

1917 Wheldon Sphagni

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Synopsis
OF THE
European Sphagna,

INDICATING

The Species, Varieties and Forms occurring
in the British Isles,

WITH BRIEF DESCRIPTIONS OF MANY
OF THE FORMS.

Compiled from Warnstorff's *Sphagnologia Universalis*, 1911,
Das Pflanzenreich, 51 Heft (with additions), for the

MOSS EXCHANGE CLUB,

BY

J. A. Wheldon, F.L.S.,

Vice-President Liverpool Botanical Society.

Darwen: W. H. Western, Printer and Publisher.

June, 1917.

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PREFACE

For the purposes of the Moss Exchange Club the triple list of Sphagna in use at present has been found somewhat cumbersome and inconvenient. This Synopsis has been compiled from Warnstorff's *Sphagnologia Universalis* (1911), to replace the Census Catalogue list, and the lists of Warnstorffian Sphagna and colour varieties previously compiled for the Club. As many members are interested in Continental Mosses, it is believed that the inclusion of all the European species will be found a useful innovation. The majority of the varieties and forms are also included, as, if carefully sought, many of them may be expected to occur in the British Isles. In order to explain certain alterations introduced by Warnstorff since the publication of Horrell's "European Sphagnaceæ," brief key characters have been given in some groups, more especially in the Cuspidata and Subsecunda. Forms and varieties not mentioned in Horrell's work are also briefly described. The descriptions are of necessity very condensed, but it is hoped they will prove useful in aiding the members to elucidate the British forms. The majority of the contractions used to save space will explain themselves, with the following indications:—br. (branch, the spreading fascicle branches), l. (leaf, those of the spreading branches only), m. or l. (more or less), occ. (occasionally), r. (rather), sect. (transverse section), st. (stem), u. (usually), and v. (very). Figures for leaf-measurements represent millimetres, and the concave or inner, and convex or outer leaf surfaces are shortly expressed as "inside" and "outside."

Distribution is broadly indicated by the letters E. S. I. (England, Scotland, Ireland) following specific names. The comital census numbers are all additional to those already recorded in the Census Catalogue. The distribution of varieties and forms is very imperfectly worked out, and the census numbers should be greatly extended in the future.

In an area so rich in Sphagna as the British Isles, it was inevitable that a few forms should be found which do not agree well with any of those described by Warnstorff. Some of these have been described. The number should probably have been larger, as even in the writer's limited collection a few apparently well-marked varieties remain, which further study may prove to be sufficiently constant to be worth description.

The compiler desires to tender his thanks for much valuable help given in the past by Messrs. J. Bagnall, H. N. Dixon, and E. C. Horrell, and to Mr. W. Ingham for helping with the census numbers, and for useful suggestions and assistance in preparing the Synopsis for the Press

J. A. WHELDON.

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Section I. *LITHOPHLOEA.

Subsection I.—ACUTIFOLIA Schlieph.

Series I.—LACINIATA.

1. **S. fimbriatum** Wils. (1847), (*S. subulatum* Bruch). E. S. I.
10 (Watson), 27 (Burrell), 30 (Dixon), 34 (Elliott), 62 (Ingham), 64, 65 (Jones & Horrell), 71 (Hartley & Wheld.), 84 (McAndrew), 100 (Travis), 101 (McAndrew.) I. 30, 33 (Tetley), 35 (Hunter).
 - a. **robustum** Braithw. v. robust, br. stout, distant (3 cm.), l. 2 × 1.4, squarrose, st. l. 1.3 × 1.3. York (Anderson). Penzance (Curnow).
 - b. **validius** Card. Weaker, yellowish, br. closer, l. 1.7—1.9 × 0.8, st. l. 0.8—0.9 × 1—1.14. Br. l. appressed or apices sl. recurved.
 - c. *spectabile* W. Tufts deep, lax, br. elong. not crowded. (60 Wils. and Wheld.). 62-64 (Ingham).
 2. *deflexum* Grav. Br. deflexed. 14 (Nicholson), 38 (Bagnall), 59 (Beesley and Wheldon).
 3. *anocladum* Est et Fax. (v. *flagellaceum* Schlieph.) Br. ascending flagellate—59-62 (Wheldon), 60 (Wils. and Wheld.), 71 (Hartley and Wheld.)
 4. *squarrosum* H. Mull. Lower l. of br. with spreading falcate points.
 - d. *compactum* W. Dense low yellowish cushions. Br. crowded, short, usu. patent.—48 (Jones), 57 (Barker), 58-59 (Wheldon) 60 (Wils. and Wheld.), 62 (Ingham), 65 (Wheldon), 69 (Jones and Horrell), 111 (Lillie).
 - e. **intermedium** Russ. Straw-yellow to brownish, rigid, compact, Br. dense, long, grad. acumin., l. smaller 1.25 × 0.5—0.6. 60 (Wils. and Wheld.).
 2. *densum* Wheld. Cæspites densi, sursum lutescenti, circa 10 cm. alti Rames breves. 62 (Ingham).
 - f. **tenue** Grav. (var. *submersum* Roll). In loose, slender, deep, grey or grass-green soft tufts (20 cm.). Br. r. distant, filiform, grad. attenuate, arcuate-falcate, l. 1—1.14 × 0.3—0.4 erect-arcuate. 38 (Bagnall), 58 (Cash), 59 (Wheldon), 60 (Wils. and Wheld.), 62-64 (Ingham), 109 (Lillie).
 2. *squarrosum* W. L. squarrose.
 - g. **laxifolium** W. Pallid, very lax, slender. Br. remote, longly attenuate, l. 1—1.5 × 0.5—0.6, very lax, patent. St. l. 1—1.14 × 0.7. 62 (Ingham).
 - h. **concinnum** W. (v. *arcticum* Jens.). In dense, low, whitish-green, yellowish or brownish tufts. Br. stout, ascending or erect, short, crowded. L. max. 1.4 × 0.7. St. l. c.8—1 × 0.7.

- 2 **S. Gиргенсонии** Russ. (1865). E.S.I. 5 (Watson), 46 (Painter), 84 (McAndrew), 88 (Dixon), 96 (Wils. & Wheld.), I. 38 (Lett & Waddell).
- a. **robustum** W. Robust, capit. large, br. spr. arc.-falc. (3—4cm.), l. subsquarrose 1.7—1.9 × 0.7—0.8. Br. elong. arcuate recurved. 5 (Watson), 62 (Ingham), 65-66 (Jones and Horrell¹), 96 (Wils. and Wheld.), 109 (Lillie), 111 (Grant).
 - a. **speciosum** W. Stately, green or yellowish. St. l. long as to longer than broad. 62 (Ingham), 65 (Horrell and Jones).
 - b. **coryphaeum** W. Lax, green. St. l. long as to shorter than broad. 65 (Horrell).
 - 2. **trichodes** (Russ.). A weak form, w. long curved filif. br. and narrower l.
 - c. **sphaerocephalum** W. Compact (8—10 cm.), br. thick, long, reflexed, loosely squarrose leaved; l. suddenly long pointed, apex channelled; st. l. 1.4—1.5 × 0.8—0.9; capit. dense, large, and roundish.
 - d. **laxifolium** W. (v. *flagellare* Schleip. v. *hygrophylum* Russ. p.p.). Stout, bleached, flaccid; br. flagellate (3—4 cm.); st. l. long as broad; br. l. lax.
 - b. **microcephalum** W. Pulvinate, capit. small; br. close, deflexed 15—20 mm.); l. 1.4—1.5 × 0.7; st. l. longer than wide. 62 (Ingham), 65 (Jones and Horrell), 69 (Wils. and Wheld.), 75 (Armitage), 88 (Wils. and Wheld.).
 - c. **gracilescens** Grav. Tufts lax, slender, green above (20—25 cm.), br. filiform, l. appressed 0.9—1.2 × 0.4—0.6, st. l. long as broad. 65 (Horrell), 69 (Wils. and Wheld.), 71 (Hartley and Wheld.), 101 (McAndrew).
 - 2. **pumilum** Angstr. 5—6 cm. high, capit. stellate; br. crowded, falcate recurved.
 - 3. **tenuissimum** W. Lax low tufts, gracile, soft, capit. small, br. dist. attenuate, l. minute (0.8—1×0.4—5).
 - d. **squarrosum** Russ. Habit. of f. *pumilum* but l. squarrose (0.9—1 × 0.6). In small greenish cushions. 66 (Jones and Horrell), 96 (Wils. and Wheld.).
 - e. **stachyodes** Russ. 65-66 (Jones and Horrell), 90 (Marrat), 88-96 (Wils. and Wheld.), 109 (Lillie).
 - 2. **fuscescens** W. Subfuscous, br. cumulate, short, erect-patent. 92 (Whitehead), 96 (Wils. and Wheld.).
 - f. **Prageri** W. Green, compact (10 cm.), capit. minute, st. l. elong., border dilated below, b. 3 atten. (10 mm.), l. 1.3 × 0.7, st. l. triang.lingul. grad. narrowed upwards.

Series II.—DENTATA.

Subseries I.—LINGULATA.

- 3 **S. Russowii** W. (1886). (S. *acutif.* v. *robustum* Russ.) E.S.I. 70 (Murray).
- a. **Gиргенсониoides** Russ. 46 (Painter).
 - a. **pallescens** W. Robust, bleached, with long, distant loose lfd. br. 96 (Wheld. and Wils.), 109 (Lillie), 111 (Grant).
 - b. **flavescens** Russ. Yellow, with a slight admixture of green or red. 65-66 (Horrell and Jones), 88, 96 (Wils. and Wheld.), 109 (Lillie).
 - c. **fuscescens** Lindl. Capitulum yellowish-subfuscous. 88 (Wheld. and Wils.).
 - d. **virescens** Russ. Grey or grass-green, with only a trace of red, or none. 60 (Wils. and Wheld.), 65 (Wheld.), 66 (Jones and Horrell), 96 (Wheld. and Wils.), 109 (Lillie).

b. purpurascens Russ.

- a. spectabile* W. Capit. purplish, br. long, divaricate.
- b. roseum* W. Capit. rose-red, compact and short, br. thicker, ascending.
- c. rhodochroum* Russ. 48 (Jones).
- a. gracile* Russ. Elongate, slender, with irreg. spr. br. 65 (Ingham), 66 (Jones and Horrell), 111 (Grant).
- b. robustum* Russ. Stouter, with long arcuate deflexed br. 60 (Wils. and Wheld.).
- d. poecilum* Russ. 65-66 (Jones and Horrell), 96 (Wils. and Wheld.).

- a. speciosum* W. Stately, with long falc. recurved br. l. 1.4—1.6 × 0.8.
- b. austерum* W. Slender, sordid rubicund-fuscous above.

4 *S. fuscum* v. Kiinggr. (1872). E.S.I. 94, 96 (Wheld. & Wils.), 98 (Wilson). I. 1 or 2 (Knight), 33 (Tetley).

- a. robustum* W. Robust, br. thicker, l. 1.3 × 0.5; st. l. 1—1.4
- a. fuscescens* W. Rufo-fuseous. 98 (Wils. and Wheld.).

× 0.5.

- b. pallescens* W. Pallido-fuscous.

- c. virescens* W. Partly grey-green.

1. *drepanocladus* W. Br. arcuate-fulcate.

2. *anocladum* W. Br. erect-patent.

- b. medium* Russ. Weaker, br. thinner, l. 1—1.2 × 0.4; st. l. 0.85—1 × 0.6—0.7.

- a. fuscescens* W.

1. *drepanocladum* W. 60 (Wils. and Wheld.), I. 18 (Lett.).

2. *heterocladum* W. 60 (Wils. and Wheld.), 65-66 (Jones and Horrell), 88, 94 (Wils. and Wheld.), 92 (Whitehead), I. 39 (Lett.).

3. *anocladum* W. 88, 96 (Wils. and Wheld.).

4. *orthocladum* W. 74 (McAndrew), 88 (Wheld. and Wils.).

- b. pailescens* W. 60 (Jones and Wheld.), 88 (Wils. and Wheld.), 92 (Whitehead).

- c. virescens* W.

- c. tenellum* W. Slender, in deep tufts; st. and br. l. of equal size (0.8—0.9 × 0.5—0.6). 89 (Wils. and Wheld.).

- a. elongata* Card. Very elongate; br. v. remote, long, falcate-recurved.

5 *S. Warnstorffii* Russ. (1887) (*S. Wilsoni* Röll pp.). E.S.

- a. virescens* Russ. 60 (Wheld. and Wils.), 66 (Horrell), 71 (Hartley and Wheld.).

- a. squarrosum* W. L. in capit. squarrose. 60 (Wils. and Wheld.), 66 (Jones and Horrell).

- b. flavescens* Russ. 58 (Jones), 60 (Wils. and Wheld.).

- c. pallescens* W.

- d. flavo-glaucescens* W.

- e. carneum* W. (v. *strictiusculum* Roth.). Pale flesh-red above, with some yellow, bleached below.

- f. purpurascens* Russ. (v. *elegans* Roth.). 58 (Jones), 60 (Wils. and Wheld.), 66 (Horrell), 88 (Ewing).

- g. versicolor* Russ. 60 (Wils. and Wheld.). 65-66 (Horrell), 71 (Hartley and Wheld.), 96 (Wils. and Wheld.).

- h. fusco-rubens* W. Capit. dingy red, entirely brownish below.

6 *S. rubellum* Wils. (1855) (*S. tenellum* v. Kiinggr., *S. Wilsoni* Roll pp.). E.S.I.

- a. viride* W. (v. *virescens* Russ.) 24 (Sherrin), 51 (Dallman and Wheldon), 60-69 (Wils. and Wheld.), 65 (Wheldon), 66 (Horrell), 94-96 (Wils. and Wheld.).

- a. pallido-glaucescens* W.

- b. **flavum** Jens. ap. W. 1 (Ley), 2 (Roberts), 46 (Ley), 48 (Horrell), 60 (Wils. and Wheld.), 62-64 (Ingham), 66 (Jones and Horrell), 88-96 (Wils. and Wheld.).
 1. *pallidescens* W. 1 (Ralfs), 5 (Briggs), 22 (Armitage), 47 (Armitage), 60 (Wils. and Wheld.), 62 (Ingham), 65 (Wheldon), 66 (Horrell), 70 (Beesley), 96 (Cocks), 94-98 (Wils. and Wheld.), 109 (Lillie).
 2. *quinquefarium* W. Stout, rigid, l. secund, distinctly quinquef.
- c. **rubescens** W. 11 (Chittenden), 14 (Sherrin), 60 (Wils. and Wheld.), 62 (Ingham), 69 (Wilson), 70 (Wils. and Wheld.), 71 (Wheld. and Hartley), 88-96 (Wils. and Wheld.), 92 (Gasking), 97 (Ingham and Macvicar), 111 (Grant).
- d. **violascens** W. 60 (Wils. and Wheld.), 62 (Ingham), 64-65 (Wheldon), 66 (Jones & Horrell), 70 (Beesley), 75 (Armitage), 90 (Ingham), 96 (Wils. and Wheld.), 109 (Lillie), 111 (Grant).
- e. **purpurascens** Russ. 9 (Linton), 11 (Chittenden), 51 (H. Wheldon), 60 (Wils. and Wheld.), 64-65 (Wheldon), 66 (Jones and Horrell), 69 (Wils. and Wheld.), 71 (Wheld. and Hartley), 75 (Armitage), 96-98 (Wheld. and Wils.), 109 (Lillie), 111 (Grant).
- f. *speciosum* W. Entirely purple-stained, robust, to 20 cm. high. 96 (Wilson and Wheld.).
- f. **versicolor** W. 4 (Armitage), 17 (Sherrin), 19 (West), 35, 47 (Armitage), 48 (Gasking), 58 (Jones), 60 (Wils. and Wheld.), 62 (Wheldon), 65 (Ingham), 66 (Horrell), 69 (West), 70 (Wils. and Wheld.), 71 (Wheld. and Hartley), 75 (Armitage), 82 (Ingham), 92 (Gasking), 95 (Macvicar), 97 (Ingham), 88, 89, 94, 98 (Wils. and Wheld.), 109 (Lillie), 111 (Grant), I. 36 (Lett).
 2. *immersum* Schleip. Plumose, dingy green above, pale red below.
 Br. short, patent. 60 (Wils. and Wheld.).
 3. *robustum* Wheld. (v. *rubrum* f. *robustum* W. in litt. ad. Horrell).
 A type caulinibus majoribus (10-20 cm.), sursum rubicundis deorsum flavovirides ramisque crassiores et densioribus differt.
 60, 65 (Wheldon), 62 (Ingham).
- g. **sordidum** W. Dusky undecided dingy brown-red to violet. 60 (Wheld. and Wils.), 96 (Wheld. and Wils.), 111 (Grant).

Subseries 2.—DELTOIDEO-LINGULATA.

- a. Shining when dry; more or less ferruginous fuscous.

7 **S. flavicomans** W. (*S. acutifolium* v. *flavicomans* Card.):
 Arctic and subarctic Europe.

- b. Not shining when dry.

* v. slender, with filiform br. resembling *S. Warnstorffii*. St. l. 1 × 0.7, hyaline cells in upper part rhombic or brevi-rhomboïd, effibrose or with a few fibres in upper part. Aporose, or with a few perforations on both sides. Br. l. minute 0.8-0.9 × 0.4.

8 **S. subtile** W. (*S. acutif.* v. *subtile* Russ. v. *leptocladum* Limpr.)

- a. **gracile** W. Grey-green, densely tufted (15 cm.). Br. deflexed (12-15 mm.).
- b. **pulchellum** W. Compact, purplish. Br. cumulate, short or long.

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** More robust. St. l. 1—1.6 × 0.4—0.7. Upper hyaline cells narrowly or widely rhomboid, fibrose to middle, or to base. Pores variable on both sides of the leaf.

- 9 **S. acutifolium** Ehrh. (1788). E.S. 90 (Marratt).
- a. **viride** W. (var. *viride*, *griseum*, *chlorinum* et *flavicaule* W.), 5 (Watson), 14 (Horrell), 17 (Sherrin), 48 (Jones), 66 (Jones and Horrell), 62, 64, 65 (Ingham).
 - a. *drepanocladum* W. 14 (Horrell), 66 (Wheld. and Wils.), 62 (Ingham), 65 (Jones and Horrell).
 - b. *heterocladum* W. 60 (Wheld. and Wils.), 62 (Ingham), 65-66 (Horrell), 69-70 (Wils. and Wheld.), 96 (Wils. and Wheld.).
 - c. *orthocladum* W. 60 (Wheld. and Wils.), 62 (Ingham).
 - d. *dasycladum* W. 60 (Wheld. and Wils.).
 - b. **pallescens** W. 24 (Sherrin), 65-66 (Jones and Horrell), 75 (Armitage), 109 (Lillie).
 - a. *heterocladum* W. 60 (Wils. and Wheld.), 65 (Jones and Horrell).
 - b. *alpinum* W. (var. *strictum* W.). Br. densely crowded, stout, short, ascending, subobtuse. 60 (Wils. and Wheld.), I. 38 (Lett.).
 - c. **roseum** W. 65 (Wheldon), 66 (Horrell) 110 (Gibson).
 - d. **rubrum** Brid. (v. *elegans* Braithw., v. *sanguineum* Sendt., v. *purpurascens* W.). 19 (Greenwood), 44 (Knight).
 - a. *drepanocladum* W. 60 (Wils. and Wheld.), 62 (Wheldon), 66 (Jones and Horrell).
 - b. *heterocladum* W. 60 (Wils. and Wheld.), 65 (Wheldon).
 - c. *orthocladum* W.
 - c. **versicolor** W. 14 (Horrell), 60 (Wils. and Wheld.), 62 (Ingham), 65-66 (Jones and Horrell), 95 (Armitage), 109 Lillie.
 - a. *venustum* Wheld. Caespites laximsculi, elati, Caulis gracilis 10—15 cm., altus, ramis subaequalibus, tenuibus, curvatulo-patulis, fasciculisque remotis. 5 (Briggs), 60 (Wils. and Wheld.), 65 (Ingham), 102 (Ley).
 - b. *deflexum* W. Shorter, fascicles approximate. Br. longer, flagelliform, deflexed. 60 (Wils. and Wheld.), 62 (Anderson), 66 (Jones and Horrell).
 - c. *densum* Wheld. Caespites densissimi 2—6 cm. profundi. Ramorum fasciculis densissimis, rami aut subdeflexi aut horizontaliter patenti. 51 (Dallman and Wheldon), 60-66 (Wheldon), 65 (Ingham).
 - f. **flavo-rubellum** W. Yellow and red above, bleached below. 5 (Briggs), 48 (Jones), 60 (Wils. and Wheld.), 62 (Barker), 65 (Jones and Horrell), 66 (Ingham), 96 (Wils. and Wheld.), 109 (Lillie).
 - g. **flavescens** W. 60 (Wils. and Wheld.), 62 (Ingham), 64 (Wheldon), 65 (Ingham), 109 (Lillie).
 - h. **obscurum** W. 65, 66 (Jones and Horrell).
 - f. *spiciforme* Ing. and Wheld. Caespites densi, sordide ochraceo-pallidi vel interdum pallido-rufi, caulinibus circa 2—3 cm. altis; fasciculis ramorum densissimis, ramis brevioribus erectis vel erecto-patentibus. Orkney. Dr. Grant.

Subseries 3.—DELTOIDEAE.

- 10 **S. quinquefarium** W. (1886). E.S.I. 5 (Watson) 46 (Painter), 61, 62 (Ingham), 69 (Painter), 105 (Salmon), 109 (Lillie). I. 14, 29, 38 (Lett.),
- a. **viride** W. (v. *virescens* W.). 5 (Watson), 46 (Painter), 48 (Jones), 60 (Wheldon), 62 (Ingham), 65-66 (Horrell and Jones), 94-96 (Wilson and Wheldon), I. 1 (Gasking).
 - a. *drepanocladum* W. 48 (Jones and Horrell), 62 (Ingham), 60, 69 (Wils. and Wheld.), 66 (Horrell), 88 (Wils. and Wheld.).

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- b. *heterocladum* W. 3 (Watson), 59 (Wilson), 60 (Wils. and Wheld.), 62 (Ingham), 66 (Jones and Horrell), 94-96 (Wils. and Wheld.).
- c. *brachyanocladum* W. 60 (Wils. and Wheld.), 62 (Ingham).
- d. *gracilescens* W. Slender and soft; br. short, thin, slightly falcate, recurved; l. small, erect-patent; st. triangular, fibrose above. Resembles *S. Warnstorffii*.
- e. *mastigocladum* Wheld. Planta pallida sursum cano-vel saturate viride, plerumque robusta (7-15 cm.). Ramulorum fasciculi plus minusve remoti, rami patuli valde attenuati (7-20 mm.), ac longe deflexi. 59 (Wilson), 71 (Hartley and Wheld.), 88 (Wils. and Wheld.).
- b. ***flavum*** W. (v. *fusco-flavum* W.). Capit. yellow to brownish, without red. 60-71 (Wils. and Wheld.), 65 (Ingham), 66 (Jones and Horrell).
- a. *homocladum* W. 66 (Jones and Horrell).
- b. *heterocladum* W. 60 (Wils. and Wheld.), 65 (Ingham).
- c. *orthocladum* W.
- d. *drepanocladum* W. 66 (Jones and Horrell), 71 (Hartley and Wheld.).
- c. ***pallens*** W. (v. *pallescens* W.). 65-66 (Jones and Horrell), 69 (Wils. and Wheld.), 111 (Lillie).
- a. *homocladum* W.
- b. *heterocladum* W. 5 (Watson), 60 (Wils. and Wheld.), 66 (Jones and Horrell), 94 (Wils. and Wheld.), 109 (Lillie).
- c. *orthocladum* W. 97 (Macvicar and Ingham).
- d. *drepanocladum* W. 5 (Watson), 94 (Wils. and Wheld.).
- d. ***roseum*** W. 48 (Jones), 60 (Wils. and Wheld.), 65-66 (Horrell), 109 (Lillie), I. Kerry (Lett).
- a. *brachyanacladum* W. 65 (Jones and Horrell).
- b. *speciosum* W. Tufts (10 cm.), rose-red above. Br. remote, attenuate arcuati reflexed (12 mm.). I. Kerry (Lett).
- c. *heterocladum* W. 60 (Wils. and Wheld.), 66 (Ingham).
- e. ***versicolor*** Russ. 48 (Jones), 96 (Wils. and Wheld.).
- a. *homocladum* W.
- b. *heterocladum* W. 48 (Jones), 92 (Gasking), 96 (Wils. and Wheld.).
- c. *orthocladum* W.
- d. *drepanocladum* W.
- e. *dasycladum* Wheld. (f. nov.). Caespites densi, pallidi, superne rubicundi ad 6 cm. profundi. Ramor. fasciculi valde cumulati, rami ad 5 vel 6 cm. longi, paulatim attenuati. 66 (Jones and Horrell), 92 (Gasking).
- 11 ***S. plumulosum*** Roll. (1886) emend W. (*S. subnitens* R. & W.). E.S.I. I. 25, 26, 28 (Tetley).
- a. ***viride*** W. (v. *virescens* W.). 17 (Sherrin), 40 (Painter), 47 (Armitage), 48 (Jones), 51, 59 (Wheldon), 58 (Holt), 60 (Wils. and Wheld.), 61-62 (Ingham), 63 (Crossland), 65-66 (Horrell), 67 (Armitage) 7c (Wils. and Wheld.), 71 (Hartley and Wheld.), 75 (Armitage), 89, 96 (Wils. and Wheld.), 111 (Grant).
- a. *laxum* W. In robust loose tufts (15-20 cm.); br. dist. l. laxly imbric. or erect-pat. 48 (Jones), 59 (Wheldon), 60 (Wils. and Wheld.), 61, 62, 64 (Ingham), 70 (Wils. and Wheld.).
- b. *squarrosum* W. (f. *tenuella* Roll.). 57 (Barker), 62 (Ingham), 60, 69, 70 (Wils. and Wheld.), 111 (Grant), I. 1 (Gasking).
- c. *griseum* W. 26 (Mayfield), 34 (Knight), 62 (Horrell), 63 (Crossland), 60, 69 (Wils. and Wheld.), 111 (Grant).
- d. *laete-virens* W. (var. *laete-virens* Braithw.). 57 (Barker), 60 (Wils. and Wheld.), 62 (Wheldon), 96 (Wils. and Wheld.).
- b. ***pallens*** W. 46 (Parsons), 51 (Wheldon), 60 (Wils. and Wheld.), 62 (Ingham), 65-66 (Jones and Horrell), 106 (Grant), 109 (Lillie).

- a. *laxifolium* W. Aquatic, with long pat. br. and spr. leaves; plumose. 1 (Curnow), 60 (Wils. and Wheld.), 62 (Ingham), 109 (Lillie), 111 (Grant).
- b. *substrictum* W. In dense compact tufts, dull lilac stained above, bleached belw. Br. dense suberect bluntish (10—12 mm.), l. imbricate. Darnholme (Braithwaite and Anderson), 60 (Wils. and Wheld.), 62 (Ingham), 111 (Grant).
- c. *strictum* W. V. dense, internally pale yell.-brown tufts (6—8 cm.); br. densely crowded, ascending, short-pointed (5—6 mm.), l. v. short, closely imbricate.
- d. *pungens* Wheldon. Rami elongati, pro maiore parte tereti, acutissimi, folia arcta imbricata, vel in ramis capitulorum saepe squarroso-recurva. 57 (Barker), 60 (Wils. and Wheldon).
- c. *cærulescens* Schleid. (v. *violascens* W., v. *luridum* W. pp.). 27 (Burrell), 40 (Painter), 59 (Wheldon), 60, 70 (Wils. and Wheld.), 62 (Ingham), 65 (Wheldon), 66 (Horrell), 69 (Wils. and Wheld.), 66 (Horrell), 75 (Armitage), 103 (Gilmour), 109 (Lillie).
- d. *lilacinum* Spruce in Herb. Stabler. 3 (Cocks), 6 (Farr), 11 (Ley), 40 (Benson), 35, 43, 46 (Ley), 60 (Wilson), 62 (Ingham), 65 (Horrell), 69 (Paul), 71 (Hartley and Wheld.), 92 (Gasking), 109 (Lillie).
- a. *orthocladum* W. Br. short, ascending. 62 (Ingham), 63 (Whitehead), 70 (Wils. and Wheld.).
- b. *compactum* W. In v. low compact tufts. 35, 43, 44, 55 (Ley), 60 (Wils. and Wheld.), 66 (Horrell), 94 (Wils. and Wheld.), 95 (Macvicar), I. 1 (Gasking).
- c. *delicatum* Wheldon. Gracilis, Ramis laxioribus, curvulatis. 4 (Farr).
- e. *purpureum* W. (S. *subnit.* v. *purpurascens* W., S. *acutif.* v. *purpureum* Braithw.). 44 (Ley), 46 (Painter), 49 (Horrell), 62 (Ingham), 63 (Needham), 65, 66, 69 (Jones and Horrell), 109 (Lillie).
- a. *robustum* W. Robust (5—10 cm.). Br. close (20 mm.), falc.-recurved, l. lax. 62 (Ingham), 71 (Hartley and Wheld.), 97 (Macvicar and Ingham).
- b. *gracile* W. Elong. slender (15—20 cm.); br. slend. distant, arc-spreading. York (Anderson), 65 (Wheldon).
- f. *versicolor* W. 18 (Chittenden), 48 (Jones and Horrell), 57 (Linton), 60 (Wheld. and Wils.), 63 (Aspin), 62, 65, 66, 69 (Horrell), 71 (Hartley and Wheld.), 75 (Armitage), 96 (Wils. and Wheld.), 97 (Ingham and Macvicar), 109 (Lillie).
- a. *validum* W. Very robust, br. close or distant. 60 (Wils. and Wheld.), 62 (Ingham), 66 (Horrell), 71 (Wheld. and Hartley).
- b. *tenellum* W. Elong. slender, in large grey-green and lilac dense tufts. 34 (Knight), 48 (Jones), 60 (Wils. and Wheld.), 62 (Ingham), 111 (Grant).
- c. *ascendens* W. Br. crowded, short, ascending. 60 (Wils. and Wheld.), 62 (Ingham), 69 (Wils. and Wheld.), 98 (Wils. and Wheld.), 105 (Salmon).
- g. *flavofuscescens* W. (v. *flavescens* W.). 1 (Ley), 32 (Dixon), 40 (Ley), 47 (Armitage), 60 (Wils. and Wheld.), 61-62 (Ingham), 63 (Needham), 65-66 (Jones and Horrell), 70 (Ley), 96 (Wils. and Wheld.), 109 (Lillie), 111 (Grant), I. 38 (Lett).
- h. *ochraceum* W. Colour obscure dingy grey-green to brownish green, often with a tinge of dull violet. 9 (Linton), 14 (Salmon), 35 (Armitage), 60 (Wils. and Wheld.), 63 (Aspin), 62-64 (Ingham), 65, 66, 69 (Jones and Horrell), 70 (Wils. and Wheld.), 71 (Hartley and Wheld.), 88 (Wils. and Wheld.), 95 (Macvicar), 109 (Lillie), 111 (Grant), I. 1 (Gasking), 38 (Lett).

- a. *Schilierianum* W. V. robust (nearly as large as *S. squarrosum*) with long thick arcuate reflexed br.; l. 2—2.08 × 0.8—0.9. 62 (Ingham).
- b. *immersum* W. Much weaker, br. arcuate reflexed, l. laxer 1.3—1.4 × 0.6—0.7.
- c. *congestum* W. In low compact tufts.
- d. *amentiforme* Wheld. and Ingh. Caespites humiliores (3—5 cm.), habitu *S. rubellum* similis, uniforme sordido-cinereo-purpureis. Ramis densissimis uniformis (usque 5 mm.); foliis patent-erectis vel frequente subsecundis. Hoy. 111 (Grant).

12 **S. tenerum** Sull. (1846). (*S. acutifolium* v. *tenerum* Aust.).

Series III.—HETEROPHYLLA.

- 13 **S. molle** Sull. (1846) (*S. molluscoides* C. Mull., *S. Mulleri* Schimp.). E.S.I. 34 (Knight), 49 (Jones), 83 (McAndrew).
- a. **molluscoides** W. Br. l. dentate, with resorption-grooved margin.
 - a. *heterophyllum* W. St. l. very variable in size and shape on same plant, lingulate and small or spatulate and larger. 70 (Dixon), 75 (Armitage).
 - 1. *pulchellum* W. In loose tufts (15 cm.), w. remote br.
 - 2. *tenerum* W. (v. *compactum* Grav., v. *tenerum* Braithw.). 4 (Larter), 16 (Parsons), 32 (Bagnall), 48 (Jones), 62 (Ingham), 66 (Jones and Horrell).
 - 3. *squarrosum* W. Br. l. squarrose. 48 (Jones), 62 (Ingham).
 - b. *homophyllum* W. St. l. more uniform, but still v. variable. N. America.
 - b. **limbatum** W. Br. l. entire, margin without resorption grooves, border of 2—3 rows of narrow cells. N. America.

Subsection II.—TRUNCATA Russ.

- 14 **S. Angstroemii** Hartm. (1858), Subarctic and Central Europe.

Subsection III.—POLYCLADA Russ.

- 15 **S. Wulfianum** Grgens. (1860) (*S. pycnocladum* Angst.). Subarctic and Central Europe.

Subsection IV.—RIGIDA W.

- 16 **S. compactum** DC. (*S. rigidum* Schp.). E.S.I. 82 (McAndrew).
- a. **squarrosum** Russ. L. squarrose. Very robust, grey or blue-green. 10 (McAndrew), 14 (Nicholson), 27 (Burrell), 34 (Knight), I. 37 (Lett).
 - a. *robustum* W. Subf. *oxycladum* W. Robust (12—20 cm.), br. thick str. or falcate, acutely pointed
 - b. *densum* Card. Tufts very dense (5—6 cm.). 17 (Sherrin), 60 (Wils. and Wheld.).
 - c. *laxum* Card. Weaker and less compact. 27 (Burrell).
 - d. *brachycladum* W. Elongate, slender (30—40 cm.), br. distant, short,
 - e. *subsimplex* Wheld. Caulis, gracilis, pallido-viridis; ramis paucioribus frequente; foliis perlaxis, patentibus. 27 (Burrell). blunt.

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- b. subsquarrosum* W. L. erect-patent or recurved. Grey, yellow, brown, or rufous. 47-75 (Armitage), 64 (Ingham), 62 (Webster).
- a. strictum* W. Green or brownish, elongate (15 cm.); br. m. or l. dense, stout, erect-appressed. 48 (Jones and Horrell), 61 (Wheldon).
- b. densum* W. Grey-green or dingy red, compact (3-5 cm.); br. short, stout, ascending, crowded. 61, 56 (Wheldon), 60, 69 (Wils. and Wheld.).
- c. divaricatum* W. Grey-green or fuscous; br. dense, patent. 5 (Briggs), 17 (Horrell), 60 (Wils. and Wheld.), 61 (Ingham).
1. *immersa* W. Robust, immersed, subfuscous, br. densely crowded.
 2. *fuscescens* W. Robust, subfuscous, br. rather more distant. 60 (Wils. and Wheld.).
- d. reflexum* W. Whitish-green to yellowish (3-5 cm.), br. acute, reflexed 10 mm. long.
- e. submersum* W. Pale greenish to brownish, floating, flaccid (10 cm.); br. thick 2-3, deflexed ones 0 or little developed, spr. ones short, blunt, thick; l. loose, large, erect-pat.; often branchless.
- c. imbricatum* W. Dense, low, oft. purplish or violet red to almost blackish (3-6 cm.). Br. crowded, thick, short. L. closely imbric. 3 (Bcyden), 10 (Knight), 22 (Armitage), 27 (Burrell), 34 (Knight), 69 (Armitage), 71 (Hartley and Wheld.), 82 (Evans), 84 (McAndrew), 92 (Gasking), 94 (Armitage), 95 (Macvicar), 101 (McAndrew).
- a. capitatum* Roll. Low, creeping, with swollen brown short-branched capitul. 96 (Wils. and Wheld.).
- b. purpurascens* W. More or less red stained above. 60, 69 (Wils. and Wheld.), 94 (Wils. and Wheld.).
- c. violaceens* W. Very compact (3-5 cm.), above violet-reddish. Plants turgid resemb. a compact *S. medium*.
- d. obscurum* W. Dingy brownish, capit. sometimes greenish. 60-69 Wils. and Wheld., 75 (Armitage), 95 (Macvicar), 88, 94, 96 (Wils. and Wheld.), 111 (Grant).
- e. nigrescens* W. Capitulum blackish.
- f. flavescentia* Wheld. (*f. Nov.*). Cæspites densi, 2-5 cm., profundi. Planta in capitulis flava, deorsum pallida. Ramorum fasciculis densissimis, rami brevis, imbricate foliosis, plerumque vel horizontaliter patentes vel ascendentes. 60 (Wilson), 62 (Ingham), 65 (Wheldon), 69 (Wils. and Wheld.), 96 (Wils. and Wheld.), 109 (Lillie).
- d. isophylla* Wheld. (var. nov.) Planta plerumque vel pallida vel cano-viridis, mollis, sæpe simplex. Cæspitibus laxis 3-6 cm. profundis. Ramorum fasciculi remoti, rami pauci (1-2), laxe foliosi, folia erecte patentia. 60 (Wheldon).

Subsection V.—SQUARROSA Schlieph.

- 17 *S. squarrosum* Pers. (1800). E.S.I. I. 7 (Lett), 27 (Waddell), 33 (Lett), 36 (Porter), 51 (Dallman).
- a. spectabile* Russ. 17 (Cocks), 63 (Nowell).
- c. densum* W. In compact tufts (15 cm.). 62, 64, 65 (Wheldon).
- b. elegans* W. Elongate, lax, with long arcuate recurved br. 59 (Wheldon), 64, 66 (Ingham).
- c. patulum* W. Loosely cæspit (15 cm.) with stout divaric br. 58, 59 (Wheldon), 60 (Wils. and Wheld.), 61 (Wheldon), 62 (Ingham), 69 (Wils. and Wheld.).

- d. robustum* W. Very robust (20 cm.). Spreading 3 cm. long, very stout.
- e. flagellare* W. Green, lax, elongate (20 cm.); br. naked, i.e. reflexed (30 mm.), l. appressed. 59 (Wheldon), 60 (Wilson).
- f. immersum* W. A very elongate, lax, floating form; leaves lax.
- b. subsquarrosum* Russ. ap. W. (v. *semisquarrosum* Russ.). 48 (Jones), 63 (Crump), 64 (Ingham), 69 (Horrell), 71 (Wheldon and Hartley), 95 (Armitage).
- a. elegans* Russ. Stout, blue-green; br. r. remote, arcuate. Cells epapillose.
- b. gracile* Russ. More slender; yellowish to brownish; br. dist., or closer, or even crowded, short, spreading, points only recurved. 60 (Wils. and Wheld.), 64 (Ingham).
- c. molle* W. Soft and low, flaccid, pale or brownish-yellowish. L. in capit. and lower half of br. squarrose, others imbricate. 19 (Chittenden), 59 (Wheldon).
- d. densum* Russ. Rigid, very dense, yellowish-brown (5—10 cm.); br. crowded, acute, patent or deflexed; chl. cells papillose. 59 (Wheldon), 60 (Wils. and Wheld.).
- e. cuspidatum* W. Low, dense cushions, br. l. near extremity of br. imbricate, forming a spine-like point as in *Hyp. cuspidatum*; br. dense. 65 (Jones and Horrell).
- f. hydropyllyum* W. Aquatic, stout, above yellowish, loose tufted (20 cm.); br. long, falcate-recurved, acute. 25 (Mayfield), 60 (Wils. and Wheld.).
- c. imoriciatum* Schimp. 10 (Livens), 30 (Dixon), 35 (Ley), 59 (Wheldon), 63 (Akroyd), 71 (Wheldon and Hartley), 96 (Armitage).
- a. silvaticum* Wheld. Cæspites virides 10—20 cm. profundi. Ramorum fasciculi satis remoti, breves vel longiores, in capitulis subequales vel breviores. 58 (Holt), 59 (Wheldon).
- b. pycnocladium* Wheld. Cæspites 5—10 cm. profundis plus minusve condensati, flavo-virescentes, sursum lutei. Rami patuli densi, paulatim attenuati, in capitulis permagnis manifeste longiores. 59 (Wheldon), 71 (Hartley and Wheld.).

18 **S. teres** Angstr. (1861). E.S.I. 71 (Hartley & Wheld.), 95 (Armitage).

- a. imbricatum* W. 5 (Watson), 10 (Livens), 27 (Burrell), 62 (Ingham), 65 (Jones and Horrell).
- a. gracile* W. Elongate (10—15 cm.). Capit. small, br. irreg. arcuate, spreading, slender. 62 (Ingham), 65 (Jones and Horrell), 71 (Hartley and Wheld.).
- b. elegans* W. Stouter (15—20 cm.), capit. small, br. regularly arcuate falcate.
- c. robustum* W. Very robust, brown to red-brown. Br. falcate-reflexed, stout and gradually atten.
- d. compactum* W. Low dense cushions, brown above. Br. close, short; l. densely imbric, large. 71 (Hartley and Wheld.).
- e. laxum* W. Pale green, br. long, attenuate, laxly leaved. 59 (Travis and Wheld.).
- f. strictum* W. Elongate, slender, yellowish or greenish; br. short, erect-pat.
- b. subteres* Lindb. (v. *sub-squarrosum* W.). 71 (Hartley and Wheld.), 65-66 (Jones and Horrell), 88 (Dixon), I. 37, 38, 39 (Lett.).
- a. submersum* W. Resemb. *S. cuspidatum*. Yellow green above, brown beneath; br. crowded, plumose; l. elongate, laxly recurved.

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- c. **squarrosum** W. (v. *tenellum* Pers.). 17 (Sherrin).
a. **hystricosum** Roth. Small, hemiisophyllous (4–5 cm.). Cells of st. epiderm. many-pored; st. l. multifibrose and multiporose.

Subsection VI.—CUSPIDATA Schlieph.

Series I.—LANCEOLATA.

Subseries I.—LACINIATA.

St. l. usu. efibrose, apex distinctly lacinate-fimbriate.

- 19 **S. Lindbergii** Schimp. (1858) (*S. cuspid.* v. *fulvum* Rabenn.) S.

- a. **macrophyllum** W. V. robust, br. l. 2–3 × about 1.
b. **mesophyllum** W. Weaker, br. l. 1.5–1.6 × 0.5–0.6.
c. **tenellum** Limpr. Gracile, br. l. 1.14 × 0.4–0.5. 112 (Lillie).
d. **microphyllum** W. Resembles *S. fuscum*. L. 0.86 × 0.4–0.5, not undulate.

Subseries II.—EROSA.

Stem l. usu. efibrose, apex rounded, more or less lacerato-bifid.

- 20 **S. riparium** Angstr. (1864) (*S. spectabile* Schimp.). E.

- a. **speciosum** Russ. Stately, loose, robust, yellowish tufts; br. arcuate, recurved, v. long; l. densely imbricate.
a. *macrocladum* W. (incl. f. *platyphylla* Russ.) Robust (20–25 cm.), with large capit.; br. grad. attenuate, falcate-reflexed.
b. *brachycladum* W. (varr. *molle et stenophyllum* Russ.). More slender, shorter (10–15 cm.), br. shortly pointed, reflexed or occ. ascending, shorter.
b. **coryphaeum** Russ. Laxly tufted, br. elong., falcate-recurved, l. laxly imbric and strongly undulate.
a. *spectabile* Russ. V. stately, capit. large; br. spr. thick (30–40 mm.). 60 (Wils and Wheld.).
b. *gracilescens* Russ. Elegant slender form; br. thick, shorter (15–25 mm.).
c. **submersum** W. Submersed (10–15 cm.), st. epid. in 2–4 distinct layers; l. lax, strongly undulate, apices twisted, small pores in upp. and low. cell angles only; br. arcuate reflexed.
d. **fluitans** Russ. (v. *aquaticum* Russ., v. *squarrosum* C. Jens.). Tall (60–70 cm.), submerged, green above, brown below, capit. small, br. dist., l. lax, squarrose, spirally twisted.

Subseries III.—TRIANGULO-LINGULATA.

St. l. fibrose or efibrose, usu. triangular-lingulate, apex rounded denticulate or subfimbriate.

1. True pores numerous on exterior surf. of br. leaves.

* Pores ringed

- 21 **S. mendocinum** Sull et Lesq. (1874) (*S. auriculatum* Lesq.). St. l. up to 1.3 × 1mm. V. minute pores in series near commissures. N. America.

- 22 **S. Jensenii** Lindb. fil. (1899) (*S. laricinum* Angstr.). St. l. up to 1 × 1mm. Pores on commissures and in mid-cell.

(Pores numerous on both sides of br. l.).

- a. **robustum** W. Robust as *S. riparium*. St. epid. distinct.
 - b. **submersum** H. Lindb. Smaller, in capit. sordid yellow-fuscous (40—45 cm.); br. 3, remote.
 - c. **viride** H. Lindb. Subgracile (20 cm.), br. 4, falcate-reflexed, st. epid. distinct.
 - a. **versicolor** H. Lindb. Green, with reddish bro. male. br., bleached below.
 - d. **flavo-fuscescens** W. Dense, fuscous-yellow, resemb. robust *S. curvum*. St. epid. only in part distinct.
 - e. **propinquum** W. Still more slender, pale yellow to yellow-brown, rarely grey-green. Resemb. *S. subsecundum*. St. epid. variable; br. l. small, asymmetric, secund, hardly undulate, w. numerous very small pores on both sides.
- (Inner side of branch l. with few pores).
- f. **annulatum** W. (*S. annulatum* Lindb.). Differs from e in pore structure only, having very few minute pores on inner side of l.
 - g. **dusenioides** W. Resemb. *S. Dusenii*, flavo-fuscescent above (10 cm.). St. epid. in 2—3 layers, distinct; l. lax, arcuate patent, strongly undul. only on outside with many minute pores.

** Pores w. indistinct contour, not ringed.

- 23 **S. obtusum** W. (1877). E. Pores very minute, chior. cells triang., enclosed on inner side.

- a. **riparioides** W. Stately as *S. riparium*. Capit. large, greenish or yellowish brown. Br. falc-recurved, stout, distant (20 mm.), l. 3 x 1. 60 (Wheld. and Wils.).
- a. **laxifolium** W. Tall (25—40 cm.). Br. remote, small indistinct pores only in mid-cell on outer side, near border of lower part of leaf; l. of defl. br. w. large ringless pores in n. all angles, and on outer side near border.
- b. **pseudo-Lindbergii** W. Above clear yellow-brown, br. dense, l. not or slightly undul., with v. numerous small pores on both sides.
- c. **aquaticum** W. Smaller. Br. elongate, remote, slender, falcate; l. closely appressed with recurved r. undulate points. Pores as in preceding. 59 (Wheldon).
- d. **teres** W. Br. terete, densely leaved; l. not or weakly und. with point alone recurved. Pores as in b. 59 (Wheldon).
- b. **pulchrum** H. Lindb. Gracile, above yellow-green, below bleached (16 cm.). Capit. small, subglobose, st. epid. incomplete, br. distant, slender (18 mm.), recurved; l. strongly undul. and points recurved. Pores uniform or mixed, with occasional ringed pores in lateral cell angles.
- c. **fuscescens** C. Jens. Stout, brownish, capit. small, st. epid. in 2—3 layers; br. close, shortly pointed; l. subsecund, broad, not undul., v. small scatt. pores in mid-cell and small ones in angles, with ringed pores in series on commiss. in upper part near margin.

- a. **tenellum** W. Habit of *S. recurvum*, w. pale brownish capit., flaccid, st. epid. in 2—4 distinct layers; l. small (1.6 × 0.5), subsec., hardly undul., pores v. small and ill-defined. 59 (Wheldon).
- e. **angustifolium** Russ. V. small, grey to yellow green, rigid (8—10 cm.). St. epid. in 2—4 distinct layers; st. l. small effibrese, margin dilated below; br. l. narrowly lanc. (1.3 × 0.4—0.5).
- f. **minimum** H. Lindb. Habit of *S. balticum*. Br. (5—8 mm.), falcate reflexed.
- g. **Winteri** W. Robust, lax (10 cm.), long branched, w. large capit.; br. long, grad. atten.; l. lax, widely lanceol., cells often all chlorophyllose above; pores in cell angles on both sides of l. near base.
- h. **plumosum** W. Robust, immersed, brownish, plumose; br. dense, divaric.; l. imbric., not undul., with v. few min. pores on both sides.
- i. **recurviforme** W. (v. *mollis* Jens.). Resembles a stout *S. recurvum*, loose soft tufts yellowish brown or above greenish, st. thick, yellowish; st. epid. in 2—3 distinct layers; br. l. 1.7 × 0.7, border narrow (2—3 rows), pores small, more or less num. on both sides of leaf mixed with smaller perforations, larger pores in angles of l. of deflexed br. near the border; st. l. 1 × 0.8—0.95, effibrese and border wider below. 59 (Wheldon).
- 24 **S. Dusenii** C. Jens. (1888), ap. W. (1903) (*S. cuspid.* v. *majus* Russ. p.p. v. *Pickii* Aust., *S. majus* C. Jens.) Pores distinct, larger. Chlor. cells trapezoid, free on both sides. St. cortex in 2-3 distinct layers.
- a. **majus** Jens. Robust, rigid (30—40 cm.), capit. small, br. patent, l. (5—6 mm.), hardly undulate, on inside w. sml. ringed pores in cell angles, on outside v. few, or many, chiefly in angles.
- b. **plumosum** W. Submersed, v. robust (20—30 cm.), pale like a plumose *S. cuspidatum* soft, capit. small. Br. remote, spreading, the weaker ones obliquely deflexed from stem. L. 5—6 mm. long.
- c. **leptocladum** W. Stout, grey-green; br. remote, 2 spreading (2.5 mm.), attenuate pointed, falcate-deflexed, weaker appressed to stem; l. 3 × 1, points recurved, undulate, on inside w. small ring-pores; on outside, usu. 2-ranked near base.
- d. **falcatum** Jens. Stout, brownish, soft, capit. dense; l. imbric, strongly undul. falcate secund.; on inside nearly poreless, on outside numerous unringed pores 2-ranked near commissures.
- e. **deflexum** Jens. Lax tufts (25 cm.), green below, brown in dense globular capit., rigid; br. deflexed; l. undul. not secund, with ringed pores in cell-angles; on outside often in one unbroken row in mid-cell or in angles; l. in capit. squarrose.

- f. **macrocephalum** W. Stately as *S. riparium*. Capit. large, br. stout, falcate; l. not or slightly undul., not secund (3×1); on inside nearly poreless; outside with pores below in 2 series, above in one row in mid-oell.
- g. **crispulum** W. Elegant, rigid (5 cm.), st. l. dimorph., upper triang.-lingulate, w. border wider below; lower and mid ones from narrow base, broadly lanceol. bord. uniform; br. l. $1.4-1.5 \times 0.5$, on outside w. many small pores in mid-cell.
- 25 **S. Vogesiacum** W. (1911). Pores small. St. cortex indistinguishable. Chlor. cells broadly trapezoid, free on both sides. A small grey-green sp. resemb. *S. amblyphyllum* v. *parvifolium*. Br. l. half size of sp. 24. St. l. small triang. lingulate, border dilated below. Occurs in France (Vosges).
2. True pores few on exterior side of branch leaves.
- a. St. l. usu. effibrose, br. l. entire.
- 26 **S. amblyphyllum** Russ. (*pseudo-cuspidatum* Roth., *S. pseudo-recurvum* Röll., *S. ligulatum* Röll.) E.S.I. 3 (Larter), 5 (Watson), 27 (Burrell), 38 (Rhodes), 63 (Armitage), 71 (Wheldon and Hartley). I. 1 (Gasking).
- a. **macrophyllum** W. Tufts deep, loose, very robust; br. long, falc.-reflexed; l. $1.5-1.8 \times 0.5-0.7$, undulate.
- a. *silvestre* W. Grey-green, capit. large, br. 2.5 cm. long; l. grad. acuminate.
- b. *breviapiculatum* W. Green or luteo-fusc. L. suddenly apiculate-acumin.
- b. **mesophyllum** W. Smaller. L. $1.2-1.4 \times 0.3-0.5$. 60 (Wils. and Wheld.).
- a. *sylvaticum* Russ. Grey-green, br. grad. atten. arcuate-recurved, l. undulate (more or less). 59 (Wheldon), 62, 64, 66 (Ingham), 70 (Wils. and Wheld.), I. 1 (Gasking).
- subf. *imbricatum* W. Br. terete, l. recurved at points only, not undul. 17 (Horrell), 66 (Jones and Horrell).
- b. *molle* Russ. Yellow to fuscous-green, very tall and soft. Br. l. undulate. 4 (Briggs), 60 (Wilson), 62 (Ingham), 71 (Wheld. and Hartley), 96 (Wils. and Wheld.).
- c. *albescens* W. Pale or whitish green (6–15 cm.), st. l. fibrose above, br. l. sl. undulate. 17 (Horrell), 59 (Wheldon).
- d. *Renaudii* W. Compact (5–6 cm.), yellowish above, st. l. small (0.6–0.7), fibr. above, narrowly triang.-lingul; br. close; l. sc. undulate, loosely imbric.
- c. **parvifolium** W. (*S. brevitfolium* Röll. *S. parvifolium* W.). Smaller, gracile, occ. subrigid and brittle. St. l. $0.45-0.8$ long, and occ. as wide or even wider. Br. l. lanceol., $0.8-1.2 \times 0.3-0.4$, sc. undulate, oft. subsecund; near apex on outside with sm. imperfectly ringed pores occ. in short rows on commis., those of deflexed br. with occ. mixed pores. 27 (Burrell), 59 (Healey), 96 (Wils. and Wheld.).

- a. *tenui* W. Resemb. *S. quinquef.* or *Warnstorffii*, green, yellowish or in capit. brownish, rigid. L. sc. undul. (0.8—1.2 × 0.3—0.4), appressed with apices recurved. Pores solit. in angles, more rarely a few in short rows on commiss. above. 59 (Wheldon), 63 (Jones and Horrell), 71 (Wheld. and Hartley).
1. *capitatum* W. Capit. dense, subrotund. 62 (Ingham), 88, 96 (Wheld. and Wils.).
2. *brachycladum* W. Br. short, divaricate. 62 (Ingham).
3. *crispulum* W. L. densely imbric, crisped in capitulum.
- b. *Warnstorffii* W. (*S. recurvum* v. *Warnstorffii* Jens.). Resemb. weak *S. recurvum*. Bright green to pale brown, or reddish above (20 cm.). Br. l. undul. recurved. 58 (Wheldon), 62 (Ingham).
- c. *Inghami* Wheldon (*S. parvifolium* var *Inghami* Wheld. MS.). Cæspites mollissimi, laxi, sursum plerumque sublutei, deorsum pallidi. Planta gracilis, 10 cm. alta. Fasciculi ramorum subremoti, rami expansi tenues. Folia ramulina sicca plus minusve undulata, apicibus recurvatis, poris minutis in cellularum angulis et nonnunquam in series breves ad commissuris dispositis. Folia caulina distincte longiora quam lata, nonnunquam plus minusve sursum parce pseudofibrosa. Goathland (62), Ingham (1908).

b. Stem l. usually fibrose.

* Branch l. serrate on margin above.

- [27 **S. trinitense** C. Mull. (1849) (Non Warnst. et Horrell in "The Europ. Sphagn."). America. Not European.]

** Branch leaves w. entire margin.

† Border of st. l. not or but little dilated below, chl. cells of br. l. triangular, enclosed on inside of leaf.

- 28 **S. balticum** Russ. (1889), (*S. recurvum* v. *brevifolium* Lindb. ap. Braithw., *S. livonicum* Roth.) 107 (Lillie).
a. *livonicum* Russ. Robust, yellowish-brown. Br. remote (15 mm.), l. on outside above w. many sml. ringed pores in cell ang., below w. 1 or more large unringed pores in upper part of cell.
b. **polyporum** W. Resembles a, but w. pores in rows on commissures.
c. **dasycladum** W. V. dense, yellowish-brown, br. dense, short, terete, l. not undul. usu. few-pored, secund.
a. *robustum* W. Robust, subfuscous. L. border truncately dilated below.
b. *elegans* W. Slender, neat, brown, dense tufts; l. often secund.
c. *homocladum* W. With short stout erect-patent br.
d. *anocladum* W. With short ascending br.
e. *compactum* W. Compact (3—5 cm.), l. densely imbric., secund, not undul.
f. *teres* W. Dense tufts, ding. yellow-green; br. erect-pat. terete; pores v. many on outside of l.
d. **delicatulum** W. Small, tender, size of *S. molluscum*. Br. dist., flagellate. L. secund, asymmetric. Br. (4-5mm.), r. distant.

- †† Border of st. l. strongly dilated below. Chlor. cells as in preceding.
- 29 **S. ruppinense** W. (1908). Resemb. *S. Dusenii* or *cuspidatum*. St. epid. in 2-3 distinct layers. St. l. equilat.-triang to triang.-lingulate. Br. l. strongly undul., twisted, broadly bordered. Pores on outside partly in cell-angles, and partly in short rows on commissures. Central Europe and Atlantic North America.

Subseries IV.—TRIANGULARIA.

St. l. triangular, apex acuminate or truncate and dentic; fibrose or effibrose.
a. St. l. usu. equilateral-triang. Chl. cells of br. l. triang., enclosed on inner side.

1. Hyaline cells united for a short distance where they meet on inner side.

- 30 **S. Torreyanum** Sulliv. (1849). E.

- 31 **S. pulchrum** W. (1900.) (*S. laricinum* Schimp. (non Spruce). *S. interm.* v. *pulchrum* Lindb. ap. Braithw.). E.S.I. 1 (Ley), 5 (Watson).

- a. **fuscoflavens** W. Entirely bright pale yellowish-brown, l. not undul. 58 (Hunt).

- a. *brachyhomalocladium* W. Br. dense, short, divaric; l. imbricate. 40 (Boswell), 59 (Hunt), 60 (Wils. and Wheld.), 62 (Ingham), I. 38 (Lett).

- b. *brachyanocladium* W. Br. short, ascending. 60 (Wilson).

- c. *tenue* W. Gracile, slender, elong. Br. remote, l. quinquef., subsecund., not undul.

- b. **sordido-fuscum** W. Robust, fuscous and grey-green; l. m. or l. undul. 60 (Wils. and Wheld.).

- b. f. *hydropphyllum* W. Robust (30—40 cm.), submerged.

- c. **virescens** W. Above grey to yellow-green, below pale or fuscous; l. strongly undul. 60 (Wils. and Wheld.).

- a. *undulatum* W. V. robust, br. m. or l. remote, l. strongly undul.

- b. *teres* W. Slender, br. close, terete.

- 32 **S. ripariooides** W. (1908.) (*S. recurvum* v. *mucronatum* f. *ripariooides* W. in litt.). E. Robust as *S. riparium*. St. l. minute, equilat.-triang. (0·85-0·9), effibrose. Br. l. on inside w. pores nearly 0, on outside w. minute pores in upp. and low. cell angles only (2 x 0·7-0·8). Br. 2 spreading (3cm. long) and 3 deflexed. St. epid. in 1-2 well-defined layers. 58 (Holt, teste Warnstorff).

- 33 **S. recurvum** P. de Beauv (1805.) (*S. intermedium* Hoff., *S. mucronatum* Russ., *S. recurvum* v. *mucronatum* W.). E.S.I. St. l. triang. (about equilateral), apiculate, 0·6-1·14 long. Br. l. 1-2·9 x 0·3-0·9, on the outside always pauci-porose. St. epid. in 2-4 indistinct layers, or appar. absent. 2 (Smitham), 18 (Chittenden), 27 (Burrell), 34 (Elliott), 37 (Armitage), 38 (Rhodes), 46 (Sherrin), 63 (Crossland), 71 (Hartley and Wheld.), 75 (Armitage), 96 (Wils. and Wheld.).

- a. **robustum** Breidl. Resemb. *S. riparium* or *S. obtusum*, greenish or yellowish. St. epid. usu. distinct., st l. effibrose and aporose, br. l. 1·6-3 x 0·5-1·2, m. or l. undulate.

- a. *strictifolium* W. Resemb. stout *S. cuspid* v. *submersum*. Br. crowded, arcuate or reflexed; l. appr. sub-tubular above, rigid, not undul. (2-3 x 0·6).

- b. *longifolium* W. Grey-green; br. r. distant, long, atten., arcuate-, recurved, l. elong-lanc., subtubular above, weakly undul. border of 2-4 cells ($2-2.5 \times 0.4-0.5$). 58 (Holt), 59 (Wheldon and Travis).
- c. *nigrescens* W. Subm.; capit. dull smoky green to blackish (15-20 cm.), st. epid. app. absent; br. remote, falc.-reflexed; l. broadly lanc., smaller, m. or l. undul. recurved ($1.6-2 \times 0.6$).
- d. *latifolium* W. Grey or grass-green, or yellow-brown in large capitulum, in loose deep tufts; br. stout, dist. or closer, falc.-recurved; l. broadly lanc. inflexed at margin near apex only, undulate ($1.7-3 \times 0.8-1.14$). 58 (Whitehead).
- e. *Limprichtii* W. Robust as *S. riparium*, grey-green or yellow-brown; br. remote (2-3 cm.), l. undulate, or w. base closely imbric and pt. recurved ($1.7-2.5 \times 0.5-0.9$).
- f. *fuscescens* W. Capit. brunnescens, subrigid. Br. atten., divaric. or deflexed (1-2 cm.), br. l. lanceol, usu. strongly undul. ($1.7-2.3 \times 0.5-0.6$).
- g. *densum* W. Very compact, above yellow fuscous (5-6 cm.); br. l. narr. lanceol. with elegantly recurved points ($1.7-2 \times 0.4-0.5$).
- h. **majus** Angstr. p.p. Distinctly weaker than a. Lax grey-grass green, brownish in capit. Br. l. $1.4-1.6 \times 0.4-0.6$, usu. distinctly undul. 69 (Stabler).
- a. *silvaticum* Russ. Entirely green Br. elong., distant, falc-recurved or reflexed. 17 (Horrell), 48 (Jones), 58, 59, 65 (Wheldon), 62 (Ingham), 60, 69, 70 (Wils. and Wheldon), 71 (H. Wheldon), 84 (Adam), 88 (Wils. and Wheldon).
- subf. *deflexum* W. Shorter (10 cm.), with long slender br. deflexed immmed. under capit. 51 (Dallman), 58 (Wheldon), 60 (Wilson), 62 (Wheldon), 66 (Ingham).
- b. *pulchellum* W. Stouter, bright pale brown above; l. strongly undul.; pores uniform in l. of both kinds of br. 5 (Briggs), 60 (Wilson).
- c. *subundulatum* W. Elegant, pale yellowish, st. epid. only partly distinct, br. terete, l. not or sl. undul., pts. recurved. 48 (Jones and Horrell), 60 (Wheldon), 66 (Ingham) 78 (Adam).
- d. *sphaerocephalum* W. Elegant, slender, yellowish (20 cm.), capit. dense rotundate, st. epid. of 2-4 distinct rings, br. dist. slender, falc., l. undul., recurved, in capit. squarrose; pores in l. of defl. br. always larger. 111 (Grant).
- e. *immersum* W. Elong. rigid, plumose (50 cm.), st. epid. indistinct; br. remote, spreading (10-14 mm.). L. sc. or not undulate, erect-patent ($1.6 \times 0.4-0.5$), st. l. r. obtuse.
- f. *hydropphyllum* W. Grey-green, lax (40-50 cm.), st. l. acumin. effibrose, br. v. remote; l. narr. lanceol., slightly undul., lax ($1.3-1.4 \times 0.4-0.5$). 62 (Ingham).
- g. **parvulum** W. Much more slender, resemb. *S. amblyph.* v. *parvifolium*, st. epid. O. or incompl., st. l. usu. equilat.-triang. effibrose $0.7-0.8$ long; br. l. narr. lanc. ($1-1.3 \times 0.3-0.4$).
- a. *viride* W. Tufts lax, green above, br. distant, slender, arcuate-reflexed. 51 (H. Wheldon), 58 (Whitehead), 59 (Wheldon), 60 (Wheldon and Wils.), 62, 63 (Ingham), 69 (Wils. and Wheldon).
- b. *pallens* W. Yellowish above, in looser tufts. 5 (Watson), 45 (Brinkman), 58 (Wheldon), 60 (Wilson), 65 (Ingham), 71 (Wheldon and Hartley), 88 (Wils. and Wheldon).
- c. *flavescens* W. Pale brownish yellow above. 60 (Wils. and Wheldon), 62, 63 (Ingham), 69 (Wils. and Wheldon).
- subf. *densum* W. V. compact (4-6 cm.), capit. dense, roundish, st. epid. in 2-4 distinct rings; br. crowded, defl. or recurved (10-12 mm.), l. not or sc. undul. 60 (Wils. and Wheldon), 69 (Dreesen).
- d. *demergens* W. Submerged, tender, green, like a weak *S. cuspid* v. *submersum*, st. epid. app. O. Br. distant, divaric or falc.-recurved (4-8 mm.), stem l acute or bluntnish.

- b. St. l. equilat. to isose. triangular. Chlor. cells triang. or trapezoid, enclosed on inner, or free on both sides of leaf.

* Br. l. serrate on margin, chl. cells trapezoid in sect.

- 34 [**S. serratum** Aust. (1877) (*S. trinitense* W. et Horrell, in *The Europ. Sphagna*; non C. Müll.) Habit of *S. cuspid.* v. *plumosum*. St. epid. in 2-3 distinct rings. Br. l. narr. or widely lin.-lanc., border wide, both sides nearly aporose.] *

- b. **serrulatum** W. (*S. cuspid.* v. *serrulatum* Schlieph.). Robust, flaccid, often isophyllous, st. epid. appar. O. L. lin.-lanc., with long awn-like acumen (2—8 × 0.4—0.5), tubular or flat above, patent, serrate, oft. chlorophyllose cells only above. 5 (Watson), 17 (Cocks), 38 (Rhodes), 58 (Holt), 59 (Wheldon), 63 (Crossland), 66 (Ingham), 60, 69 (Wils. and Wheld.).

** Branch l. with entire margins.

†Chlor. cells triang., enclosed on inner side of l., st. epid. indistinctly defined.

- 35 **S. fallax** v. Klinggr. (1880), emend W. (1900), (*S. cuspid.* v. *Roelli* Schlieph., *S. Roelli* Roth., *S. cuspid.* x *recurvum* W., *S. pseudo-recurvum* Röhl, *S. cuspid.* Roll. nee Ehrh.). E. This species resembles *S. recurvum* in form and structure of branch leaves, and *S. cuspidatum* in size and structure of stem leaves.

Pores on spr. and defl. br. l. uniform.

- a. **laxifolium** W. Resemb. robust *S. cuspid.*, st. l. shortly acumin. fibrose above, border not dil. below. Br. remote, l. 1.7—2 × 0.7—0.8. 38 (Rhodes).
- b. **plumosum** W. Green, robust, plumose, soft (15—25 cm.), st. l. w. bord. dilated below. Br. elong. lax, l. 3—4 × 1, sl. concave, not undul., a minute pore in each upper cell ang. on both sides.
- c. **microphyllum** W. Resemb. *S. recurvum*. st. l. suddenly shortly acumin. 1—1.4 × 0.6—0.8, bord. sc. dil. below; br. l. 1.4—1.5 × 0.6—0.8.
- d. **Roellii** W. V. robust, st. l. (1—1.14 × 0.8—0.9), sometimes fr. base grad. wider above, then sudd. ending in a long channelled acumen, when they meas. 1.7—2.3 × 0.6—0.8; br. l. very large (2—3 × 0.7—1), border in 4—6 rows. 59 (Holt).

Pores in defl. br. larger and more numerous than in spr. br., and often several together in cell-angles on both sides of leaf.

- e. **gracile** W. Slender st. l. sudd. shortly acumin., bord. sc. dil. below; br. l. 1.4 × 0.5 (the original *S. fallax* Klinggr!).

- f. **robustum** W. Resemb. *S. obtusum*. St. l. suddenly acumin., border m. or l. dilated below; br. l. $2-3 \times 0.7-0.9$; l. undul. 17 (Sherrin), 59 (Holt).
- f. *strictifolium* W. L. not undulate, rigidly erect-patent.
- g. **latifolium** W. Robust, green, st. l. as in e. Br. suddenly shortly acumin., l. $1.7-2 \times 1.14-1.3$. Chlor. cells trapez. free on both sides.
- h. **saxoniense** W. Green above (16 cm.), Bord. uniform; br. l. $1.7-1.8 \times 0.6-0.8$, border narrow.
- i. **Schultzii** W. (*S. Schultzii* W.). Like a pale soft *S. recurvum*. Br. l. above with minute perfor. both sides, and rarer ringed pores in cell-angles; on outside with many larger unringed pores on commissures on deflexed br. l. w. many large unringed pores, st. l. $1.4-1.7 \times 0.6$ or sl. smaller.
 - a. *polyphyllum* W. V. small, dense, low. Br. close, l. $1-1.4 \times 0.3-0.4$, st. l. suddenly long, or short acumin. $0.5-0.9 \times 0.4-0.6$, bord. wider below.
 - 2. *fibrosum* W. St. l. broader $0.8-0.9 \times 0.5-0.6$, inside w. large ringless pores; br. l. inside w. large ringless pores, outside w. many mixed pores.
 - 3. *alandicum* W. Soft, dense tufts; st. epid. 1-layered, st. l. porose on outside; br. l. (1×0.3) w. sml. perfor. in upper and lower cell ang. on both sides.

†† Chlor. cells trapezoid, free on both sides of leaf, st. epid. in 2-3 distinct layers.

- 36 **S. cuspidatum** Ehrh. (1791), emend. E.S.I. I. 10 (Lett), 11, 12, 14, 25, 26, 28 (Tetley), 30 (Lett), 35 (Hunter), 36 (Stewart).
- a. **falcatum** Russ. Very variable, br. usu. falcate, l. more or less distinctly falcate-secund. 2 (Smetham), I. 11, 13, 17 (Tetley), 20 (Moore), 29 (Tetley), 30 (M'Ardle), 32 (Kane), 33, 38 (Lett),
 - a. *molle* W. Soft, l. crisped below, recurved above, lax. 62 (Ingham), 66 (Jones and Horrell), 71 (Wheld. and Hartley), 110 (Gibson), 111 (Grant), I. 18 (Lett).
 - 1. *polyphyllum* W. Tufts dense (10 cm.), br. 3-5, n. uniform or 1-2 weaker, deflexed (10-15 mm.); l. $2-3 \times 0.3$, border of 6-8 cells; st. l. ($1.2 \times 0.5-0.6$) numerous, broad, and w. broad border strongly widened below.
 - 2. *urycladum* W. Lax (15-20 cm.), br. remote (15-20 mm.), arcuate-falcate; l. $2-2.5 \times 0.3$, bord. wide, st. l. $1-1.14 \times 0.7$, oft. effrose, border wider below. 62 (Ingham and Bellerby).
 - 3. *tenellum* W. Slender, sub-compact (5-7 cm.); br. 3, arc-falcate (10-12 mm.), l. $1.7-3 \times 0.3$, bord. narrow, strongly secund-falcate, st. l. $1.4 \times 0.4-0.5$, bord. strongly dil. below. 110 (Lewis).
 - 4. *hypnoides* W. Soft, densely overlapping (4-6 cm.) with habit of *Hyp. uncinatum*, unbranched, or w. shrt branchlets, capitula absent, st. and br. l. uniform 1.3-1.5 long, bord. in 3-4 rows.
 - 5. *capitatum* Wheldon. Planta parva (3-6 cm. alta). Ramis superioribus in capitulum terminalem subglobosum dense aggregatis inferioribus plerumque laxe dispositis. 111 (Grant), I. 1 (Gasking).

- b. rigidum* W. Rigid, l. closely imbricate, not crisped, only the points recurved, capit. br. terete.
1. *pumilum* Grav. V. small, compact (1—2 cm.), br. thick, l. unsymmetric, v. narrow, lanc. 1.6—1.9 × 0.2—0.3, bord. narrow; st. l. narrowly lanc. or isosec.-triang. 1—1.14 × 0.4—0.5.
 2. *pungens* Grav. Stronger (8—12 cm.), br. distant, in capit. falcate-curved, terete and spiniform, l. 1.14 × 0.6—0.7, narr. lanceol., border narrow. 60 (Wils. and Wheld.), 61 (Ingham), 66 (Horrell), 88, 96 (Wils. and Wheld.), 111 (Grant).
 3. *gracile* W. Lax, grey-green, bleached below (20 cm.), capit. small, br. v. dist., 2 stronger, falcate-reflexed (20 mm.), attenuate, l. lanc., erect-arcuate and partly secund-falc., not undul. (2—0.5), border narrow. 61 (Ingham), 62 (Wheldon), 88 (Wils. and Wheld.), 110 (Gibson).
 4. *robustum* W. Stout (20 cm.), capit. large, br. r. dist., 2 stronger falcate-reflexed, thicker (15—20 mm.), l. broadly lanc. falcate secund, not undul. 2—3 × 0.6. 60 (Wheldon).
 5. *aquaticum* W. Immersed (20—30 cm. or more), capit. indistinct, br. dense, divaric and apices falc. or recurved from base (8—12 mm.), l. narr. lanceol (2—3 × 0.3—0.4), bord. wide, subsec.-falcate, m. or l. undulate. 45 (Ley).
- c. submersum* Schimp. Dull green to brownish (in capit.), soft or subrigid. Fas. usu. 4-branched, 2 spread or recurved, and 2 obliquely deflexed. St. l. not secund-falcate, usu. not undulate. 25 (Tetley), 37 (Armitage), 83 (McAndrew), I. 1 (Lett).
- a. crispatum* W. Br. l. closely crisped. 60 (Wilson), 66 (Horrell), 92 (Gasking), 111 (Grant).
- subf. *pallens* W. Pale, very soft (15—20 cm.), capit. large, br. distant, l. ovate-lanc., st. l. oft. effibrose. 60 (Wheld. and Wils.).
- b. rigescens* W. Br. l. rigid, not undulate 5 (Briggs), 40 (Armitage), 51 (Wheldon and Dallman), 58 (Whitehead), 60 (Wils. and Wheld.), 61 (Ingham), 62 (Wheldon), 66 (Jones and Horrell), 96 (Wils. and Wheld.), 1.1 (Gasking).
1. *robustum* W. V. robust, capit. large, br. l. 2—3 × 0.5—0.7. 40 (Armitage), 59 (Wheldon), 60 (Wilson), 61 (Ingham), I. 37 (Lett), 38 (Waddell).
 2. *subtilis* W. Smaller, tender (10 cm.), capit. smaller, br. dist., 1 deflexed, 2 spread, falcate-reflexed. L. 1.4×0.6, bord. uniform. 59 (Wheldon), 61 (Ingham), 84 (Adam).
 3. *densum* Ingh. and Wheld. Caules graciles, ramis brevis, divaricatisque superioribus compakte incumbentis. Widdy Bank 66 (Ingham), 60 (Wheldon).
- d. plumosum* Schimp. Submerged, light or dk. green, plumose; br. l. more or less lanceolate-awned (2.5—5 × 0.5—0.7), erect-patent, not or indistinctly undul. 63 (Gibson), I. 14, 26, 28 (Tetley).
- a. remotum* W. Br. remote, elongate. 8 (Livens), 5 (Briggs), 17 (Sherrin), 58 (Holt), 60 (Wheld. and Wils.).
- b. densum* W. Br. crowded. 60 (Wilson), 61, 65 (Wheldon).
- e. plumulosum* Schimp. Very soft. Fas. br. 2—3, short, uniform, l. 1.5—2.5 × 0.3—0.4, usu. undulate. 63 (Crossland).
- a. filiforme* W. St. filiform, weak (8—12 cm.), capit. minute, br. remote (6—8 m.).
- b. densissimum* W. Tufts dense (3—8 cm.), br. dense, divaric (6—9 mm.), l. more or less undul. (2 × 0.3), narrowly lanceolate. Kent (Cocks), Wales (Ley).

Subseries 5.—AEQUIFOLIA.

St. and b. l. similar, multifibrose, and almost aporose.

- 37 **S. monocladum** W. Robust, resembling a *Harpidium*.
Br. oft. cauliform, very long. l. very large (4-5 x 1-2).
Chlor. cells rectang. free on both sides.

Series II.—OVALIA W.

- 38 **S. molluscum** Bruch. (1825) (*S. tenellum* Lindb.). E.S.I.
l. 14, 26, 28 (Tetley), 30 (Lett), 32 (Bingham), 36 (Stewart).
- c. **hydropphyllum** Wv. Grey-green, robust, aquatic; st. l. v. large 1.4—2 x 0.8—0.9, alm. triang.-lanc., border much widened below. Br. l. 1.6—0.8, lax, ovate-lanceolate.
 - b. **angustifolium** W. Dense low cushions, st. l. inconspic., triang. to triang.-lingul 1.14—1.3 x 0.3—0.4; border n. uniform; br. 1—2, short, l. 0.9—1 x 0.4.
 - a. *falcatum* Jens. Comal. br. v. compact, acute, arcuate-falc.
 - b. *rufescens* W. V. compact (3—4 cm.), capit. red-brown, br. 1—2 shorter and thicker, acute, st. l. small, bord. wider below, oval to oval lingul., epid. of st. orange.
 - c. **confertulum** Card. V. small and compact (4—7 cm.), st. l. small, from narr. base oval to lingul (0.7—0.9 x 0.3—0.4), border wider below; br. dense, short, suberect; l. longly ovate, size of st. l.
 - d. **Brebissonii** Husn (f. *simplex* Breidl.). Compact (3—7 cm.), st. simple, with retort cells and gen. branch structure, or w. sparse, thin, short branchlets; l. broadly oval.
 - e. **vulgatum** W. Mod. stout, or slender; br. 2—4, st. l. broadly triang. to oval or lingulate, 1—1.3 x 0.5—0.6, bord. widened below.
 - a. *immersum* Schp. Submersed (20—30 cm.), br. 2, distant, elong.
 - b. *robustum* W. Robust, br. 3—4, remote, primary br. again. br. above base. 18-19 (Chittenden), 58 (Wheldon), 62 (Ingham), 60-69 (Wils. and Wheld.), 111 (Grant).
 - c. *compactum* W. Compact, br. 2—3, crowded. 1 (Roberts), 34 (Knight), 58 (Wheldon), 59 (Marrat), 60-69 (Wils. and Wheld.), 61-62 (Wheldon), 65 (Barnes), 66 (Ingham), 83 (McAndrew), 88-94 (Wils. and Wheld.), 95 (Macvicar), 101 (McAndrew), I. 39 (Lett).
 - d. *gracile* W. V. slender, br. v. remote, short, blunt, leaves lax. 94 (Wilson and Wheldon).
 - f. **suberecta** (Grav.). Often with simple stems intermixed; br. suberect, their leaves smaller than the stem leaves.

Subsection VII.—SUBSECUNDA Schlieph.

Series I.—APOROSA. L. without pores.

- 39 **S. Pylaiei** Brid. (1825). Sep. from some forms of *S. obesum* by the leaves having a hyaline border, often wider upwards.
- a. **sedoides** Lindb. A small subsimple (4—12 cm.) plant, br. hardly (when present) exceeding the leaves; apices of st. l. rounded-cucullate.
 - b. **ramosum** W. More robust, br. more numerous (5 mm. long). America.

Series II.—POROSA. Br. l. always porose.

Subseries I.—PAUCIPOROSA W.

Br. l. on both sides with few pores.

1. Hyalodermis in 1 layer. Chlor. cells rectang. or orbiforme.

- 40 **S. Holtii** W. E. Gracile, submersed, resembling *S. inundatum*. St. l. triang.-lingul. $0.9-1.14 \times 0.8-0.9$. Efibrose or fibrose in upper part, often simply septate. Br. l. $1.7-2.7$ long on both sides with pores only in upp. and low. cell. angles or with others on commissures on the outside near margin in lower half of leaf. 58 (Holt), 60 (Wils. and Wheldon).

- a. **subcrispulum** W. Leaves crisped. 58 (Holt).

- 41 **S. obesum** W (*S. contortum* v. *obesum* Wils. *S. turgidum* Röll p.p.). E.L. St. l. ovate or oblong-ovate $1.7-2.7 \times 1.14-1.4$ multifibrose. Br. l. $3.5 \times 1.4-1.7$. 17 (Cocks), 37 (Rhodes), 60 (Wils. and Wheld.), 62 (Spruce), 63 (Leyland), 71 (Hunter), 109 (Lillie). I. 14, 17, 26, 30, 33 (Tetley), 21 (Hutton), 35 (Glover), 40 (Lett).

- a. **plumosum** W. Immersed, green, lax, plumose (10—30 cm.); br. l. v. wide ($4-6 \times 2.5-3$), nearly aporose. 60 (Wils. and Wheld.), 69 (Stabler), 70 (Wils. and Wheld.).

- b. **versicolor** W. Robust, rufous brown with green intermixed.

- c. **perlaxum** W. V. lax, green. Br. 25—30 mm., l. lax, aporose ($2-2.6 \times 1.14-1.4$).

- b. **luxurians** W. V. robust, sordid green, floating, divided (10—15 cm.), br. stout (20—25 mm.), grad. acuminate, l. widely ovate-lanc. ($5-6 \times 2-2.5$). 63 (Wheldon).

- a. **versicolor** W. Above sanguineous, below green.

- c. **natans** W. Olive-green, floating, st. thick, usu. divided (4—6 cm.); br. thick 2—3 (8—10 mm.), l. widely oblong-lanc. ($5-6 \times 2-2.5$), oft. nearly aporose.

- d. **insolitum** Card. V. lax, green, floating (5—10 cm.), st. slender, usu. divided, br. solit., st. l. widely cordiform ($4-5 \times 3$), hyal. cells narrow, oft. efibrose and aporose, br. l. subsimilar, wide ovate lanc. ($4-5 \times 1.5-2$).

- b. **versicolor** W. Rufescens and virescent (10—15 cm.). Br. 1—2 in fascic.

- c. **parvifolium** Wheldon. Planta submersa (5—10 cm.), ramis fasciculorum saepe 2, laxe dispositis, folia saturate viridia, laxissime patentia, minora (2 mm. longa), cellulis aut aporosis aut poris perpaucis. 59 (Wheldon).

- e. **teretiramosa** W. Robust, paludal, cæspitose, versicolorous (5—15 cm.), st. l. triang. to lingulate ($1.5-1.8 \times 1$). Hyal. cells oft. septate, inside alm. aporose, outside with minute pores in angles and on commiss. Br. dense 3—5, subrapuliform. L. $2 \times 1.4-1.5$, pores as in st. l.

- b. **magnifolium** W. More robust, compact, rufescent. Br. l. $4-6 \times 2-3$.

- c. **pumilum** W. L. equal on stem and br. ($3-4 \times 2-2.5$), pauciporous both sides, st. only 2—3 cm. long.

- f. **sanguineum** W. Lax, robust, sanguin. red above, pallid below, stout (15 cm.). Br. 2—3, grad-acumin ($15-20$ mm.), shorter, thicker, and very dense-leaved in capit. Br. l. as in a. and b. 60 (Wils. and Wheld.).

- g. **mastigocladum** W. Immersed, v. robust, versicolorous (15—20 cm.), br. 2—3, thick, turgid, obtuse or v. shortly pointed, crowded, not incurved (10—15 mm.); l. 5—6 × 2—2.5, both sides pauciporose.
- f. *nigroviolaceum* W. Capit. indistinct, nigroviolac. above, ochraceous below.
- h. **macrocephalum** W. Submersed, pallid above, fuscous-black below (10—15 cm.), capit. large, br. close, upper much longer. Br. l. 4 × 2, with pseudopores on outside in series on commiss.; st. l. 1.7—1.8 × 1.
- i. **brachycladum** W. Submersed, grey-green above, ochrac. below (20 cm.), br. distant 2—3, short, thick, shortly acum. (5—8 mm.), l. 2—2.3 × 1.3—1.4, few-pored, rotund to elong.-ovate. 69-70 (Wils. and Wheld.).
- j. **monocladum** W. Very small, tufts dense, rufous bro. above (3—4 cm.), br. 1 v. short (3—5 mm.), rapuliform, st. l. spathulate, 2 × 0.6—0.7 (at base), br. l. 1.4—1.7 × 0.5—0.7, few-pored.
- k. **canoviridis** W. Submersed, densely tufted, grey-green (20 cm.), br. remote, grad. atten. l. 1.7—2 × 1.2, few-pored; st. l. w. pores in cell-angles and some on commiss. (1.4—2.3 × 0.9—1).
- b. *inæquabile* W. Immersed, lax (40—45 cm.), capit. v. small, br. l. dimorph. lower 2.3—3 × 1.4—1.9, both sides multiporose (as in *S. turgidum*), upper br. l. 1.4—1.9 × 1.14—1.3, both sides few-pored.
- c. *subfalcatum* W. Resemb. *S. rufescens*. Br. l. subsecund-falcate 3 × 1, both sides few-pored.
- l. **hemisophyllum** W. Submerged, glaucescent, laxly tufted (8—10 cm.), br. 2—3, remote, attenuate (15—20 mm.), br. l. few-pored (2—3 × 1.3); st. l. large 2—3 × 1.3—1.9, fibrose on inside with v. small pores in angles and on commiss. 60 (Wheldon).

Subseries II.—MULTIPOROSA Br. l. with many pores.

* Br. l. on inner side few, on outer side many-pored.

1. Hyalodermis in 1 layer.

a. Stem l. minute (0.5—1 × 0.3—0.6).

- 42 **S. subsecundum** Nees (1819) (*S. contortum* var. *subsecundum* Wils.) E.S. 3 (Larter), 34 (Knight), 71 (Wheld. and Hartley), 96 (Wils. and Wheld.), 111 (Grant).
- a. **pusillum** Schleph. V. small (5—10 cm.), br. dense or sub-distant 4—5, short (3—5 mm.), st. l. 0.3—0.5, usu. effibrose; br. l. 0.5—0.7 × 0.3—0.4.
 - f. *crispulum* W. Elong. but slender (15 cm.), subfuscous; br. r. dist., short; l. lax, crisped in capit.
 - b. **parvulum** W. Short, fuscous, dense (3—5 cm.); br. crowded, divaric, short (3—5 mm.), l. imbric (0.9—1 × 0.4—0.5), st. l. 0.7—0.8 × 0.4, hyal. cells oft. septate. 111 (Grant).

- c. **tenellum** W. Deeper tufts, lax and gracile, br. atten., l. asymmetric, laxly incumbent or patent, oft. falcate-secund ($0.7-1 \times 0.5-0.6$), st. l. $0.5-1 \times 0.5-0.6$, rarely septate. 60 (Wils. and Wheld.), 62-65 (Wheldon).
- b. *subfalcatum* W. Br. l. distinctly secund-subfalcate. 61 (Ingham), 69 (Wils. and Wheld.), 71 (Hartley and Wheld.).
- c. *imbricatum* W. Br. subterete, l. dense, incumbent. (60 (Wheldon), 69 (Wils. and Wheld.).
- d. *brachycladum* W. Gracile, green, yellowish or rufous-fusc. (20 cm.); br. close, short (4-5 mm.), lax-leaved. 28 (Burrell), 59 (Dearden), 94-96 (Wils. and Wheld.).
- e. *viridissimum* W. Elong., loose, weak, grey-green (15-20 cm.). Capit. small, br. dist., blunt, arcuate-recurved (10-12 mm.), l. of lower br. lanc., larger (1.14-1.4) than oval upper ones (0.7-0.8); st. l. 0.6-0.8, usu. fibrose above.
- d. **intermedium** W. More robust, br. l. usu. unequal $1-1.5 \times 0.8-1$; st. l. 1 mm. long, oft. fibrose above, with septate hyal. cells; br. usu. terete, st. l. (1 mm.), oft. fibrose and septate. 60 64 (Wils. and Wheld.), 88 (Wils. and Wheld.).
- b. *intortum* W. Grey-green (12 cm.), capit. br. terete and incurved, their l. dense, ovate ($0.9-1 \times 0.8$).
submersum W. Grey-green (15 cm.), capit. globular, br. remote, lower (15-20 mm.), attenuate, upper with smaller l.
- c. *dasycladum* W. Grey-green (5-6 cm.), br. crowded, short (5-8 mm.), acuminate.
- e. **lanceolatum** W. Submersed, gracile (15 cm.), br. 4-8 mm., attenuate, l. lax, unequal in upper br. ovate ($0.9-1$ long), in lower lanceol much larger and sub-tubular at apx (2.3×0.4); st. l. effibrose $0.5-0.6$ long and wide, usu. effibrose.
- a. *versicolor* W. Colour a mixture of red and green.
- b. *laxifolium* W. Grey-green, v. lax (20 cm.), capit. minute; br. distant, l. lax, erect-patent ($1.4-1.6 \times 0.7$); st. l. v. minute, effibrose and esepitate.
- c. *brevirameum* W. Grey-green, ochrac. below (5-8 cm.), br. dense, short (4-5 mm.). L. dimorphous, on lower br. smaller and narr. (1 x .4), on upper 1.7-1.8 x 0.8; st. l. 0.6-0.8 long, fibrose above
- d. *silvaticum* W. Green above, lax (4-5 cm.), br. r. close, arcuate-recurred (8-10 mm.), l. subsec.-falcate, narr. lanc. (1.14 x 0.4); st. l. 0.5-0.9 oft. fibrose above. 109 (Lillie).
- e. *bicolor* W. Grey-green, pallid red below (10-12 cm.), br. dense, atten. divaric (8-10 mm.), l. equal, secund or subfalcate. (1.7-1.9 x 0.6-0.8) Wood cylind. rufous.
- f. *humilis* W. Compact, yellow in capit. (3-5 cm.), br. cumulate, atten., arcuate-recurred, l. dense $1.14-1.2 \times 0.4-0.5$; st. l. fibrose above (0.7-1). 51 (Wheld. and Dallman), 60 (Wheld. and Wils.), 62 (Wheld. and Massee).
- f. **robustum** W. V. robust, resemb. large *S. rufescens* (30 cm.), br. remote, l. usu. lax, oft. dimorph. $2-3 \times 0.8-1$, st. l. minute, usu. fibrose above.
- a. *submersum* W. Submersed, lax, grey-green (30 cm.), capit. small, br. v. remote 3-4 (10-18 mm.), arc.-recurred, l. incumbent $1.4-1.7 \times 0.8-1$; st. l. 0.6-0.7.
- b. *fluitans* W. Immersed, green (20-25 cm.), capit. small, br. recurv. or divaric, attenuate (10-15 mm.), l. longly acumin., asymmetric, subsecund or subfalcate $1.4-1.7 \times 0.5-0.6$; st. l. 0.6-0.7 each way.
- c. *Bernetii* W. Immersed, sanguin, above, ochrac. below (15-20 cm.); br. closer, short (10 mm.), acumin.; l. $1.4-1.7 \times 1$; st. l. usu. effibrose ($0.5-0.9 \times 0.5-0.6$), septate.

- d. *diversifolium* W. Submersed, grey-green (15 cm.), br. dist., attenuate, reflexed (10–15 mm.), l. dimorph., lower v. large (to 3×1.14), upper smaller (1.6 long); st. l. septate, fibrose or efbrose, 0.6–0.8 long.
- e. *decipiens* W. Stout, grey or yellowish (15 cm.), capit. dense rotund; st. l. variable, efbrose or fibreose, larger or smaller (on same stem); br. l. oval, sudd. pointed, secund-inclined $1.3-1.6 \times 0.7-1$.
- b. Stem l. larger ($1-2 \times 0.5-1$).
- † St. l. many-pored on both sides; narr. triangular lingulate ($1-1.3 \times 0.5-0.6$). Hyaloderm cells in sect. ellipt. and strongly incrassate, chlor. cells trapezoid or almost triang. in sect.
- 43 **S. hercynicum** W. (1911). Pallid (3-5cm.). Wood cyl. rufous-fuscous. Br. 3-5 slender v. dense, atten. 5-8mm. L. asymmetric, subfalc-secund ($1.3-1.4 \times 0.6-0.7$), on outside w. many pores in dense rows on commiss., or 1 or more in mid-cell; on inside w. few pores. Central Europe.
- †† St. l. on inner or both sides many-pored. Hyaloderm cells subcircular w. thinner walls.
- o. Chlor. cells oblong or orbiforme in sect.
- 44 **S. inundatum** R. et W. (1896). (S. subsec. v. *virescens* Angstr., S. *pungens* Röll p.p.). On inside of br. l. pores chiefly in angles and near leaf margin, on outside numerous, small, ringed, in rows on commis. E.S. 2 (Smitham) 4 (Boyden), 5 (Watson), 20 (Darton), 27 (Burrell), 47 (Armitage), 51 (H. Wheldon), 59 (Beesley), 69 (Wils. and Wheld.), 71 (H. Wheldon), 63 (Crossland), 96 (Armitage).
- a. **ovalifolium** W. Br. l. uniform, ovate.
- a. *brachycladum* W. Resemb. robust *S. subsec.* Br. patent, short (4–8 mm.), l. $1.14-1.2 \times 0.6-0.7$; st. l. $1-1.14 \times 0.7$, fibreose above, often septate. 62 (Ingham).
- b. *brachyanocladum* W. Grey-green, capit. yellowish; br. dense, ascending, short (5–8 mm.), l. $1.4 \times 0.6-0.8$; st. l. as above.
- c. *robustum* W. Robust, submersed (20–25 cm.), subsanguin. above, grey-green below; br. r. dist., arcuate-reflexed, atten.; l. lax ($1.4-1.5 \times 1$). 62 (Ingham).
- d. *eurycladum* W. Submersed (15–20 cm.), capit. beautiful yellow, rest grey-green; br. dist. arcuate-reflexed, atten. (12–15 m.); l. laxly incumbent ($1.14-1.3 \times 0.7-0.8$). 59 (Beesley).
- e. *subfalcatum* W. Robust, grey-green (20 cm.), br. dense, divaric or arc.-recurved (8–10 mm.); l. of lower br. imbric., upper falcate-secund ($1.4 \times 0.9-1.14$); st. l. $0.9-1 \times 0.7$ on inside with many large pores. 4 (Briggs), 62 (Ingham).
- f. *laxifolium* W. Submersed, grey-green, robust; l. v. lax; br. usu. distant. 51 (Dallman and Wheldon), 58 (Wheldon), 60 (Wheldon and Wils.), 71 (Wheld. and Hartley), 111 (Grant).
- g. *densum* W. Compact, grey-green, yellow to yellow fusc. (5–15 cm.), br. densely crowded, short, divaric, l. dense.
- h. *brachycladum* W. Br. short, dense, upper 4–6 mm. long. 65 (Ingham), 69 (Wils. and Wheld.), 52 (Travis), 111 (Grant).
- i. *gracile* W. R. slender, green, tall (20 cm.); br. remote, short, divaric (5–8 mm.), st. l. $1 \times 0.6-0.7$, above fibreose, cells oft. septate.
- b. **lancitolium** W. L. uniform, ovate-lanceol. to lanceolate.
- a. *falcatum* Schleph. Gracile or r. robust, grey-green (20 cm.); br. remote, arc.-recurved, attenuate (8–15 cm.); l. secund-falc. ($1.4-1.6 \times 0.5-0.6$).
- b. *tenellum* W. Gracile, grey-green (15–20 cm.); br. dist., upper shorter, all attenuate, arc.-recurved; l. subsec.-falcate ($1.4-1.5 \times 0.7-0.8$); st. l. $0.9-1.14 \times 0.6-0.7$. 60 (Wheld. and Wils.), 36 (Binstead).

- c. *submersum* W. R. robust, submersed, grey-green (20 cm.), habit of *S. cuspidatum* v. *submersum*; br. r. dist., arcuate-spr. (12–15 mm.); l. erect-pat. 1.3–2.3 × 0.6–0.7; st. l. 0.9–1.3 × 0.7. 60 (Wils. and Wheld.), 62 (Ingham).
- d. *Jensenii* W. Compact, above sordid-fuscous (5–7 cm.); br. v. crowded, v. short, terete (5–6 mm.); st. l. porose on both sides, fibrose above. 59 (Wheldon).
- e. *densissimum* W. Low, pallescent, v. dense (3–5 cm.); br. v. crowded, ascending, terete; l. smaller, narrower (1.14–1.4 × 0.4–0.6), oft. with many hemisoph. br. intermixed. 66 (Horrell).
- c. ***diversifolium*** W. L. dimorphous, ovate, or ovate-lanc. to lanceolate. 60 (Wheldon).
- a. *eryycladum* W. R. robust, green or grey-green (15–20 cm.); br. remote, arcuate (15–18 mm.); l. lax, on lower br. widely ovate-lanc. or lanc. (1.7–2.4 × 0.8–0.9), on upper much smaller ovate or obl.-ovate (1–1.4 × 0.7); st. l. fibrose above. 60 (Wils. and Wheld.), 71 (H. Wheldon).
- b. *dasybrachycladum* W. Tufts dense (10–15 cm.); br. dense, usu. divaric (5–6 mm.); l. of low. and upp. br. widely ovate; if mid. br. lanceol. usu. secund-falcate.
subf. *fuscescens* W. Ochraceous, in capit. sordid grey-green to subviolascens; br. l. oval (1–1.3 × 0.7–0.8), and lanceol. (1.3 × 0.4–0.5); st. l. (1 × 0.6). 71 (Wheld. and Hartley), I. 1 (Gasking).
- c. *rufescens* W. Sanguin-red (10–15 cm.); l. on lower br. widely ovate (1.4–1.7 × 1), on upper lanceol. (0.5–0.6 wide); st. l. dimorph., upper smaller (0.7–0.8 long), pauci or efbrose, lower 1–1.4 long, fibrose above.

oo. Chlor. cells. usually trapezoid in sect.

+ St. l. lingul. to ling.-spathulate, multifibrose, only on outside or on both sides many-pored.

- 45 ***S. auriculatum*** Schimp. (1857) (*S. Gravetii* Russ. p.p.). E.S. Br. l. ovate or elong- to ovate-lanceol. (1.2 × 0.7–1.14), lateral marg. widely incurved, on inside w. few pores or multiporose only near margin, on outside w. many ringed pores on commiss. 35 (Armitage), 57, 58 (Whitehead), 63 (Crossland), 69 (Stabler), 107, 109 (Lillie).

A. Fascicles m. or l. dense.

- a. ***tenellum*** W. Slender, above subfusc. (4–7 cm.); br. short (3–4 mm.), st. l. from nar. base ovate or subspath. (1.14–1.4 × 0.4–0.5); Hyal. cells, rarely septate, fibrose to base.
- b. ***ovatum*** W. Br. longer (10–12 cm.), shorter above (4–5 mm.), obtuse, st. l. widely lingul. (1.6–1.8 × 0.9–1), br. l. imbricate (1.5–1.7 × 1.14–1.2). 69 (Wils. and Wheld.).
- a. *brachycladum* W. Yellowish-brown (10 cm.); br. divaric, shortly acumin. (4–5 mm.).
- b. *intortum* W. Yellowish-brown; br. short (5–10 mm.), terete, incurved. 9 (Linton), 45 (Brinkman).
- c. *rufescens* W. Rufous; br. v. short, suberect (5 mm.). Llanberis (Holt), 35 (Armitage), 110 (Gibson).
subf. *subsimplex* W. St. simple, or w. few br. (3–4 cm.); l. v. concave, densely appressed. 35 (Armitage), 70 (Benson), Llanberis (Holt), 110 (Gibson).
- d. *pallidoflavum* W. Low, yellowish (3–5 cm.); br. 3–4, short, atten.-divaric. (8–10 mm.), on lower imbricate, on upper lax-leaved; st. l. w. large auricles. 60 (Wils. and Wheld.), 62 (Ingham).

- e. *variegatum* W. Dense tufts, pale rufous above (10 cm.); br. acumin.-divaric. (4-8 m.). 60 (Wheldon), 69 (Wils. and Wheld.).
- f. *pungens* W. Dense, grey-green, rigid (5-8 cm.); br. terete, acutely apiculate, pungent wh. dry (5-8 mm.). 69 (Wils. and Wheld.).
- c. ***laxifolium*** W. Deep, v. soft, lax, grey-green (8-10 cm.); br. grad. atten. (10-15 mm.), st. and br. l. on inside pauci, on outside multiporose (1.3 x 0.5-0.6 and 1.5-1.7 x 0.6-0.7 respect.). 69 (Wils. and Wheld.).

B. Fascicles m. or l. remote.

- d. ***cano-virescens*** W. Dense, pale or grey-green (5-10 cm.); br. atten., arc.-recurved (5-12 mm.), l. (1.3-1.7 x 0.8-1.14) st. l. (1.3-1.9 x 0.6-0.8). 60 (Wheldon), 65 (Ingham).
- e. ***fluitans*** W. Immersed, subfuscous (25 cm.); br. 3, shortly acumin (5-8 mm.), divaricate, l. imbric. (1.7-1.8 x 1.14-2); st. l. 1.3-1.5 x 0.8-0.9, multifibrose.
- f. ***submersum*** W. Submersed, grey-green, reddish in small capit., br. 3-4, lower to 15 mm., upper shorter, reflexed; l. dimorph., on upper br. much smaller (1.14-1.3 x 0.7), on lower (2-2.3 x 1.4), st. l. as in e. 58 (Whitehead), 69 (Wils. and Wheld.), 88 (Wils. and Wheld.).
- g. ***plumosum*** W. Immersed, v. lax, plumose, grey-green (10-12 cm.); br. 2-3, grad. atten., divaric (8-16 mm.); l. lax, loosely spreading (2-2.3 x 0.7-0.8); st. l. 1-1.14 x 0.4-0.6, fibrose to base, rarely septate.
- h. ***racemosum*** W. Submersed, grey-green (20 cm.); br. 3-4, shortly acumin, divaric-horizont. (5-10 mm.), st. l. (1.3-1.4 x 0.9), br. l. (1.4-1.7 x 1), imbricate, on inside with minute pores in cell-ang., on outside usu. w. few pores on commiss.
- f. *brachycladum* W. Gracile; br. 3-5 mm. long.

†† St. l. ovate or lingul., often dimorphous, smaller paucifibrose and few-pored; larger multifibrose, on inside few, or on both s. many-pored.

- 46 **S. aquatile** W. (1899). (*S. subsec.* v. *turgidum* C. Mull. p.p.)
E. Br. l. ovate or elong.-cvate (1.4-2.3 x 1-1.5), v. concave, marg. incurved, on inside w. few minute pores in cell-ang. and on commiss., and usually some pseudopores; on outside w. many pores in series on commiss. 35, 37 (Duncan and Rhodes), 71 (Wheld. and Hartley).
- a. ***turgidum*** W. Low, robust, turgid, yellowish; br. divaric, terete, remote, grad. acumin. (10-12 cm.), l. 2 x 1.3, st. l. v. large, from narr. base ovate or lingul (2-2.3 x 0.9-1), multiporose both sides. 60 (Wils. and Wheld.).
 - b. ***mastigocladum*** W. V. robust, resemb. *S. crassicladum*, above grey-green, below ochraceous, densely caespit. (20 cm.); br. short, thick, shortly acum., l. 1.7-2 x 1.14-1.3; st. l. 1.5 x 0.9, cells oft. septate, both sides multiporose.

- c. **Beckmannii** W. Grey-green, rubicund in capit. (15—20 cm.); br. remote, terete (10—12 mm.), l. 1.4—2.3 × 1—1.4; st. l. widely lingul. 1—1.8 × 0.8—0.9, w. minute pores in cell-ang. only on both sides.
- d. **intortum** W. Robust, dense, oft. rufescent; br. close, terete, incurved (10—15 mm.); l. ovate (1.7—2 × 1—1.2); st. l. 1—1.5 × 0.8—1, on both sides or outside only multiporose.
- e. **sanguinale** W. Robust, rufescent above (20 cm.); br. dense, arc.-recurved, shortly acumin, stout, l. 2.4—3 × 1.5—1.7; st. l. (2 × 0.9—1), at base multiporose on both sides. 9 (Fisher), 60, 62 (Wheldon).
- b. **strictum** W. Less robust; br. erect-pat. or ascending; l. ovate-lanc.
- c. **congestum** W. Low (3—4 cm.), simple or short singly br., tufts dense; st. and br. l. uniform (1.9—2.3 × 1—1.2), widely ovate.
- f. **remotum** W. Submersed, grey-green, oft. lutescent or violascent in capit. (10—25 cm.); br. remote, arcuate (15 mm.), l. 1.9—2.3 × 1—1.2, w. pores on outside in interrup. rows; st. l. 1—1.14 × 0.9.
- b. **perlaxum** W. Habit of *S. cuspidatum*, lax, green, capit. violascent; br. l. widely lanc., laxly erect-pat. (3—5 × 1—1.5); st. l. 1.3—1.5 × 0.7—0.8.
- c. **breviramosum** W. Gracile (20 cm.); br. short, l. oval 1.14 × 1; st. l. 1.3 × 0.7—0.8.
- g. **subfuscum** W. Submersed, fuscous (20 cm.); br. remote, short; l. lax, ovate (1.6—1.9 × 1); st. l. 1.4—1.6 × 0.9, fibrose above, w. pores in cell ang. on both sides.
- h. **plumosum** W. Immersed (15—20 cm.), robust, plumose, grey-green to ochrac., above violascent (15—20 cm.); br. divaric. (15 mm.); l. lax, small ovate-lanc. (1.3—0.7) or larger ovate (2 × 1.14); st. l. 1.14 × 1, fibrose above, inside multiporose.
- i. **pallidum** W. Submersed, whitish-pallescent (10—15 mm.); br. remote, strongly atten., variously recurved (10—12 mm.); st. l. 1.14—2 × 0.6—0.8, outside only multiporose; br. l. (1.6—2.3 × 0.7—1), pores on outside in dense rows.
- j. **ochraceo-violascens** W. Dense, ochraceous, in capit. sordid violet (15—20 cm.); br. dense; l. lax (2—2.4 × 1.3), inside pauci, outside multiporose in rows; st. l. dimorph (1—1.7 × 0.7—0.8) inside, or on both sides multiporose.
- k. **pauperatum** W. Dense, decumbent, grey-green (3—6 cm.), capit. stellate; br. acumin; l. 2—3 × 1—1.5; st. l. 1.5—1.8 × 1, inside pauci, outside multi-porous.

2. Hyalodermis in 2-3 rarely 4 layers.

a. Chlor. cells oblong or orbiform in sect.

+ St. l. small (0.7—1 × 0.5—0.8).

- 47 **S. contortum** Schultz (1819) (*S. laricinum* Spruce. *S. neglectum* Angstr. *S. curvifolium* Wils.). E.S. 71 (Wheld. and Hartley), 96 (Wils. and Wheld.). I. 6 (Lett), 8 (Armitage), 20 (Davies), 21 (Orr), 28, 29 (Tetley), 31, 39 (Lett), 35 (Hunter).

- a. **permagnum** W. V. robust, aquatic (10 cm.), sordid-green, below brown or nigrescent; br. dense, deflexed (20 mm.); l. 3—3.2 × 0.9—1, imbricate, not secund-falc.

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- b. **majus** C. Jens. Submerged, stout, dusky-brown to blackish-violet (20—25 cm.), capit. large, br. l. 1.5—2.5 × 0.7—0.8. 109 (Lillie).
- a. *falcifolium* W. Br. l. secund-falcate. 71 (Wheld. and Hartley), 96 (Wheld. and Wils.).
- b. *laxifolium* W. Br. l. lax, not secund-falcate. 71 (Whel. and Hartley).
- c. *strictifolium* W. Capit. brownish or virescent; br. l. teretely-imbric, not secund-falcate.
1. *deflexum* W. Br. atten. (15—18 mm.), deflexed; l. on both sides few-pored, imbricate.
 2. *arcuatum* W. Br. arc.-recurved (8—10 mm.), l. nearly aporose.
- d. *Reinkei* W. Robust, br. l. outside w. large pores in dense rows on commiss. St. l. soft, on inside w. many pores on commiss., on outside few pores in cell-ang. only.
- c. **gracile** W. Bog-form, weaker, habit of *S. subsecundum*; green, brownish, or violet; l. 1.2—1.3 × 0.5—0.7, not crisped.
- a. *falcatum* W. Br. and br. l. distinctly falcate-secund. 58 (Wheldon), 60 (Wils. and Wheld.), 71 (Hartley and Wheld.).
 1. *virescens* W. Above grey-bluish or grass-green. 71 (Hartley and Wheld.).
 2. *fuscescens* W. Dense, brown (10—12 cm.); br. short, arc.-recurved. 14 (Nicholson), 71 (Hartley and Wheld.).
 3. *sordidum* W. Of a dusky uncertain colour. 60 (Wheld. and Wils.).

b. *teretiramosum* W. Br. l. imbric, not secund-falcate. 60 (Wils. and Wheld.). 61 (Ingham), 71 (Hartley and Wheld.).

d. **microphyllum** W. V. slender, br. v. thin, l. minute 0.7—1.14 × 0.3—0.4.

a. *leiophyllum* W. Br. l. not crisped. 58 (Whitehead), 60 (Wils. and Wheld.).

b. *crispulum* W. Green or red-brown, l. many or all strongly crisped.

†† St. l. larger (1.2—2 × 0.9—1).

- 48 **S. platyphyllum** W. (1884). (*S. laricinum* varr. *teretiusculum*, *platyphyllum* et *cyclophyllum* Lindb.). E. S. (?)
- a. **teretiusculum** W. Low, dense or submerged, elong., loose; green, brown, or dull violet; br. 2—3, falc.-recurved, short-pointed; l. cochleariform, 1.4—3 × 0.7—1.7. 69 (Barnes).
- a. *compactum* W. Compact, brownish above (3—10 cm.), br. dense, short, catkin-shaped.
- b. *contortum* W. Dense (15 cm.), w. longer, terete, reflexed-falcate br.
- c. *submersum* W. Submersed, stout, green or dusky; br. close, turgid, shortly-pointed; st. l. v. large (2—2.3 mm. long); br. l. roundish oval, imbricate (3 × 1.7)
- b. **laxifolium** W. (v. *noltei* Roll). Submersed, v. lax; br. longer 1—2; l. flat, elong.-lanc. (3 × 1.4).
- a. *pallidum* W. Dense, pale or wh.-green, below sordid fusces.
- b. *tenellum* W. Slender, lax, yellowish above (20—25 cm.); br. single, slender.
- c. *monoecladum* W. Subgracile, lax, sordid viol. above (20—30 cm.); br. solit., long and stemlike.
- d. *simplex* W. V. lax, submerged, subsimp. (10—12 cm.), rarely 1—2 br.; l. uniform, cochlearif.-concave (3—4 × 1.5—1.6).
- e. *subcristatum* W. Subgracile, green above, brown below, dense, subrigid (20—25 cm.), br. slend., remote, in pairs, l. irreg. undulate.

- c. **gracile** Röll. Neat, slender, pulvin. (10—15 cm.); br. 1—3, reflexed, l. 1—1.3 × 0.6—0.8.
 - a. *tenue* W. Pallid or grey-green (4—6 cm.); st. l. 0.7—0.8 × 0.5.
 - b. *crispatum* W. Br. l. more or l. crisped.
 - c. *simplicissimum* W. Low, gracile (4—5 cm.), simple or 1—2 br.; br. v. short (4—5 mm.), st. l. 1.14 × 0.6—0.8; br. l. ovate-cochleariform, complanate when dry.
 - d. *bracycycladum* Bureau Dense, rigid, flavescent above (12—15 cm.); br. 2—3 v. short (5—6 mm.), acuminate.
- d. **subsimplex** W. Stout, grey-green, or brown-red (12 cm.), resembling *S. Pylaiei*, st. subsimp., br. (if any) scattered, short, turgid, st. l. 2 × 1.3, br. l. smaller.

** Br. l. on inside many, on outside few-pored, w. pseudopores in interrup. series on commissures.

- 49 **S. crassicladum** W. (1889). (*S. batumense* W., *S. turgidum* C. Mull p.p.). E.S.I. 2 (Ingham), 10 (Napier), 34 (Knight), 51 (Wheld. and Dallman), 59 (Holt), 65 (Wheldon), 70 (Ingham), 71 (H. Wheldon), 75 (Armitage), 84 (Adam), 96 (Wils. and Wheld.), 98 (McAndrew). I. 17, 25, 30 (Bellerby), 27 (Lett), 33 (Tetley).
- a. **magnifolium** W. V. robust (10—70 cm.), br. thick, shortly or gad. acumin., l. uniform, ovate to ovate-lanc. (3—7 × 2—3).
 - a. *fluctuans* W. Br. shortly acumin.-turgid, l. imbric.-ovate. 60 (Wils. and Wheld.), 61 (Ingham).
 - b. *plumosum* W. V. lax, plumose; br. 3, distant, all spreading; l. erect-pat. 61 (Ingham).
 - c. *lonchocladum* W. (*S. batumense* W.). Upper br. 20—25 mm. long; l. grad. acumin, densely imbric. Inchnadamph (Dixon) 62 (Bellerby).
 - d. *fluitans* W. Grey-green (30—40 cm.), more slender than a, capit. minute; br. distant (8—10 mm.), shortly acumin.; l. lax. 60 (Wils. and Wheld.), 71 (Hartley and Wheld.), 88 (Wils. and Wheld.).
 - e. *macrocephalum* W. V. robust, versicolorous (20 cm.), capit. large, dense, br. v. thick, shortly acumin.; br. l. 7 × 3.
 - f. *laxissimum* W. Immersed, grey-green or scridid nigrescent (10—20 cm.), oft. subsimple. br. 2—3, l. laxly appressed, capit. indistinct. England (Hobkirk), 60 (Wils. and Wheld.), 62 (Wheldon).
 - g. *discrepans* W. Submersed, lax, grey-green (20 cm.); br. remote, attenuate (15—20 mm.), l. lax, ovate (3.5—4 × 2.5) above m. or l. chlorophyllose.
 - h. *sanguineum* W. Subm. lax, sanguinolent above (30 cm.); br. remote, attenuate (15—20 mm.); l. lax, widely ovate lanc. (5—6 × 2). 60 (Wils. and Wheld.).
 - i. *subluteum* W. Subm. pallid-yellow, green in small capit.; br. remote, deflexed (12—15 mm.), l. lax.
 - j. *rufescens* W. Subm. reddish; br. dense, short, thick; l. dense. 60 (Wils. and Wheld.), 62 (Ingham).
 - k. *versicolor* W. R. Robust, reddish and green mixed; br. thick, acuminate, lax leaved.
 - subf. *turgescens* W. V. Robust (15—20 cm.); br. remote, turgescens, shortly acumin (10—18 mm.), l. imbric. (4—5 × 2.5—3). 59 (Holt), 60 (Wheldon).
 - b. **diversifolium** W. Mod. robust, grey-green (15—25 cm.); l. dimorphous, on low br. widely lanc. (3—4 × 2), on upp. br. more dense, widely ovate (2—2.5 × 1.5—2). 60 (Wils. and Wheld.), 71 (Hartley), 84 (Adam).

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- b. *squarrosum* W. L. of upper br. with squarrose points. 16 (Sherrin), 60 (Wheldon), 62 (Ingham).
- c. *inundatum* W. Immersed, v. lax (25—30 cm.); br. remote, atten.; l. upp. ovate-lanc. 3 x 1.5, lower ovate (1.5—2 x 1), lax. 60 (Wheldon), 62 (Ingham).
- c. **intermedium** W. Less robust, l. uniform, ovate or lanc. (1.5—2.5 x 1.5).
- a. *ovalifolium* W. Grey-green, br. remote (10—12 cm.), l. ovate (2—2.5 x 1.5) lax. 60 (Wils. and Wheld.).
subf. *breviramosum* W. Grey-green, oft. branchless below (25—30 cm.); br. 2—3, thick, short (5—8 mm.); l. 2—2.5 x 1.2—1.5, imbricate. 61 65 (Ingham).
- b. *lanceolatum* W. Slend. lax green (20—25 cm.); br. atten. grad. acumin.; l. lanceol. (2.5—3 x 1), densely imbric. 59 (Watson), 61.63 (Ingham).
- c. *leptocladum* W. Slender, less lax, grey-green (10—15 cm.), br. shorter in capit., terete, dense-leaved; l. 2—2.5 x 1.5, in capit. (1.5—2 x 1). 60 (Wils. and Wheld.), 61-62 (Ingham), 88 (Wils. and Wheld.).

*** Br. l. on both sides multiporose.

1. Hyalodermis in a single layer.

† St. l. small (0.8—1), pores most numerous on inside.

- 50 **S. bavaricum** W. (1908). Resemb. robust *S. subsec.* or *rufes*. Hyaline cells of br. l. multiporose with many pseudopores on inside. St. l. as wide or wider than high. Goathland 62 (W. Bellerby), 8-07 teste Warnstorf.

- a. **microphyllum** W. Small (size of *S. subsecund.*); br. l. maxim. 1.2 x 0.7.
- b. **mesophyllum** W. Larger (size of *S. rufescens*); br. l. maxim. (1.7 x 1).
- c. **macrophyllum** W. Br. l. maxim. 2.6 x 1.5.

†† St. l. larger (1—1.4), on both sides with few pores, in cell angles (outside often nearly aporose).

- 51 **S. Camusii** W. (1911). (*S. subsec.* v. *Camusi* Card., *S. inund.* v. *Camusii* Roth.). Habit of *S. rufescens*. St. l. lingulate 1-1.14 x 0.7-0.9, apex rounded fimb. dent. Br. l. often secund-falcate, 1.4-1.8 x 0.7-1, on both sides with many pseudopores on the commissures, with here and there a very minute true pore.

- a. **crispatum** W. Resemb. *S. recurvum*; grey-green (15 cm.); br. remote, arcuate (10—18 mm.), l. distinctly crisped.
- b. **plumosum** W. Immersed, plumose, grey-green or violasc.; below ochrac.
- c. **pyrenaicum** W. Grey-green (8—10 cm.), resemb. *S. rufescens*; l. on outer side with some true pores intermixed.
- d. **venustum** W. Grey-green (15 cm.), resemb. *S. inundatum*; l. on both sides with v. minute true pores mixed w. pseudopores.

+++ St. l. much larger (1—2 or 3 mm.), multifibrose.

- o. St. l. 1—2.3, br. 3—5. Pores of br. l. on inside in interrupted series, and in cell angles; on outside in continuous series on commissures.

52 **S. rufescens** Nees et Hornsch (1823). E.S.I. 27, 28 (Burrell), 34 (Roper), 63 (Leyland), 71 (Wheld. and Hartley), 75 (Armitage), 94 (Wheld. and Wils.), 95 (Macvicar). I. 30 (Tetley).

a. **magnifolium** W. Robust, variously colored; br. l. large, 2—3 × 1.14—1.3, rarely less.

a. **rufidulum** W. More or less sanguin-red above.

1. **densiramosum** W. Br. v. dense, 3—4, terete (10—12 mm.); l. imbricate, on inside pores mixed with pseudopores. 9 (Fisher), 48 (Jones), 60-70 (Wils. and Wheld.), 62 (Ingham), 69 (Wils. and Wheld.), 98 (Wils. and Wheld.), 100 (Ley), 111 (Grant).

2. **subsimplicum** W. Low (3—4 cm.), oft. simple, or br. 1—2; l. of st. and br. uniform (2—3 × 0.7—1.4).

b. **bicolor** W. Robust, rubicund, grey-green and yellowish (10—20 cm.), oft. irreg. branched, st. l. 1.4—1.7 × 1; br. l. 2—2.3 × 1—1.14. 48 (Jones and Horrell).

subf. **intortum** W. V. robust, submersed, versicolorous (20 cm.); br. close, stout, shortly acumin.-incurved; l. 2.3—2.6 × 1.3—1.5. 60 (Wils. and Wheld.).

c. **albescens** W. Robust, whitish-green, or above pale yell (15 cm.); br. remote, atten. terete (12—20 mm.), st. l. 1.6—2 × 1—1.2; br. l. dense (2—2.3 × 1.4). 51 (Wheld. and Dallman), 60 (Wheld. and Wils.), 61 (Ingham), 65 (Wheldon), 84 (Adam), 87 (Wils. and Wheld.).

d. **virescens** W. Robust, submersed, lax caespit, grey-green (20 cm.); br. remote, arc.-recurved; l. lax, inside w. pseudopores, outside w. pores in dense rows (1.6—1.7 × 0.9—1.14); st. l. 1—1.2 × 0.7—0.8, fibrose above, both sides multiporose. 4 (Briggs), 60 (Wheldon), 61, 62, 63 (Ingham), 71 (Wheldon and Hartley), 95 (Macvicar).

subf. **multifibrosum** W. St. l. larger (1.4—1.6), multifibrose to base, on outside only multiporose in rows.

e. **uliginosum** W. Subfuscous, lax (8—10 cm.), br. remote, atten.-recurved, st. l. 1.14—1.3 × 0.7—0.8; br. l. 1.9—2.14 × 1.14—1.3. 59 (Wilson), 60 (Wils. and Wheld.).

f. **submersum** W. Robust, submersed, rigid, fulvous above (20 cm.); br. remote; l. dense, imbric. (2 × 1.3); st. l. 1.7 × 1.

g. **abbreviatum** W. Robust, green, with yellowish globose capit. (20—30 cm.), br. strong, remote, regular, recurved; st. l. 1—1.2 × 0.6—0.8; br. l. 1.6—2.3 × 1.3—1.4. 60 (Wilson).

h. **luteofuscum** W. Beautiful yell.-fuscous (10—15 cm.), br. close (10—15 mm.), l. laxly incumb. subsecund; st. l. 0.9—1.2 × 0.6—0.7; br. l. (1.14—2 × 1—1.4).

i. **dimorphum** W. St. l. dimorph., lower 0.6—0.9 long, upper 1.3—1.7 × 0.7—0.9; br. l. 2—2.3 × 1—1.14, pores on outside v. minute; in sordid grey-green dense tufts (10 cm.). 60 (Wheldon).

j. **fluitans** W. Immersed, sordid green, above violas. (30—40 cm.); br. distant (10—15 mm.); st. l. 1.14—1.2 × 0.6—0.7; l. lax, ovate (2 × 1.14—1.3). 17 (Horrell), 60 (Wilson), 61 (Ingham).

b. **parvulum** W. Much smaller than a., tufts dense (10 cm.); br. close, v. short; l. 1—1.5 × 0.5—1, both sides multiporose; st. l. 1—1.3 × 0.6—0.8 or smaller.

a. **fuscescens** W. Of a bright subfuscous colour. 60 (Wils. and Wheld.), 66 (Horrell).

1. **intortum** W. Tufts dense (5—10 cm.); br. crowded, incurved (4—5 mm.); br. l. r. larger. 60, 69, 70 (Wils. and Wheld.).

2. *gracile* W. Lax; br. more distant, arcuate; st. l. dimorphous, upper larger (1.14—1.2). 4 (Briggs), 60 (Wheldon), 62 (Ingham).
3. *pulchrum* W. Compact, br. crowded, subterete (5 mm.). 61 (Ingham), 69 (Wils. and Wheld.).
4. *densissimum* W. Very compact (4—6 cm.); br. crowded, divaric or recurved (5—7 mm.); l. larger, subsecund falcate. 60 (Wils. and Wheld.).
- b. *canovirescens* W. Grey-green (10—12 cm.), br. close, divaricate (10 mm.); br. l. on inner side with many pseudo-pores. 60 (Wils. and Wheld.), 62 (Ingham), 65 (Horrell), 71 (H. Wheldon).
- oo. St. l. 1.4—1.7; br. l. 2—4 mm. Very minute pores on both sides of br. leaves in interrupted rows on commiss.
- 53 **S. turgidulum** W. (1903). E. Branch l. usu. broader, with a more widely rotund-truncate apex than the preceding, 6-8 dentate. The chief difference from *S. rufescens* lies in the pores on the outside of the leaf being (while still numerous) only in interrupted and not in continuous rows.
- a. **immersum** W. Grey-green, immersed (20—25 cm.), st. l. oft. many-pored on both sides; br. remote; l. lax, rotund-ovate 1.6—2 × 1.14. 60 (Wils. and Wheld.).
- f. *perlaxum* W. More slender, green, v. lax (10—30 cm.); br. l. ovate-lanc. 2—3 × 0.9—1.4.
- b. **plumosum** W. Robust, submersed, plumose (20—25 cm.); br. remote, l. dimorph., upper smaller (3 × 2), few pored as in *S. obesum*, lower multiporose (5—6 × 2).
- c. **laxifolium** W. Robust, subm., yellow-green; st. l. equal or dimorph., lower minute triang.-lingul. (0.8—0.9 × 0.7), oft. effibrose and aporose, upper (1.4 × 1) multifibrose and porose; br. l. v. large, lax (2.3—3 × 1.4), erect pat.; br. 15—20 mm., deflexed.
- f. *perlaxum* W. Immersed, slender, grey-gr. (25 cm.), capit. minute; br. remote, lax-leaved; l. of upper br. concave (1.5—2.5 × 1—1.5).
- d. **teretiusculum** W. Robust, pallid above (10—20 cm.); br. terete, upper incurved; br. l. large, rotund ovate, closely imbric. 60 (Wils. and Wheld.).
- e. **brevirameum** W. Robust, grey-green (20—25 cm.); br. remote, short (10—12 mm.), m. or l. acumin., not incurved. 9 (Fisher).
- f. **sanguinale** W. V. robust, sanguin-red (15—20 cm.); br. dense, thick; l. v. large, ovate, v. concave 2—3 or 5 × 1.4—3.
- g. **sordidofuscoatrum** W. Robust, sordid ochrac., nigricant or subviolaceous, occas. grey-green above (20—25 cm.); br. v. dense, short, thick, turgid; l. dense (3 × 1.8—1.9).
- f. *plumosum* W. Above nigro-violaceous, plumose (20 cm.); br. dense, divaric (15 mm.).
- h. **tenuissimum** W. V. slender, lax, grey-green (25—30 cm.), br. remote, slender, lax, grad. acumin.
- i. **insignitum** W. V. robust, reddish or yellowish (5—10 cm.), br. terete or laxly leaved (20—25 mm.), l. 3—3.4 × 2—2.3; upper st. l. 2 × 0.9 usu. esepate, multifibrose. 60 (Wheld. and Wils.), 71 (Holt).

- j. **fulvum** W. Submersed, robust, above grey-green, capit. reddish or yellowish, laxly tufted (10—15 cm.), br. dist. (10—18 mm.); l. 2—2.3 × 1.4; st. l. 2—2.4 × 0.9—1. 4 (Briggs).
- k. **remotum** W. Submersed, virescent, capit. oft. flavescent, below fuscescent (20—35 cm.), br. remote, arcuate (8—15 mm.), l. dense (2.5—3 × 1.5).
- l. **isophyllum** W. Dense, pale rufescent (8—12 cm.); br. solit., tumid, acuminate; l. uniform on st. and br. (3—4 × 2).
- m. **subsquarrosum** W. Glaucous or grey-green, robust (10—12 cm.); br. dist., attenuate (15—20 mm.); l. squarrose (2 × 1.14).

Section II. INOPHLOEA Russ.

Subsection VIII.—CYMBIFOLIA Lindb.

Subseries I.—PECTINATA.

54 **S. imbricatum** Russ. (1865). (*S. Austini* Sull.). E.S.I.
62 (Wheldon), 92 (Nicholson), 107 (Lillie), 110 (Braithwaite).

a. **cristatum** W.

- a. *glaucescens* W. Robust, in looser v. deep blue-green tufts.
subf. *squarrosum* W. Br. l. in upper half squarrose. 88 (Braithwaite).
- b. *congestum* W. Dense low pale or brownish tufts; br. closer, shorter, erect or sub-erect. 65 (Wheldon), 66-69 (Jones and Horrell), 74 (McAndrew), 88 (Wils. and Wheld.), I. 18 (Lett.).
- c. *fuscescens* W. In v. dense dome-like cushions, inside rusty-brown, and often grey-green externally; br. terete, rapuliform. 96 (Wils. and Wheld.), 109 (Lillie).
- d. *spectabile* Wheldon. Caespites robusti, laxiusculi; planta tota fuscescens vel interdum sursum ex parte subrufescens, ramis subturgidulis patentibus plus minusve laxe cumulatis 8—12 mm. longis. Folia laxe imbricata erecto-patentia. 48 (Jones), 66 (Horrell).

b. **sublaeve** W.

- a. *glaucescens* W. Usu. glaucous green
subf. *squarrosum* W. L. squarrose.

c. **affine** W. (*S. imbricatum* v. *laeve* W.).

- a. *glaucescens* W. Loose, grey or blue-green tufts; l. oft. squarrose. 17 (Horrell), 27 (Burrell), 38 (Bagnall), 60 (Wils. and Wheld.), 62 (Wheld.), 63 (Needham), 65 (Horrell), 96 (Wils. and Wheld.).
- b. *degenerans* W. (*S. degenerans* W.). Submerged, elongate grey-green, w. many long slend. stem-like adventitious shoots; capit. minute, st. epid. 2—3 layered, cells alm. effibrose, pores of outer epid. cells 5—6. 58 (Holt).

Subseries II.—PAPILLOSA.

55 [**S. hakkodense** W. et Card. Japan.] The chlor. cells in sect. resemble those of *S. cymbifolium* in not having the inner wall thick, and in shape, but are papillose as in *S. papillosum*.

var. **Gravetii** W. Slender, resemb. *S. cymbifolium*, capit. small (20-25cm.). Br. remote. Ch. cells widely triang. or trapezoid, enclosed on outside or free on both sides, lightly papillose. Belgium.

- 56 *S. papillosum* Lindb. (1872). E.S.I. 10 (Napier), 34 (Knight), 37 (Duncan and Rhodes).
- a. *normale* W. 51 (Dallman and Wheldon), 82 (Evans), 94 (Wils. and Wheld.).
- a. *majus* Grav. V. robust, greenish or yellowish; br. long, stout, more or less attenuate, divaricate. 11 (Gibbs), 60 (Wils. and Wheld.), 94, 96 (Wils. and Wheld.), 95 (Macvicar).
1. *elegans* Wheldon. Caespites pallide virides vel albicantes vel sursum pallido-flavescentes, ramis turgidulis acutis vel subobtusis, foliis magis concavis obtusisque. 58-60 (Wheldon), 69 (Wils. and Wheld.).
 2. *subfuscum* Wheldon. Caespites cano-virides plus minusve fuscescentes, ramis longioribus attenuatis, foliis laxioribus subacuminatis. 4 (Briggs), 11 (Gibbs), 17 (Horrell), 60 (Wheldon), 62 (Ingham), 71 (Wheld. and Hartley).
- b. *squarrosum* Ingham and Wheldon. Praecedente simillima, sed foliis laxioribus magis patulis distinguitus.
1. *pulcherrimum* Ingh. and Wheld. Planta speciosa, pallida, capitulum amplum subfuscum. 62 (Ingham).
 2. *neglectum* Ingh. and Wheld. Caespites sordide virides. Capitulum parvum. 58-60 (Wheldon), 62 (Ingham), 71 (Wheld. and Hartley).
- c. *brachycladum* W. Weaker, more compactly tufted; br. short, straight, suddenly pointed, spreading or ascending.
1. *pallescens* Wheldon. Caespites albido vel flavo-virides. 17 (Horrell), 59 (Wheldon), 60 (Wils. and Wheld.), 62 (Ingham), I. 1 (Gasking), 69 (Wils. and Wheld.).
 2. *flavofuscum* Wheldon. Caespites plus minusve fuscescentes. 11 (Crespiigny), 17 (Horrell), 60 (Wheldon and Wilson), 62 (Ingham), 66 (Jones and Horrell), 70, 88, 96 (Wils. and Wheld.).
- d. *confertum* W. Very dense low tufts; br. densely crowded, short-pointed; l. closely imbricate. 97 (Ingham), I. 20 (Lett).
1. *pallidum* Wheldon. Caespites superne pallide virides vel sublutescentes, inferne cano-virides. 60 (Wils. and Wheld.), 62 (Ingham), 64 (Wheldon), 69 (Stabler), 70 (Wils. and Wheld.).
 2. *fusculuteum* Wheldon. Caespites sordide virescentes vel pallide-fuscescentes, sursum saepe ochraceo-lutescentes. 60 (Wils. and Wheld.), 65 (Wheldon), 69 (Wils. and Wheld.), 95 (Macvicar), 88-96 (Wils. and Wheld.), 97-98 (Ingham and Macvicar), I. 1 (Gasking), 39 (Lett.).
 3. *Warnstorffii* Schlieph. Smallest known form, extremely compact, readily falling apart; br. v. short and dense, turbinate, l. small.
 4. *inundatum* Wheldon. Caespites mollissimi, pallidi vel superne fuscolumi, caules usque 6 cm. alti, ramis plus minusve cumulatis patentibus, folia eorum laxe patentia erecta. 4 (Jarter), 58-59 (Wheldon).
- b. *sublaeve* Limpr. 27 (Burrell), 34 (Knight), 46 (Sherrin), 65 (Horrell).
- a. *validum* W. V. robust, yellow-brown, bluish or greyish. I. 1 (Lett).
1. *pycnocladum* W. With thicker, closer, longer branches and laxer leaves. 60 (Wils. and Wheld.), 71 (Wheld. and Hartley), 96 (Wils. and Wheld.).
 2. *riparium* W. Dusky grey-green; br. dist., attenuate lax-leaved, and in the capit. elongate.
 3. *Bernetii* W. Violaceous above, brownish below (15 cm.); br. spreading, in capit. long and arcuate, leaves lax. 71 (Hartley and Wheld.).
 4. *submersum* W. Submerged, grey-green (10—18 cm.), capit. small, br. distant, patent or ascending, turgid, blunt or shortly acute. 60-69 (Wils. and Wheld.), 66 (Horrell), I. 1 (Gasking).

5. *fuscescens* W. Bright yellow-brown above, capit. dense; br. grad. attenuate, falcate reflexed, lax leaved. 60 (Wilson), 69 (Wils. and Wheld.). I. 1 (Gasking).
- b. *glaucovirens* Schieph. Elongate, submersed, grey-green, w. small capit.; br. distant, attenuate, l. lax, patent or subsquarrose. 5 (Briggs), 58-60 (Wheldon), 62-64 (Ingham), 71 (Wheld. and Hartley).
- c. *breviramosum* W. Moderately stout, grey-green to yellow-brown; br. cumulate, straight, short, rather suddenly pointed, or obtuse. 5 (Briggs), 66 (Ingham).
- f. *heterocladium* W. Br. divaricate. 17 (Horrell), 60 (Wheld. and Wils.), 62 (Ingham).
- f. *orthocladum* W. Br. ascending. 60 (Wheld. and Wils.), 62 (Ingham).
- d. *compactum* W. In very dense yellow-brown tufts; br. dense, short, and blunt, or longer and acute. 5 (Briggs), 57 (Barker), 58 (Wheldon), 60-69 (Wils. and Wheld.), 64 (Wheldon), 96 (Wils. and Wheld.).
- c. **leve** W. 96 (Wils. and Wheld.).
- a. *crispulum* W. Grey, yellowish in capit. (15 cm.); br. close, arcuate.
- b. *subfuscum* W. Subfuscous, compact (6-8 cm.), br. close, horizontal (10 mm.), shortly acuminate.

Subseries III.—LEVIA.

57 **S. cymbifolium**. Ehrh. (1780). E.S.I. 84 (McAndrew).

- a. *glaucescens* W. In loose pale-grey to blue-green tufts; no yellow or brown. 16 (Sherrin), 18 (Chittenden), 19 (Horrell), 58 (Jones), 60 (Wils. and Wheld.), 62 (Wheldon), 63 (Needham), 64 (Ingham), 65 (Wheldon), 66-69 (Horrell), 70 (Wils. and Wheld.), 71 (Wheld. and Hartley), 96 (Wils. and Wheld.), 109 (Lillie).
- a. *squarrosum* Pers. Br. distant, l. in capitulum and oft. in upper br. squarrose. 45 (Brinkman), 62 (Anderson), 63 (Ingham), 71 (Wheld. and Hartley), 84 (Adam), I. 1 (Gasking).
1. *deflexum* W. Stout, with longly attenuate deflexed branches. 40 (Benson), 60 (Wils. and Wheld.).
2. *pycnocladum* W. Stately and robust, with thick long pointed branches and recurved l. 48 (Whitehead), 59 (Wheldon), 60 (Wils. and Wheld.), 62 (Wheld.).
3. *immersum* W. Elongate, submersed, lax; br. distant, spreading; l. recurved. 92 (Gasking).
4. *globiceps* W. Strong, with oblong dense many-branched capitulum; lower br. distant; l. oft. squarrose, esp. in capitulum 60 (Wils. and Wheld.).
- b. *brachycladum* W. Tufts deep, br. v. distant, thick, straight, l. dense. 17 (Horrell), 49 (Waddington), 60 (Wils. and Wheld.), 61 (Ingham).
- c. *deflexum* W. Low dense tufts; br. close, longly attenuate, reflexed. 48 (Gasking and Mason), 60 (Wheldon), 88 (Wils. and Wheld.).
- b. *pallescens* W. Above pale green, pale-yellow, or almost white, no blue-green or brown (includes v. *glauco-pallens* W.). 14 (Horrell), 24 (Sherrin), 38 (Bagnall), 48 (Jones), 54 (Smith), 58 (Jones), 59 (Wheldon), 60 (Wils. and Wheld.), 61 (Ingham); 62 (Anderson), 63 (Needham), 65 (Wheldon), 66 (Horrell), 71 (Wheld. and Hartley), 75 (Armitage), 96 (Wils. and Wheld.), 102 (Ley).
- b. *laxum* W. Looser, softer (15 cm.); br. long, weak, grad. attenuate, lax leaved. 5 (Briggs), 38 (Bagnall), 40 (Painter), 48 (Whitehead), 59 (Wheldon), 60 (Wils. and Wheld.), 62 (Ingham), 69 (Stabler), 88-96 (Wils. and Wheld.).

- c. *confertum* Wheldon. A forma typica statura minore, ramis teretis densioribus, interdum suberectis, foliisque siccitate imbricatis differt. 59 (Wheldon and Travis), 62 (Wheldon and Ingham).
 - c. **flavescens** W. Straw to brownish-yellow, without green (includes varr. *fusco-flavescens* Russ. and *fusco-pallens* W.). 18 (Brinkman), 59 (Wheldon), 60 (Wils. and Wheld.), 61 (Ingham), 62 (Anderson), 65 (Wheldon), 66 (Horrell), 71 (H. Wheldon), 75 (Armitage), 96 (Wils. and Wheld.), 109 (Lillie), I. 38 (Lett).
 - f. *flagelliferum* Wheldon. Planta minora (8 cm. alta) et graciliora, ramis capitulorum densis, inferioribus distantis, saepe deflexis, tenuis, flagelli formis. Folia parva, acuminata plus minusve distincte squarrosa vel erecto-patentia. 60 (Wheldon).
 - d. **fuscescens** W. (var. *ochraceum* Röll.). Brown predominating above (includes varr. *fusco-glaucescens* W. et *fusco-rubescens* W.). 18 (Chittenden), 38 (Bagnall), 48 (Jones), 60 (Wils. and Wheld.), 65 (Horrell), 88 (Cocks), 109 (Lillie).
 - e. **atroviride** Schlieph. Dull dusky violet above.
 - f. **rubescens** W. (v. *purpurascens* W.). Pale reddish-violet (not purple as in *S. medium*), without green (includes v. *versicolor* W.). 19 (Chittenden), 27 (Burrell), 48 (Jones), 70 (Ley), 71 (Wils. and Wheld.), 105 (Macvicar).
- 58 **S. subbicolor** Hampe (1880). (*S. centrale* Jens., *S. intermedium* Russ.).
- a. *virescens* Russ. Grey to blue-green above, bleached below, usu. no yellow or brown. 62 (Wheldon), 88 (Cocks).
 - b. **flavescens** Russ. Straw-yellow above.
 - c. **fuscescens** Russ. Brownish, mixed occ. with yellow; no green. 62 (Wheldon).
 - d. **subcarneum** W. Faded or pale flesh-red, usu. mixed with green or yellow. 60 (Wils. and Wheld.), 105 (Salmon).
- 59 **S. medium** Limpr. (1881), E.S.I. I. 9 (Stewart), 10 (Lett), 30 (Waddell).
- a. **pallescens** W. (v. *albescens* W.). 60 (Wils. and Wheld.).
 - b. *virescens* W. (v. *glaucescens* Russ.). 60 (Wils. and Wheld.), 65-66 (Jones and Horrell).
 - a. *abbreviatum* W. Br. dist., short, abrupt-pointed, erect or patent. 65 (Jones and Horrell).
 - b. *congestum* W. Br. dense, short, tufts compact, green. 60 (Wils. and Wheld.).
 - c. *squarrosum* W. Green (12 cm.); br. stout, irreg. recurved, l. squarrose.
 - d. *molle* W. Soft loose tufts, blue-green (10 cm.); l. lax.
 - e. *immersum* W. Floating, elongate, grey-green (in capit. pale violet); br. divaric. or ascending.
 - f. *laxum* W. Br. longly attenuate-flagellate, lax leaved.
 - c. **flavescens** Russ.
 - f. *brachyanocladum* W. Densely caespit; br. short, ascending. 65 (Jones and Horrell).

- d. obscurum* W. 17 (Sherrin), 27 (Holmes), 66 (Horrell), 69 (Barnes), 109 (Lillie).
- a. fuscescens* W. Entirely dingy to yellowish brown. 65-66 (Horrell), 88 (Wils. and Wheld.), 109 (Lillie).
 - subf. *dasymbrachycladum* W. V. densely tufted; br. short.
- b. plumosum* W. Floating, dusky, br. dense, patent, plumose.
- e. roseum* W. 38 (Bagnall), 60 (Wils. and Wheld.), 65-66 (Horrell), 69 (Stabler), 88 (Cocks), I. 34 (Hunter), 37 (Lett).
- a. squarrosulum* W. 60-69 (Wils. and Wheld.), 65 (Jones and Horrell), 109 (Lillie).
- b. abbreviatum* W. 27 (Burrell), 60, 69 (Wils. and Wheld.), 65 (Jones and Horrell).
- c. congestum* W. 60-96 (Wils. and Wheld.).
- f. purpurascens* W. 14 (Nicholson), 27 (Holmes), 60 (Wils. and Wheld.), 62 (Ingham), 65-66 (Jones and Horrell), 69 (Stabler), 73 (Hamilton), 88 (Cocks), 109 (Lillie).
- g. versicolor* W. (varr. *glaucō-purpurascens* et *flavo-virescens* Russ.). 14 (Nicholson), 16 (Horrell), 27 (Burrell), 48 (Jones), 60 (Wils. and Wheld.), 62 (Ingham), 65, 66, 69 (Jones and Horrell), 97 (Ingham and Macvicar), 109 (Lillie).
 - a. brachyorthocladum* Wheld. Rami expansi breves ascendentibus leviter cumulati. 14 (Nicholson), 60 (Wils. and Wheld.), 69 (Jones and Horrell), 97 (Ingham and Macvicar).
 - b. compactum* Wheld. Fasciculi ramorum densissimi, rami breves vel longiores, folia eorum dense imbricata. 16 (Horrell), 48 (Jones), 60 (Wils. and Wheld.), 69 (Jones and Horrell), 88-96 (Wils. and Wheld.), 109 (Lillie).

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