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Notes on *Andreaea heinemannii* Hampe & Müll. Hal. in the Iberian Peninsula

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Abstract – Taxonomic study of taxa belonging to the *Andreaea heinemannii* group in the Iberian Peninsula is presented. Type collections of Hampe and Luisier were examined. One new combination, *Andreaea heinemannii* Hampe & Müll. Hal. subsp. *crassifolia* (Luisier) Sérgio comb. et stat. nov., is proposed for Iberian plants. Characters discriminating the two subspecies are discussed and illustrated.

Musci / *Andreaea* / Taxonomy / Iberian Peninsula

INTRODUCTION

Hampe & Müller (1846) described *Andreaea heinemannii* from a specimen collected in Switzerland. Previously, this *Andreaea* had been named as *A. heinemanniana* (*nom. herbariorum*) in the Hampe specimen collection now kept in the BM herbarium. The taxon was further forgotten until Murray (1987) studied the type material from BM.

Schultze-Motel (1969, 1970) considered that *A. crassifolia*, a species described by Luisier (1916) and so far an endemic of Iberian Peninsula, was conspecific with *A. angustata* Lindb. ex Limpr., and treated it as *A. blyttii* Schimp. subsp. *angustata* Lindb. ex Limpr. Subsequently Murray (1987) considered that *A. heinemannii* was the correct name for *A. angustata* Lindb.

To date all European lists have included *A. crassifolia* Luisier under *A. heinemannii* Hampe & Müll. Hal. It was also mapped under this name in the Iberian Bryophyte Cartography (Casas *et al.*, 1996).

However, studying all the available Iberian material of this taxon including its type, and reviewing the iconography by Murray (1987), we have concluded that *A. crassifolia* Luisier is distinct from *A. heinemannii* and consequently we propose to rise this taxon to the subspecies rank.

Murray (comm. per.) suggests that, in the Iberian Peninsula some different forms of *A. heinemannii* can be observed. In addition, Schultze-Motel (1970) has noted that the plants from Spain, Portugal and Canary Islands are morphologically different from those of Alps and Central France specimens.

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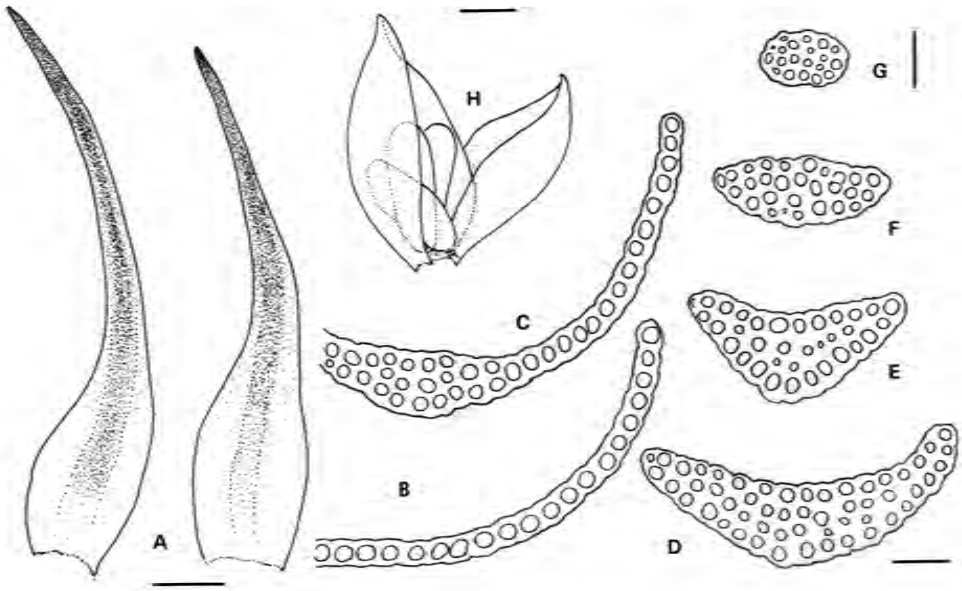

Fig. 1. *Andreaea heinemannii* Hampe & Müll. Hal. subsp. *heinemannii*. **A.** Two mature leaves; **B-G.** Transverse sections of mature leaves, from the base to near the apex of the subula; **H.** Androecium without paraphyses. From Spain: Madrid, Sierra de Guadarrama, Puerto de Navacerrada, *Casas* (BCB 14498) and Portugal: Beira Alta, Serra da Estrela, Ponte do Soalheiro, *Sérgio* (LISU 175555). Scales: A = 250 μm; B-G = 30 μm and H = 100 μm.

The identity of *A. crassifolia* has been obscured because the morphological characters of its leaves are really comparable and related to those of typical *A. heinemannii*.

In the present revision, based on the study of more than 40 specimens, we have confirmed the lack of intergrading forms between typical *A. heinemannii* and *A. crassifolia* Luisier, and this suggests that the two plants do not represent a habitat modification. So, we consider that they correspond to distinct subspecies: *A. heinemannii* subsp. *heinemannii* and *A. heinemannii* subsp. *crassifolia*. On the other hand, we have a collection from Portugal where the two taxa co-exist and the two plants can be easily individualised in different tuffs.

***Andreaea heinemannii* Hampe & Müll. Hal. subsp. *crassifolia* (Luisier) Sérgio comb. et stat. nov.**

Basionym: *Andreaea crassifolia* Luisier, *Brotéria, Sér. Bot.* 14: 19. 1916. *Andreaea rupestris* Hedw. var. *crassifolia* (Luisier) Podp., *Conspectus Muscorum Europaeorum* 46. 1954. **Type**: Portugal. Beira Baixa, Serra da Gardunha, 08.1906, *Luisier* (INA!); España. Salamanca, Pico de Jalama, 1915, *Luisier*, (LISU ! 3980 **Lectotype** here designated).

Distinguishing Characters

A. heinemannii leaves are characterised by an inconspicuous or poorly differentiated costa at leaf base, sometimes even absent; the basal laminal cells are

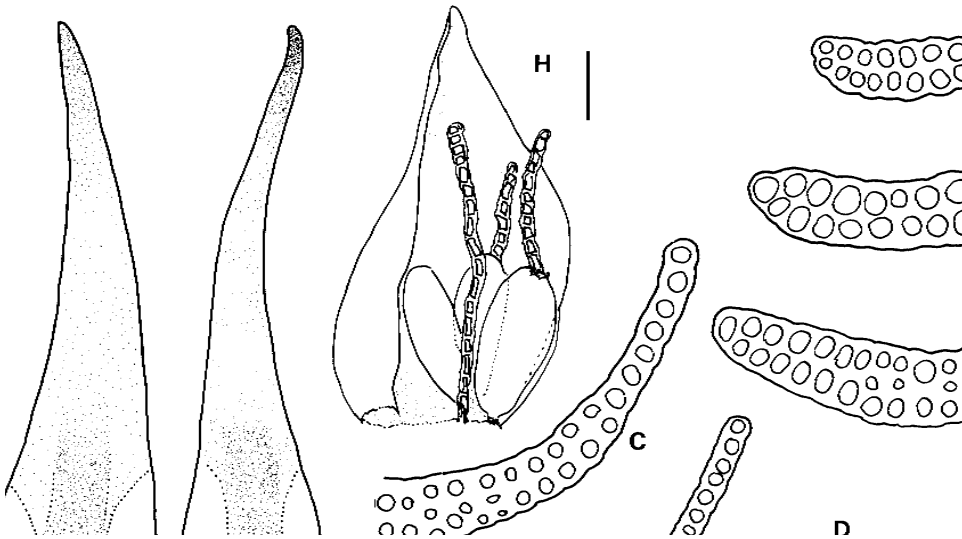

Fig. 2. *Andreaea heinemannii* Hampe & Müll. Hal. subsp. *crassifolia* (Luisier) Sérgio. **A.** Two mature leaves; **B-G.** Transverse sections of mature leaves, from the base to the apex of the subula; **H.** Androecium with paraphyses. From Portugal: Beira Baixa, Serra da Gardunha, *Luisier* (INA) and Spain: Salamanca, Int. Candelario et la Gargante, *Elías* (BCB 20149). Scales: A = 250 μm; B-G = 30 μm and H = 100 μm.

sinuosely thickened and the basal marginal cells are predominantly rectangular. The leaf lamina is uni or bistratose, generally distinct from the nerve in section, at least in a small portion of the leaf. On the other hand, the nerve of subsp. *crassifolia* represents the most inconspicuous expression for a nerved *Andreaea.* In normal leaves the nerve is scarcely differentiated or only distinct in a very small portion of the limb base, where it is very wide and at most with 3 layers of cells. The leaves are bistratose, excluding a very small unistratose area of the limb near the base. These features are well described by Luisier (1916). Concerning the leaf form, subsp. *crassifolia* has more obtuse leaf tips or with a wider flattened subula (Figs 1 & 2).

There are no clear-cut discontinuities in important characters such as the sexual condition, stem structure, cell morphology, and there are no marked differences in spore size. The only consistent and reliable differences, excluding the lamina and nerve structures, appear to be the presence of paraphyses in the androecium in plants of subsp. *crassifolia.* We never have observed paraphyses in plants of subsp. *heinemannii,* including the type material (BM), apart from one specimen that presents a reduced number of paraphyses.

We have not found in the European literature references to plants without paraphyses in the androecium. The only exception is Murray (1988) who reported "paraphyses occasional to numerous" for *A. blyttii* in her treatment of *Andreaea* in Britain and Ireland, as well as Schultze-Motel (1970) who has included the paraphyses type for the majority of species description. Also Limpricht (1890) has considered that *A. angustata* could not develop paraphyses. A re-examination of all Iberian material of *A. heinemannii* group has show that the presence of paraphyses is restricted to subsp. *crassifolia.* Plants of *A. heine-*

Table 1. Differences between *Andreaea heinemannii* subsp. *crassifolia* (Luisier) Sérgio and subsp. *heinemannii* Hampe & Müll. Hal. (based on Iberian material).

Andreaea heinemannii	subsp. *heinemannii*	subsp. *crassifolia*
Plant size (mm)	2,3-3(4,5)	2,5- 5(6,5)
Mature leaves		
– long (mm)	(0,8)1,2-1,8(2,3)	(0,8)1,3-2(2,2)
– large (mm)	(0,17)0,20-0,35	(0,17)0,28-0,45
Nerve		
large (μm)	(45)50-70 (85)	(95)100-110(112)
dorsal surface	indistinct at base, flattened and bulging from 1/3	indistinct at base, flattened, not bulging
transversal section	3 layers (3-4), not or scarcely differentiated at base differentiated at the subula	2 to 3 layers, not differentiated at base and scarcely differentiated for all its extension
Lamina : transversal section	almost entirely 1-stratose, only 2-stratose from 1/2 to subula	almost entirely 2-stratose, only at base 1-stratose
Subula: transversal section	elliptic to lunate	flattened to lentiform
Androecium	usually without paraphyses	with paraphyses
Spores size (μm)	(20)24-32(36)	23-35(39)
Habitat ecology (in the Iberian Peninsula)	On wet acid rocks, also exposed sites. Occurs frequently on mountains from 1150 to 1900 m	Dry exposed rocks (granite), in open spaces in boulders. Occurs on mountains from 450 to 1600 m, with predominantly oceanic influence.
Distribution (in the Iberian Peninsula)	Very rare, known only in hight mountains in Sistema Central: Minho and Serra da Estrela in Portugal, Sierra de Gredos and Guadarrama in Spain	Rare, but locally abundant in oceanic mountains of the Iberian Peninsula from North-western to Sistema Central: Minho, Serra da Estrela, Serra da Gardunha, Sierra de Eljas and Sierra de Francia

mannii of the type material as well as from France (*leg.* P. Culman, 1919, S ! and *leg.* J.-P. Hébrard 1996), do not present paraphyses in the androecium.

The morphological similarity between subsp. *heinemannii* and subsp. *crassifolia* (Luisier) Sérgio (Figs 1 and 2) is striking. However, there are some character-states in which the two taxa consistently differ (Table 1).

It is important to note that most populations of *A. heinemannii* subsp. *crassifolia* are concentrated in the central regions of the Iberian Peninsula, in an area were most Iberian endemic taxa grow (Sérgio & Draper, 2001).

Andreaea heinemannii subsp. *crassifolia* is probably a meridional vicariant taxon of subsp. *heinemannii* and, could belong to a series gradually emerging into ecostate *Andreaea*.

Selection of examined specimens.

subsp. *heinemannii*

SWITZERLAND: "Helvetiae" *Hampe* 1840 (BM 667938), sub *Andreaea heinemanniana* Hampe & Müll. (*nom. herbariorum*). – FRANCE: Auvergne, Puy-de-

Dôme, Val de la Cour, 1300 m, 08.1919, *P. Culmann,* SB72085 (E. Bauer, *Musci europaei exsiccati* 1351 b); Aigoual, 475 m N de Les Pises (Lac Pises), 1310 m, 12.09.1996, *J.-P. Hébrard* (Hebrard dupl. in LISU). – ESPAÑA: Madrid, Sierra de Guadarrama, Puerto de Navacerrada, 1800 m, *Casas* (BCB 14498). – PORTUGAL: Minho: Serra de Castro Laboreiro, Portelinho, Corga do Caneiro, 1150 m, 1990, *Sérgio & Séneca* 6826 (LISU 162918); Beira Alta, Serra da Estrela, Ponte do Soalheiro, 1150 m, 26.05.1993, *Sérgio* (LISU 175555).

subsp. *crassifolia*

ESPAÑA: Salamanca, Pico de Jalama, 20.11.1915, *Luisier* (LISU 3980, Lectotype) and (INA); Salamanca: Int. Candelario et la Gargante, 10.12.1984, *Elías* (BCB 20149). – PORTUGAL: Trás-os-Montes e Alto Douro, entre Alijó e Murça, 1994, *Sérgio* 9410 (LISU 171104); Beira Alta, Zona Florestal do Ladário, Lagoa, 1978, *Sérgio* 1997 B (LISU 153256); Beira Baixa, Serra da Gardunha, 08.1906, *Luisier* (INA); Beira Baixa, Serra da Gardunha, Louriçal do Campo, próximo de S. Fiel, 600 m, *Sérgio* 7850 (LISU 162913); Beira Baixa, Serra da Estrela, 2 km to Penhas da Saúde, ± 1400 m, 26.06.1996, *Sérgio & Sim-Sim* 10428 (LISU 175563).

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