

Two hybrids of *Equisetum sylvaticum* L. new to the British flora

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ABSTRACT

Two hybrids of *Equisetum sylvaticum* are reported, which are new to the British flora. These are *E. × bowmanii* C. N. Page, **hybr. nov.** (*E. sylvaticum* L. × *E. telmateia* Ehrh.), from Hampshire, and *E. × mildeanum* Rothm. (*E. pratense* Ehrh. × *E. sylvaticum* L.) from Perthshire.

INTRODUCTION

No hybrids involving Wood Horsetail (*Equisetum sylvaticum* L.) have been previously recorded from the British Isles. This paper reports the occurrence of two such hybrids new to the British flora, one of which is unknown elsewhere and is described here for the first time. These are *E. × bowmanii* C. N. Page, **hybr. nov.** (*E. sylvaticum* L. × *E. telmateia* Ehrh.), from Hampshire, and *E. × mildeanum* Rothm. (*E. pratense* Ehrh. × *E. sylvaticum* L.) from Perthshire. Herbarium material of each has been deposited in the herbarium of the Royal Botanic Gardens, Edinburgh (E).

EQUISETUM × BOWMANII

***Equisetum × bowmanii* C. N. Page, **hybr. nov.** (*Equisetum sylvaticum* L. × *E. telmateia* Ehrh.)**
TYPUS: Hampshire, New Forest, Minstead, near A337 Minstead Road, July 1986, *R. P. Bowman* s.n., det. *R. P. Bowman* & *C. N. Page* (Holotypus: E).

Caules 30–50 cm alti, 2.5–5.0 mm diam., fere albi, 8–14 sulcati; vaginae (dentibus exclusis) 5–7 mm, pallide viridi-griseae; dentes tot quot sulci, 2–costati, tenues, acuti, marginibus latis pallide brunneis scariosis lateraliter inter se adhaerentibus: cavitas centralis $\frac{1}{3}$ – $\frac{1}{2}$ caulis diam. Ramuli patentes, tenues regulariter verticillati, iterum ramosi, plerumque tetragoni vivide sed pallide virides; costae biangulatae; vaginae pallidae, dentibus triangularibus-acuminatis patulis minute nigro-apiculatis. Strobilus c. 1.2 cm longus; sporae abortivae.

Stems 30–50 cm or more, erect, thick, 2.5–5.0 mm in diameter; main stem internodes somewhat fleshy, mostly very pale green, nearly white in the lower part of the stem, minutely rough; grooves 8–14, numerous, fairly deep, ridges \pm rounded, sheaths long, 5.0–7.0 mm (excluding teeth), \pm appressed, pale greenish-grey, sometimes blackish above and below; teeth numerous, as many as the grooves, 2-ribbed, of variable length, mostly 4.0–6.0 mm long, slender, acute, their central portions deep brown, mostly straight, their margins broad, pale brown and scarious; the teeth often adhering laterally by their margins in 2s–4s for their full length; central hollow about $\frac{1}{3}$ – $\frac{1}{2}$ diameter of stem. Branches numerous, long (up to c. 7.5 cm), in regular and numerous whorls, spreading widely all around the shoot and drooping at their tips, very slender, mostly 4-angled, bright pale green, almost all bearing sparse to numerous long secondary branches of similar form and colour; branch sheaths pale greenish-brown, teeth triangular-acuminate, green and dark-tipped, somewhat spreading; branchlet ochreolae conspicuous, chaffy, pale golden brown; branch internode with narrowly grooved (biangulate) ridges and shallowly rounded furrows.

Cones, when present, borne from the tops of shoots of generally similar form to the vegetative

ones but the shoots thicker (mostly 5 mm diam.), with larger, looser, leafier sheaths to 2 cm long; the cones ovoid, c. 1.2 cm long, dark, hardly rising out of the uppermost sheath, their sporangia poorly-filled, the spores abortive.

The vegetative and cone-bearing shoots of this hybrid are both strikingly intermediate in size and morphology between those of *E. telmateia* and *E. sylvaticum*. The vegetative shoots differ from those of *E. sylvaticum* in their slightly larger size, and thicker and more succulent stems, and especially in the long, narrow, dark-centred teeth to their sheaths, the paleness of their main stem internodes (especially on the lower parts of the stem), and branches with \pm biangulate internodal ridges and of bright pale green colour, forming the dominant colour of the plant. They differ from *E. telmateia* in the much more slender main stem, with long nodding tip, the slenderness of the branches which are themselves drooping at the tips and copiously branched, and roughness of the main stem internodes and the depth of their grooves, and the conspicuous brown scarious margins to the main stem teeth which are broad and tend to adhere laterally with each other, forming broad lobes. The stem in section has a central hollow, and the number of carinal and vallecular canals (about 8–14) is intermediate between those of the parents. The length of the first internode of the branches is also intermediate between the short, first internode of *E. telmateia* and the long, first internode of *E. sylvaticum*.

The intermediate form of the fertile (cone-bearing) shoots is also striking. These are semi-dimorphic, with thick, somewhat succulent shoots, shorter than those of *E. sylvaticum*, and much larger chaffier and looser sheaths than in *E. sylvaticum*, sparse whorls of branched green branches, and a cone like that of *E. telmateia* in shape but similar to that of *E. sylvaticum* in size.

The sporangia of the cone of *E. \times bowmanii* contain numerous but poorly-formed spores, which appear to be 100% abortive. These include about 95% of very small, generally irregularly rounded, misshapen or wholly shrivelled, nearly colourless spores, each with a shrunken and nearly colourless cytoplasm and only very rudimentary and scarcely-formed elaters; and about 5% of varyingly larger spores of imperfectly rounded form, but with varyingly pale green-coloured chloroplasts, and fairly well-formed but inoperative elaters.

The spore evidence thus wholly supports the conclusion that this plant is of hybrid origin, whilst its very distinctive morphology, which is almost exactly intermediate between that of two native horsetail species in a large number of distinct characters, enables its parentage to be deduced with a very high degree of certainty. These features also readily distinguish this hybrid from both parents and from *E. \times mildeanum* (see below), which shares *E. sylvaticum* as a common parent, as well as from other hybrids in *Equisetum* (Page 1972, 1982).

DISTRIBUTION AND ECOLOGY

This hybrid was found by R. P. Bowman in July 1986 in a single colony spreading over heathland road banks, grass verges and in adjacent short turf on wet clay soil near the A337 Minstead Road, Minstead, New Forest, S. Hants., v.c. 11 (GR 41/296.105). Plants occur in open sites where they are more slender and rather stunted and subject to grazing by ponies, except where they emerge in the shelter of low *Rubus fruticosus*, *Ulex*, *Prunus spinosa* and *Pteridium aquilinum*, with some *Quercus robur* seedlings. Other associates include *Mentha aquatica*, *Cirsium palustre*, *Senecio aquaticus*, *Betonica officinalis*, *Prunella vulgare*, *Galium palustre*, *Lysimachia nemorum* and *Juncus conglomeratus*. *Equisetum arvense* occurs nearby on the same road banks. On the periphery of the site is a light cover of medium-aged *Quercus robur*, *Fagus sylvatica* and *Pinus sylvestris*, with an open understorey of stunted *Ilex aquifolium*. It is possible that a few trees were earlier removed during the construction of the new section of road. The site dips slightly to the west and the road ditches drain into a main ditch, in turn draining an open grazed sward. The altitude of the site is approximately 35 m. On the southern side of the road, shoots of the hybrid occur along approximately 30 m of verge, whilst on the northern side, they extend along at least 50 m of road bank. The clay exposure is that of the Barton Clay of the Eocene.

There are four recorded sites for *Equisetum sylvaticum* in the area, all situated along the same watercourse: Fleet Water, Minstead, on flushed slope in deciduous woodland; below mill pond outfall (GR 41/295.100), 500 m distant from the hybrid site; Fleet Water, Newtown, Minstead, side of damp ride in bushy plantation (GR 41/278.107), 1800 m distant; Stoney Cross, wet flush in

pasture (GR 41/260.117), 3650 m distant; and near Bartley Water, Busketts Lawn Inclosure, damp sides of ditch draining into stream (GR 41/314.103), 1750 m distant.

Recorded but unlocalized sites for *Equisetum telmateia* exist at Minstead (GR 41/26.10) and Canterton (GR 41/26.12), both about 3 km away, west and north-west of the hybrid site. In Busketts Lawn Inclosure (GR 41/314.103), there is a local population of *E. telmateia* along ditch banks on clay only 10 m from the very small population of *E. sylvaticum* described above. The habitat of this site is beech and oak plantation, but the presence of *Sorbus torminalis* is indicative of a former ancient woodland. Here *E. telmateia* grows mainly where the clay is exposed, whilst *E. sylvaticum* prefers the damp slightly flushed ground, where some *Sphagnum* is present.

EQUISETUM × MILDEANUM

Equisetum × mildeanum Rothm. (*E. pratense* Ehrh. × *E. sylvaticum* L.).

Stems 10–35 cm, erect, slender, 0.8–1.5 mm in diameter; main stem internodes very pale green, conspicuously and minutely rough with perpendicular setose spicules; grooves 8–15, numerous, fairly deep, the ridges angular; sheaths long, 3.0–4.5 mm (excluding teeth), somewhat loose, pale greenish-grey, sometimes pale brown to blackish above; teeth numerous, as many as the grooves, 1-ribbed, 2.0–3.0 mm long, slender, acute, their central portions deep brown above, grey-green at the base, straight or, when paired, bent laterally mostly only at the base, their margins scarious, mostly pale brown, narrow near the tips of the teeth, but broadening rapidly downwards, adjacent teeth mostly adhering laterally by their margins in 2s–3s for their full length; central hollow about $\frac{1}{2}$ diameter of stem. Branches numerous, up to c. 5.5 cm long, whorled but becoming somewhat asymmetrically arranged to give the shoot an often slightly bilaterally compressed appearance, spreading and drooping at their tips, very slender, all 3-angled, mid-green, each usually bearing a small number of regular, short, spreading secondary branches of similar form and colour; branch sheaths pale green, teeth triangular-acuminate, green throughout, \pm straight or only slightly spreading; branchlet ochreolae chaffy, pale brown; branch internodes with very prominent acute, uniangulate ridges and deep, flat-sided V-shaped furrows each with a narrow, lengthwise basal channel.

Vegetative shoots of this hybrid are strikingly intermediate in morphology between those of *E. pratense* and *E. sylvaticum*. They differ from *E. pratense* most clearly in having, in most specimens, secondarily branched branches throughout all or much of the length of the shoots, somewhat looser main stem sheaths which bear fewer teeth with broader, whitish to pale brown margins which also typically adhere together laterally by their margins in 2s and 3s. It differs from its other parent, *E. sylvaticum*, principally in the more bilaterally compressed (and hence not quite radially symmetric) habit of the overall shoot, its shorter, somewhat fewer, branchlets to the branches, the paler ochreolae at the branchlet bases, the generally non-spreading and concolorously green habit of the branch node teeth, the more numerous, more acute angles of the main stem internodes, and the straighter, darker-centred, more acutely tapering teeth of the main stem sheaths. Its sheaths are also generally tighter and typically somewhat less cup-shaped than are those of *E. sylvaticum*. Cone-bearing shoots have not, as yet, been found, but overall, the slender, pale green, somewhat compressed shoots of *E. × mildeanum*, combined with main stem sheaths with long dark teeth adhering together by broad scarious margins, and branches which are themselves mostly sparsely but regularly secondarily branched, leave little doubt about its identity, and produce a horsetail of distinctive and delicate appearance. The combination of these characters distinguishes this hybrid from both parents and from *E. × bowmanii*, which shares *E. sylvaticum* as a common parent, as well as from other hybrids in *Equisetum* (Page 1972, 1982).

DISTRIBUTION AND ECOLOGY IN BRITAIN

Three British stations for *E. × mildeanum* are known:

Perthshire, Ben Lawers, between large tumbled boulders on west-facing, slightly flushed damp, grassy slope, c. 2050 ft (625 m), with both parents; July 1985, C. N. Page & D. Marden, det. C. N. Page.

Perthshire, Caenlochan, in scree, 2900 ft (860 m); 10 July 1986, H. McHaffie, conf. C. N. Page.

Perthshire, Glenshee: Glas Choire, 26 August 1986, E. Birse, comm. P. I. Rothwell, conf. C. N. Page.

All three montane locations are in sites where both parents occur in the general vicinity or in the immediate neighbourhood of the hybrids. All are in fairly base-flushed (and in one site, wet) habitats over mica-schist rocks, and two of the sites are amongst boulders or on scree. In its Glas Choire locality, the rather small shoots of the plant grow with *Carex nigra*, *C. echinata* and *Sphagnum recurvum*. In the other two localities, plants grow in sites where, in addition to both parents, other pteridophytes of upland, basic screes are frequent, including *Dryopteris expansa*, *Polystichum aculeatum* and *P. lonchitis*.

DISCUSSION

Both hybrids reported here have *Equisetum sylvaticum* as one parent, and are the first two hybrids involving this parent known in the British flora.

Equisetum × *bowmanii* is a hybrid hitherto unknown anywhere, and its two, rather dissimilar-looking parents are, elsewhere, often widely separated geographically. In Europe as a whole, *E. sylvaticum* is generally northern and montane, and *E. telmateia* southern and lowland (Jalas & Suominen 1972). The ranges of two parent species thus mostly overlap only in middle latitudes in Europe, where they are often further separated by habitat differences (Page 1982, 1988). Even in Britain, their geographical overlap is not large (Jermy *et al.* 1978), and the New Forest locality for this hybrid is in one of the few regions of Britain where the two parents seem to occur near to each other in some quantity.

Here, the habitat of *E.* × *bowmanii* in many ways represents an abutment of habitats each more typical of the parent species locally: *E. telmateia* on damp clay banks and *E. sylvaticum* in damp acid heathy woodland. Further, the bulk of the habitat of *E.* × *bowmanii* occurs along a section of road which was constructed anew as part of a road realignment 13 years before (1973) the date of the first find of this plant, with the area of the hybrid closely coincident with that of roadside clay originally disturbed. It is not known whether the hybrid was present before the road widening event, but it seems probable that its formation may be a direct result of the soil disturbance resulting from this activity, the road construction creating new damp clay verge sites initially free of competition from established vegetation and suitable for gametophyte growth. It is by no means impossible that the whole of the present population area, including plants on both sides of the road, is a single clone.

The only other hybrid involving *E. telmateia* in the British Isles is *E.* × *font-queri* Rothm. (*E. telmateia* Ehrh. × *E. palustre* L.) known from the Isle of Skye (Page 1973) and from two lowland English sites (Roberts & Page 1979; Page & Busby 1985). The damp, clay substrate of *E.* × *bowmanii* and its roadside situation is strongly reminiscent of some of the sites for *E.* × *font-queri* in Skye. The only other known hybrid involving *E. sylvaticum* in the British Isles (or, indeed anywhere) is *E.* × *mildeanum* Rothm. (*E. sylvaticum* L. × *E. pratense* Ehrh.), reported and described here. *E.* × *bowmanii* is thus significant not only in its unusual appearance and in being a hybrid between two species of very different morphology and ecology, but also in having two parents neither of which seems to enter into many natural hybrid combinations.

Equisetum × *mildeanum* was described by Rothmaler (1944) from a number of localities in central and northern Europe, viz. "Hassia, Holsatia, Saxonia, Prussia, Silesia, Rossia". I have examined and confirmed the identity of Rothmaler's type (at Jena, J), and the match of these British specimens to it. Through central and northern Europe and Asia, the two parents of this hybrid have, indeed, very widely sympatric ranges, and their ecology is such that the two species probably frequently meet. It is of interest that all three known British stations for *E.* × *mildeanum* reported here are in Perthshire, thus all within the sympatric portions of their parental ranges (cf. Page & Barker 1985), and indeed, Scotland is probably the only part of the British Isles in which *E. pratense* occurs in any great abundance. Only one other hybrid involving *E. pratense* in its parentage is known in the literature. This is *E.* × *montellii* Hiitonen (*E. arvense* L. × *E. pratense* Ehrh.), reported from Finland, Sweden and the Canadian arctic (Duckett & Page 1975), and which could also yet be found in the British Isles. These two finds now bring to eight the total number of native

British horsetail hybrids (Page 1982), and update the information and further emphasize the ecological conclusions drawn in Page & Barker (1985).

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