



Sphagnum: a field guide

by
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Revised and updated by
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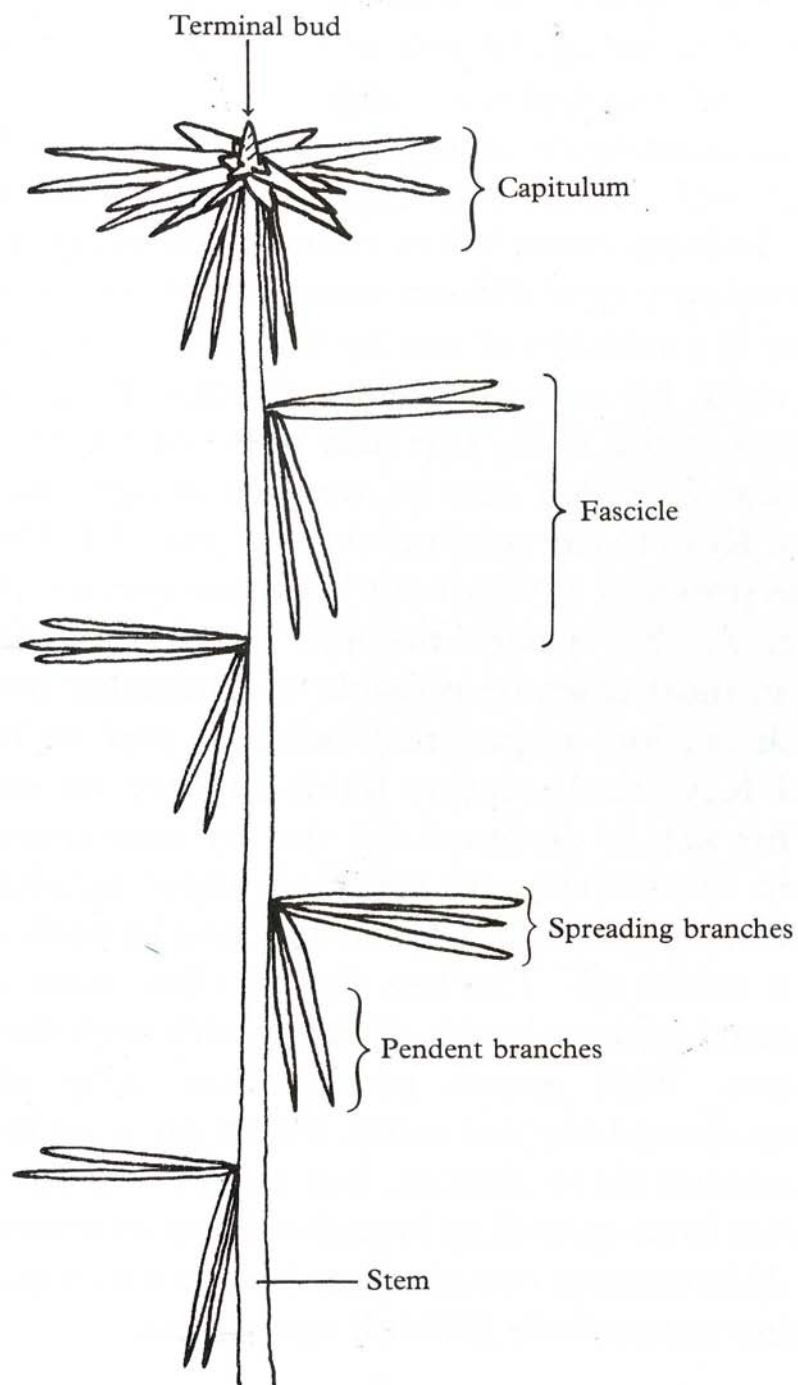
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Introduction

Species of *Sphagnum* have a reputation among non-bryologists of being difficult to identify, yet the genus as a whole is of unparalleled importance among bryophyte genera in defining communities, and is extensively used in the National Vegetation Classification (Rodwell 1991a, 1991b). Indeed, many mires cannot effectively be assigned to a community type without some knowledge of *Sphagnum*. This key is a revision of one by Hill (1976) and is designed to be used by non-specialists to determine species of *Sphagnum* in the field. The first part consists of a General Key (page 9) which can be used to assign specimens to sections. Keys to the sections start on page 14. The General Key also provides a “short cut” to some species. After some practice, as the species become increasingly familiar, it should in most cases be possible to determine immediately to which section a specimen belongs, and so bypass the General Key. Each section tends to have its own special ‘jiz’. This key is designed for use by non-specialists and therefore illustrations are repeated where helpful. A x10 hand lens is required to use the key, and in addition a x20 lens is a useful aid. The key should allow most specimens to be named without much difficulty although there may be exceptions. Well grown plants from fully illuminated situations should key out easily. Plants growing in the shade are sometimes more difficult, but should key out with care. Use leaves from spreading branches when examining branch leaves. Microscopic examination is sometimes necessary to determine particularly difficult specimens.

Figure 1. A stylised single stem of Sphagnum



Glossary

Acumen: Long narrow upper part of leaf. (fig. 2)

Capitulum: Head formed of crowned branches around stem apex. (fig. 1)

Cortex: Clear outer part of stem (as opposed to the opaque central strand). (fig. 3)

Fascicle: Group of branches arising from the same point on a stem. (fig. 1)

Lingulate: Tongue-shaped, broad and \pm -parallel-sided. (fig. 4c)

Pendent branches: Branches hanging \pm -parallel to the stem. (fig. 1)

Recurved: In *Sphagnum*, refers to the branch leaf margins being curled back when dry, giving plant a characteristic crisped appearance.

Spreading branches: Branches spreading \pm - at right angles to the stem. (fig. 1)

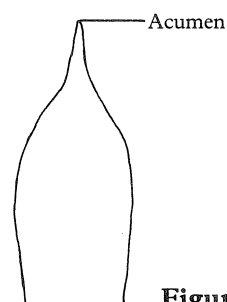


Figure 2

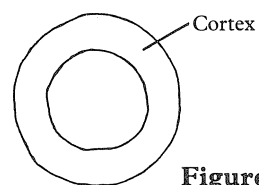
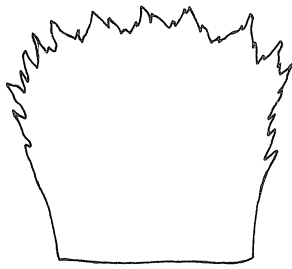
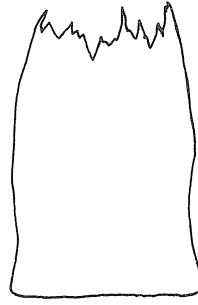


Figure 3

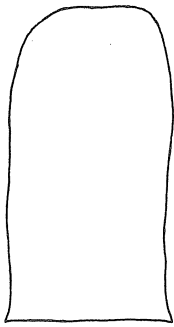
Figure 4. Stem leaves of *Sphagna*



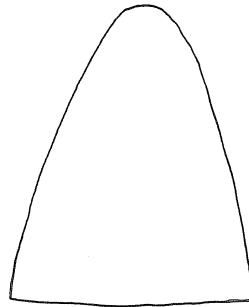
a. Spathulate, tattered.
(*S. fimbriatum*)



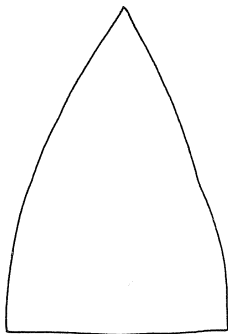
b. Lingulate, tattered
(*S. girgensohnii*)



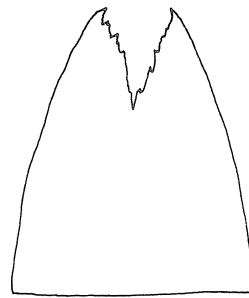
c. Lingulate, entire
(*S. squarrosum*)



d. Triangular, entire, obtuse
(*S. recurvum* var. *amblyphyllum*)



e. Triangular, entire, acute
(*S. recurvum* var. *mucronatum*)



f. Triangular, cleft
(*S. riparium*)

Spathulate: Spoon-shaped, broad above, narrow below. (**fig. 4a**)

Squarrose: Upper part (of branch leaf) bent back sharply; squarrose leaves give branches a “prickly” appearance. (**fig. 5**)

Figure 5. Branch leaf arrangement



a. Typical
(*S. recurvum*)

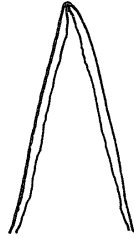


b. Squarrose
(*S. squarrosum*)

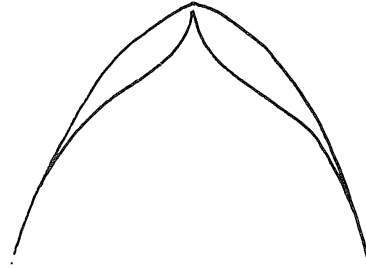


c. Concave
(*S. tenellum*)

Figure 6. Branch leaf apices

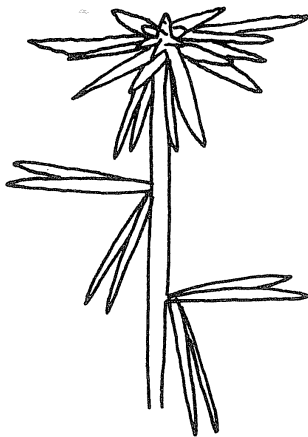


a. Not hooded

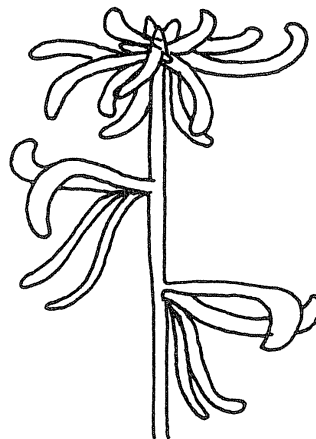


b. Hooded
(Section *Sphagnum*)

Figure 7. Branch orientation



a. Typical



b. Curved
(Section *Subsecunda*)

General key

(Keys to sections are given after the general key.)

- | | | | |
|----|----|--|---------------------------------------|
| 1. | a) | Branch leaves ovate, concave, hooded (fig. 6); stem cortex easy to see with x10 lens, occupying about $\frac{1}{3}$ - $\frac{1}{2}$ stem diameter (fig. 3 page 3: pull stem in half to see this); stem leaves large, lingulate. | Section
<i>Sphagnum</i>
(p. 18) |
| | b) | Branch leaves various, but not conspicuously hooded; stem cortex always occupies $\frac{1}{4}$ stem diameter or less; stem leaves various, sometimes large and lingulate. | 2 |
| 2. | a) | Leaves reddish or flecked with red. | 3 |
| | b) | Leaves without any trace of red pigment. | 4 |
| 3. | a) | Red pigment crimson or rose-pink (with yellowish tints present only in unhealthy plants); stem crimson, brownish or green; branches +/- straight. | Section
<i>Acutifolia</i> (p. 32) |
| | b) | Red colour +/- coppery; lurid yellow tints often present; stem dark brown or black; branches curved, often strongly so. (fig. 7b) | <i>S. auriculatum</i> |
| 4. | a) | Stem dark brown or black, at least in part. | 5 |
| | b) | Stem pale or reddish throughout. | 13 |

- | | | | |
|----|-----|--|---|
| 5. | a) | Branches markedly curved. (fig. 7b) | Section
<i>Subsecunda</i>
(p. 24) |
| | b) | Branches +/- straight. | 6 |
| 6. | a) | Compact plant, rarely > 6 cm tall; stem leaves tiny, < 1/2 length of branch leaves; branches squeezed together in tufts and pointing upwards so that stem is concealed and individual capitula are often hard to distinguish. Peaty banks and damp heathland, avoiding permanently waterlogged ground. | <i>S. compactum</i> |
| | b) | Plants usually more lax; stem leaves larger, about the same size as the branch leaves. | 7 |
| 7. | a) | Orange-brown plant; stem leaves conspicuously tattered across broad truncate apex. Arctic-alpine, rare. | <i>S. lindbergii</i> |
| | b) | Colour various; stem leaves lingulate or triangular, apex rounded or acute, not conspicuously tattered. | 8 |
| 8. | (a) | Stem leaves triangular, acute; branch leaves clearly arranged in 5 ranks, recurved when dry; branches in fascicles of 4; bright orange or rarely yellow plant. | <i>S. pulchrum</i> |

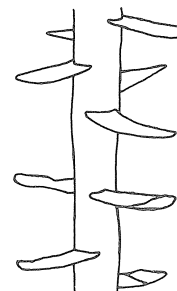
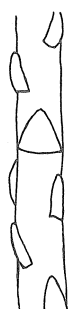
- (b) Stem leaves triangular or lingulate, rounded; branch leaves not in 5 ranks, little modified when dry; branches in fascicles of 3-6; colour various. 9
9. (a) Stem leaves +/- erect, triangular, acute. *S. subnitens*
- (b) Stem leaves variously oriented, obtuse. 10



Figure 8. Leaves squarrosa

10. (a) Branch leaves squarrose (**fig. 8**) Section *Squarrosa* (p. 23)
- (b) Branch leaves slightly spreading or appressed 11
11. (a) Central bud of capitulum large and prominent, like the nose-cone of a rocket; branch leaves ovate, not concave, with a distinct acumen which is slightly recurved, more rarely +/- squarrose. Base-rich marshes. *S. teres*
- (b) Central bud not conspicuously large; branch leaves ovate, lacking recurved acumen. 12

Figure 9. Stem leaf orientation



a. Erect, appressed
(typical of Section
Acutifolia)

b. Hanging (typical
of Section
Cuspidata)

c. Spreading (typical
of Section
Subsecunda and
Squarrosa, and
S. tenellum)

12. (a) Stem leaves erect, appressed to stem (**fig. 9a**); pendent branches distinct, whitish, appressed to stem; slender brown plant, usually forming hummocks in raised and blanket bogs.

S. fuscum

- (b) Stem leaves hanging (**fig. 9b**) or spreading (**fig. 9c**), or if erect then pendent branches little different from spreading; never hummock-forming.

Section
Subsecunda
(p. 24)

13. (a) Stem reddish or flecked with crimson.

14

- (b) Stem green or pale brown.

15

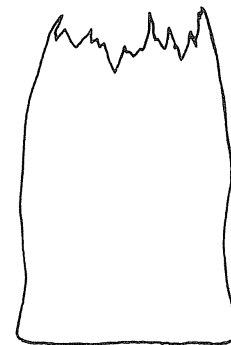
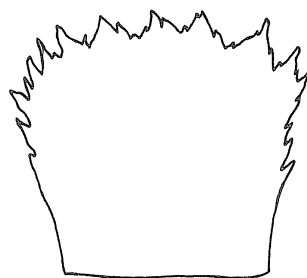
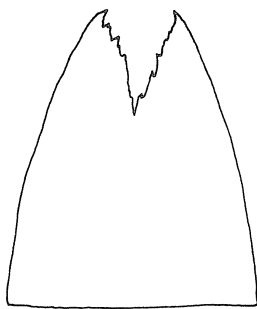
14. (a) Leaves bright yellowish-orange; stem leaves hanging. (**fig. 9b** page 13)

S. recurvum

(N.B. Three varieties of *S. recurvum* occur in the British Isles; see page 30)

- | | | | |
|-----|-----|--|--------------------------------------|
| | (b) | Leaves dingy; stem leaves erect.
(fig. 9a page 13) | Section
<i>Acutifolia</i> (p. 32) |
| 15. | (a) | Stem leaves conspicuously tattered or cleft at apex (observe by pulling off capitulum and looking at leaves at top of stem). | 16 |
| | (b) | Stem leaves with apex entire or slightly fringed. | 17 |
| 16. | (a) | Stem leaves hanging (fig. 9b page 10), +/- triangular, apex cleft.
(fig. 10a) | <i>S. riparium</i> |
| | (b) | Stem leaves erect, lingulate or spatulate, apex tattered. (figs. 10b, 10c) | Section
<i>Acutifolia</i> (p. 32) |

Figure 10. Stem leaves



- a. Triangular, cleft b. Spatulate, tattered c. Lingulate, tattered

17. (a) Branch leaves squarrose when wet. **(fig. 11)** 18
- (b) Branch leaves sometimes modified and recurved when dry (in members of Section *Cuspidata*), but not squarrose when wet. 19

Figure 11. Leaves squarrose

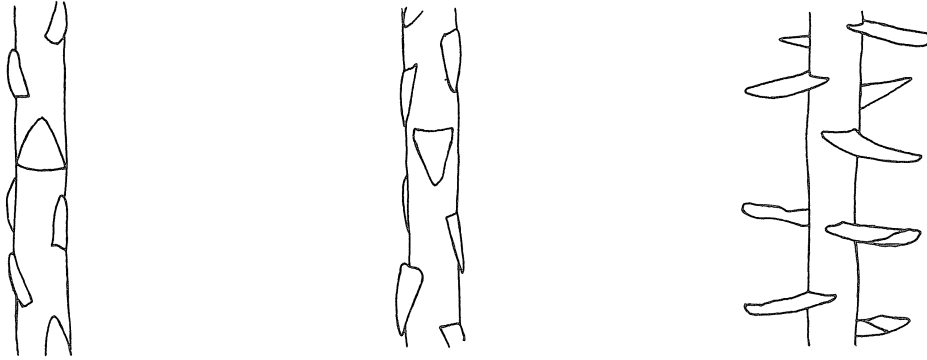


18. (a) Stem leaves, triangular, obtuse, tiny. Occasional in areas of high rainfall, rare elsewhere *S. strictum*
- (b) Stem leaves lingulate, large. Section *Squarrosa* (p. 23)
19. (a) Compact plant; branches squeezed together in tufts and pointing upwards. 20
- (b) Not markedly compact; branches spreading or hanging. 21
20. (a) Stem leaves hanging (**fig. 12b** page 12), tiny, ½ length of branch leaves or less. Section *Rigida* (p. 22)
- (b) Stem leaves spreading (**fig. 12c** page 12) or erect (**fig. 12a** page 12), about same size as branch leaves. Section *Acutifolia* (p. 32)
21. (a) Pendent branches and spreading branches not, or hardly, differentiated 22

- (b) Pendent branches differentiated from spreading branches, appressed to stem.

24

Figure 12. Stem leaf orientation



a. Erect, appressed (typical of Section *Acutifolia*)

b. Hanging (typical of Section *Cuspidata*)

c. Spreading (typical of Section *Subsecunda* and *Squarrosa*, and *S. tenellum*)

22. (a) Branch leaves long and narrow; limp plant with “drowned kitten” habit when submerged.

Section *Cuspidata* (p. 27)

- (b) Branch leaves lanceolate to ovate; plant not limp; if growing submerged, plant large and swollen.

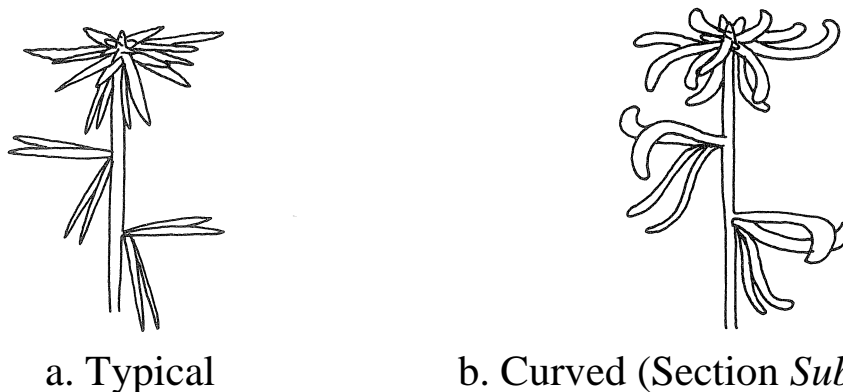
23

23. (a) Small; branches mostly in fascicles of three, rarely exceeding 8 mm in length; stem leaves spreading, large for size of plant, 2-3 times as long as stem is wide (remove branches to observe).

S. tenellum

- (b) Medium to large; branches in fascicles of three to five, often exceeding 8 mm in length; stem leaves spreading or appressed, not large for size of plant, 1-2 times as long as stem is wide, or if longer than plant robust. Section
Subsecunda
(p. 24)
24. (a) Stem leaves erect (**fig. 12a**) Section
Acutifolia (p. 32)
- (b) Stem leaves hanging (**fig. 12b**) or spreading (**fig. 12b**) (though often some leaves on a stem are +/- erect. 25
25. (a) Spreading branches usually +/- curved (**fig. 13b**); branch leaves pointing towards centre of curve of branch, not or hardly modified when dry; stem leaves obtuse, +/- spreading. Section
Subsecunda
(p. 24)
- (b) Branches +/- straight; branch leaves appressed when wet, recurved when dry; stem leaves usually acute, hanging. Section
Cuspidata (p. 27)

Figure 13. Branch orientation



Section *Sphagnum*

Section distinct and generally easily recognised.

Characteristic features:

- Plants large and swollen
- Branch leaves with hooded apex (**fig. 14**)
- Stem leaves obtuse, +/- lingulate (**fig. 15**).

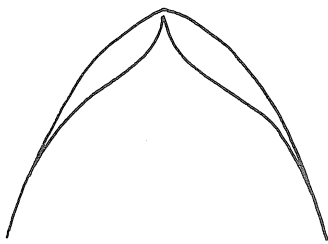


Figure 14. Branch leaf with hooded apex

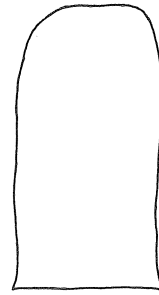


Figure 15. Stem leaf lingulate, obtuse

Only *S. compactum*, *S. auriculatum* and *S. squarrosum* are likely to be confused with plants in this section. *S. compactum* has minute triangular stem leaves. *S. squarrosum* differs in its narrower stem cortex and non-hooded apex of branch leaves. *S. auriculatum* differs in its narrow stem cortex and, usually, the presence of some spreading stem leaves.

The stem leaves of Section *Sphagnum* lack the mechanical strength to be spreading (though in compact forms, the stems may not elongate sufficiently to allow the stem leaves to lie flat).

- | | | | |
|----|---|---|--|
| 1. | (a) Non-green pigment present in leaves. | 2 | |
| | (b) Leaves green. | 7 | |
| 2. | (a) Colour pinkish-orange or dull crimson, at least in capitulum; stems green, brown or sometimes red. | 3 | |
| | (b) Colour yellowish or ochre; stems green or brown, never red. | 4 | |
| 3. | (a) Colour of capitulum and mature branches usually dull crimson (mud brown in weak alkali, e.g. household bicarbonate); mature branches blunt; stems red. Acid bogs on deep peat. | | <i>S. magellanicum</i> |
| | (b) Colour pinkish-orange, often +/- confined to capitulum and male branches (unchanged in weak alkali); mature branches +/- tapering; stems green or brown. Common in a variety of habitats. | | <i>S. palustre</i> |
| 4. | (a) Yellowish or ochre colour well marked, affecting whole plant. | 5 | |
| | (b) Colour predominantly green or greenish. | 7 | |
| 5. | (a) Strongly ochre or brown; branches in fascicles of 3; forming hard compact hummocks on northern and western bogs. Rather rare. | | <i>S. imbricatum</i>
ssp. <i>austinii</i> |

- (b) Dull coloured; branches in fascicles of 3-4; forming softer hummocks, or in loose tufts or carpets in slightly basic marshy conditions. 6
6. (a) Robust; mature spreading branches blunt; branches in fascicles of 3-4. Common. *S. papillosum*
- (b) Rather small; mature spreading branches tapering; branches in fascicles of 4. Rare, forming loose tufts or carpets in slightly basic marshy conditions. *S. imbricatum*
ssp. affine
7. (a) Robust plant; mature branches tapering, in fascicles of (3-)4-6(-7); branch leaves with broad or narrow apex. Common in a wide range of habitats, including woods. *S. palustre*
- (b) Robust or small; mature branches blunt, or shortly tapering, in fascicles of 3-4; branch leaves with broad apices. Rarely in woods. 8
8. (a) Robust; mature spreading branches blunt; branches in fascicles of 3-4. Common. *S. papillosum*
- (b) Rather small; mature spreading branches tapering; branches in fascicles of 4. Rare, forming loose tufts or carpets in slightly basic marshy conditions. *S. imbricatum*
ssp. affine

Note

It is not always possible to distinguish between *S. palustre*, *S. papillosum* and *S. imbricatum* ssp. *affine* in the field. In autumn and winter, *S. palustre* in well illuminated situations is relatively easy to recognise by its pinkish colour, but in summer the pink tinge vanishes.

Section *Rigida*

Characteristic features:

- Compact habit
- Minute stem leaves
- Very strongly differentiated pendent branches.

Medium sized, compact plants characterised by their minute hanging, +/- triangular, stem leaves, which are less than half the length of the branch leaves. Only in *S. subsecundum* are the stem leaves so small, but that species differs in its slender habit and curved branches.

1. (a) Stem dark brown or black, rarely pale; branch leaves ovate, +/- appressed, occasionally squarrose; colour green, bright ochre, orange-brown, yellowish or whitish, with colours often mixed to give an 'autumnal' appearance. Compact patches on peat or rock, common. *S. compactum*
- (b) Stem pale; branch leaves squarrose with broad base and narrow acumen; colour pale green, yellowish-green or straw; forming looser patches than *S. compactum*. Rare, except in areas of high rainfall. *S. strictum*

Section *Squarrosa*

Characteristic features:

- Stem leaves large and lingulate
- Branch leaves not hooded

Two species in Britain, both of which occur in +/- base-rich habitats, and have large lingulate stem leaves. As in Section *Sphagnum*, the dorsal surface of the hyaline cells in the stem leaves is resorbed, making the leaves thin and weak. They consequently tend to lie appressed to the stem (except in compact forms).

1. (a) Robust green or slightly brownish plant; branch leaves usually squarrose. *S. squarrosum*
- (b) Medium-sized greenish-yellow, orange or brown plant, rarely completely green; branch leaves +/- appressed, occasionally squarrose. *S. teres*

Note

S. palustre can be confused with *S. squarrosum*, but has a wider stem cortex and the branch leaves have hooded apices. *S. girgensohnii* can be confused with *S. teres*, but has a pale stem, and stem leaves +/- torn at the apices.

Section *Subsecunda*

Characteristic features:

- Sometimes curved, often swollen, branches (**fig. 16**)
- Coppery colours often present
- Branch leaves not hooded at apex
- Some or all stem leaves spreading.

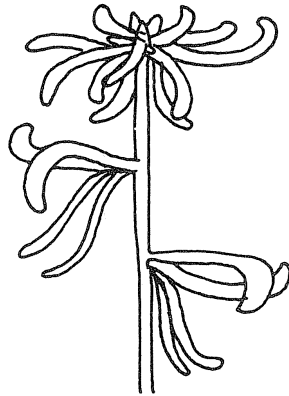


Figure 16. Branches curved

This section can be a troublesome one to recognise, as *S. auriculatum* is exceptionally variable, often resembling other species and commonly growing in a wide range of habitats, including base-rich marshes. However, plants with markedly curved, swollen branches almost always belong to this section.

1. (a) Pendent branches and spreading branches not sharply differentiated; plant usually large and swollen; branches in fascicles of 1-5. 2
- (b) Pendent branches clearly differentiated from spreading branches; habit various, not large and swollen; branches in fascicles of 4-7. 3

2. (a) Plant relatively slender; branches in fascicles of 1-3; stem leaves broadly elliptic; colour usually green with slight brown tinge. Rare plant of base-rich marshes, often with *Drepanocladus revolvens*. *S. platyphyllum*
- (b) Plant robust; branches in fascicles of 3-5; stem leaves lingulate; colour very variable, often yellow or coppery. Common. *S. auriculatum* var. *auriculatum*
3. (a) Stem dark brown or black, at least in part. 4
- (b) Stem green or pale brown throughout. 5
4. (a) Stem leaves small (0.5-1.1 mm long), hanging; small and slender plant with curved branches with the leaves pointing towards the centre of the curve. Base-rich marshes, often with *S. teres*. Uncommon. *S. subsecundum*
- (b) Stem leaves larger (1.0-1.5 mm long), hanging or spreading; plant medium-sized to robust; branches curved or straight, leaves variously arranged. Common. *S. auriculatum* var. *inundatum*

5. (a) Spreading branches curved, with leaves pointing towards centre of curve; stems pale. Base-rich marshes, often with *Drepanocladus revolvens* and *Scorpidium scorpioides*, frequent. (Check with microscope until familiar). *S. contortum*
- (b) Branches curved or straight, leaves variously arranged; stems usually dark. (Well pigmented forms almost invariably have dark brown or black in some stems, but green forms can be hard to separate from *S. contortum*). *S. auriculatum*
var. *inundatum*

Section *Cuspidata*

Characteristic features:

- Branch leaves recurved when dry, usually narrow
- Stem leaves usually hanging (**fig. 17**)

Figure 17. Stem leaves hanging



Except for *S. balticum*, *S. pulchrum* and *S. tenellum*, terrestrial forms normally have uniformly hanging stem leaves. Except for *S. tenellum*, the branch leaves are lanceolate or narrowly ovate. A useful character, not applicable in submerged forms, nor in *S. tenellum*, is that the branch leaves usually bend back conspicuously on drying, especially at the margins, giving the plants a slightly crisped appearance. Plants whose branch leaves do this can safely be assigned to Section *Cuspidata*.

1. (a) Small green plant; branch leaves ovate, concave, shell-like (**fig. 18**); stem leaves large and spreading; branches in fascicles of (2-)3(-4), with little or no differentiation between the pendent and the spreading.

S. tenellum

- (b) Not as above.

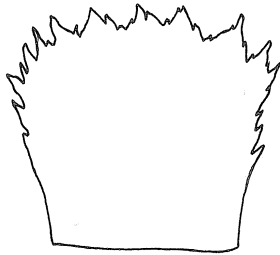
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Figure 18. Branch leaves concave

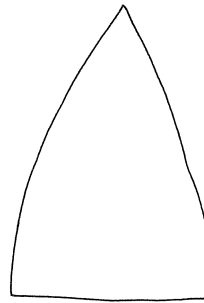


2. (a) Plant orange, yellow or golden-brown. 3
 (b) Plant green, greenish or dingy brown. 6
3. (a) Stem darker than leaves, dark brown or coppery, at least in part. 4
 (b) Stem pale or flecked with red. 5

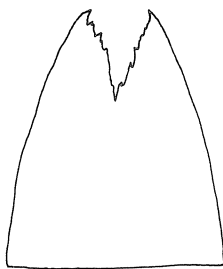
Figure 19. Stem leaves



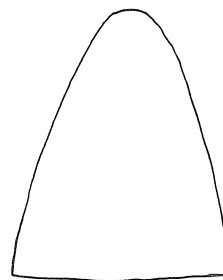
a. Spatulate, tattered



b. Triangular, entire, acute



c. Triangular, cleft



d. Triangular, entire, obtuse

4. (a) Central bud of capitulum large; stem leaves with broad tattered apex (**fig. 19a**). Rare, arctic-alpine.

S. lindbergii

- (b) Central bud of capitulum hidden by upper branches; stem leaves triangular with acute apex (**fig. 19b**). Rare, western raised bogs and Dorset heaths. *S. pulchrum*
5. (a) Branches mostly in fascicles of 3; stem leaves +/- spreading. Very rare, raised bogs. *S. balticum*
- (b) Branches in fascicles of 4-5; stem leaves hanging. 9
6. (a) Central bud of capitulum large; stem leaves conspicuously cleft at apex (**fig. 19c**). Rare, usually in eastern upland marshes. *S. riparium*
- (b) Central bud of capitulum hidden by upper branches; apex of stem leaves rounded or acute, not cleft. (**fig. 19b, 19d**) 7
7. (a) Little or no differentiation between pendent and spreading branches; branch leaves very long and narrow, often curved; when terrestrial, leaves at branch tips rolled into a cusp; often +/- submerged, flaccid plant with 'drowned kitten' habit when well soaked. 8

- (b) Pendent branches differentiated from spreading branches, appressed to stem; branch leaves lanceolate, straight when wet, not rolled into a cusp; rarely submerged, not flaccid. 9
8. (a) Plant light green, often yellowish or whitish, rarely olive. Common. *S. cuspidatum*
- (b) Plant dingy, olive and/or khaki. Very rare but possibly overlooked. (Check using microscopic characters.) *S. majus*
9. (a) Stem leaves triangular, with acute apex (**fig. 19b**) page 22). Very common. *S. recurvum* var. *mucronatum*
- (b) Stem leaves triangular or triangular-lingulate, with obtuse apex. Frequent. 10
10. (a) Stem leaves rounded at apex but not fringed; relatively slender plant, sometimes with highly pigmented branch leaves and red flecks at the branch-bases and on the stem. *S. recurvum* var. *tenuis*
- (b) Apex of stem leaves fringed; plant the same size as var. *mucronatum*, almost always green. Lacking other pigments. *S. recurvum* var. *amblyphyllum*

Note.

S. obtusum, probably now extinct in Britain, is more robust than *S. recurvum*, entirely green, with obtuse stem leaves. (Microscopic check needed.)

Section *Acutifolia*

Characteristic features:

- Rose-red tints often present
- Habit usually slender
- Branches not swollen
- Pendent and spreading branches usually well differentiated
- Stem leaves mostly erect (**fig. 20**).

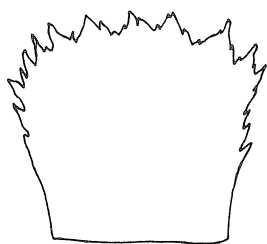
Figure 20. Stem leaves erect



Several species contain a rose-red pigment (anthocyanin) which, when present, is a good way of identifying the section. A chemical test is that it turns blue in alkali, whereas the reddish pigments sometimes found in *S. auriculatum* and *S. recurvum* are unmodified. Other characters are the highly differentiated pendent branches with whitish appressed leaves, and the mostly erect stem leaves. These characters may be absent in compact forms, but, taken together, they usually suffice to identify the section. *S. teres* (Section *Squarrosa*) can resemble *S. girgensohnii* - see under Section *Squarrosa* (p. 18) for differences. *S. tenellum* can resemble green forms of *S. capillifolium* but differs in the strongly spreading stem leaves and lack of distinct pendent branches. *S. magellanicum* is often a similar shade of red to species in this section, but is easily distinguished by its robust swollen appearance.

1. (a) Brown plants with dark brown stems. 2
- (b) Stem reddish or pale. 3
2. (a) Stem leaves triangular, acute (see note below). *S. subnitens*
- (b) Stem leaves lingulate, obtuse. *S. fuscum*
3. (a) No trace of red pigment present either in stem or in leaves; stem leaves spathulate or lingulate. (**fig. 21a, 21b**) 4
- (b) Red pigment present, or if absent then stem leaves triangular. 6

Figure 21. Stem leaves



a. Spathulate



b. Lingulate

4. (a) Stem leaves conspicuously tattered at apex, or if +/- entire then with discrete patches of brown pigment at basal angles. 5

- (b) Stem leaves not conspicuously tattered, though sometimes +/- fringed; discrete patches of brown pigment lacking. (Green forms of normally reddish plants.) 6
5. (a) Stem leaves spatulate, conspicuously tattered around most of upper leaf, forming “Elizabethan ruff” around stem apex when capitulum removed; brown pigment absent except in male branches. *S. fimbriatum*
- (b) Stem leaves lingulate, widest at base, tattered only across truncate apex, not forming “ruff”; brown pigment often present in discrete patches at basal angles of stem leaves, as well as in male branches. *S. girgensohnii*
6. (a) Compact plant with branches pointing upwards and concealing stem; pendent branches and spreading branches not sharply differentiated. 7
- (b) Stem usually visible; pendent branches clearly differentiated from spreading branches. 8

7. (a) Stem leaves large, easily seen, normally widest above base; plant compact, whitish green, often with pink tinge; pendent branches not, or weakly, differentiated. Rare, except in west. *S. molle*
- (b) Stem leaves normally widest at base, length about equalling width of stem. 8
8. (a) Stem leaves lingulate, with broad rounded apex. 9
- (b) Stem leaves +/- triangular. 10
9. (a) Relatively robust plant; stem leaves lingulate, often with broadly rounded, truncate, fringed apices, at top of stem usually 1-1.5 times as long as broad (remove capitulum); branch leaves ovate with broad base. Hilly districts, in marshes or forming large tussocks on sheltered banks. (Check with microscope until familiar.) *S. russowii*
- (b) Plants slender, though sometimes forming large hummocks; stem leaves lingulate to triangular lingulate with narrow apices, at top of stem usually 1.5-2 times as long as broad; branch leaves ovate. Widespread in lowlands and uplands. 12

10. (a) Stem cylinder green, occasionally red-flecked in exposed situations; branches mainly in fascicles of 4-5, except when obviously depauperate. On well-drained ground, especially on steeply sloping banks in western woodland and by streams. *S. quinquefarium*
- (b) Stem cylinder usually pigmented; branches mainly in fascicles of 3-4. Often in wet places, but can also grow on steep, well-drained banks. 11
11. (a) Red pigment usually salmon pink, weaker at centre of capitulum than in surrounding branches, or plant completely green or brown; relatively large untidy plant; stem leaves sharply triangular with inrolled margins at apex; male branches not brightly coloured; capsules common. *S. subnitens*
- (b) Red pigment usually deep crimson, stronger at centre of capitulum than in surrounding branches, rarely completely green; usually a small, neat plant; stem leaves lingulate to triangular-lingulate, blunt; male branches conspicuous, with dark crimson leaves; capsules rare. 12

12. (a) Elegant pinkish-red plant; branch leaves ovate with narrow apex, strikingly 5-ranked when wet. Upland base-rich flushes, often with *S. contortum* and *S. teres*. (Check with microscope until familiar.) *S. warnstorffii*
- (b) Colours various, deep crimson to green with red flecks, rarely wholly green; branch leaves ovate, usually without a narrow apex, +/-5-ranked. *S. capillifolium*

Notes

S. subnitens ssp. *ferrugineum* has been found in Ireland. This plant is brown or yellowish-brown, usually lighter in colour than *S. fuscum* and with the habit of *S. subnitens*. Stem leaves are triangular-lingulate. Found in mesotrophic to moderately eutrophic mires.

S. skyense has been described from a plant found in Skye. It is like a large form of *S. subnitens*, with slightly broader stem leaves.

S. rubellum, variously regarded as synonymous with *S. capillifolium*, a variety of *S. capillifolium* or a species in its own right, may key out to either *S. capillifolium* or *S. warnstorffii*. It differs from *S. capillifolium* in having a flat capitulum (rather than hemispherical), often being deep crimson throughout (*S. capillifolium* is seldom deep crimson throughout), and having branch leaves densely imbricate (somewhat spreading in *S. capillifolium*). The branch leaves are frequently 5-ranked but usually not as strikingly so as in *S. warnstorffii*.

Further reading and references

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