

On the identity of some *Entosthodon* species endemic to Macaronesia or the North of Africa

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Abstract – After a revision of the types of *Entosthodon krausei*, *E. deserticola*, *E. saharae* and *Funaria fritzei* we conclude that all are synonymous with *E. commutatus*. All have a double peristome that comprises well-developed exostome teeth with intermediate exostome teeth, and a rudimentary, fugacious endostome. The distribution of *E. commutatus* is widened to include Madeira and Canary Islands. Lectotypes for the four synonymised names are selected.

Canary Islands / endemic bryophytes / *Entosthodon deserticola* / *Entosthodon krausei* / *Entosthodon saharae* / *Entosthodon commutatus* / *Funaria fritzei* / Macaronesia / north Africa

INTRODUCTION

The genus *Entosthodon* Schwägr. (Funariaceae) comprises a large number of species distributed around the world. Some of them were originally described as *Funaria* Hedw., but we follow Fife (1985), who segregates *Entosthodon* from *Funaria*.

Entosthodon krausei Besch. is a Macaronesian endemic widespread in the Canary Islands (González-Mancebo *et al.*, 2008) and Madeira (Sérgio *et al.*, 2008). It was described by Beschereille (1894) as having a double peristome with an exostome composed of 16 long, red, papillose teeth and an endostome with short, red, reduced segments, alternating with the exostome teeth. However, species in the Funariaceae with double peristomes have endostome segments opposite to the exostome and not alternate, as Beschereille described in *E. krausei*.

Our first aim was to study the peristome of the type specimen of *E. krausei* and other samples of this species as well as the type specimen of *E. fritzei* Geh. (invalid name, combined in the genus *Funaria* as *Funaria fritzei* Geh.), a species described by Geheeb (Geheeb & Herzog, 1910) from Madeira and also reported from the Canary Islands, and considered synonymous with *E. krausei* (Losada *et al.*, 2001). Geheeb did not describe the peristome of

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F. fritzei, but showed a plate in the protologue with one exostome tooth apparently fragmented at its base.

Subsequently, owing to the results obtained with *E. krausei*, we extended our study to *E. deserticola* (Trab.) Jelenc (Trabut, 1922) and *E. saharae* (Trab.) Jelenc (Trabut, 1927), the two only species endemic to North Africa, included in the subgenus *Entosthodon* like *E. krausei*.

RESULTS

The type of *Entosthodon krausei* has a double peristome, with an exostome of 16 teeth, straight, red but hyaline at apex, 160-220 µm long, papillose-striate and trabeculate on the inner side. Between these teeth there are some intercalary short structures or small teeth, regularly distributed and similar in colour and ornamentation to the long teeth. We assume that Beschereille mistook these structures for alternate endostome segments. The term “intermediate exostome teeth” used by Edwards (1984) in the description of the exostome of *Encalypta procera* Bruch, has been adopted for naming the above-mentioned intercalary structures. The endostome of *Entosthodon krausei* is rudimentary, hard to observe, with 16 short segments, hyaline, papillose, wider at the base and fugacious, but when present these segments are easy to detect between the teeth even at low magnification.

The peristomes observed in several specimens of *Entosthodon deserticola*, *E. saharae* and *Funaria fritzei*, have strong similarities to that of *E. krausei*.

The remaining sporophyte characters such as the capsule erect, symmetric, pyriform, with transverse mouth equal in diameter to the urn after dehiscence, exothecial cells oblong, with cuneate walls, neck 1/3-1/2 of the capsule length and spores 24-26 µm, are also very similar.

Gametophytic characters are the same in *Entosthodon deserticola*, *E. saharae*, *E. krausei* and *F. fritzei*, especially in leaf shape, oblong acute or shortly apiculate; leaf margin, entire or slightly dentate, with undifferentiated marginal cells; leaf cells rectangular or oblong-hexagonal; and nerve 1/2-2/3 of the leaf length.

DISCUSSION AND CONCLUSIONS

Entosthodon deserticola, *E. krausei*, *E. saharae* and *Funaria fritzei*, have the same type of peristome as that observed in *E. commutatus* Durieu et Mont. (Brugués et al., 2010). Gametophytic and sporophytic characters also match those of *E. commutatus*. This species, described from Algeria (Montagne, 1849), was recently reported from Morocco and from Southeast Spain (Brugués et al., 2010). In conclusion, we consider these four names synonymous with *E. commutatus*, whose name has priority. Thus the distribution of *E. commutatus* extends to Madeira and Canary Islands.

In their original descriptions, *E. deserticola*, *E. krausei* and *Funaria fritzei* were compared with *E. attenuatus* (Dicks.) Bryhn, together with *E. commutatus* are the only *Entosthodon* species in Europe and Macaronesia with a well-developed exostome and rudimentary endostome. Nevertheless, *E. attenuatus* can be distinguished by its cerise rhizoids, the plane lid, the angled spores and the narrow marginal leaf cells (Brugués et al., 2010).

On the other hand, Thériot (1931), who offers a more complete description than Trabut (1927), connects *E. saharae* with *E. commutatus*, pointing out that the leaf apex and nerve length are the most important differential characters. In a manuscript note, kept in the herbarium of Cryptogamie at the Muséum National d'Histoire Naturelle (PC), Thériot says that these are very close species and that it would not be surprising if in the future intermediate forms were found, which would mean the merger of these two species.

Entosthodon commutatus Durieu et Mont., *Ann. Sci. Nat. Bot.*, sér. 3, 12: 317. 1849. **Epitype:** [Algeria] Mustaphae, près Alger, *Trabut s.n.* (PC 008753! selected by Brugués et al., 2010, Fig. 1).

= *Entosthodon krausei* Besch., *J. Bot. (Morot)* 8: 44. 1 f. 5-8. 189. 1884 = *Funaria krausei* (Besch.) Geh. et Herzog, *Biblioth. Bot.* 73: 57. 1910. **Type:** [Canary Islands] Tenerife, *Krause* n° 23 (BM!, ex Hb. Bescherelle, lectotype, selected here, Fig. 2).

Syn. nov.

= *Entosthodon fritzei* Geh., *Gen. Musc. Frond.* 109. 1900 nom. inval. = *Funaria fritzei* Geh. *Biblioth. Bot.* 73: 57. 8. 1910. (**Type:** [Madeira] S. Vicente ad rupes, *Fritze*, 1880 (PC! lectotype, selected here, Fig. 3). **Syn. nov.**

= *Funaria deserticola* Trab., *Rev. Bryol.* 49: 65. 1922 = *Entosthodon deserticola* (Trab.) Jelenc, *Bull. Soc. Géogr. Archéol. Oran* 75: 74. 1952.

Type: [Algeria] Beni Onmi, *Trabut* (PC 83765! lectotype, selected here, Fig. 4).

Syn. nov.

= *Funaria saharae* Trab. *Bull. Soc. Hist. Nat. Afrique N.* 18(1): 13. 1927 = *Entosthodon saharae* (Trab.) Jelenc, *Bull. Soc. Géogr. Archéol. Oran* 75: 76. 1952.

Type: [Algeria] Sahara, entre el Golea et Insalah, 1927, *Chevalier* (PC 83769! lectotype, selected here, Fig. 5). **Syn. nov.**

Other specimens examined

Funaria fritzei: Canary Islands: Tenerife, Puerto Cruz, 1925, *Armitage* (BM). *Funaria krausei*: Canary Islands: Lanzarote, Jameos del Agua, 2000, *Sérgio* (LISU 11405).

F. fritzei: Madeira: Ilhéu dos Desembarcadouros, 1993, *Fontinha* (MADJ 7687).

Funaria saharae: [Algeria]: Hoggar, O. Tarouda, 2100 m, 1928, *Maire* (PC 83766); Hoggar, Atakor, 1928, *Maire* (PC 83770); Tassili n Ajjer, Amgid, *Maire*, 1928, (PC 83768); Tahourit Arak, *Maire*, 1930, (PC 83771); Tassili des Ajjers, Plateau d'Edjerit a l'est de Djanet, 1965, *Faurel* (PC 83773).

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Figs 1-5. Herbarium labels of the 5 type specimens. **1.** *Entosthodon commutatus*, **2.** *E. krausei*, **3.** *Funaria fritzei*, **4.** *Entosthodon deserticola*, **5.** *E. saharæ*.

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