

Mielichhoferia in the British Isles

Fred Rumsey reports on the consequences of mistaken identify for one of our most elusive British mosses

▷Left: Rocks with *Mielichhoferia elongata* and *Grimmia atrata* photographed at Coire Kander in June 1991.
F. Rumsey



The taxonomic status of the British *Mielichhoferia* species had long been contentious, but even following their resolution by molecular techniques (Shaw, 1994) we still have to unpick the problems caused by possible hybridisation, by the consequences of nomenclatural changes, past taxonomic treatments (their confused and partial application for legislative purposes) and latterly scepticism as to the (past) presence of one taxon (Blockeel *et al.*, 2014).

The genus *Mielichhoferia* is widely distributed with its centre of diversity in the Andes (Shaw & Crum, 1984); it is remarkable for the obligate metallophyte nature of many of its species, including both of the European (and British) species: *M. elongata* (Hoppe & Hornsch. ex Hook.) Hornsch. and *M. mielichhoferiana* (Funck.) Loeske. The former was first discovered in the British Isles by Greville in Glen Callater, VC92 in 1830 (Coker, 1968b) and later found by W. Mudd in 1862 on alum-shale workings on

the northern scarp of the North Yorkshire moors at Ingleby Greenhow, VC62; it persists in both sites. Subsequently *M. elongata* has only been found in one further location, on a broken iron-rich west-facing crag on Ben Hope, VC108, by Gordon Rothero, as recently as 2004.

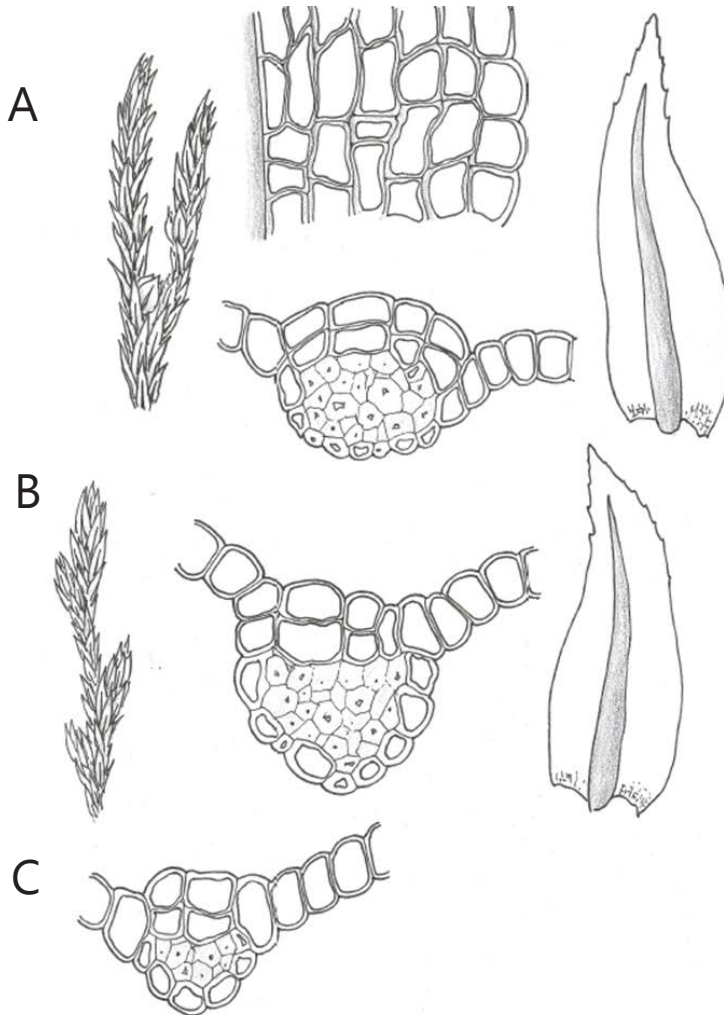
Herbaria reveal that many of our earlier eminent bryologists made the long trudge up to the head of Glen Callater to the first known site, on the metal-rich, acidic cliffs of Coire Kander, collecting specimens and then in some cases questioning the identity of what they had gathered. Thus material collected by J.B. Duncan and H.H. Knight in July 1930 was sent to H.N. Dixon for his comments – he annotated one packet, now at BM (BM000668595)! and discussed further below as “scarcely separable from the continental type (*M. mielichhoferi*) and yet is obviously only a form of the abundant variety (*M. elongata*).”

Coker (1968a) having found material he definitely believed to be *M. mielichhoferiana*



(syn. *M. mielichhoferi* (Hook.) Wijk. & Marg.) reviewed Duncan's and Knight's collections and identified them, and two later gatherings, by E.C. Wallace from 1934 and A.C. Crundwell from 1964, as *M. mielichhoferiana*. The view earlier expressed by Dixon still had currency, with the specific status of these entities still widely questioned. Shaw & Crum (1984) argued that it was unlikely that two genetically isolated species could achieve the same broad pattern of geographic distribution, the same disjunctions, and precisely the same local occurrences. They felt that it was more likely that they represented modifications of a single species, especially considering their morphological similarity. Shaw (1989) admitted that experimental studies were still needed and, overcoming his earlier scepticism, he and his students went on not only to prove that the two were genetically distinct, but that some of the cause for confusion may result from hybridisation between them (Shaw, 1994; 1998). His molecular studies did not

however contain British material of both species. Prior to this clarification many authors had chosen to lump both species under the earlier name *M. mielichhoferiana*, and it was as such that the collective species was accorded protected status under Schedule 8 of the Wildlife and Countryside Act, 1981. The intention was clearly also to protect the taxon we now again regard as *M. elongata*, although of course following its re-elevation to specific rank this re-assessment of status has not happened. We are left with protection for a species whose very presence in this country has become doubted (see Hodgetts *et al.*, 2013) and which if proven has not actually been seen since 1971, or even earlier. Surveys under the Scottish Cryptogamic Conservation project (Rothero & Long, 1995) established the continuing presence of a healthy population of *M. elongata* at Coire Kander, locating fruiting plants seen for the first time since 1930, but did not re-find *M. mielichhoferiana*.



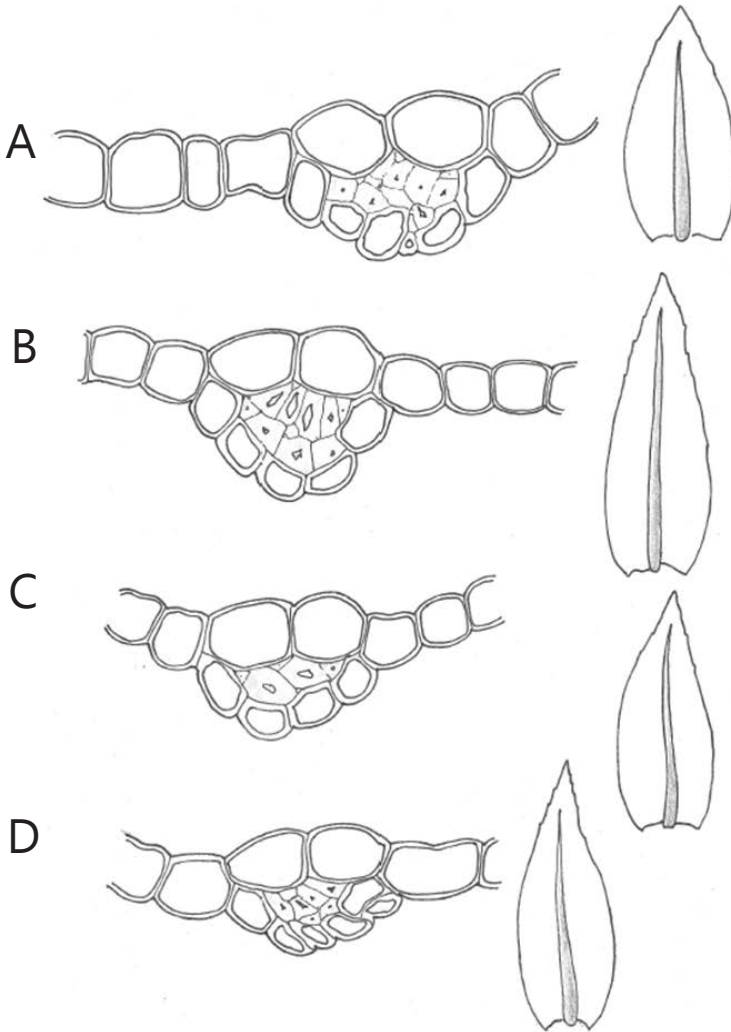
△Figure 1. *Mielichhoferia mielichhoferiana*. A: Coire Kander, VC92, P.D. Coker, 1966 (Herb. Crundwell); B: Moel Siabod, VC49, R. Braithwaite, no date (BM000668597); C: Beinn Dorain, VC98, M. Corley, 1971 (BBSUK).

Is *Mielichhoferia mielichhoferiana* a British plant?

While very similar and intergrading in some respects there are consistent morphological differences between the two taxa. When fertile the two are easily distinguished: *M. elongata* has an arcuate yellow seta, *M. mielichhoferiana* a longer erect reddish seta. Sadly both species are dioicous, fruit and indeed gametangia are unknown from the English locality of *M. elongata*, and while both sexes are present at

Coire Kander many patches are clonal and unisexual, fruiting is restricted to those patches with both sexes and, of course, these have been disproportionately collected. Capsules of the *M. mielichhoferiana* type have not been recorded in Britain.

Typical *M. mielichhoferiana* can be differentiated from *M. elongata* by its more lax cushions, the second, elongate-triangular leaves with stouter nerves, the upper leaf-cells narrower and more vermiform, the basal

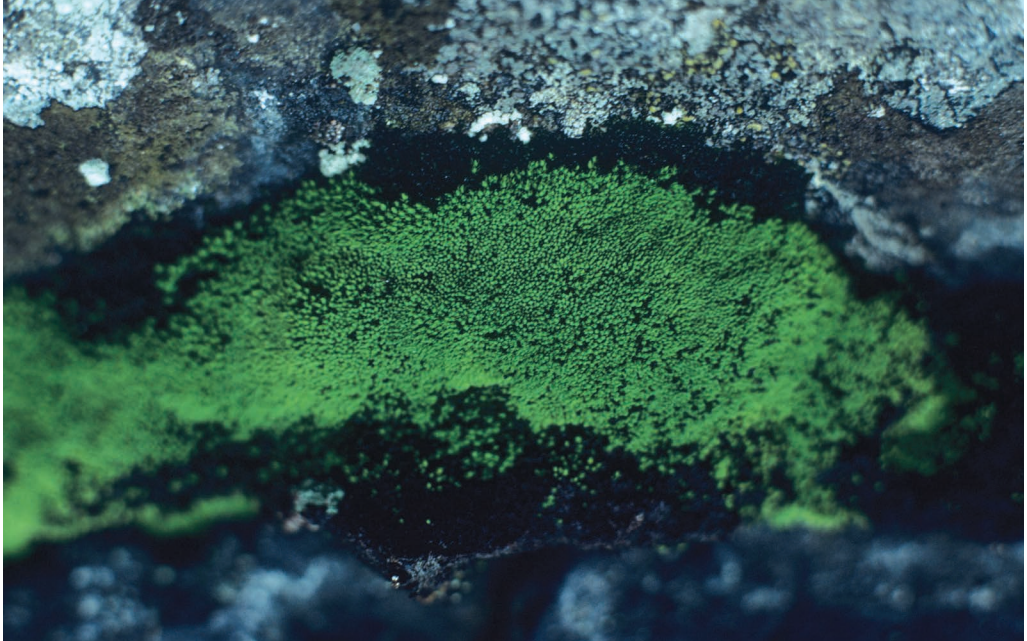


△Figure 2. *Mielichhoferia elongata*. A: Ingleby Greenhow, VC.62, F.J.Rumsey (Herb. FJR); B: Coire Kander, VC.92, W.E. Nicholson, 1912 (CGE); C: Coire Kander, VC.92, J.B. Duncan, 1930 (CGE); D: Coire Kander, VC.92, A.C. Crundwell, 1964 (Herb. Crundwell).

cells more quadrate, and by its more coarsely papillose rhizoids. All of these characters to an extent intergrade between the species but I have found they can be consistently separated by sectioning the leaves (Figs. 1 & 2). Leaves of *M. mielichhoferiana* (Fig. 1) have two tiers of larger, rather thick-walled cells over the well-developed nerve (as shown by Nyholm, 1981), those of *M. elongata* (Fig. 2) have only one tier with thinner walls and few thick-walled nerve cells.

Coker's material collected in 1966 was very

fragmentary but a small sample of a few shoots had been retained by Alan Crundwell (perhaps those destined for BBSUK?) and when sectioned (and as shown by Coker, 1968b in his Fig.1e), leaves of these clearly had the nerve character of *M. mielichhoferiana*. The specimen was producing antheridia. A specimen from Herb. Coker now in BM (BM000668596) is equally fragmentary. On a determinavit label Hodgetts has identified the material as *Pohlia nutans* (Hedw.) Lindb. on the basis of leaf-sections. As



△Above: *Mielichhoferia elongata* at Coire Kander, June 1991. F. Rumsey

Nyholm (1981) illustrates in this species there tend to be some small thick-walled cells above the more central band of the largest cells, the upper surface cells over the nerve of similar dimension to those on the lower surface. In these respects the putative *Mielichhoferia* specimens differ as shown in Fig.1. The July 1930 Duncan specimen in herb. Dixon (BM!), (apparently not seen by Hodgetts), has been determined by Shaw as *M. mielichhoferiana* – “apparently mixed with and possibly hybridizing with *M. elongata*”. The portion mentioned by Coker (1968) as having been sent to W.E. Nicholson and now at CGE! I believe to (now) only contain rather long-leaved *M. elongata*. Similarly the Wallace 1934 (NMW!) and Crundwell 1964 (Herb. Crundwell!) collections I also believe, from their nerve sections (see Fig. 2d), to be rather attenuated *M. elongata* with more secund elongate leaves. In the light of the studies by Shaw (1994; 1998) it is quite possible that these somewhat morphologically intermediate plants might represent the progeny of past hybridisation. I believe that there can be little doubt that *M. mielichhoferiana* was present

at Coire Kander, albeit apparently in very small quantity; although not re-found in spite of intensive searching (Blockeel *et al.*, 2014) it may still survive.

The claim for *M. mielichhoferiana* to be a British plant does not rest exclusively on the now (partially) vindicated Coire Kander specimens. A specimen identified as this was collected by Martin Corley on Beinn Dorain, VC98 in August 1971, although it was ten years before its identity as this species was suggested. He (*in litt.*) recalled that the area in which the plant was collected was on calcareous mica-schist and not obviously metalliferous, the plant found on the floor of a gully on fine mineral soil near the foot of the cliff wall. The plant has not been re-found here (Rothero & Long, 1995). The specimen collected looked like a very undistinguished scrappy *Poblia* but in its essential leaf characters (Fig.1b) it conforms well with typical *M. mielichhoferiana*. I am still not completely convinced as to its identity but cannot suggest a better name.

Examinations of the herbarium collections

at BM revealed another somewhat atypical undated specimen purporting to be *M. mielichhoferiana*, collected by R. Braithwaite on Moel Siabod, VC.49 (BM000668597). This was cursorily mentioned by Coker (1968b) in his caption to the distribution map of *M. elongata*, published shortly after his first record of *M. mielichhoferiana*. He rather bizarrely dismissed it as an unusual form of *Campylopus flexuosus*, which name does appear boldly on the newspaper packet above a fainter “*Oreas mielichhoferi*” in pencil. Anatomically (Fig.1c) and from gross morphology I regard this as a far better candidate for good *M. mielichhoferiana*. It too has been determined by Hodgetts as “*Pohlia nutans*” but the density of the shoots, fragility of stems and general appearance all, I suggest, argue against this. Moel Siabod supports an interesting suite of montane taxa, is less well bryologised than the more accessible main Snowdonian peaks and most importantly supports the metalliferous habitat required by the species; it may well still support the plant.

I suspect that much of the doubt which has arisen over the presence of *Mielichhoferia mielichhoferiana* in the British Isles has been through our inability to re-find it. Unlike *M. elongata* which may grow in large, distinctively coloured dense patches, *M. mielichhoferiana* is perhaps less obligately metallophytic, far more non-descript and therefore easily overlooked. I hope that in re-stating its presence I am not recording its extinction!

Acknowledgements

This little note has sadly been far too long (20 yrs +) in its gestation and I have missed the opportunity to thank many of those who helped me properly. I would still like to put on record my grateful thanks to the late Alan Crundwell for specimens from his herbarium and to the late Paddy Coker for his reminiscences about the Corrie Kander find. I would also like to thank Martin Corley for his reminiscences and map

relating to Beinn Dorain, Tom Blockeel and Mark Hill for their helpful comments long ago and finally Len Ellis and all of the other herbarium curators who have helped me with access to specimens.

References

- Blockeel, T.L., Bosanquet, S.D.S., Hill, M.O. & Preston, C.D. (eds.) (2014).** *Atlas of British & Irish Bryophytes Vol.1*. Pisces Publications, Newbury.
- Coker, P.D. (1968a).** *Mielichhoferia mielichhoferi* (Hook.) Wijk & Marg., new to the British Isles. *Transactions of the British Bryological Society* 5: 448-451.
- Coker, P.D. (1968b).** Distribution maps of bryophytes in Britain: *Mielichhoferia elongata*. *Transactions of the British Bryological Society* 5: 598.
- Coker, P.D. (1971).** *Mielichhoferia elongata* (Hornsch.) Hornsch. and *Saelania glaucescens* (Hedw.) Broth. in Scotland. *Trans. Br. Bryol. Soc.* 6: 317-322.
- Hodgetts, N., Rothero, G. & Genney, D. (2013).** BAP surveillance in Scotland. *Field Bryology* 109: 9-13.
- Nyholm, E. (1981).** *Illustrated moss flora of Fennoscandia II. Musci, Fasc.3 2nd Ed.* Swedish Natural Science Research Council, Stockholm.
- Rothero, G. & Long, D. (1995).** *Mielichhoferia mielichhoferiana* Species dossier. Scottish Cryptogamic Conservation Project SNH/RBGE, Unpubl. report.
- Shaw, A.J. & Crum, H.A. (1984).** Peristome homology in *Mielichhoferia* and a taxonomic account of the North American species. *Journal of the Hattori Botanical Laboratory* 57: 363-381.
- Shaw, A.J. (1989).** *Heavy metal tolerance in plants: Evolutionary aspects*. CRC Press.
- Shaw, A.J. (1994).** Systematics of *Mielichhoferia* (Bryaceae: Musci). III. Hybridization between *M. elongata* and *M. mielichhoferiana*. *American Journal of Botany* 81: 782-790.
- Shaw, A.J. (1998).** Genetic analysis of a hybrid zone in *Mielichhoferia* (Musci) in Bates, J.W., Ashton, N.W. & Duckett, J.G. (eds.) *Bryology for the Twenty-first century*, BBS Pp. 161-174.

Fred Rumsey

Natural History Museum, London

e F.Rumsey@nhm.ac.uk