Anales de Biología 36: 5-9, 2014
DOI: http://dx.doi.org/10.6018/analesbio.36.2

NOTA BREVE

New chorological data on *Hedwigia striata* (Bruch & Schimp.) Bosw., (Hedwigiaceae, Musci) in Spain, and remarks on its morphological characters

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Received: 2 December 2013
Accepted: 22 January 2014
Published on-line: 31 January 2014

Resumen

Nuevos datos corológicos de Hedwigia striata *(Bruch & Schimp.) Bosw. (Hedwigiaceae, Musci) en España y comentarios sobre sus caracteres morfológicos*

Hedwigia striata (Bruch & Schimp.) Bosw., un taxón olvidado en España y del que sólo se conocía una cita antigua de principios del siglo XX en Cáceres, se cita por vez primera en Ávila, Burgos, Ciudad Real, La Coruña, León, Lugo, Orense, Salamanca, Teruel y Zamora. Con estas nuevas localidades se amplía su rango de distribución peninsular, ya que mayormente se ha citado de Portugal. Se discuten sus caracteres diagnósticos y su diferenciación con las especies europeas más cercanas. Se proporcionan microfotografías de sus caracteres diferenciales.

Palabras clave: Briófitos, Distribución, Nuevas citas, Península Ibérica.

Abstract

Hedwigia striata (Bruch & Schimp.) Bosw., a neglected species known in Spain only from a single and old collection of the early 20th century in Cáceres, is newly reported from Ávila, Burgos, Ciudad Real, La Coruña, León, Lugo, Orense, Salamanca, Teruel and Zamora. With these new localities, its distribution range in the Iberian Peninsula it expanded, since it was recorded mainly from Portugal. Diagnostic characters and differentiation from closely related European taxa are discussed. The species is illustrated.

Key words: Bryophytes, Distribution, New records, Iberian Peninsula.

Introduction

According to Casas (1991) and Casas et al. (2006), the genus *Hedwigia* P. Beauv. is represented in Spain by three species segregated in four taxa: *H. ciliata* var. *ciliata* (Hedw.) P. Beauv., *H. ciliata* var. *leucophaea* Bruch & Schimp., *H. integrifolia* P. Beauv. [= *Braunia imberbis* (Sm.) N. J. Dalton & D. G. Long] and *H. stellata* Hedenäs. Traditionally, two other varieties have been recorded in Spain: *H. albicans* var. *striata* (Bruch & Schimp.) Dalla Torre & Sarnth. (Luisier 1924) and *H. ciliata* var. *viridis* Bruch & Schimp. (Casares Gil & Beltrán Bigorra 1912). The first three species are well known among European authors and are included in modern works, unlike

the last two taxa which remain as poorly known, forgotten, and not listed in the European checklist of mosses (Hill et al. 2006).

There are two main reasons why *H. albicans* var. *striata* has been a neglected taxon in Spain. First, it was only known from a single and old collection of the early 20th century, published mistakenly from Salamanca by Luisier (1924: Musci Salmanticenses). The second one refers to the taxonomy of the *H. ciliata* complex, since Hedenäs (1994) treated the homotypics *H. albicans* var. *striata* and *H. ciliata* var. *striata* Bruch & Schimp., as synonymous of *H. ciliata* var. *ciliata*, pointing out their morphological similarity. This synonymy has been followed by most European authors (Crundwell 1995, Smith 2004). However, it was recently reported from several localities in Portugal (Hespanhol et al. 2010, 2011, 2013, Sérgio et al. 2012, Vieira et al. 2012) and considered at the species level as *H. striata* (Bruch & Schimp.) Bosw., supported by morphological and molecular evidence (Hespanhol et al. 2011, Buchbender et al. in press).

With regard to the taxonomic validity of *H. ciliata* var. *viridis*, we can only point out that currently its taxonomic status remains uncertain because the type material could not be traced (Hedenäs 1994). Thus, other authors have not clarified it but have identified plants previously named *H. ciliata* var. *viridis* as *H. ciliata* var. *ciliata* or *H. stellata* (Crundwell 1995, Hill et al. 2006).

During the course of a taxonomic treatment of the family Hedwigiaceae, for volume V of *Flora Briofítica Ibérica* (http://www.florabriofiticaiberica.com), we had the opportunity to study numerous specimens of *Hedwigia* from Spain. Among them, several specimens with an unusual feature mainly from the western Spanish mountains attracted our attention. After a detailed morphological study of all Hedwigiaceae taxa recognized from Spain, and the type material of some of them, we identified these specimens as *H. striata*. As far as we know, no other records from Spain than that indicated above by Luisier (1924) are known.

The obtained morphological data, in combination with a survey of herbarium collections and relevant floristic literature, enabled us to present the actual distribution of this plant in Spain and remarks on its morphological characters.

Materials and Methods

During a revision of *Hedwigia* for Spain, about 600 specimens belonging to this genus were studied with the typical anatomical and morphological methods applied for mosses. The specimens included in this study are housed in the herbaria BCB, BM, LISU, MUB, MACB, VAL, VIT, S and SALA. Herbarium specimens were soaked in tap water and temporary slide preparations for light microscopy were mounted in glycerol gelatine. Microscopic examinations and measurements were taken with an Olympus-BX41 light microscope, while microphotographs were obtained with a Jenoptik ProgRes C7 camera mounted on this microscope.

Results and Discussion

Hedwigia striata (Bruch & Schimp.) Bosw., Naturalist (Hull) n. s. 5: 46. 1879 Fig. 1: A-C, E-F, I-K

Hedwigia ciliata var. *striata* Bruch & Schimp., Bryol. europ. 3: 153. 1846 (basyonym) ≡ *Anictangium striatum* Wilson in Sm., Engl. fl. (ed. 2) 5(1): 12. 1833 [identical with W. J. Hooker, Brit. fl. (ed. 4) 2(1): 12. 1833], nom. illeg., non Brid. 1806 [≡ *Amphidium lapponicum* (Hedw.) Schimp.] – *Pilotrichum ciliatum* var. *striatum* (Bruch & Schimp.) Müll. Hal., Syn. musc. frond. 2: 164. 1851 – *Hedwigia albicans* var. *striata* (Bruch & Schimp.) Dalla Torre & Sarnth., Fl. Tirol 5: 285. 1902. Ind. Loc.: "in Britannia et Hybernia". Type: United Kingdom, North Wales, Llyn Idwal, 29-VIII-1828 [lectotype designated by Hedenäs (1994) BM!; isolectotype BM!].

A complete description of gametophyte and sporophyte characters, habitat and illustrations are provided in Guerra et al. (in press).

Spanish records: Ávila: Hoyocasero, río Alberche, 08-IX-2003, *Heras & Infante* (VIT 32025); Peña Negra, Hirguejuela, *Costa* (MACB 60278; VIT 36321); Sierra de Gredos, Nava del Barco, Garganta de la Nava, *Brugués, Cros & Lloret* (BCB 41802). Burgos: Neila, desfiladero del Najerilla, 19-VIII-1989, *Heras* (VIT 12248). Cáceres: Sierra de Jalama, April 1916, *Luisier* (BM 973058); Sierra de Altamira, Riscos del Prado, Carrascalejo, 07-IV-1971, *Laredo* (MACB

24348; 60282); Tapadanueva, 04-IV-1991, *Sérgio, Cros, Granzow & Brugués* (BCB 31936); San Martín de Tresero, 31-V-1986, *Cros & Brugués* (BCB 21811). Ciudad Real: Viso del Marqués, arroyo de la Poveda, 14-VI-2006, *Brugués, Cros & Barrón* (BCB 56743). La Coruña: Monte del Penedo Blanco, 25-II-1984, *Alvary* (BCB 46429); Pontedeume, Caaveiro, 30-VI-1981, *Reinoso* (BCB 2670). León: Sierra de Ancares, cerca de Pereda, 10-VII-1984, *Fuertes* (MACB 17462). Lugo: Carretera de Campo La Braña a Piornedo, 05-VI-1986, *Cros & Brugués* (BCB 44489). Orense: Parque do Xurés, río Caldo, subiendo a la Portela do Home, Casas, *Sérgio & Brugués* (BCB 44110); Parque do Xurés, Cela, 24-IX-1995, *Casas, Sérgio & Brugués* (BCB 47077). Salamanca: La Alberca, bajada al Valle de Las Batuecas, 25-V-1984, *Elías* (SALA 748); Sierra de La Peña de Francia, 26-IX-1991, *Fuertes* (MACB 81449). Teruel: Orihuela del Tremedal, Albarracín, Montes Universales, 22-IX-1997, *Infante & Heras* (VIT 21487); pr. Orihuela del Tremedal, supra Los Pradejones, 1936, *Font* (BCB 2665). Zamora: Galende, camping Los Robles, 07-IX-1999, *Heras & Infante* (VIT 24528).

Additional specimens examined from Portugal, *Hedwigia striata*: Alto Alentejo: Mosteiros, Ribeira de Arronches, 03-IV-1991, *Sérgio*, *Brugués*, *Cros* & Granzow (BCB 32012); Castelo de Vide, pr. Da Ribeira de S. João, strada para Póvoa das Meadas, 05-VI-1993, *Sérgio*, *Brugués* & *Cros* (BCB 36629). Beira Alta: Oliveira do Hospital. Oliveira do Cravo, Casa do Penedo, 08-VI-2002, *Sérgio* (LISU 208366). Beira Litoral: Coimbra, *Machado* (S B117461). Douro Litoral: Rãs, próximo de Penafiel, 04-XI-1998, *Sérgio* (LISU 247240). Minho: Soajo nos Espigueiros, 07-VI-2012, *Sérgio* (LISU 251028). Trás-os-Montes e Alto Douro: Vila Real, Alijó, próximo do Apeadeiro de S. Lourenço, 07-X-2008, *Sérgio* (LISU 232092).

According to the original description, the most important morphological character state of *Hedwigia striata* is the longitudinally plicate leaf. Among European taxa this species is morphologically most similar to *H. ciliata* in having a hyaline apex, middle and upper laminal cells papillose, with 1-3(4) bifurcate or branched papillae, and having recurved leaf margins in the lower third, in one or both sides. However, it is easily differentiated by its strongly longitudinally plicate leaves (Fig. 1: A-B). In addition, the abundance of Spanish material has allowed us a detailed examination of several microscopic characters, and we found a striking character at the basal marginal leaf that is useful to differentiate *H. ciliata* from *H. striata*. The latter has strongly papillose basal marginal cells, with simple and bifurcate papillae on both sides (Fig. 1: E), and the margins at the leaf base usually have geminate teeth (Fig. 1: F, I-K). These papillae were not found in the other studied *Hedwigia* species (Fig. 1: G-H). On the other hand, the cilia of the perichaetial leaves in *H. striata* are significantly less abundant and less crisped than those in *H. ciliata* (Fig. 1: C-D).

H. stellata and *H. striata* can be easily distinguished by the papillae of medial and upper leaf cells: the former has one central, branched to stellate papillae per cell, compared with 1-3(4) bifurcate to branched, rarely simple papillae of the latter. Moreover, the leaf apices of *H. stellata* tend to be recurved or squarrose when dry and H. striata has erect to spreading, more rarely recurved ones.

H. striata shares with *Braunia* Bruch & Schimp. the plication of the leaves, but they are clearly distinguished by the hyaline leaf apices, ciliate perichaetial leaves and usually bifurcate or branched papillae of the former. Following Dalton et al. (2012), with the new synonymy of *Braunia* and *Hedwigidium* Bruch & Schimp., only *B. imberbis* has been recorded from Spain.

Previously, *H. striata* was only known from a Spanish specimen that was reported from Salamanca by mistake (Luisier 1924). Luisier published this first record as *H. albicans* var. *striata* in Musci Salmanticenses on the basis of material collected in "*Sierra de Gata, Pico de Jálama, 1450 m*". We have studied material collected by Luisier in 1916 labelled "*Spain, Sierra de Jálama, ± 1500 m, Luisier 58*" identified by H. N. Dixon as *H. albicans* var. *striata* and deposited at BM. Based on the altitude at which this specimen was collected, we suppose that the locality is the summit of Jálama (Sierra de Gata), in Cáceres instead of Salamanca. This specimen perfectly matches the general habit, leaf shape and anatomical details of *H. striata*.

We obtained the new distribution data on *H. striata* based solely on herbarium material, so as a

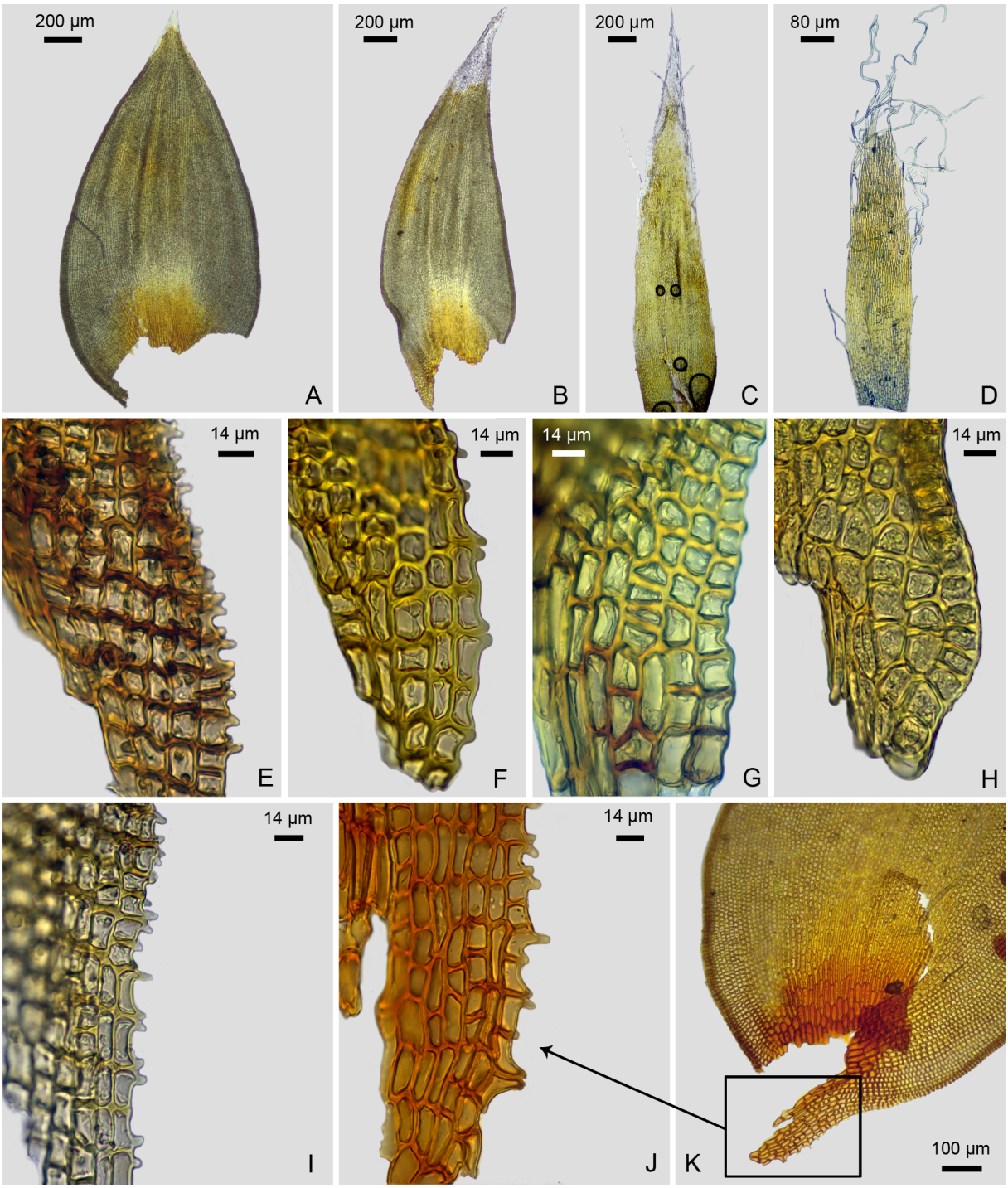

Figura 1. Fotografías con microscopio óptico de *Hedwigia striata* (A-C, E-F, I-K), *Hedwigia ciliata* (D, G) y *Hedwigia stellata* (H). **A-B:** Filidios. **C-D:** Filidios periqueciales. **E:** Células basales marginales de un filidio donde se observan papilas simples. **F, I-J:** Células basales marginales de un filidio donde se observan dientes simples y geminados. **G-H:** Células basales marginales de un filidio. **K:** Base de un filidio cuya porción se aumenta en la sub-figura J. [Procedencia imágenes: A, F: MACB 60278; B, C: BCB 21811; D: MUB 40468; E: MACB 60282; G: MUB 2389; H: MUB 40484; I: MACB 24848; J, K: BCB 41802].

Figure 1. Light microscope photographs of *Hedwigia striata* (A-C, E-F, I-K), *Hedwigia ciliata* (D, G) and *Hedwigia stellata* (H). **A-B:** Leaves. **C-D:** Perichaetial leaves. **E:** Basal marginal cells of the leaf showing simple papillae. **F, I-J:** Basal marginal cells of the leaf showing simple and geminate teeth. **G-H:** Basal marginal cells of the leaf. **K:** Leaf base indicating the portion that is magnified in J. [Pictures: A, F from: MACB 60278; B, C from: BCB 21811; D from: MUB 40468; E from: MACB 60282; G from: MUB 2389; H from: MUB 40484; I from: MACB 24848; J, K from: BCB 41802].

relatively recently recognized species which has not yet been studied globally it may be found to have a wider distribution in the future.

Acknowledgments

This research was carried out with financial support from the Spanish "Ministerio de Ciencia e Innovación" [Project CGL2012-30721, co-financied by FEDER]. We thank the curators of the herbaria cited in the text for the loan of specimens, specially to Len Ellis to locate the Luisier's collection and J. Muñoz for valuable comments on nomenclature. We like to thank the researchers who haveprovided us their *Hedwigia* collections to enable this work.

References

Buchbender V, Hespanhol H, Sérgio C, Séneca A, Hedenäs L & Quandt D. (in press). Phylogenetic reconstructions of the Hedwigiaceae reveal cryptic speciation and hybridization in Hedwigia. Bryophyte Diversity & Evolution 1.

Casares Gil A & Beltrán Bigorra F. 1912. Flora briológica de la Sierra de Guadarrama. Trabajos del Museo de Ciencias Naturales 12: 1-50.

Casas C. 1991. New checklist of Spanish mosses. Orsis 6: 3-26.

Casas C, Brugués M, Cros RM & Sérgio C. 2006. Handbook of mosses of the Iberian Peninsula and the Balearic Islands. Barcelona: Institut d'Estudis Catalans.

Crundwell AC. 1995. Hedwigia stellata and H. ciliata in the British Isles. Journal of Bryology 18: 807-810.

Dalton N, Kungu EM & Long DG. 2012. The misaplication of Hedwigia integrifolia P. Beauv. and identity of Gymnostomum imberbe Sm. (Hedwigiaceae, Bryopsida). Journal of Bryology 34: 59-61.

Guerra J, Cano MJ & Brugués M (eds.) (in press). Flora Briofítica Ibérica, vol. 5. Orthotrichales: Orthotrichaceae; Leucodontales: Fontinalaceae, Climaciaceae, Anomodontaceae, Cryphaeaceae, Leptodontaceae, Leucodontaceae, Neckeraceae; Hedwigiales: Hedwigiaceae; Hookeriales: Hypopterigiaceae, Hookeriaceae, Leucomiaceae, Pilotrichaceae. Murcia: Universidad de Murcia/Sociedad Española de Briología.

Hedenäs L. 1994. The Hedwigia ciliata complex in Sweden, with notes on the occurrence of the taxa in Fennoscandia. Journal of Bryology 18: 139-157.

Hespanhol H, Séneca A, Figueira R & Sérgio C. 2011. Microhabitats effects on bryophyte species richness and community distribution on exposed rock outcrops in Portugal. Plant Ecology & Diversity 4: 251-264.

Hespanhol H, Séneca A & Sérgio C. 2010. Bryophytes from exposed rocks outcrops in the north and centre of Portugal: distribution and conservation. Boletín de la Sociedad Española de Briología 34/35: 19-35.

Hespanhol H, Vieira C, Garcia C & Sérgio C. 2013. New distribution data on Hedwigia striata (Wilson) Bosw., a forgotten and misplaced taxon, in Portugal. Boletín de la Sociedad Española Briologia 40/41: 49-53.

Hill MO, Bell N, Bruggeman-Nannenga MA, Brugués M, Cano MJ, Enroth J, Flatberg KI, Frahm JP, Gallego MT, Garilleti R, Guerra J, Hedenäs L, Holyoak DT, Hyvönen J, Ignatov MS, Lara F, Mazimpaka V, Muñoz J & Söderström L. 2006. An annotated checklist of the mosses of Europe and Macaronesia. Journal of Bryology 28: 198-267.

Luisier PA. 1924. Musci Salmanticenses. Madrid: Imprenta de Estanislao Maestre.

Sérgio C, Garcia C, Hespanhol H, Vieira C, Stow S & Long D. 2012. Bryophyte diversity in the Peneda-Gerês National Park (Portugal): selecting Important Plant Areas (IPA) based on a new survey and past records. Botanica Complutensis 35: 39-50.

Smith AJE. 2004. The moss flora of Britain and Ireland, 2nd ed. Cambridge: Cambridge University Press.

Vieira C, Hespanhol H, Gonçalves J, Marques J & Bota A. 2012. Biological valuation in mountain landscapes as a tool for the conservation of bryophytes in Baixo-Tâmega, Portugal. Studia Botanica Hungarica 43: 69-84.