Key to Species within Genera of Brown Seaweeds

by

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59. ASPEROCOCCUS

1 Thallus compressed; plants epiphytic, gregarious.

A. compressus

Thallus terete; plants epiphytic or epilithic, gregarious or solitary.

——————— 2

2 Plants > 1.0 cm length, > 1.0 mm diam.

——————— 3

Plants not > 1.0 cm length, not > 1.0 mm diam.; fronds solitary or gregarious, springing from a basal disc.

A. scaber

3 Plants inflated, > 1.0 cm diam.; fronds narrowing abruptly at base.

A. turneri

Plants not inflated, rarely > 1.0 cm diam.; fronds narrowing gradually at base.

A. fistulosus

24. CHILONEMA

1 Erect filaments and sporangia in prominent, sometimes concentric, sori; hairs usually abundant.

C. ocellatum

Arrangement of erect filaments and sporangia diffuse, or in small, numerous and indistinct sori; hairs uncommon.

C. reptans

74. CHORDA

1 Plant bearing colourless hairs; frond usually > 30 cm length; paraphyses clavate with blunt apices, longer than sporangia.

C. filum

Plant bearing brown assimilatory hairs; frond usually < 30 cm length; paraphyses elipsoid with rounded apices, same length as sporangia.

C. tomentosa

41. CLADOSIPHON

1 Frond usually > 10 cm length, branched; assimilatory filaments branched, fasciculate; plurilocular sporangia in clusters.

C. contorta

Frond usually < 10 cm length, simple or with a few short branches; assimilatory filaments simple or branched once; plurilocular sporangia single.

C. zosterae

85. CLADOSTEPHUS

1 Branch whorls distinct, sufficiently separated to reveal axes; unilocular sporangia often invested by series of empty walls of earlier sporangia; in pools or on rocks in low eulittoral zone.
C. verticillatus

Branch whorls indistinct, too closely compressed to reveal axes; unilocular sporangia not invested by empty walls; on rocks in eulittoral zone.
C. spongiosus

Cladoskephus

NOTE: The form differences between these species derive from the relative amounts of unlimited (axial) growth and limited (whorl) growth, and these may simply reflect habitat differences.

The reproductive character seems of small value.

25. COMPSONEMA

1 Plants epilithic; erect filaments unbranched; with unilocular sporangia.

C. saxicola

Plants epiphytic; erect filaments branched; with plurilocular sporangia.

C. microspongium

36. CYLINDROCARPUS

1 Plants epilithic; forming dark brown, irregular hemispherical cushions about 10 mm diam.

C. berkeleyi

Plants epi-endophytic: forming light brown patches 1 - 2 mm diam on host frond (*Gracilaria* spp.)

C. microscopicus

96. CYSTOSEIRA

1 Axis flattened, apex surrounded by incurved young laterals; basal region bearing stumps of deciduous laterals.

C. baccata

Axis radial.

——————— 2

2 Axis bearing zones of laterals with ovoid swellings at their bases (tophules).

C. nodicaulis

Axis lacking tophules.

——————— 3

3 Plants solitary; apical region of axis and young laterals closely covered with whorls of bifid appendages giving Equisetum - like appearance; strongly irridescent when submerged.

C. tamariscifolia

Plant caespitose; apical region of axis smooth or covered with small tubercles; not irridescent.

——————— 4

Cystoseira

4 Lateral branches of young plants flattened and foliose; occasional flattened laterals in adult plants.

C. foeniculacea

Lateral branches of young plants radial and filiform, never foliose; no flattened laterals in adult plants.

C. myriophylloides

73. DESMARESTIA

1 Frond branched.

——————— 2

Frond simple, foliaceous.

D. dresnayi

2 Branching opposite.

——————— 3

Branching alternate.

D. aculeata

3 Axes and branches rounded, filiform.

D. viridis

Axes and branches flattened, ligulate.

D. ligulata

64. DICTYOSIPHON

1 Frond unbranched, not > 8 cm in length.

D. elmanii

Frond branched, usually > 8 cm in length.

——————— 2

2 Branching mainly primary, few secondary branches produced; branches attenuate at base.

D. chordaria

Secondary, tertiary and other branches produced in profusion; branches not attenuate at base.

D. foeniculaceus

George Russell's key to species of brown.

3. ECTOCARPUS

1 Branches densely crowded at frond tips, or recurved, or both; branching usually alternate and subsecund, occasionally helical and opposite; plurilocular sporangia rarely >125 μ length and without apical hairs; sporangia and branches often in subsecund series on adaxial faces of lateral branches.

E. fasciculatus

Branches usually evenly distributed over plant, seldom recurved or fasciculate; branching usually pseudodichotomous and alternate, never opposite or helical; plurilocular sporangia frequently > 125 μ length and frequently with apical hairs; sporangia and branches seldom in subsecund series.

E. siliculosus

Echocarpus

NOTE: The genus Eotocarpus is polymorphic, a result of great genetic variability combined with phenotypic plasticity. Even the two species listed are not always readily separable.

32. ELACHISTA

1 Assimilatory filaments > 100 u diam., tapering abruptly at base; epiphytic on Cystoseira, Halidrys.

E. flaccida

Assimilatory filaments not > 100 u diam., tapering gradually at base; epiphytic on Fucus, Himanthalia and other algae.

2

2 Plants forming tufts, not usually > 3 mm diam. at base; epiphytic on Fucus and other algae.

E. fucicola

Plants forming irregular cushions, usually > 3 mm diam.; epiphytic on Himanthalia.

E. scutulata

5. FELDMANNIA

1 Filaments of erect system < 25 µ diam.

——————————— 2

Filaments of erect system > 25 µ diam.

——————————— 3

2 Plants with a felt-like growth form; erect filaments usually unbranched above base.

F. padinae

Plants forming small tufts; erect filaments usually with a few branches above base.

F. lebelii

3 Filaments of erect system with > 1 zone of intercalary growth; sporangia sessile.

F. irregularis

Filaments of erect system with 1 zone of intercalary growth; sporangia usually pedicellate.

——————————— 4

4 Plants with a felt-like growth form; erect filaments not > 35 µ diam.; plurilocular sporangia ovoid-elongate.

F. simplex

Plants forming small tufts; erect filaments > 40 µ diam.; plurilocular sporangia subspherical

F. globifera

Feldmannia

NOTE: If the plant has an erect filament diameter of about 25 μ and is growing epi-endophytically on *Codium* spp., it is *F. simplex*.

Key to the British species of Fucus.

1 Confined to estuaries and other situations subject to the influence of fresh water, usually membranous, lacking vesicles but often with irregular infoldings running along either side of the thallus, usually with spreading fan like branches towards the tips

F. ceranoides

Name at or on salt marshes, membranous or leathery may have paired vesicles, branching dichotomous not fan-like 2

2. Frond edge serrated like a saw; receptacles flat

F. serratus

Frond edge smooth, not serrated, receptacles swollen 3

3. Frond usually membranous, often spirally twisted; receptacles hermaphrodite, globular, with a distinct rim around the edge as if moulded in two pieces

F. spiralis

Frond usually leathery, rarely twisted, receptacles hermaphrodite or unisexual, elongate, often bifid, without a distinct rim. 4

4 Frond with paired vesicles especially in sheltered localities; conceptacles unisexual, cavernata lacking

F. vesiculosus

Vesicles lacking, but cavernata present; conceptacles hermaphrodite 5.

5. Wings well developed, frond up to 20mm wide usually in pools 6

Wings reduced or absent, frond less than 4mm wide, usually on open rock in very exposed situations

F. distichus

b. Plant usually more than 20 cm long; frond 5-20 mm wide, holdfast large, stipe thick, found on relatively sheltered shores F. distichus subsp. edentatus

Plant less than 20 cm long; frond not more than 4 mm wide; holdfast small; stipe thin on mid and upper shore in exposed situations F. distichus subsp. distichus

FUCUS DISTICHUS

(key to sub species - after Powell 1957)

1 Wings well-developed.

——————— 2

Wings reduced or absent; plants 4 - 15 cm length, brown; holdfast relatively large; stipe thick, stiff; frond < 4 mm width; on open rock in upper eulittoral zone on very exposed shores.

s. sp. anceps

2 Plant > 20 cm length; frond 5 - 20 mm width; dark brown; holdfast large; stipe thick; on rocks, in pools throughout eulittoral zone, in relative shelter.

s. sp. edentatus

Plant < 20 cm length; frond not > 4 mm width; yellow - brown; holdfast small; stipe thin; in pools in upper eulittoral zone or littoral fringe of very exposed shores.

s. sp. distichus

6. GIFFORDIA

1. Branching opposite, at least in part.

——————— 2

Branching not opposite

——————— 3

2. Branching opposite in main filaments, sub-secund or secund in ultimate branches; plurilocular sporangia borne on adaxial sides of ultimate branches, sessile, ovoid, not in series; plants up to 25 cm.

G. granulosa

Branching partly opposite but mainly alternate; plurilocular sporangia borne on main filaments and often in opposite pairs or clusters, sessile, narrowly ovoid; plants $\not>$ 3 cm.

G. ovata

3. Branching alternate or pseudodichotomous

——————— 4

Branching secund, at least in distal portions of plant

——————— 5

4. Branching sparse; plurilocular sporangia spindle-shaped, pedicellate.

G. fenestrata

Branching profuse; plurilocular sporangia cylindrical, sessile.

G. mitchellae

5. Plurilocular sporangia conical, sessile and borne in long series on adaxial sides of ultimate branches, thus giving the filaments a serrated appearance; plants up to 5 cm ; usually epiphytic on Saccorhiza.

G. hincksiae

Plurilocular sporangia not as above.

——————— 6

6. Plurilocular sporangia ovoid, sometimes curved, length < 2× breadth, length > 60μ ; branching consistently secund; plants up to 2 cm.

G. secunda

Plurilocular sporangia spindle-shaped, length > 2× breadth; length not > 60 μ; some alternate branching in main filaments; plants up to 20 cm.

G. sandriana

Griffithsia

NOTE: Forms of G. granulosa exist with alternate rather than opposite branching in main filaments. These can be distinguished from G. sandriana by their greater diameter (> 50 μ) of main filaments but are easily confused with G. secunda.

26. HECATONEMA

1 Cells of erect filaments 1 - 2 × breadth in length.

———————————— 2

Cells of erect filaments 2 - 6 × breadth in length; hairs rare or absent; epiphytic on Corallina and other calcareous algae.

H. liechtensternii

2 Erect filaments unbranched.

———————————— 3

Erect filaments branched, at least in part; plurilocular sporangia mainly terminal and lateral on erect filaments; epiphytic on Rhodymenia, Ulva and other algae.

H. maculans

3 Erect filaments not > 100 u in length; plurilocular sporangia not > 60 u in length, borne on disc; epiphytic on Rhodymenia, Laminaria.

H. foecundum

Erect filaments > 100 u in length; plurilocular sporangia > 60 u in length, borne terminally on erect filaments; epiphytic on Laminaria, Saccorhiza, Fucus, Himanthalia.

H. hispanicum

Hecatonema

NOTE: H. foecundum = Ascocyclus foecundus;

Hecatonema Hispanicum = Ascocyclus hispanicus.

9. KUETZINGIELLA

1 Plants epilithic; sporangia (mainly unilocular) borne only on erect filaments, never from prostrate system.

K. holmesii

Plants epiphytic; sporangia (mainly plurilocular) borne on prostrate as well as erect filaments.

K. battersii

7. HERPONEMA

1 Plants arising from galls on frond of host species (*Cystoseira* spp.)

H. valiantei

Plants arising from host species, galls absent.

——————— 2

2 Plants forming microscopic tufts; erect filaments sparse; epiphytic on *Dictyota*

H. solitarium

Plants forming macroscopic patches; erect filaments abundant; epiphytic on *Himanthalia*

H. velutinum

Laminaria

NOTE: L. groenlandica may be worth recognition only as a forma of L. saccharina.

75. LAMINARIA

1 Lamina digitate, smooth.

——————————— 3

Lamina entire, crinkly.

——————————— 2

2 Mucilage ducts present in stipe.

L. groenlandica

Mucilage ducts absent from stipe.

L. saccharina

3 Mucilage ducts present in stipe and lamina; stipe attenuate.

——————————— 4

Mucilage ducts absent; stipe cylindrical.

L. digitata

4 Stipe flexible, smooth, usually without epiphytes; lamina pale brown and bearing a translucent yellow patch at base; sublittoral fringe.

L. ochroleuca

Stipe stiff, rough, usually with epiphytes; lamina deep brown and lacking a basal yellow patch; sublittoral zone.

L. hyperborea

61. LITOSIPHON

1 Thallus > 60 µ diam.; completely parenchymatous.

——————————— 2

Thallus not > 60 µ diam.; filamentous in parts.

L. filiformis

2 Thallus rarely > 1.0 cm length; plants form discrete tufts on fronds of Alaria.

L. laminariae

Thallus usually > 1.0 cm length; plants aggregate in dense irregular patches on host surface; epiphytic on Chorda and other algae.

L. pusillus

44. MESOGLOIA

1 Assimilatory filaments > 60 u length, extending beyond apices of unilocular sporangia.

——————— 2

Assimilatory filaments not > 60 u length, not extending beyond apices of unilocular sporangia.

M. neglecta

2 Frond irregular, swollen in places; appearance smooth; cells of assimilatory filaments showing steady increase in diameter to apex.

M. vermiculata

Frond regular, unswollen; appearance wooly; terminal and subterminal cells of assimilatory filaments of equal diameter.

M. lanosa

11. MIKROSYTHAR

1. Filaments > 5μ in diam., at least in part; endophytic in Polysiphonia spp. M. polysiphoniae

Filaments ≯ 5u in diam.; endophytic in Porphyra spp. M. porphyrae

39. MYRIACTULA

1. Paraphyses markedly fusiform, 20 - 35 μ max. diam.; cell length not > breadth; epiphytic on Cystoseira, Halidrys.

M. rivulariae

Paraphyses cylindrical or slightly fusiform, seldom > 20 μ diam; cell length > breadth; epiphytic on other algae.

——————— 2

2. Paraphyses > 10 μ diam.

——————— 3

Paraphyses < 10 μ diam.

——————— 5

3. Paraphyses incurved at tips, 10 - 12 μ diam.; epiphytic on Himanthalia.

M. areschougii

Paraphyses straight.

——————— 4

4. Paraphyses 15 - 25 μ diam.; epiphytic on Scytosiphon; plurilocular sporangia uniseriate, unilocular sporangia intercalary, in chains.

M. haydenii

Paraphyses 10 - 14 μ diam.; epiphytic on Dictyota; plurilocular sporangia uniseriate, unilocular sporangia terminal, solitary.

M. stellulata

Myriactula

5. Paraphyses 7 – 8 μ diam., cells cylindrical; epiphytic on Fucus ceranoides.

M. clandestina

Paraphyses 8 – 10 μ diam., cells torulose; epiphytic on Chorda.

M. chordae

45. MYRIOCLADIA

1 Axis > 1 mm diam.; assimilators attenuate at apices, unbranched.

M. tomentosa

Axis not > 1 mm diam.; assimilators cylindrical branched at base.

M. bunniae

29. LYRIONEMA

1 Erect assimilatory filaments present ——— 2

Erect assimilatory filaments absent (hairs and podicells present) ——— 4

2 Erect assimilatory filaments papillate; epiphytic on Laminaria.

M. papillosum

Erect assimilatory filaments not papillate ——— 3

3 Erect assimilatory filaments at centre of disc sometimes branched; plurilocular sporangia only, never sessile; epiphytic on Fucus serratus.

M. polycladum

Erect assimilatory filaments unbranched; unilocular and plurilocular sporangia, sometimes sessile; epiphytic on Enteromorpha, Ulva and other algae.

M. strangulans

4 Epiphytic on Laminaria; hairs 4 – 5 μ diam.

M. corunnae

Epiphytic on *Zostera*; hairs 7 – 12 μ diam.; elongated 'ascocysts' often present.

M. magnusii

Myriotrema

NOTE: N. magnusii = Ascocyclus magnusii.

57. LYRIOTRICHIA

1 Plants microscopic, mainly uniseriate with sporangia borne in terminal clusters on erect filaments.

M. repens

Plants macroscopic, mainly parenchymatous with laterally-borne sporangia.

——————— 2

2 Lateral branches numerous, evenly distributed; axis parenchymatous.

M. clavaeformis

Lateral branches patchily distributed; axis filamentous in parts.

M. filiformis

66. PETALONIA

1 Fronds laminate, usually solitary; holdfast discoid.

——————————— 2

Fronds filiform, usually gregarious; holdfast rhizoidal.

P. filiformis

2 Fronds ribbon-shaped, usually < 5mm width.

P. zosterifolia

Fronds elipsoid, oval or irregular, usually > 5 mm width.

P. fascia

62. PUNCTARIA

1 Frond ⩾ 1.0 cm in width.

——————————— 2

Frond < 1.0 cm in width.

P. tenuissima

2 Frond edges markedly convoluted, >10 cm in width; thallus stiff.

P. crispata

Frond edges not or slightly convoluted, < 10 cm in width; thallus soft.

——————————— 3

3 Frond lanceolate – oval, narrowing abruptly at base; sporangia in elongate sori.

P. latifolia

Frond lanceolate – ribbon-shaped, narrowing gradually at base; sporangia in rounded sori or solitary.

P. plantaginea

21. RALFSIA

1 Thallus thick, coriaceous, extensive.

R. verrucosa

Thallus thin, smooth, in small patches 1 – 3 cm diam.

——————————— 2

2 Plants epilithic.

——————————— 3

Plants epiphytic on Laminaria, Chaetomorpha, Zostera.

R. pusilla

3 Paraphyses not 2 cells.

R. disciformis

Paraphyses 2 cells.

——————————— 4

4 Paraphyses 3 – 6 cells, clavate.

R. clavata

Paraphyses 10 – 12 cells, cylindrical.

R. spongiocarpa

46. SAUVAGEAUGLOIA

1 Thallus branched profusely at base but scarcely, if at all, elsewhere; axes 1 - 3 mm diam.; assimilatory filaments > 120 u length.

S. chordariaeformis

Thallus branched sparsely but evenly; axes seldom > 1 mm diam.; assimilatory filaments < 120 u length.

S. griffithsiana

17. STREBLONEMA

1. External assimilatory filaments present (assimilatory pedicells or hair bases not to be included)

——————— 2

External assimilatory filaments absent

——————— 4

2. Assimilatory filaments > 10 μ diam.; hairs present; plurilocular sporangia absent; unilocular sporangia elipsoid, (20-35 × 50-70 μ); endophytic in Dudresnaya.

S. volubilis

Assimilatory filaments < 10 μ diam.

——————— 3

3. Assimilatory filaments > 8 μ diam.; hairs absent; plurilocular sporangia multiseriate, oval or oval-lanceolate, 15 - 20 μ diam.; unilocular sporangia absent; endophytic in Ascophyllum.

—— S. breve

Assimilatory filaments < 8 μ diam.; hairs present; plurilocular sporangia biseriate, attenuate, 9 - 10 μ diam.; unilocular sporangia absent; endophytic in Ceramium, Gracilaria, Cystoclonium.

S. parasiticum

Stebonema

4. Plurilocular sporangia uniseriate

——————————— 5

Plurilocular sporangia bi- or multiseriate

——————————— 7

5. Plurilocular sporangia > 6 μ diam., entirely linear

——————————— 6

Plurilocular sporangia ≤ 6 μ diam., linear and occasionally branched, fasciculate; endophytic in Nemalion.

S. tenuissimum

6. Plurilocular sporangia 6 - 8 μ diam., massed together with hairs; plants form small pustules or streaks on Laminaria spp.

S. aecidioides

Plurilocular sporangia 8 - 10 μ diam.; hairs present but not massed with sporangia; endophytic in Stilophora.

S. stilophorae

7. Plurilocular sporangia mainly biseriate

——————————— 8

Plurilocular sporangia multiseriate

——————————— 9

8. Plurilocular sporangia uni- or biseriate, 12 - 16 µ diam.; Unilocular sporangia spherical 40 - 60 µ diam.; endophytic in Liebmannia, Mesogloia, Nemalion.

S. sphaericum

Plurilocular sporangia bi- or multiseriate, 10 µ diam.; fasciculate; unilocular sporangia oval; endophytic in Chordaria.

S. chordariae

9. Plurilocular sporangia not > 20 µ diam.

——————— 10

Plurilocular sporangia > 20 µ diam.

——————— 11

10. Plurilocular sporangia usually branched, 10 - 20 µ diam.; endophytic in Eudesme, Mesogloia.

S. fasciculatum

Plurilocular sporangia unbranched, 18 µ diam.; endophytic in Chylocladia.

S. zanardinii

11. Plurilocular sporangia lanceolate, < 30 μ diam.; endophytic in Rhodophyceae

12

Plurilocular sporangia irregular or obcordate, 30 - 40 μ diam.; unilocular sporangia ovoid 24 - 34 μ diam.; endophytic in Chorda.

S. aequale

12. Hairs present; endophytic in Ceramium.

S. effusum

Hairs absent; endophytic in Brongniartella

S. intestinum

NOTE: Streblonemoid growth in Petrocelis = S. helophorum, a very dubious species.

Streblonema sp. with unilocular sporangia alone endophytic in Chordaria is probably S. chordariae.

54. STICTOSIPHON

1 Plant not > 10 cm length; branching mainly opposite; branch apices markedly uniseriate (longitudinal cell divisions not beginning until emergence of lateral branches).

S. griffithsianus

Plant > 10 cm length; branching seldom opposite.

——————— 2

2 Frond soft, fragile; yellow - brown in colour; branch apices markedly uniseriate (usually until emergence of lateral branches or beyond); medullary cells of equal length and breadth; plurilocular sporangia forming conspicuous mosaic-like sori on frond or as intercalary or terminal structures on uniseriate parts of frond.

S. soriferus

Frond robust, cartilagenous; dark brown - black in colour; branch apices uniseriate for only few cells (longitudinal cell divisions before emergence of lateral branches); medullary cell length 3 - 10 × breadth; plurilocular sporangia

Stictyosiphon

forming confluent areas or scattered in subapical parts of frond, never found in uniseriate parts of frond.

S. tortilis

51. STILOPHORA

1 Assimilatory filaments of equal length; sori hemispherical and usually discrete; plant often > 20 cm length.

S. rhizodes

Assimilatory filaments of 2 unequal lengths; sori elongate and usually confluent; plant seldom > 20 cm length.

S. tuberculosa

82. SPHACELARIA.

1. Secondary transverse divisions absent from every segment; propagules of frequent occurrence.

——————— 2

. Secondary transverse divisions present in every segment; propagules unknown.

——————— 7

2. Propagules with radiating arms

——————— 3

Propagules wedge-shaped.

——————— 6

3. Plants partly endophytic.

——————— 4

Plants not endophytic.

——————— 5

4. On *Cystoseira* spp.; rhizoids sparse.

S. hystrix

On *Halidrys*; rhizoids abundant.

S. bipinnata

Sphacelaria

5. Branching sparse to rather dense but always irregular; all laterals of indeterminate growth; propagules tri- or bifurcate, arms cylindrical, stalk slightly tapering towards its base.

S. furcigera includes F

Branching pinnate; many laterals of determinate growth; propagules trifurcate, arms sausage-shaped, stalk clavate.

S. cirrosa

6. Branching sparse, irregular.

S. tribuloides

Branching dense, pinnate.

S. plumula

7. Plants not endophytic.

——— 8

Plants partly endophytic.

S. caespitula

8. Branching sparse, irregular; all laterals of indeterminate growth.

——— 9

Branching pinnate; almost all laterals of determinate growth.

——— 10

9. Unilocular sporangia often paired and sessile; plants form a turf not 10 mm in height.

S. radicans

Unilocular sporangia in crowded racemes; plants tufted, 10 mm in height.

S. racemosa

10. Corticating rhizoids formed only in plane of branching; unilocular sporangia borne on ordinary laterals.

S. plumigera

Corticating rhizoids formed in all planes; unilocular sporangia borne on special stichidia arising from cortication.

S. plumosa

Sphacelaria

NOTE: Sphacelaria furcigera includes S. fusca, see van den Hoek and Flinterman (1968).