America, Europe and Asia (DIERBEN 2001), and is reported for most of the European countries as a not threatened taxon.

In the Iberian Peninsula it is reported as a vulnerable taxon only to Portugal, since few populations are known (SÉRGIO *et al*. 1994, SÖDERSTRÖM *et al.* 2002).

The conservation status of this species is not defined for Madeira, although SÖDERSTRÖM *et al.* (2002) have reported it for the area with no first hand source. *Plagiochila porelloides* has been collected on a small number of sites in the Madeira's Laurissilva, and is distributed by less than twenty 10x10 km squares and/or less than ten localities over the entire Madeira Island (Figure 2). From these data and following the criteria defined by the IUCN (HALLINGBÄCK *et al.*, 1998), we propose the attribution of the Vulnerable (VU) status for this species in Madeira Island.

SPECIMENS REVIEWED:

Mainland Portugal: Estremadura, Sintra, 29SMC69, 09/1908, Luiser, (INA 27); **Beira Litoral**, Arganil, Mata da Maragaça, 29TNE9154, 4/10/1980, Sérgio, (LISU 155883); Coimbra, Côja, Benfeita, Mata da Maragaça, 29TNE95, 08/05/1985, Sérgio *et al*., (LISU 155889); **Minho**, Serra do Gerês, 29TNG6921, Machado, (PO 117B); a 1 Km de Albergaria, estrada para a Geira Romana, 650 m, 29TNG7228, 22/06/1984, Sérgio & Schumacker, (LISU 153892); junto da ponte de Maceira, 950 m, 29TNG7325, 07/04/1949, Tavares, (LISU 153889). **Trás-os-Montes e Alto Douro**, Parque Natural de Montezinho, próximo de Terrosa, Moínhos, Carvalhal próximo do Rio Baceiro, 29TNG7738, 10/07/2002, Sérgio *et al.*, (LISU 189207); Pitões das Junias, 1100 m, 29TNG8633, 15/08/2002, Garcia, (LISU 189206); Montalegre, entre Pitões e Paradela. Carvalhal de Sezelhe, 1100 m, 29TNG9325, 21/06/1985, Sérgio & Schumacker, (LISU 153890). **Beira Alta,** Serra da Estrela, Sra do Desterro, próximo da ponte do Gaio, 29TPE1072, 08/1954, Tavares, (LISU 155607); Mangualde da Serra, curva da Ribeira de Valongo, 770 m, 29TPE1780, 01/03/2000, Garcia &. Sérgio, (LISU 181344); Rua dos Mercadores, 1870m, 29TPE1864, 26/07/1995, Sérgio & Jansen, (LISU 176513); cirque between C. Magro and C. Gordo., 1820m, 29TPE1865, 14/7/92, Jansen, (LISU 177025); Chancas, gorge SW of Lagoa do Peixão, 1700m, 29TPE1866, 06/7/92, Jansen, (LISU 176887); Vale entre Cântaro Gordo e Cântaro Magro, 1850m, 29TPE1965, 20/07/1995, Sérgio *et al*., (LISU 176209); shaded rivulet in woodland near road between Penhas Douradas and Manteigas., 1185m, 29TPE2274, 23/07/1995, Jansen, (LISU 177345); descida do Vale do Zêzere para Manteigas, 1300m, 29TPE2373, 25/07/1995, Sérgio & Jansen, (LISU 176436), Poço do Inferno, 1100 m, 29TPE2670, 26/06/99, Garcia, (LISU 181750); Soutomoinho, encosta a Sul. Aceiro do lado direito a seguir à curva apertada, 750 m, 29TPE3893, 02/07/2000, Garcia, (LISU 181904); Fernão Joanes, 900 m, 29TPE3982, 08/10/99, Garcia, (LISU 181167). **Madeira Island**: Levada do Seixal, encumeada do Lombo Barbinha para o lado da Ribeira João Delgado antes de entrar no túnel, 28SCB0229, 12/07/1988, Nóbrega, (MADJ 1426); junto da ponte da Meia Légua na Ribeira Brava na subida para o Espigão, 28SCB0919, Nóbrega, (MADJ 1164); Pico Ferreira, descida ao poço da Nozelha, lado do Pico Jorge, 28SCB1425, 02/05/1989,

Nóbrega, (MADJ 2344); Córrego dos Açougues, num poço que fica atrás da estrada entre o túnel do Serrado e o dito Córrego, 28SCB1518, 21/03/1989, Nóbrega, (MADJ 1492); Vereda próxima de Pedra Rija, Pico Arieiro, 28SCB1823, 13/08/1993, Fontinha, (MADJ 2555); Fajã da Nogueira, Levadinha João de Deus, 28SCB2025, 07/10/2003, Sim-Sim *et al*., (LISU 189208); Vereda do Vale da Lapa para a Ribeira do Inferno em S. Jorge, 28SCB2029, 26/06/1982, Nóbrega, (MADJ) 1142; Levada entre os Balcões e a Ribeira da Metade, São Roque do Faial, 28SCB2526, 22/08/1989, Nóbrega & Fontinha, (MADJ 1634); margem direita da Ribeira Seca do Faial, 1300 m, 28SCB2627, 03/10/1990, Nóbrega, (MADJ 2091).

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