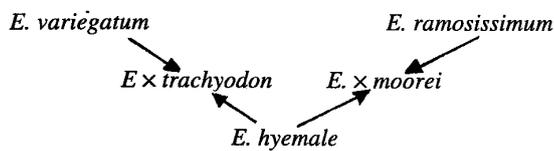


EQUISETUM

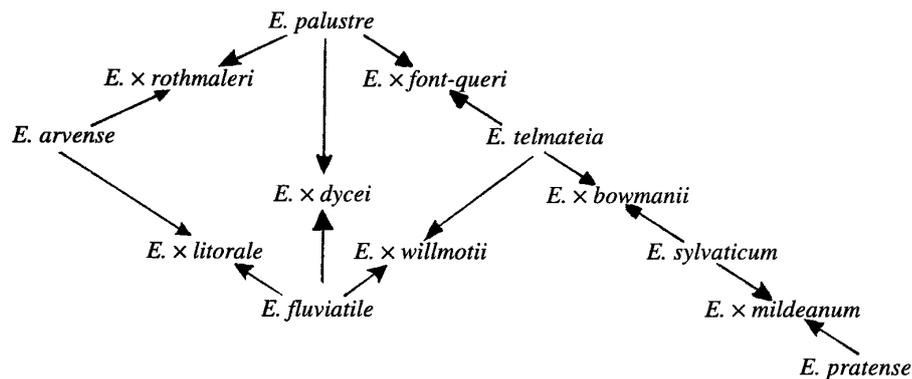
Equisetum is divided into two distinct subgenera (which by some European botanists are accepted at generic rank, with good reason): *Equisetum* and *Hippochaete* (Milde) Baker. Hybrids are formed between most species but not between species in different subgenera. Normally hybrids are found where the two putative parents grow together but *E. × moorei* is often found well beyond the present range of *E. ramosissimum*. Page & Barker (1985) discuss the biology and geography of hybrids in *Equisetum*. Page (1997) describes in detail the morphology of *Equisetum* seen in the British Isles.

Hybrids so far found in the British Isles are given below.

Subgenus *Hippochaete*

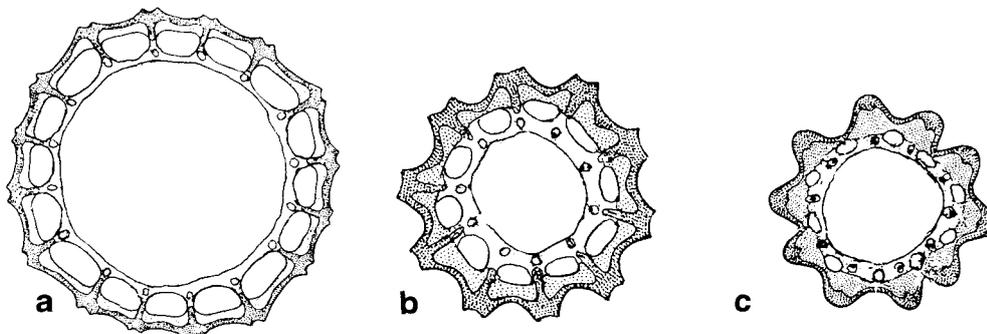


Subgenus *Equisetum*



1. *Equisetum hyemale* / *E. ramosissimum* / *E. × moorei*

E. ramosissimum is protected under the Wildlife and Countryside Act 1981. It is generally accepted that the Lincolnshire population of that species was introduced. However, that in Somerset was misidentified for many years (FitzGerald & Jermy 1987) and it is possible that the species may turn up elsewhere. *E. × moorei*, the putative hybrid between *E. ramosissimum* and *E. hyemale*, is spasmodic in its appearance throughout Europe and is recorded so far only from V.c. H20. Any stand of an *Equisetum* that might pass as *E. hyemale* but which has no or few cones should be looked at more closely.



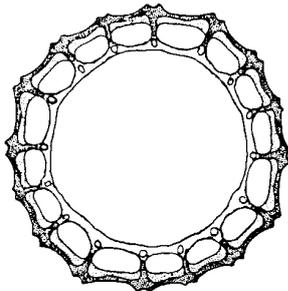
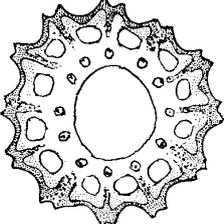
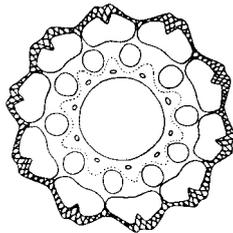
T.S. of stem internodes: (a) *Equisetum hyemale*, (b) *E. × moorei*, (c) *E. ramosissimum*.

Plant Crib

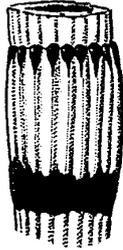
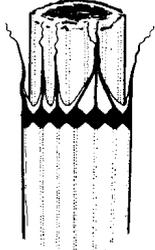
	<i>E. hyemale</i> L.	<i>E. × moorei</i> Newman	<i>E. ramosissimum</i> Desf.
Stem	Deep green, erect, unbranched, with 10-30 ridges; stem feels firm and rough, hollow 2/3 - 3/4 diameter; winter-green	Deep green, erect, unbranched, with c. 20 ridges; stem feels firm hollow 2/3 diameter; dies down in winter unless in warm hollow	Green, often ± glaucous, tending to lie prostrate if not held up, with 10-20 distinct ridges, irregularly branched, slightly rough; stem feels soft, hollow 1/2 - 2/3 diameter. dies down in winter unless in warm hollow
Internodes	Become inflated so that stem seems narrowed above and below sheaths	Not or only slightly inflated	Not inflated
Sheath teeth	Quickly lost as stem expands, leaving a 'pagoda' of whorls of teeth at stem apex and a dark, crenulated upper margin to sheath	Black, attenuated from triangular base c. 1 mm, not lost until stem fully expanded then leaving a slightly crenulated margin	Black, pointed, persistent, up to 5 mm, with scarios margin very narrow or lacking,

2. *Equisetum hyemale* / *E. variegatum* / *E. × trachyodon*

The hybrid *Equisetum × trachyodon* (recorded for V.c. 58, 67, 70, 88, 90) is more like a robust form of *E. variegatum*. The nodal sheath teeth show the most useful characters.

	<i>Equisetum hyemale</i> L.	<i>E. × trachyodon</i> A. Braun	<i>E. variegatum</i> Schleich. ex F. Weber & D. Mohr.
Cone	Not apiculate but sharply pointed, 7-15 mm long, partly concealed by teeth of uppermost sheath	Apiculate at apex, 4-5 mm long, usually remaining half within the uppermost sheath	Apiculate at apex, 5-7 mm long
Stem	Deep green, erect, unbranched, less than 12 mm wide, with 10-30 ridges; stem feels soft, hollow 2/3 - 3/4 diameter of stem; winter-green. 	Deep green; erect or becoming procumbent, sometimes branched on previous year's stems and then very much like <i>E. variegatum</i> , 8-13 acutely bi-angled ridges, hollow 1/2 diameter of stem; winter-green 	Deep to mid-green, usually prostrate or ascending, occasionally erect, with 6-8 bi-angular ridges, hollow c. 1/3 diameter of stem; winter-green 

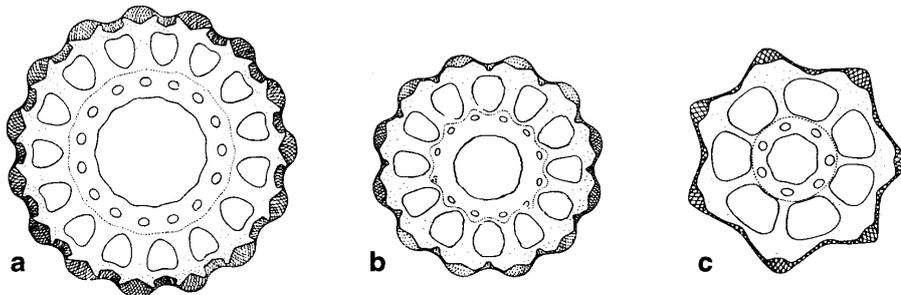
Plant Crib

<i>Continued</i>	<i>Equisetum hyemale</i>	<i>E. × trachyodon</i>	<i>E. variegatum</i>
Internodes	Becoming inflated so that stem seems narrowed above and below sheaths; stomata not obvious	Not or only slightly inflated; stomata just visible as in <i>E. variegatum</i>	Not inflated; stomata visible as a single row of white dots either side of each trough between stem ridges
Sheath	Green at first, becoming pinkish-grey in middle, with a black band at base that broadens with age 	Pale green or ash grey with narrow black band near top, becoming almost totally black 	Black band develops at base of sheath teeth; nodes and internodes may be orange-tinted 
Sheath teeth	Soon lost as stem expands, leaving a dark, crenelated upper margin to sheath and a 'pagoda' of whorls of teeth at stem apex.	Finely attenuate apex, black, with scarios margin of varying width below, eventually lost during winter	Broadly triangular, with a broad, white, scarios margin and a dark mid-line ending in a dark hair-point which is soon lost from the otherwise persistent tooth.

3. *Equisetum arvense* / *E. palustre* / *E. × rothmaleri*

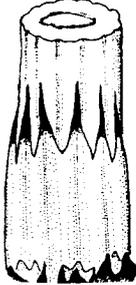
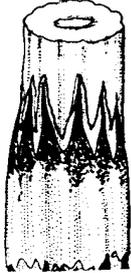
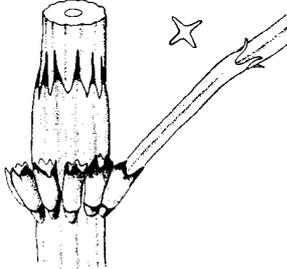
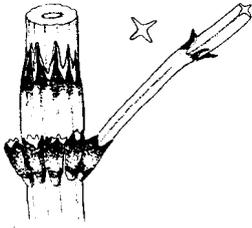
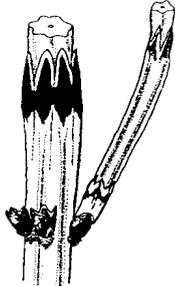
In high altitude flushes and micaceous mires small forms of *E. arvense* which are rarely branched can be mistaken for *E. palustre* but their sheath teeth are characteristic. Similarly unbranched and very slender forms of *E. palustre* grow in similar base-rich mires and can, in turn, be confused with *E. variegatum*. Presence of a cone will dispel any doubts, that of *E. variegatum* being apiculate. Also compare Tables above and on next page.

The hybrid between *Equisetum arvense* and *E. palustre* (*E. × rothmaleri*) is rarely detected (V.c. 20, ?52, ?82, 104) but should be looked for where the two parents grow near each other, which is often. Those found have the jizz of *E. arvense* early in the year but soon develop that distinct green of *E. palustre* and these two stages can be found growing together. On closer examination it will be seen that it is not completely identical with *E. palustre*.



T.S. of stem internodes: (a) *Equisetum arvense*, (b) *E. × rothmaleri*, (c) *E. palustre*. (Partly after Page, 1997, with the permission of Cambridge University Press.)

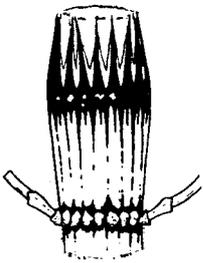
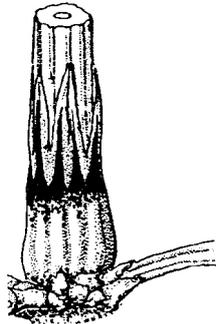
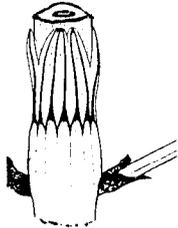
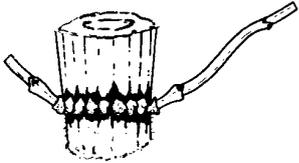
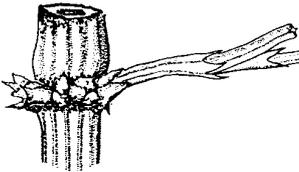
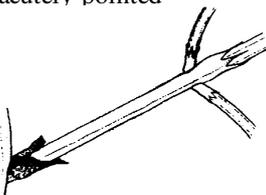
Plant Crib

	<i>Equisetum arvense</i> L.	<i>E. × rothmaleri</i> C. N. Page	<i>E. palustre</i> L.
Cone	Ovoid when young, elongating on ageing, 10-40 mm, on colourless stems in spring	Ovoid-cylindrical, 4-9 mm, on green shoots in summer	Cylindrical, 15-25 mm, on green shoots in summer
Sterile stem	Robust erect pale stems with 8-20 ridges, smooth, stem feels firm (it resists a gentle squeeze), hollow less than 1/2 – 1/3 stem diameter; stomata not obvious with × 10 lens; branches usually spreading	General appearance when first emerging in Spring somewhat robust and often pale pinkish, with 6-12 ridges, hollow 1/2-1/4 diameter of stem; stomata not obvious	Very smooth, with 5-9 ridges; stem feels very firm, hollow less than 1/4 diameter, stomata visible with × 10 lens as white dots scattered in each trough between stem ridges; branches ascending
Sheath teeth	With black tips, no or very narrow scarious margin 	With black tips, with narrow scarious margin 	With a conspicuous broad, white, scarious margin surrounding the central black triangle 
Branch internode and ocreolae (small scales) at junction with main stem.	4-angled in TS, 1-2 mm wide; lowest internode equal to or longer than adjacent stem sheath, with pale ocreolae 	4-6-angled in TS, c. 1 mm wide; lowest branch internode about as long as or slightly longer than adjacent stem sheath, with dark ocreolae 	4-6-angled in TS, c. 1 mm wide; lowest branch internode much shorter than adjacent stem sheath, with black ocreolae 
Branch teeth	Usually green throughout, spreading away from branch axis, free part 1-2 mm long	Black-tipped but spreading away from branch axis	Usually blackish-tipped, with a scarious margin, clasping branch axis

Plant Crib

4. *Equisetum pratense* / *E. sylvaticum* / *E. × mildeanum*

Equisetum pratense and *E. sylvaticum* frequently grow together in upland base-rich mires and adjacent grassland. Their hybrid (*E. × mildeanum*) has been recorded in V.c. 88, 89 and 90, and could be elsewhere within the sympatric range.

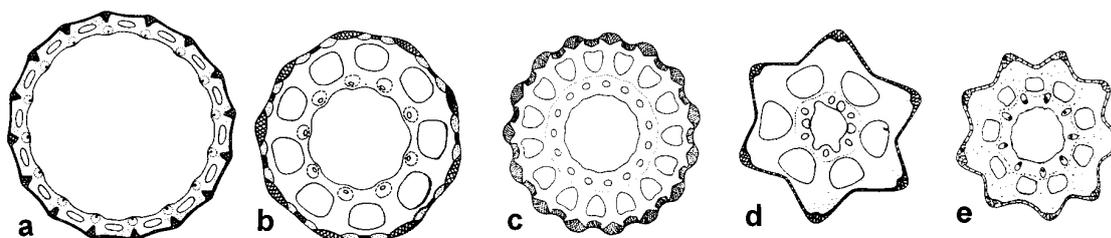
	<i>E. pratense</i> Ehrh.	<i>E. × mildeanum</i> Rothm.	<i>E. sylvaticum</i> L.
Sterile shoots	10-30 cm × 1-3 mm, pale, ± glaucous green; outline blunt-topped or rounded, terminal segment of main stem nodding when fully expanded; branches simple, slender, usually curved down, without secondary branches	10-50 cm × 2-6 mm, very similar to <i>E. pratense</i> in general appearance and often with a ± compressed appearance; apex somewhat tapered but often nodding and branches slender, with only occasional secondary branches	10-50 cm (occasionally larger in lush sites) × 3-6 mm, grass-green, outline abruptly tapered to a short, often nodding spire; branches usually bearing 5 or more secondary branches, gracefully drooping
Stem	With 8-20 ridges, very rough, feels very firm, hollow c. 1/2 diameter of stem	With 8-15 ridges, smooth to slightly rough, feels firm, hollow c. 1/2 diameter of stem	With 10-18 ridges, each main ridge topped by two small ridges of silica, smooth to fairly rough, feels firm, hollow 1/4 - 1/3 diameter of stem
Sheath teeth	With a black centre and a conspicuous broad, white, scarios margin, teeth not adhering together 	As <i>E. pratense</i> but some teeth adhering together 	With a dark central stripe and a very broad, russet-brown, scarios margin, teeth adhering at margins into groups of 2 or 3 
Branch internode and ocreolae	3-angled in TS, 0.5-1 mm wide; lowest branch internode shorter than adjacent stem sheath at lower nodes, but longer at upper nodes; ocreolae pale	3-angled in TS, c. 1 mm wide, lowest branch internode always longer than adjacent sheath; ocreolae pale	3(-4)-angled in TS, 0.5-0.6 mm wide; lowest branch internode always longer than adjacent sheath; ocreolae dark
Branch teeth	Often brown tipped, free part 0.5 mm, appressed to branch axis 	Green, c. 1 mm long, slightly spreading, acuminate 	Green, c. 1 mm long, slightly spreading, slender, acutely pointed 

Plant Crib

5. *Equisetum palustre* / *E. × litorale* / *E. × dycei*

Equisetum fluviatile L. hybridises with *E. arvense* (to form *E. × litorale*) and *E. palustre* (to form *E. × dycei*). Both hybrids can be confused and it is possible that some early records for *E. × litorale* may have been *E. × dycei* and possibly branched forms of *E. fluviatile*. Whilst both *E. × dycei* and *E. fluviatile* can be found on the bare shores of more oligotrophic lakes, the latter has a very large central hollow (over 3/4 of stem width). The former, probably more common than present records show, has a characteristic procumbent base to its sterile stem; it is also rarely forms cones. *E. × litorale* on the other hand, is more frequently found on banks and near ditches. It can be very similar to *E. arvense* but does have a larger cavity in its stem such that a gentle squeeze will detect it. When the same pressure is put on *E. arvense* the stem will resist and feel firm. If you break the stem (and gently pull it apart) *E. arvense* will retain the inner cortical cylinder within, whereas *E. × litorale* will snap completely leaving a ragged edged break (Merryweather 1992). For characters of *E. arvense* see page 11.

	<i>E. palustre</i> L.	<i>E. × litorale</i> Kuhlew. ex Rupr.	<i>E. × dycei</i> C. N. Page
Cone	Cones usually present in summer; blunt-tipped, slightly tapered	Rarely produced; terminal on main stem in summer, barrel-shaped, c. 8-12 mm, remaining tightly closed	Rarely formed; terminal on main stem in summer, barrel-shaped, 10-15 mm, remaining tightly closed
Stem	Dull to fresh green, very smooth, with 5-9 ridges; stem hollow less than 1/4 diameter, very firm; branches regularly whorled at most nodes; stomata visible (×10 lens) as white dots scattered in each trough between stem ridges	Dull grey-green, c. 9 ridges, hollow 1/3-1/2 diameter, branches irregularly clustered towards prostrate base, upper half unbranched, curved and flagellate (whip-like); stomata not conspicuous	Bright green often with slight orange tinge around nodes, 9-12 ridges, hollow c. 1/4 diameter, yields slightly to gentle pressure between finger and thumb; branches regularly whorled at most nodes; stomata not conspicuous
Sheath teeth	With a conspicuous broad, white, scarios margin surrounding the central black triangle	With an inconspicuous narrow scarios margin; often with orange tinge around base of sheath	With an inconspicuous, very narrow scarios margin; often with orange tinge around base of sheath
Lowest branch internode	Much shorter than adjacent stem sheath	About the same length as, or slightly longer than, adjacent stem sheath	About same length as adjacent stem sheath
Branch teeth	Usually blackish tipped, with a scarios margin, clasping branch axis	Pale, usually lacking black tips and with spreading tips	Usually blackish tipped, with a scarios margin, clasping branch axis



T.S. of stem internodes: (a) *Equisetum arvense*, (b) *E. × litorale*, (c) *E. palustre*, (d) *E. × dycei*.

Plant Crib

6. Other hybrids

Hybrids of *E. telmateia* Ehrh. with *E. sylvaticum* (*E. × bowmanii* C. N. Page), with *E. palustre* (*E. × fontqueri* Rothm.), and with *E. fluviatile* (*E. × willmotii* C. N. Page) are not described here as they are clearly intermediate between the parents and show the pale or white chlorophyll-free stems of *E. telmateia*.

References FitzGerald, R. & Jermy, A. C. (1987). *Pteridologist* **1**(4): 178-181.
Jermy, A. C. (1996). *British Wildlife*, **8**(1): 37-41.
Merryweather, J. (1992). *The fern guide*. Field Studies Council, Shrewsbury.
Page C. N. & Barker, M. (1985). *Proceedings of the Royal Society of Edinburgh* **B**,
86: 265-272.

Authors A. C. Jermy, C. N. Page & P. J. Acock, January 1998.