

A VISUAL KEY TO FIVE SPECIES OF ELEOCHARIS (SPIKE-RUSHES)

This Key was created by Bob Leaney for the Norfolk Flora Group, and covers the five species of *Eleocharis* which occur in Norfolk and across much of England, making this Key of use to botanists outside Norfolk.

Of the seven species of spike-rush recorded in Britain and Ireland, and which feature in Clive Stace's *New Flora of the British Isles* (2019) 4th Ed., two (*E. mamillata* and *E. parvula*) can be discounted as possibilities in Norfolk and much of England. *E. mamillata* (Northern Spike-rush) is restricted to Northern England and Scotland and is easily identified by its broadly conical, rather than cylindrical spikelet shape. *E. parvula* (Dwarf Spike-rush) is a tiny plant of estuarine habitats and is restricted to the south coast of England, north-west Wales, and an area around Londonderry; it can be separated by its green, rather than brown glumes.

The Norfolk species

Of the 5 species that might be encountered in Norfolk, *E. palustris* (Common Spike-rush) is by far the most frequent, occurring on marshes, and the margins of ponds, ditches and rivers. *E. uniglumis* (Slender Spike-rush) is associated with fens, marshes and dune slacks. *E. multicaulis* (Many-stalked Spike-rush) is scarcer and confined to more acidic habitats such as bog, wet heath or poor-fen. The two smallest species, *E. quinqueflora* (Few-flowered Spike-rush) and *E. acicularis* (Needle Spike-rush) are both very scarce in the county. *E. quinqueflora* has a broadly northern and western distribution in Britain and Ireland and is an occasional plant of marsh and fen. *E. acicularis* is more widely distributed, but has very different habitat preferences to the other spike-rushes, occurring on wet sand or mud as a 'draw-down' species at the edge of lakes, ponds, reservoirs or rivers. It can also colonise gravel pits, and is unusual in having a submerged form (see below). All of these habitats are difficult to access and it is probable that this species is under-recorded.

Common problems with identification characters

The Key has been developed to try to avoid the Stace character of whether only the lowest glume or the lowest two glumes, are empty. Most botanists, including myself, find it very difficult, and potentially misleading to use this character, not least because when an empty glume is encountered it may not be apparent whether the nut has already been shed.

Similarly the number of stigmas (2 or 3) works for only a limited period at anthesis, and gives rise to much disagreement when used in the field. I feel that this character should be used only at home following examination or 5-10 fertile glumes with a microscope, and in the knowledge that the tip of a stigma may break off, so that a specimen with 3 stigmas may appear to only have 2. Conversely, in species with 2 stigmas, it is common to see under the microscope a stigma emerging from beneath the tip of a neighbouring glume and inserting itself under the tip of the glume being examined, so giving the impression of a plant bearing 3 stigmas.

Habit

The degree of tufting is an unreliable feature, except in the case of *E. multicaulis*, which is nearly always densely tufted. *E. acicularis* is unique in having an underwater form in which the stems become greatly elongated and fail to produce spikelets.

Height of the flowering stem

The flowering stem height is very variable and likely to be misleading, except as a spotting feature for possible 'non-palustris' spike-rushes.

Length and width of spikelets

All species can have spikelets as short as 5mm in depauperate populations and so the minimum length is of limited value in reaching an ID; conversely the maximum spikelet length in a population is a useful character.

Number of flowers and glumes

This feature varies considerably, and along with the size of the spikelet, is of limited usefulness in itself.

Floral characters

Features such as perianth bristles, the shape of the base of the style and anther length are only discernible for a brief period of time and so of limited usefulness.

Degree to which the lowest glume encircles the spikelet

This character is a major source of confusion and it is important to remember that the lowest glume more or less encircles the base of the spikelet in all of the Norfolk species with the exception of *E. palustris* (and even in that species it may encircle up to $\frac{3}{4}$ the diameter of the base).

The shape of the nut

The nut shape (3-angled or biconvex) may be a useful character, but it may not be easy to obtain fruits, presumably because they are quickly shed, unlike in taxa such as *Luzula* and *Polygonum*, where vigorous rubbing is nearly always successful in producing a few seeds.

Collecting material

The angle of the upper sheath apex is so crucial that specimens consisting of just the stem apex and spikelet are useless – the upper sheath apex is always on the lower few centimetres of the stem, and samples should therefore be taken at ground level. Also, variability in the other ID characters is so great that one should always take c5 stems, selecting, if possible, specimens that still display their stigmas. If you are sure that a population with a gradation of heights consists of only one species, take the tallest stems with the longest spikelets.

The Key

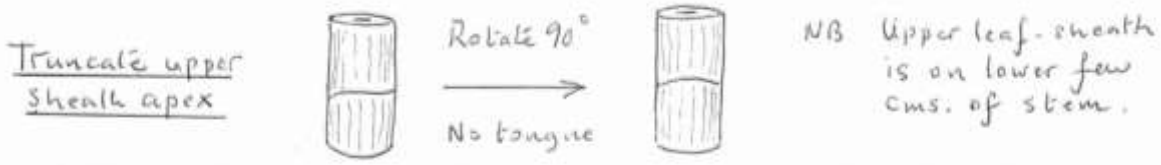
The Key is designed to be used in the field to enable a decision to be made as to which specimens should be taken home for further examination, preferably with a microscope. If the specimens are at anthesis or in fruit, the standard 'empty glume' flora and fruit characters can also be used, but these require careful dissection. Attempts to dissect spikelets in the field are likely to be misleading.

The main ID characters can be obtained using a good millimetre ruler and a 10x lens; mainly maximum spikelet length, stem width, stem cross-section shape and the shape of the 'tongue' on oblique sheaths. The tongue character can be found by rotating the stem by 90° and seems not to have been described before. As shown in the drawings, though, it is very helpful. The key makes an immediate distinction (Couplet 1) between 2 groups that have: either a truncate, more or less horizontal apex to the uppermost leaf sheath, lacking a tongue (*E. palustris* and *E. uniglumis*); or an oblique apex with a tongue that is either short with an obtuse-rounded tip (*E. acicularis* and *E. quinqueflora*), or long, and with an acute-acuminate tip (*E. multicaulis*). The two species groups are then separated by spikelet characters.

The Visual Key

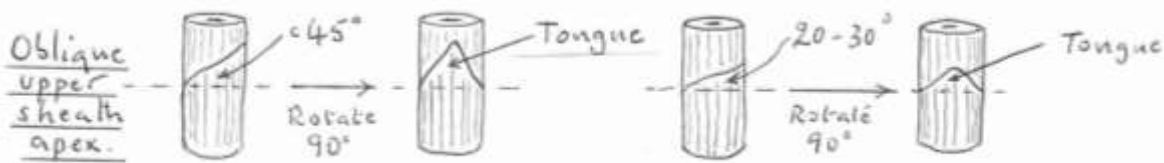
1. Uppermost stem leaf-sheath apex truncate (i.e. \pm horizontal), without a 'tongue' when rotated 90° .

2.



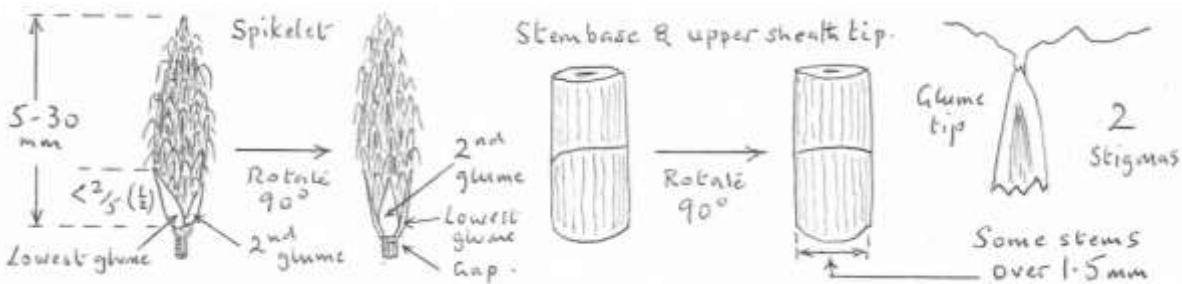
1. Uppermost stem leaf-sheath apex either very obliquely-angled ($\approx 45^\circ$), with acute-tipped 'tongue' when rotated 90° ; OR slightly oblique ($20-30^\circ$) with obtuse to rounded- 'tongue'.

3.



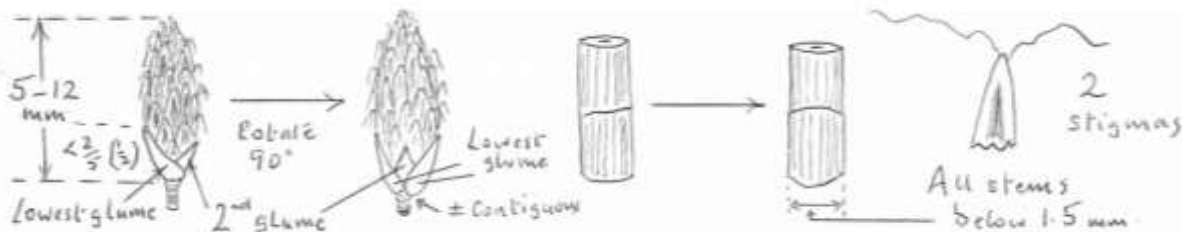
2. Usually tall, with very large spikelets (some $>12\text{mm}$ long), and dull, broad stems (usually some $>1.5\text{mm}$ diameter); 2 basal glumes sub-equal, each \pm half-encircling the base of the spikelet. Lowest glume $< 2/5$ (up to $1/2$) length of spikelet.

E. palustris



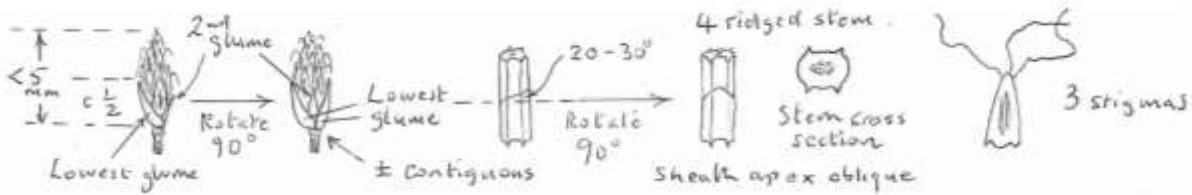
2. Usually fairly tall, with medium-large spikelets ($<12\text{mm}$ long), and fairly broad stems ($<1.5\text{mm}$), which are usually shiny (when not muddy); lowest glume \pm encircling the base of the spikelet and $< 2/5$ (up to $1/2$) length of spikelet.

E. uniglumis



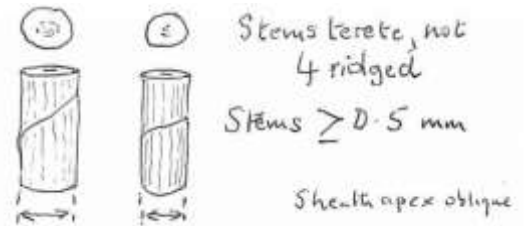
3. Usually <10cm tall with 4-ridged, very fine stems (<0.4mm diameter); spikelets tiny (usually ≤5mm), lowest glumes c1/2 as long as spikelet and ± encircling base.

E. acicularis



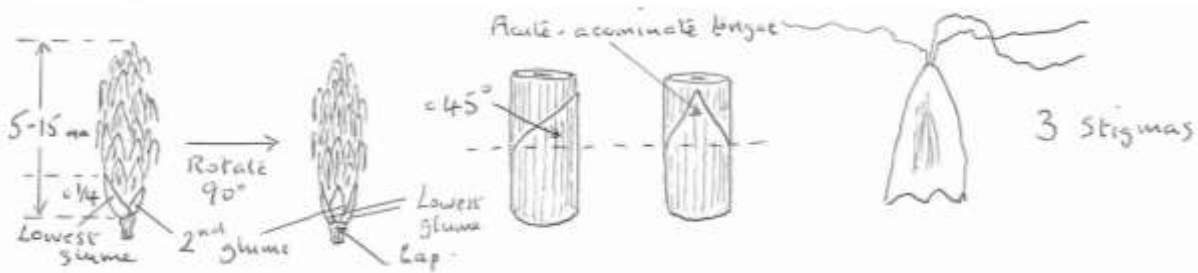
3. Usually >10cm tall; stems ≥0.5mm diameter, rounded; spikelets over 5mm long.

4.



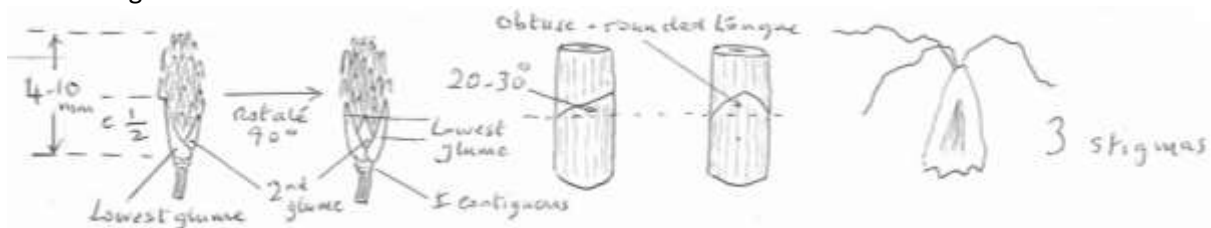
4. Usually densely tufted, upper leaf sheath apex very oblique (c45°), with acute-acuminate 'tongue'; lowest glume c1/4 length of spikelet and not fully encircling base. Spikelets 5-15mm long.

E. multicaulis



4. Usually loosely tufted; upper stem sheath slightly oblique (20-30°) with obtuse 'tongue'. Lowest glume usually c1/2 length of spikelet and fully encircling the base. Spikelets 4-10mm long.

E. quinqueflora



Acknowledgements

This Key is the result of numerous discussions with Norfolk Flora Group members whilst attempting to identify Spike-rushes in the field, and further examination of many specimens taken home after field meetings. Stem width measurements are taken from Sell & Murrell (1996); other measurements and characters mainly from Stace (2019). The 'CTW' illustrations (1965) and the illustrations in Haslam, Sinker and Wolseley's *British Water Plants* (1975) also have excellent whole-plant drawings, which are very useful.

I would also like to thank Jo Parmenter, for deciphering my handwritten notes and laying out the virtual key.

Bob Leaney