

RANDOM-ACCESS GUIDE TO SEDGES OF THE BRITISH ISLES USING A MICROCOMPUTER

COLIN J. LEGG

*University of Edinburgh Institute of Ecology and Resource Management
The King's Buildings, Mayfield Road, Edinburgh EH9 3JU*

ABSTRACT

An identification guide for British sedges of the genus *Carex* is provided for IBM-compatible or BBC microcomputers using the Random-Access Identification system (Legg, 1992). The guide includes a database of 182 character states for 73 species and two sub-species. The database uses flowering and vegetative characters for the plants and information on distribution and habitat. Some new characters based on the structure of the leaf epidermis are included.

INTRODUCTION

This illustrated guide to sedges of the genus *Carex* (Cyperaceae) and the associated computer database are designed for use with the Random-access KEY program which runs on either the BBC-B computers or IBM PC compatible machines using MS-DOS. The KEY program is described elsewhere (Legg, 1992) and is available from the Field Studies Council, Preston Montford, Montford Bridge, Shrewsbury SY4 1HW. Users should refer to the instructions distributed with the program before using this database.

The characters used in this key are based largely on the descriptions and illustrations given in Jermy, Chater and David (1982) and Clapham, Tutin and Warburg (1962) but all characters have been checked on fresh material or herbarium sheets where fresh plants were not available. Many of the leaf characters (N, n, O, and P) are new and, though derived from direct observations, have not been checked on a wide range of material so may show more intra-specific variation than is indicated here.

The characters are arranged in order from the top of the plant and its flowers down through stem, leaves, rhizomes and roots, with habitat and distribution last. A plant should not necessarily be scored in this order. Some characters are more useful than others, either because they are constant for particular groups of species, or because they are relatively easy to score without error. These characters are indicated in bold type in the illustrations which follow. Some other characters require a microscope for reliable recognition and these are described in italics. It is not usually necessary to use the microscopic characters, though they may provide valuable additional information on difficult or incomplete specimens.

The identification will be fastest and most efficient if any unusual or distinctive features of the unknown plant are scored first. Failing this, however, you should start with the characters indicated in bold type.

If you wish to reduce the size of the database by using exclusive characters (by using the ! function - see instructions in Legg, 1992), then the number of stigmas (J) is very reliable for young plants, and the distribution (Z) is sufficiently well known for British sedges that you are unlikely to find species outside their known range. Other characters can be used with discretion. For example, the inflorescence structure (A) is a valuable character, but there is some variation between A4 and A5 (number of male spikes). If this is to be used as an exclusive character you should enter both A4 and A5 before the ! so that all species with distinct male spikes are included in the reduced set of species.

Related characters in the illustrations are grouped under a single letter code, but this does not mean that the characters so grouped are mutually exclusive. If your plant is intermediate between two character states then you should enter both characters into the key.

Note that the characters listed for each species in the database are not intended as accurate descriptions of the species; they are intended to include all characters which may possibly be recorded for that species *including likely errors of observation*. For example, *Carex maritima* is normally considered by taxonomists to have an inflorescence of several similar spikes (A2). However, the spikes are small and densely packed into a tight head superficially giving the impression of a single spike (A1). Conversely, if examined closely, the terminal spike may be found to be entirely male and different in appearance from the lower spikes; the inflorescence would then be recorded as A4. The database therefore includes A1, A2 and A4 for this species.

The comments which appear on the computer screen after each description include an English name and brief notes on similar species or particular diagnostic features. The number which appears beside the English name is the species number in Jermy, Chater and David (1982) except for the two sub-species (*C. muricata lamprocarpa* and *C. divulsa leersii* which are numbered 74 and 75). The species are included in the database in the same order as in this paper so the 'absolute numbers' used to access information on particular species (function 6 in the program) are the same numbers as used by the book except for the two subspecies. These numbers are indexed on pages 34 and 35.

A major problem for the complete beginner may be to distinguish the members of the genus *Carex* (the true sedges) from other 'grass-like' plants. The diagram on page 36 shows the structure of a typical sedge plant and also illustrates some of the diagnostic features which will distinguish them from other members of the sedge family (Cyperaceae), and from grasses and rushes. The bottle shaped utricle enclosing the nut in the female flower is diagnostic for *Carex*, but other features are valuable; for example, nearly all other species (except the very rare *Kobresia*) have hermaphrodite flowers containing both male and female parts. No British members of the genus *Carex* have cottony flowers, or hollow, tubular leaves; all have at least some fully developed leaf blades.

Identifications using the random-access key should always be checked against illustrations and descriptions in a conventional flora. The book by Jermy, Chater and David (1982) is particularly valuable, but those by Fitter, Fitter & Farrer (1984) and Rose (1989) are also recommended.

ACKNOWLEDGEMENTS

The author is grateful to Dr. A. C. Jermy for permission to draw heavily on information from '*Sedges of the British Isles*', the numerous students and anonymous referees who made valuable comments on the test version, and particularly to Dr. M. C. F. Proctor for inspiration, much advice, the loan of specimens and for the electron micrographs which illustrate the leaf surface characters.

REFERENCES

- CLAPHAM, A. R., TUTIN, T. G. & WARBURG, E. F. (1962). *Flora of the British Isles, 2nd edition*, Cambridge University Press, Cambridge.
- FITTER, R., FITTER, A. & FARRER, A. (1984). *Collins Guide to the Grasses, Sedges, Rushes and Ferns of Britain and Northern Europe*, Collins, London.
- JEREMY, A. C., CHATER, A. O. & DAVID, R. W. (1982). *Sedges of the British Isles*, BSBI Handbook No. 1, 2nd edition, Botanical Society of the British Isles, London.
- LEGG, C. J. (1992). Random-Access Identification Guides for a Microcomputer. *Field Studies*, **8**, 1-30.
- Rose, F. (1989). *Colour Identification Guide to the Grasses, Sedges, Rushes and Ferns of the British Isles and North Western Europe*. Viking, London.

INDEX OF ENGLISH NAMES

The numbers given are the 'absolute numbers' used to access information on the computer using Function 6.

A50	Bird's-foot Sedge	A23	Lesser Pond Sedge
A61	Black Alpine Sedge	A3	Lesser Tussock Sedge
A27	Bladder Sedge	A42	Long-bracted Sedge
A60	Bog Sedge	A45	Long-stalked Yellow Sedge
A26	Bottle Sedge	A59	Loose-flowered Alpine Sedge
A70	Bristle Sedge	A75	Many-leaved Sedge
A10	Brown Sedge	A58	Mud Sedge
A35	Carnation Sedge	A15	Oval Sedge
A63	Close-headed Alpine Sedge	A48	Pale Sedge
A62	Club Sedge	A30	Pendulous Sedge
A68	Common Sedge	A56	Pill Sedge
A46	Common Yellow Sedge	A7,A74	Prickly Sedge
A13	Curved Sedge	A54	Rare Spring Sedge
A25	Cyperus Sedge	A14	Remote Sedge
A17	Dioecious Sedge	A72	Rock Sedge
A40	Distant Sedge	A28	Russet Sedge
A12	Divided Sedge	A9	Sand Sedge
A41	Dotted Sedge	A57	Scorched Alpine Sedge
A53	Downy-fruited Sedge	A36	Sheathed Sedge
A51	Dwarf Sedge	A22	Slender Sedge
A18	Elongated Sedge	A69	Slender Tufted Sedge
A64	Estuarine Sedge	A47	Small-fruited Yellow Sedge
A5	False Fox Sedge	A38	Smooth-stalked Sedge
A71	Few-flowered Sedge	A55	Soft-leaved Sedge
A2	Fibrous Tussock Sedge	A6	Spiked Sedge
A49	Fingered Sedge	A52	Spring Sedge
A73	Flea Sedge	A16	Star Sedge
A34	Glaucous Sedge	A37	Starved Wood Sedge
A29	Graham's Sedge	A66	Stiff Sedge
A24	Greater Pond Sedge	A11	String Sedge
A1	Greater Tussock Sedge	A43	Tawny Sedge
A39	Green Ribbed Sedge	A33	Thin-spiked Wood Sedge
A8	Grey Sedge	A4	True Fox Sedge
A32	Hair Sedge	A67	Tufted Sedge
A21	Hairy Sedge	A65	Water Sedge
A21	Hammer Sedge	A20	White Sedge
A19	Hare's-foot Sedge	A31	Wood Sedge
A44	Large Yellow Sedge	A44-A47	Yellow Sedge
A75	Leer's Sedge		

INDEX OF SCIENTIFIC NAMES

Nomenclature follows Jermy, Chater & David (1982).

A69	<i>C. acuta</i>	A45	<i>C. lepidocarpa</i>
A23	<i>C. acutiformis</i>	A58	<i>C. limosa</i>
A2	<i>C. appropinquata</i>	A60	<i>C. magellanica</i>
A65	<i>C. aquatilis</i>	A13	<i>C. maritima</i>
A9	<i>C. arenaria</i>	A70	<i>C. microglochin</i>
A61	<i>C. atrata</i>	A55	<i>C. montana</i>
A57	<i>C. atrofusca</i>	A7	<i>C. muricata muricata</i>
A66	<i>C. bigelowii</i>	A74	<i>C. muricata lamprocarpa</i>
A39	<i>C. binerovis</i>	A68	<i>C. nigra</i>
A62	<i>C. buxbaumii</i>	A63	<i>C. norvegica</i>
A32	<i>C. capillaris</i>	A50	<i>C. ornithopoda</i>
A52	<i>C. caryophyllea</i>	A5	<i>C. otrubae</i>
A11	<i>C. chordorrhiza</i>	A15	<i>C. ovalis</i>
A20	<i>C. curta</i>	A48	<i>C. pallescens</i>
A46	<i>C. demissa</i>	A35	<i>C. panicea</i>
A37	<i>C. depauperata</i>	A1	<i>C. paniculata</i>
A3	<i>C. diandra</i>	A71	<i>C. pauciflora</i>
A49	<i>C. digitata</i>	A30	<i>C. pendula</i>
A17	<i>C. dioica</i>	A56	<i>C. pilulifera</i>
A40	<i>C. distans</i>	A25	<i>C. pseudocyperus</i>
A10	<i>C. disticha</i>	A73	<i>C. pulicaris</i>
A12	<i>C. divisa</i>	A41	<i>C. punctata</i>
A8	<i>C. divulsa divulsa</i>	A59	<i>C. rariflora</i>
A75	<i>C. divulsa leersii</i>	A64	<i>C. recta</i>
A16	<i>C. echinata</i>	A14	<i>C. remota</i>
A67	<i>C. elata</i>	A24	<i>C. riparia</i>
A18	<i>C. elongata</i>	A26	<i>C. rostrata</i>
A54	<i>C. ericetorum</i>	A72	<i>C. rupestris</i>
A42	<i>C. extensa</i>	A28	<i>C. saxatilis</i>
A34	<i>C. flacca</i>	A47	<i>C. serotina</i>
A44	<i>C. flava</i>	A6	<i>C. spicata</i>
A29	<i>C. x grahamii</i>	A33	<i>C. strigosa</i>
A21	<i>C. hirta</i>	A31	<i>C. sylvatica</i>
A43	<i>C. hostiana</i>	A53	<i>C. tomentosa</i>
A51	<i>C. humilis</i>	A36	<i>C. vaginata</i>
A38	<i>C. laevigata</i>	A27	<i>C. vesicaria</i>
A19	<i>C. lachenalii</i>	A4	<i>C. vulpina</i>
A22	<i>C. lasiocarpa</i>		

STRUCTURE OF THE SEDGE PLANT

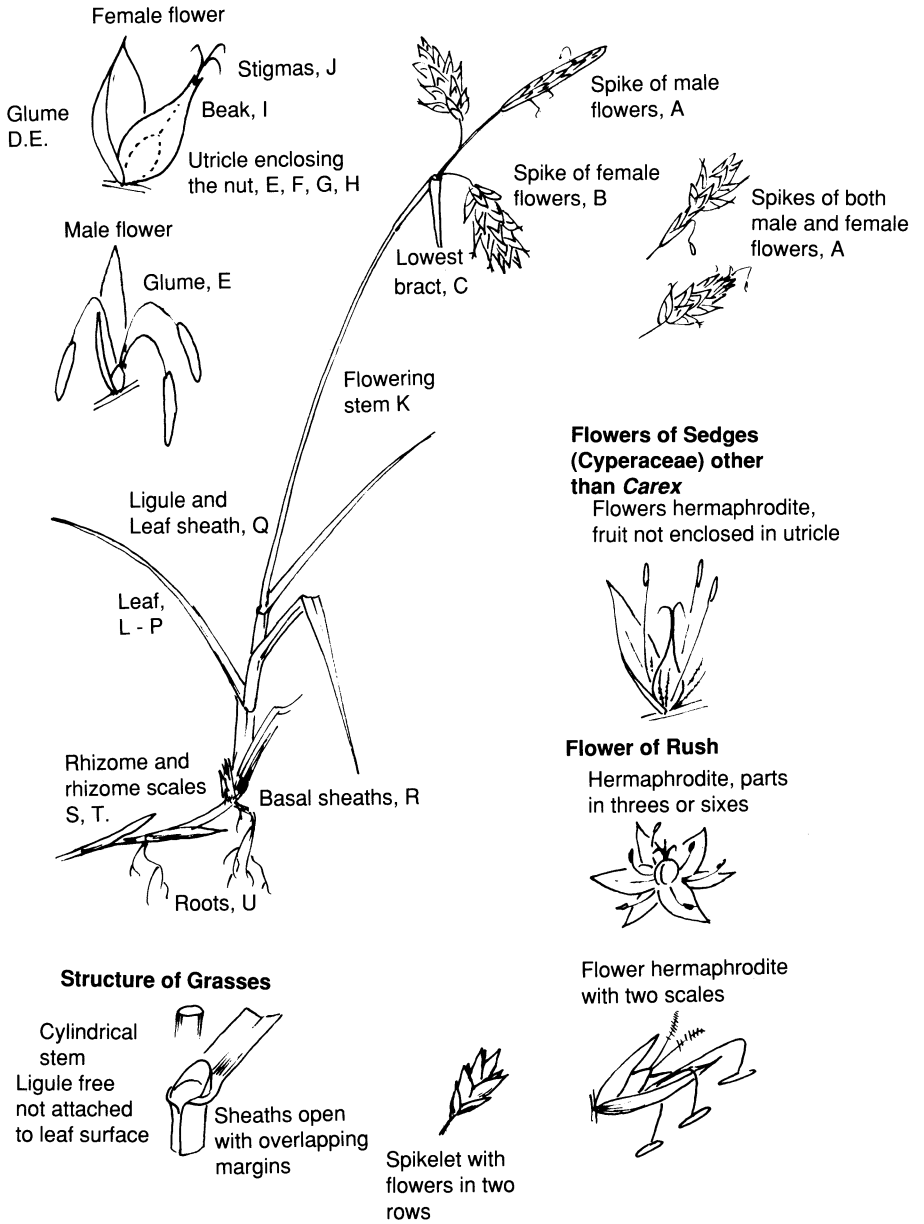


FIG.1
Structure of the sedge plant

TABLE OF CHARACTERS

A Inflorescence Type

Each spike contains a number of individual flowers. Male flowers may be very hard to find in A1, A2 and A3 but usually show the remains of stamens (filaments) except in old specimens. Spikes which are entirely male in A4 and A5 usually have more closely appressed glumes (scales), are darker in colour and more slender than the fruiting female spikes.

- A1** Single, unbranched terminal spike of several to numerous flowers



- A2** Several unbranched spikes, all very similar in appearance. The spikes may be tightly clustered and appear superficially like a single head of flowers. Most spikes contain both male and female flowers



- A3** Spikes all similar, but forming a branched panicle (*i.e.* at least the lower branches are themselves branched)



- A4** Single terminal spike entirely male and distinct from the one or more lateral female spikes



- A5** Two or more male spikes distinct from the lower female spikes



B Lateral Spikes

These characters apply to the lower, lateral spikes of plants in A2 and A3 above, and to the female spikes in A4 and A5. They cannot be applied to plants in category A1 above which do not have lateral spikes.



- B1 All spikes sessile (without a stalk joining them to the main stem). Note that the stalk of some species may be hidden within the sheath of the lower bract, see C5 below



- B2 The lowest spikes with a peduncle (stalk), but the upper spikes sessile



- B3 All lateral spikes with a peduncle more than 2mm long



- B4 Lower spikes short, length less than twice the width



- B5 Lower spikes long and narrow, length more than twice the width



- B6 All spikes clustered near the top of the stem



- B7 At least some spikes well spaced out down the stem

C Lowest Bract

The lowest bract is the leaf-like structure or papery scale on the main stem where the lowest spike is attached. Untypical bracts may occur where the lowest spike is in the bottom third of the flowering stem and these should be ignored.

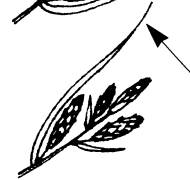
C1 Bract shorter than the lowest spike



C2 Bract longer than the lowest spike, but shorter than the whole inflorescence



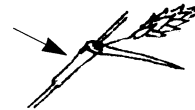
C3 Bract longer than the whole inflorescence



C4 Base of lowest bract not sheathing the stem



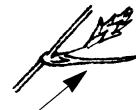
C5 Base of lowest bract forming a tubular sheath enclosing the main stem and the base of the peduncle



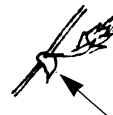
C6 Lowest bract flat, green and leaf-like



C7 Lowest bract setaceous (bristle-like), solid and triangular in section for most of its length



C8 Lowest bract glumaceous (a brown and papery scale similar in appearance to the female glumes)



D Female Glume Colour and Shape

The glume is the papery scale at the base of each individual flower. All young flowers tend to have pale glumes so colour should only be scored on mature flower heads. Examine several glumes for D6 to D8 as the tips are brittle and easily damaged.



D1 Female glumes colourless, greenish, or pale brown



D2 Female glumes mid-brown or reddish-brown



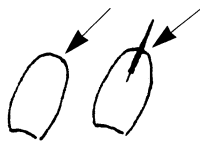
D3 Female glumes purple-brown to blackish



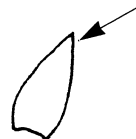
D4 Midrib of female glume of contrasting colour



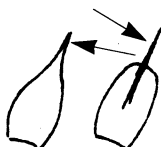
D5 Margin of female glume white, silvery or transparent and colourless



D6 Apex of membranous portion of female glume obtuse (with or without extending midrib)



D7 Apex of female glume acute



D8 Apex of female glume acuminate or midrib extending in a short point

E Glume and Utricle Length

The length of the glume includes the projecting midrib (if present) and the length of the utricle includes the beak. The glumes break easily so it is better to measure several. Measure only mature fruit. The utricle is the bottle-shaped structure which encloses the fruit.

E1 Female glume less than 3 mm long

E2 Female glume 3 - 5 mm long

E3 Female glume more than 5 mm

E4 Male glume much longer than the female glume (by at least 1 mm)

E5 Male glume about equal in length to female, or shorter

E6 Utricle less than 3 mm long including beak

E7 Utricle 3 to 5 mm long

E8 Utricle more than 5 mm long



F Utricle Shape

The utricle is the bottle-shaped structure enclosing the nut and the shape is critical in the identification of many species, but difficult to define precisely. F1 to F3 concern whether the widest point of the utricle is above or below the middle (excluding the beak). F6 to F8 concern the length and shape of the beak.



F1 Utricle obtuse, widest above the middle (pear-shaped)



F2 Utricle obtuse, widest at about the middle (ellipsoid)



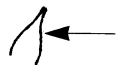
F3 Utricle obtuse, widest below the middle (ovoid)



F4 Utricle (excluding the beak) acute, ovoid



F5 Utricle narrowly lanceolate



F6 Beak of utricle gradually tapered



F7 Beak of utricle abrupt



F8 Beak of utricle very short or absent

G Surface of Utricle

A hand lens (x10) is essential for G1 and G2 while G5 can only be seen clearly with a x40 binocular microscope. See sections N and P for illustrations of papillae and notes on how they should be observed.

G1 Utricle strongly ribbed, or at least with two marginal veins prominent - x10



G2 Utricle faintly veined, or only ribbed at the base - x10



G3 Utricle smooth (with or without ribs), but with a dull matt surface



G4 Utricle with a shiny, glossy surface



G5 Utricle surface covered with minute papillae (see section N) - x40



G6 Utricle surface hairy - x10



H Colour of utricle

All young fruits may be pale so record only mature fruits or those with a well developed colour.

H1 Utricle mid-green to dark green

H2 Utricle pale greyish green to blue-green, glaucous (with a waxy bloom)

H3 Utricle yellowish to olive-green

H4 Utricle straw or golden to pale brown

H5 Utricle mid- to dark brown

H6 Utricle reddish or red-brown

H7 Utricle flushed with purple or blackish



I Apex of Utricle Beak

Use a hand lens to score I1 to I6; I7 and I8 require x40 magnification from a binocular microscope.



I1 Beak tip truncate (neither notched, nor oblique) - x10



I2 Beak tip oblique - x10



I3 Beak tip shallowly notched - x10



I4 Beak tip deeply bifid - x10



I5 Beak split, at least down one side - x10



I6 Margins of the beak winged - x10



I7 Margins of the beak rough or scabrous - x40



I8 Margins of the beak not rough or scabrous (though they may be papillose) - x40

J Number of Stigmata

Stigmata are easily seen on young flowers but are soon damaged where one may fall off, or two stick together. This character is very valuable taxonomically, but it is important to count several flowers using a hand lens, or a binocular microscope on older flowers.



J1 Three stigmata per flower - x10



J2 Two stigmata per flower - x10

K Length, Shape and Roughness of Flowering Stem

For shape and roughness of the stem, examine just below the lowest node of the inflorescence (*i.e.* just below the lowest bract)

K1 Flowering stems shorter than the leaves



K2 Flowering stems about as long as the leaves



K3 Flowering stems longer than the leaves



K4 Stems more or less cylindrical or grooved, but not three-sided



K5 Stems triangular in section, but with convex faces and blunt angles



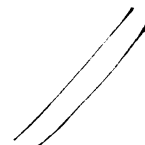
K6 Stems sharply triangular with flat or concave faces and either with acute angles or winged



K7 Stem minutely rough, at least on the angles near the apex (if in doubt, roughness can best be felt with the tip of the tongue - but take care not to cut yourself!)




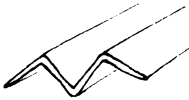

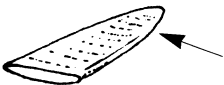
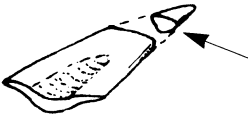

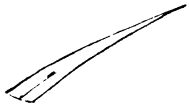
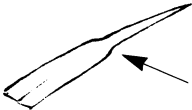



K8 Stem entirely smooth (though the peduncles and stem above the lowest bract may be rough)



L Shape of Leaf in Section, and Leaf Tip

Examine the leaf section in about mid-leaf. This is best done by cutting or breaking the leaf and viewing it from the cut end. The leaf tips should be examined with a handlens.

- | | |
|---|--|
|  | L1 Leaf more or less flat in cross section |
|  | L2 Leaves channelled (U-shaped) or with the margins inrolled |
|  | L3 Leaves folded along the midrib or strongly keeled |
|  | L4 Leaves plicate (M-shaped) |
|  | L5 Leaves bristle-like and solid |
|  | L6 Leaf tip flat or channelled |
|  | L7 Leaf tip triangular in cross section for a short length |
|  | L8 Leaf tip with a long whip-like tip, triangular in cross section |
|  | L9 Leaf gradually tapered to the apex |
|  | LA Leaf abruptly narrowed at a point just below the apex |
|  | LB Leaf abruptly broadening just below the apex |

M Leaf Size

Measure the largest leaves. Measure width at about mid leaf, and length of the blade from the top of the leaf sheath.

M1 Leaf width less than 2 mm

M2 Leaf width 2 - 5 mm

M3 Leaf width 5 - 10 mm

M4 Leaf width more than 10 mm

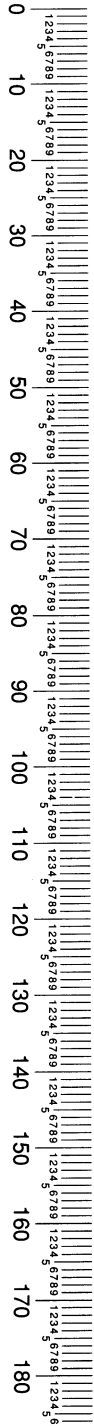
M5 Leaf length less than 12 cm

M6 Leaf length 12 - 25 cm

M7 Leaf length 25 - 50 cm

M8 Leaf length 50 - 75 cm

M9 Leaf length more than 75 cm



N Upper Surface of Leaf (Uppercase N)

Character N8 can usually be seen with a hand lens, and N6 can usually be felt with the finger (or tongue - but take care not to cut yourself), but other characters require a microscope. Epidermal papillae (N2, N3) are difficult to see even with a binocular microscope, but can become very clear at x40 magnification by touching the surface of the leaf with certain types of ink which then flows between the cells. The author has found black 'Uni-ball micro' deluxe waterproof pens ideal for this purpose. Papillae may not cover the whole surface of the leaf; those at the extreme margin should be scored under O7 and O8. Stomata can usually also be seen on x40 when treated with ink, but are best observed by removing fragments of the epidermis and viewing under a compound microscope at x100 magnification.

PLATE 1.

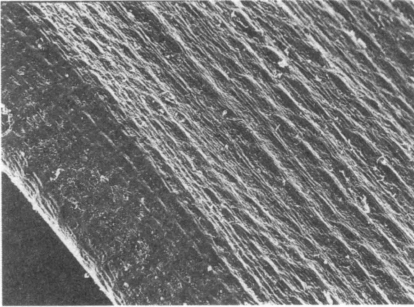
C. extensa upper surface x100

PLATE 2

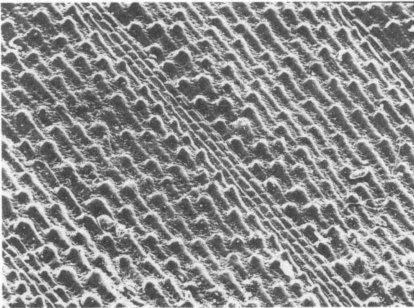
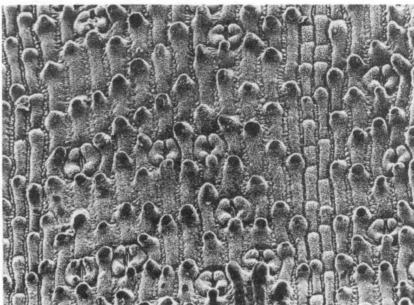
C. divulsa upper surface x100

PLATE 3.

C. aquatilis upper surface x200

- N1 Upper epidermis not papillose - x40 (Plate 1)
- N2 Some cells of upper epidermis slightly papillose, or with elongate cells swollen at one end - x40 (Plate 2)
- N3 Some cells of upper epidermis more or less isodiametric and strongly papillose - x40 (Plate 3)
- N4 Upper surface not at all scabrous x 40 (Plate 1)
- N5 Upper surface of leaf scabrous near apex only (Plate 5)
- N6 Upper surface of leaf rough-scabrous throughout (Plate 5)
- N7 Leaf without hairs on upper surface x10 (Plate 1)
- N8 Leaf with hairs on upper surface x10 (Plate 6)**
- N9 Upper surface of leaf without stomata - x100 (Plate 1)
- NA Upper surface of leaf with stomata present - x 100 (Plate 7)

n Lower Surface of Leaf (Lowercase n)

Character n8 can usually be seen with a hand lens, and n5 and n6 can usually be felt with the finger (or tongue - but take care not to cut yourself), but other characters require a microscope. Papillae may not cover the whole surface of the leaf; those at the extreme margin should be scored under O7 and O8.

n1 Lower epidermis not at all papillose (Plate 1)

n2 Some cells of lower epidermis slightly papillose, or with elongate cells swollen at one end (Plate 2)

n3 Some cells of lower epidermis more or less isodiametric and strongly papillose (Plate 3)

n4 Lower surface of mid-leaf not at all scabrous (Plate 1)

n5 Lower surface of mid-leaf scabrous on midrib only (Plate 4)

n6 Lower surface of leaf rough-scabrous throughout (on lamina as well as midrib) (Plate 5)

n7 Leaf without hairs on lower surface - x10 (Plate 1)

n8 Leaf with hairs present on lower surface - x10 (Plate 6)

PLATE 4.

C. acutiformis lower surface x100

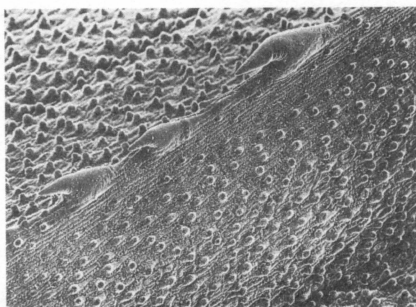


PLATE 5.

C. riparia upper surface x100

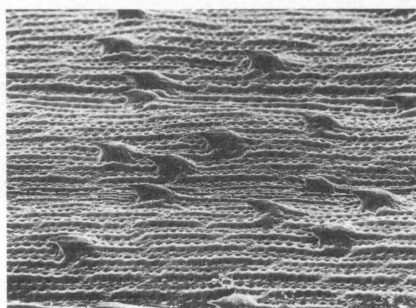


PLATE 6.

C. pallescens upper surface x100

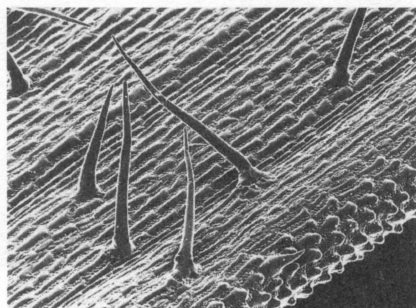
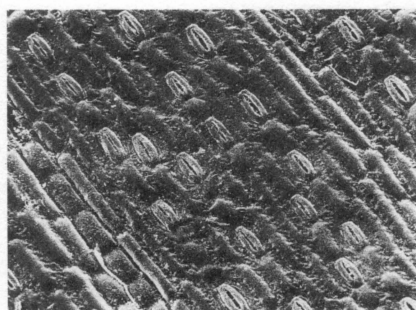


PLATE 7.

C. serotina lower surface x200

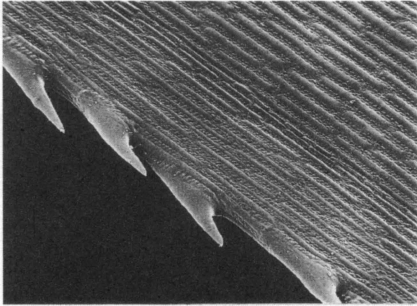


O Leaf Colour and Leaf Margin

Record leaf colour only on young, fresh leaves. Teeth on the leaf margin can normally be felt with the finger (or, failing this, with the tip of the tongue - but do not cut yourself!) but O4 may need a microscope for confirmation. Epidermal papillae should be examined under a binocular microscope as described for N above.

PLATE 8.

C. pseudocyperus upper surface x100



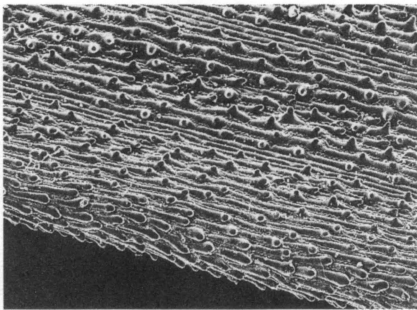
O1 Leaves mid-green or dark green

O2 Leaves pale yellowish-green

O3 Leaves blue-green or glaucous (with a waxy bloom), at least on the under surface when young

PLATE 9.

C. curta upper surface x100



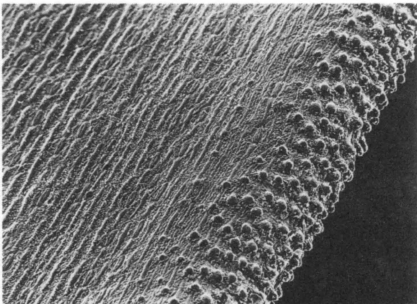
O4 Leaf margin not toothed at mid leaf (though may be toothed near the apex) (Plate 1)

O5 Leaf with marginal teeth in mid-leaf (Plate 8)

O6 Epidermal cells of leaf margin not papillose - x40 (Plate 1)

PLATE 10.

C. laevigata lower surface x100



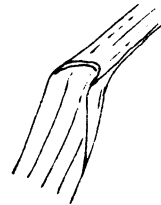
O7 Epidermal cells of leaf margin slightly papillose, or with elongate epidermal cells swollen at one end (Plate 9)

O8 Epidermal cells of leaf margin more or less isodiametric and strongly papillose (Plate 10)

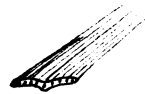
P Leaf Venation and Thickness

The number of longitudinal veins is most easily counted at the top of the leaf sheath where the tissue is often slightly translucent. A binocular microscope is useful for these characters, though a handlens is sufficient for many specimens.

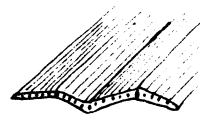
P1 Leaves with 3 longitudinal veins - x10



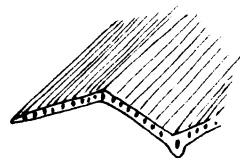
P2 Leaves with 5 - 7 veins - x10



P3 Leaves with 9 - 13 veins - x10



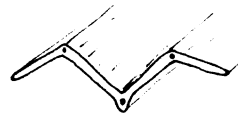
P4 Leaves with 15 - 21 veins - x10



P5 Leaves with 23 - 35 veins - x10

P6 Leaves with more than 35 veins - x10

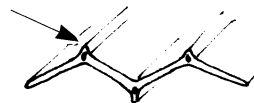
P7 Leaf lamina in cross section uniformly thin throughout - x10



P8 Leaf lamina becoming thicker and spongy with large air spaces between the main secondary veins - x10

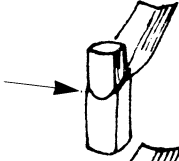


P9 Main secondary (lateral) veins of the lamina forming prominent ridges on the upper surface -x10

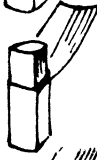


Q Leaf Sheath and Ligule

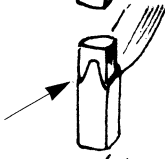
The inner face of the leaf sheath is the face opposite the angle bearing the leaf blade. The apex of the inner face must be viewed on very young leaves as this splits and becomes damaged very easily. The ligule is best seen on the leaves at the base of flowering stems when the leaf blade is pulled back and flattened. Examine young, undamaged leaves for Q8.



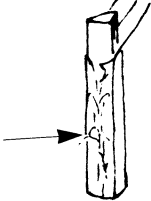
Q1 Apex of inner face of sheath concave



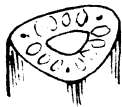
Q2 Apex of inner face of sheath more or less flat



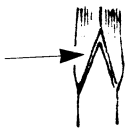
Q3 Apex of inner face of sheath convex, or with a tongue-like protrusion



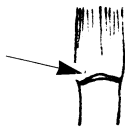
Q4 Inner face of sheath becoming fibrillose as the persistent veins form a ladder-like network of fibres when the sheath decomposes



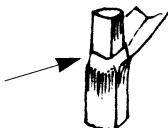
Q5 Basal sheaths becoming thick, soft and spongy



Q6 Ligule acute, longer than the width of the leaf



Q7 Ligule rounded or obtuse, shorter than the width of the leaf



Q8 Undamaged ligule tubular with the whitish membrane surrounding the young shoot

R Basal Sheaths

Examine the colour developing in the older sheaths at the base of the plant. Characters R6 to R8 concern the way old leaf sheaths decay.

R1 Basal sheaths becoming pale straw, yellowish or pinkish

R2 Basal sheaths becoming brown

R3 Basal sheaths becoming red, red-brown or at least flushed with red

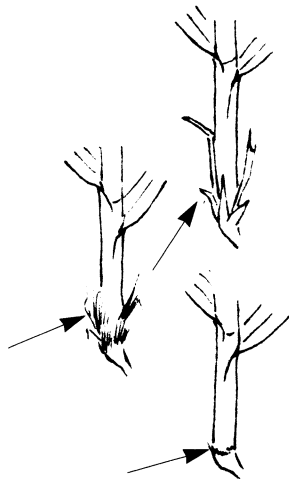
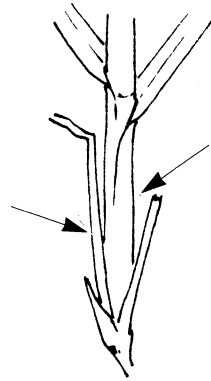
R4 Basal sheaths becoming flushed with purple

R5 Basal sheaths becoming blackish

R6 Basal sheaths persistent, not decaying rapidly nor becoming fibrous

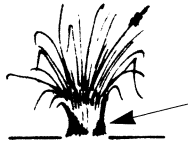
R7 Basal sheaths becoming fibrous through persistence of the main veins when the soft tissue decays

R8 Basal sheaths soon decaying and leaving no trace

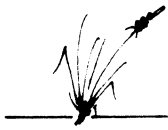


S Habit and Rhizomes

Monopodial rhizomes (S5) have a terminal bud which continues growing horizontally while the aerial shoots form from lateral buds. In most species (with sympodial rhizomes, S1-S4) the terminal bud of the rhizome turns upwards to form the aerial shoots and lateral buds grow out to form new rhizomes.



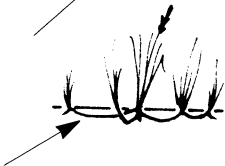
S1 Plant forming dense tussocks which feel firm when kicked



S2 Plant tufted, sometimes with short rhizomes growing obliquely upwards



S3 Plant turf or mat-forming with shortly creeping rhizomes



S4 Plant spreading with long rhizomes giving rise to aerial shoots singly or in small clusters



S5 Plant with monopodial rhizomes giving rise to isolated shoots or small clusters in straight lines

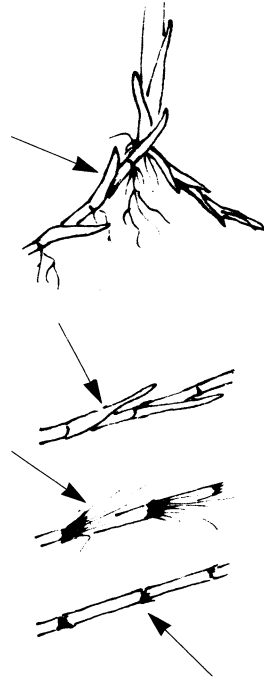


S6 Plant with creeping, decumbent shoot bases spreading above ground

T Rhizome Scales

Rhizome scales are easily found on spreading rhizomes, but may be hard to locate on plants classed as S1 or S2 above. The colour may be darker than normal when growing in black anaerobic mud and peat.

- T1 Rhizome scales pale grey-brown
- T2 Rhizome scales yellowish or orange-brown
- T3 Rhizomes scales dark brown or red-brown
- T4 Rhizome scales purplish or blackish
- T5 Rhizome scales persistent, neither decaying rapidly nor becoming fibrous
- T6 Rhizome scales becoming fibrous on decaying
- T7 Rhizome scales soon decaying with only traces remaining

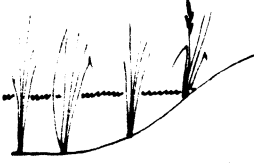


U Root colour

Examine living roots two or three cm behind the growing tip. Root tips may always be pale while older roots may stain darker in anaerobic mud and peat.

- U1 Roots pale grey-brown
- U2 Roots yellowish or orange-brown
- U3 Roots dark brown or red-brown
- U4 Roots purplish



W Habitat

W1 Plants growing in standing water, or in fen or swamp vegetation on deep organic soils



W2 Wet flushes (wet sites with shallow soils and moving ground water)



W3 Sphagnum bog and blanket bog



W4 Heath and dry acidic moorland



W5 Eutrophic marsh on mineral soil



W6 Mountains above 600 m (2000 ft) altitude



W7 Lowland grassland, rough grazing, roadsides, etc.



W8 Coastal dunes, sea cliffs and brackish marshes

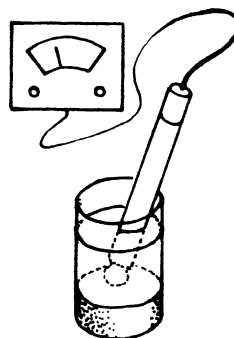


W9 Woodland, scrub and shady places

X Soil Reaction

Soil pH can be measured by mixing roughly one part of soil with two of distilled water and measuring with a pH meter or placing a drop of the solution onto pH papers. With experience, however, knowledge of the rock and soil types, or of other plant species in the community will give a sufficient indication of soil quality.

- X1 Acidic soils (pH below ca. 5.5)
- X2 Neutral soils (pH in range ca. 5.5 - 7.0)
- X3 Calcareous soils (pH above about 7.0)
- X4 Brackish or estuarine soil water, or within the influence of sea spray.

**Z Distribution**

- Z1 Southern England, south of a line from the Mersey to the Humber
- Z2 Northern England, north of a line from the Mersey to the Humber
- Z3 Wales
- Z4 Southern Scotland, south of a line from the Clyde to the Tay
- Z5 Scottish Highlands and Islands north of a line from the Clyde to the Tay
- Z6 Ireland

