Key to Genera of Brown Seaweeds

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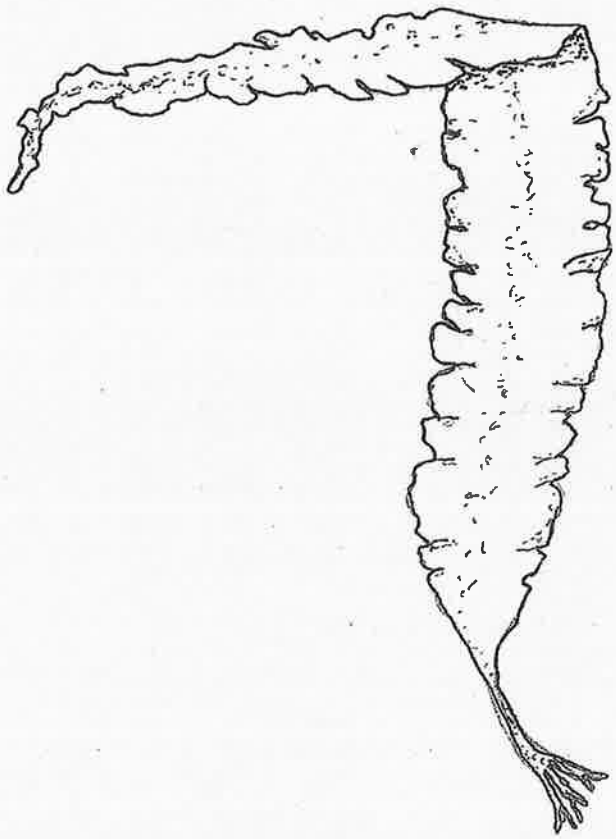

KEY TO GENERA OF BRITISH PHAEOPHYCEAE John W. Kenn

by George Russell.

Thallus of uniseriate heterotrichous filaments; filaments branched or unbranched, free or united to form an encrusting tissue - - - - - - - - - - - - 2

Thallus of another form - - - - - - - - - - - - 39

2. Filaments of erect systems (or emergent filaments of plant endobiotic) present, either as assimilatory cells, colourless hairs or both - - - - - - - - - - - - 3

Filaments of erect systems absent, procumbent filaments sometimes coalescent; plurilocular sporangia formed from scarcely modified vegetative cells and consisting of 2-4 loculi; unilocular sporangia unknown; plants endophytic in Porphyra spp. and Polysiphonia urceolata . . . . . MIKROSYPHAR

3. Filaments of erect systems branched ± profusely; plants usually macroscopic (> 5 mm); epilithic or epibiotic but not markedly endobiotic - - - - - - - - - - - - 4

Filaments of erect system unbranched or sparsely branched; plants usually microscopic (< 5 mm); epilithic, epibiotic or endobiotic - 12

4. Plastids ribbon-shaped, branched or unbranched, usually few per cell - - - - - - - - - - - - 5

Plastids ± discoid, usually many per cell - - - - - - - - - - - - 6

5. Plastids usually unbranched; filaments densely interwoven forming a branched, string-like frond; crampons present; very mucilagenous . . . . . SPONGONEMA

Plastids usually branched; filaments free; crampons absent; plants not particularly mucilagenous . . . . . ECTOCARPUS

6. Plants small, rarely > 1.0 cm - - - - - - - - - - - - 7

Plants > 1.0 cm - - - - - - - - - - - - 8

7. Filaments of erect system with diffuse growth; usually branched only at base giving subsimple appearance to filaments; plastids with pyrenoids; reproduction by plurilocular sporangia, unilocular sporangia rare; propagula absent . . . . . FELDMANNIA

Filaments of erect system with optical (apical?) growth from prominent apical cell; filaments sparsely branched but throughout length; plastids lacking pyrenoids; reproduction by unilocular and plurilocular sporangia; propagula of 2(1-3) distended cells present. CHORISTOCARPUS

8. Erect filaments profusely branched, frequently in ± orderly succession; angle of branch emergence usually 90°; crampons absent - - - - - - - - - - - - - -9

Erect filaments sparsely branched, branches arising in no obvious pattern; angle of branch emergence ± 90°; crampons sometimes present; plastids irregularly discoid; reproduction by unilocular, plurilocular and monosporangia . . . . . ACINETOSPORA

9. All erect filaments terminating in colourless hair with basal growth - - - - - - - - - - - - - 10

True hairs absent or infrequent - - - - - - - - - - - - - 11

10. Plurilocular sporangia small (< 20 μ long) and borne in dense clusters on main filaments, sometimes at bases of hairs . . . . . SOROCARPUS

Plurilocular sporangia usually > 20 μ long, borne singly; sporangia irregular in shape and loosely constructed, resemble mulberries; each loculus opens independently to outside . . . . . POLYTRETUS

11. Insertion of ultimate branches usually opposite; all filaments ecorticate; longitudinal divisions in older vegetative cells quite common; plants usually eulittoral; plurilocular and unilocular sporangia intercalary in branches, latter in chains . . . . . PILAYELLA

Insertion of ultimate branches rarely opposite; lower parts of main erect filaments commonly corticate; longitudinal cell divisions rare; plants usually sublittoral; plurilocular and unilocular sporangia sessile or pedicellate but never intercalary in position. . . . . GIFFORDIA

12. Basal tissue composed of procumbent filaments fused laterally? lathally - - - - - - - - - - - - - 13

Basal tissue composed of layer of procumbent filaments unfused laterally; thallus a microscopic flet, turf or tuft; epilithic, epibiotic or endobiotic - - - - - - - - - - - - - 14

13. Thallus a brown stain, patch or crust; epilithic or epibiotic- - 23 24

Thallus another form - - - - - - - - - - - - - 39

14. Erect filaments present as assimilatory filaments, colourless hairs or both - - - - - - - - - - - - - 15

Erect filaments absent; endophytic in Porphyra spp. or Polysiphonia urceolata; procumbent filaments sometimes coalesce in parts; plurilocular sporangia formed from scarcely modified vegetative cells and consisting of only 2-4 loculi; unilocular sporangia unknown . . . . . MICROSPONGIUM

15. Erect filaments assimilatory; at least in part - - - - - - - - 16

Erect filaments present only as colourless hairs; epiphytic on Zostera, Scytosiphon, Chorda, Laminaria; procumbent filaments often coalescent; plurilocular sporangia formed from repeated divisions of vegetative cell(s), very irregular in shape, with many loculi; unilocular sporangia borne from upper surfaces of procumbent filaments. . . . . PHAEOSTROMA

16. Erect system greater than prostrate system; plants epilithic or epibiotic, never endobiotic - - - - - - - - - - 17

Erect systems equal or in less than prostrate systems; plants usually endobiotic - - - - - - - - - - 19

17. Each vegetative cell contains 1, or rarely 2, plastids; plastids irregularly discoid or lobate - - - - - - - - - 18

Each vegetative cells contains several plastids; plastids discoid; plants epilithic or epiphytic on Taonia, Padina; erect filaments sparsely branched; plurilocular sporangia sessile or pedicellate and borne either on procumbent filaments or laterally on erect filaments; unilocular sporangia sessile or pedicellate and borne laterally on erect filaments . . . . . KUETZINGIELLA

18. Plant olive-green in colour; procumbent filaments coalescent; at least some of erect filaments terminate in a colourless hair; unilocular sporangia sessile on prostrate system or terminal on erect filaments; plant about 1.0 mm; epilithic or on shells in open . . . . . KOLDERUPIA

Plant golden-brown in colour; procumbent filaments free; true hairs absent; unilocular sporangia pedicellate and borne laterally on erect filaments; plants up to 5.0 mm; epilithic in cracks, crevices or in caves. . . . . WAERNIELLA

19. Growth of filaments emergent from host as great as that internally - - - - - - - - - - - - 20

Growth of emergent filaments less luxuriant than that internally and frequently reduced to sporangia, hairs and tips of erect filaments . . . . . STREBLONEMA*

20. Emergent (erect) filaments unbranched or sparsely branched; branching never fastigiate; plants not mucilaginous - - - - - 21

Emergent (erect) filaments repeatedly branched; branching usually fastigiate; plants mucilaginous - - - - - - - - - - 24

21. Emergent filaments with diffuse growth; vertical divisions in vegetative cells absent - - - - - - - - - - - - - 22

Emergent filaments with apical growth by prominent apical cell; plants endophytic in Carpomitra; occasional vertical divisions in vegetative cells, unilocular sporangia pedicellate and lateral on emergent filaments. . . . . SPHACELLA

22. Emergent filaments rarely branched; plastids discoid, several per cell - - - - - - - - - - - - 23

Emergent filaments sparsely branched; plastids band-shaped, 2(1-3) per cell; plurilocular sporangia uniseriate, borne terminally or laterally onemergent filaments; unilocular sporangia unknown; plants usually endophytic in Laminaria . . . . . LAMINARIOCOLAX

23. Hairs present, borne simply or in small clusters at apices of erect filaments; plurilocular sporangia uniseriate and borne in small clusters terminally on erect filaments; unilocular sporangia also in terminal clusters or occasionally on prostrate filaments; sporangia sessile, sometimes shortly pedicellate. . MYRIOTRICHIA

Hairs absent; plurilocular sporangia multiserrate; plurilocular and unilocular sporangia borne singly, never in clusters; sporangia terminal or lateral on erect filaments, sessile or pedicellate . . . . . HERPONEMA

24. Emergent filaments attenuate; cells cylindrical, length 2 x diam. or more; unilocular sporangia cylindrical; plurilocular sporangia biseriate; plants endophytic on Gracillaria. . . CYLINDROCARPUS

Emergent filaments clavate; cells toniform, isodiametric; unilocular sporangia ovoid or spherical; plants endophytic in Mesogloia and ~~Suevaglaugloia~~ Sauvageaugloia . . . . . STREPSITHALIA

25. Erect assimilatory filaments absent; erect system reduced to colourless hairs and reproductive bodies; plants strictly of the sublittoral zone - - - - - - - - - - - - 26

Erect system includes assimilatory filaments; plants mainly of the eulittoral zone - - - - - - - - - - - - 27

26. Thallus roundish or reniform, up to 20 cm diam.; growing edge of thallus bears fringe of hairs; older plants become dark and coriaceous with ragged edges; upper surfaces of plants bear colourless hairs and either plurilocular gametangia or unilocular sporangia . . . . . ZANARDINIA

Thallus membranous, lobate, 1-2 cm long, liverwort-like, gregarious; growing edges lack hairs, upper surface of plants bear colourless hairs and unilocular sporangia. .CUTLERIA

27. Erect assimilatory filaments free from one another - - - - - - 28

Erect assimilatory filaments coalescent or fused laterally - - 34

28. Erect assimilatory filaments usually unbranched - - - - - - - 29

Erect assimilatory filaments usually branched - - - - - - - 32

29. Usually several plastids per cell ---------- 30

Usually one plastid per cell; erect filaments variable in length rarely branched; colourless hairs present, pedicellate on procumbent tissue or terminal on short erect filaments; plurilocular sporangia uniseriate and/or lateral on erect filaments, if lateral they are also sessile* . . . . . MICROSPONGIUM*

30. Erect assimilatory filaments of uniform length [up to c 100 μ] and densely and evenly distributed over central region if procumbent tissue; hairs and sporangia sessile or pedicellate on procumbent tissue ---------- 31

Erect assimilatory filaments of variable length [up to c. 1.0 mm] and arranged in clumps or concentric zones on procumbent tissue; erect filaments rarely branched; hairs and sporangia occasionally sessile on procumbent tissue but more commonly on erect filaments and either terminal or lateral; plurilocular sporangia multiseriate . . . . . CHILIONEMA

31. Procumbent systems a compact disc with no or few downward-growing rhizoids; plurilocular sporangia uniseriate ------- MYRIONEMA

Procumbent systems a loose and irregular disc with many rhizoids; plants epiphytic on Rumontia ---------- ULONEMA**

32. Usually one plastid per cell ---------- 33

Usually several plastids per cell; erect filaments of variable length and usually with several branches; vertical cell divisions occasionally present; plurilocular sporangia lanceolate and multiseriate; in young plants plurilocular sporangia terminal on erect filaments, later they are more commonly borne laterally, sessile or pedicellate; plants epiphytic on Rhodymenia, Chondrus, Ectocarpus, Laminaria, Cladophora . . . . . HECATONEMA

33. Erect filaments of fairly constant length, sometimes producing downward growing 'stolons'; unilocular sporangia sessile on procumbent tissue, or on basal parts of erect filaments; plurilocular sporangia multiseriate, lanceolate and usually terminal or lateral on erect filaments and branches; plurilocular sporangia never branched; plants epilithic or epiphytic on Ralfsia . . . . . COMPSONEMA

Erect filaments very variable in length, 'stolons' absent; unilocular sporangia sessile on procumbent tissue or lateral and pedicellate on erect filaments; plurilocular sporangia multiseriate, at first lanceolate and sessile on procumbent tissue, later terminal or lateral on erect filaments and branches; at later stages plurilocular sporangia usually long and branched, branching mainly secund; plants epiphytic on various algae and epizoic on Patella . . . . . PROTECTOCARPUS

34. Erect filaments loosely coalescent ---------- 35

Erect filaments tightly adpressed, sometimes with a continuous superficial cuticle ---------- 36

* If plurilocular sporangia multiseriate, this is PROTECTOCARPUS in young stages.

** May be simply an ecad of Myriohema

35. Erect filaments with up to 20 cells; plurilocular sporangia uniseriate or multiseriate, borne terminally on erect filaments, irregular in shape but often clavate (widest distally), unbranched. . . . PETRODERMA

Erect filaments with 2-7 cells; plurilocular sporangia multiseriate, irregular in shape, sometimes branched, 4-12 loculi, borne terminally on erect filaments; plants epiphytic on Chaetomorpha-SYMPHYOCARPUS

36. One plastid per cell. 37

Several plastids per cell. 38

37. Erect filaments often > 10 cells; thallus a brown and often dark leathery crust, sometimes confluent and showing concentric growth rings; unilocular and plurilocular sporangia known, borne apically on erect filaments but mixed with numerous secondary assimilatory filaments (paraphyses) and hence somewhat submerged in thallus; unilocular sporangia ovate-cylindrical, plurilocular sporangia multiseriate; plants usually epilithic and usually in eulittoral zone . . . . . RALFSIA

Erect filaments usually about 6 cells, seldom > 10 cells; thallus a brown crust, sometimes confluent but lacking growth rings; unilocular sporangia pyriform and widest distally, borne apically on erect filaments; secondary assimilatory filaments absent; plants usually epizoic on mollusc shells and usually in sublittoral zone . . . . . SORAPION

38. Erect filaments rarely > 10 cells; thallus a brown membranous crust; plurilocular and unilocular sporangia never on same plant, borne terminally on erect filaments, hense 'sessile' on crust surface; plants epilithic and usually in sublittoral zone. . . PSEUDOLITHODERMA

Crust truly parenchymatous in origin and therefore lacking separable filaments; thallus a black leathery crust up to 4 cm thick bearing on upper surface some sparse uniseriate filaments; filaments unbranched or branched, short; unilocular sporangia borne terminally or laterally on filaments, hence projecting above crust surface; plurilocular sporangia unknown. . . . . BATTERSIA

39. Thallus a small knob of pseudoparenchyma composed of fused procumbent and erect filaments and from which a ruft of free unbranched assimilatory filaments is borne; plants wart-like or resembling a small shaving brush 40

Thallus another form 45

40. Free erect filaments of two morphologically distinct types; prominent assimilatory filaments and small paraphyses at their bases. 41

Free erect filaments of one morphological type only. 42

41. Thallus not mucilaginous, conspicuous, 2-20 mm; paraphyses abundant; unilocular sporangia and plurilocular sporangia at bases of free filaments, latter uni- or multiseriate; plants epiphytic on Fucus, Ascophyllum, Himanthalia and other algae, occasionally epilithic. . . . . ELACHISTA

Thallus mucilagenous, inconspicuous, 2-4 mm; paraphyses sparse, unilocular and plurilocular sporangia at bases of free filaments, latter uniseriate; plants epiphytic on Arthrocladia . . SYMPHORICOCCUS

42. Maximum diameter of free filaments $> 10\ \mu$ ---------- 43

Maximum diameter of free filaments $< 10\ \mu$ ---------- 44

43. Colourless hairs present; epiphytic on Phaeophyceae; unilocular and plurilocular sporangia at bases of free filaments, latter uniseriate; plants not usually epiphytic on Zostera . . . . . MYRIACTULA

Colourless hairs absent; plurilocular sporangia intercalary and consist of band of loculi encircling a core of somatic cells of erect filament; unilocular sporangia absent; plants epiphytic on Zostera . . . . . HALOTHRIX

44. Colourless hairs absent; thallus not mucilaginous; plurilocular sporangia intercalary on free filaments; uni- or multiseriate cylindrical; unilocular sporangia at bases of free filaments, pedicellate . . . . . LEPTONEMATELLA

Colourless hairs present; thallus mucilaginous; plurilocular sporangia at bases of free filaments, in tufts, uniseriate (?), fusiform; unilocular sporangia absent. . . . MICROCORYNE

45. Thallus pseudoparenchymatous and in the form of a spherical or hemispherical cushion, ± convoluted, ± gelatinous, ± hollow ---------- 46

Thallus of another form ---------- 49

46 Thallus gelatinous, slippery ---------- 47

Thallus not gelatinous; thallus spherical, membranous, papery, consisting of two tissue layers, 2-10 cm diam.; colourless hair present; plurilocular sporangia uniseriate and massed in sori over thallus surface; plants usually epibiotic
[This genus is in fact truly parenchymatous and when a small portion of frond is lightly squashed no separable filaments can be seen]. . . . . COLPOMENIA

47. Outermost layer of thallus composed of unbranched paraphyses ▼▼▼---------- 48

Outermost layer of thallus composed of branched paraphyses; two species very different in organisation, see text . . . . . CYLINDROCARPUS

48. Paraphyses short, 2-4 cells; thallus solid when young but soon becoming hollow; irregular in shape, convoluted, 1-3 cm diam.; yellow; gregarious; internal tissue consisting of large, stellate, colourless cells; cells of outer branches progressively smaller and pigmented; hairs present; unilocular and plurilocular sporangia borne at paraphyses bases, latter uniseriate and short; plants epilithic or epiphytic. LEATHESIA

Paraphyses long, 10-17 cells; thallus not obviously hollow; forms small, brown cushions, 2 mm diam; cells of internal tissue cylindrical, not stellate; sporangia as in Leathesia; epiphytic on Chondrus . . . . . CORYNOPHLOEA

49. Thallus pseudoparenchymatous and formed by lateral fusion of axes, branches or both; essentially filamentous nature of thallus evident and often only slight pressure is required to separate constituent filaments; thallus in form of branched cylindrical frond, often filiform, ± hollow, occasionally flattened, ± mucilage, soft or cartilaginous, rarely marine; axial filaments single (uniaxial) or multiple (multiaxial) - 50

Thallus truly parenchymatous and formed by repeated cell division within axes, branches or both; seperate filaments lacking; thallus variable in form, often massive but simplest species may be sub-filamentous - - - - - - - - - - - 67

50. Thallus uniaxial 51

Thallus multiaxial. 59

51. Frond constructed solely by dense cortication of single axial filament and its branches; cortication forms a small-celled tissue, axial cell remains distinct in T.S. frond; frond bears prominent assimilatory hairs, especially in juvenile parts (may be absent in winter); often tough and cartilaginous, not mucilaginous; filiform, terete or ligulate; branching opposite or alternate 52

Frond constructed by loose cortication of single axial filament and its branches; cells of cortication similar in size to those of axis, acial cell becomes indistinct; cortication arises from short lateral assimilatory filaments and may in turn, bear secondary assimilatory filaments; hairs colourless; thallus soft and often mucilaginous, never cartilaginous; branching pseudodichotomous or irregular - - - - - - - - - - 52

52. Frond filiform, not > 15 cm; pigmented hairs borne in branched tufts and arranged in whorls around axes, over the entire length; unilocular sporangia in chains on whorled tufts.. . . . . .ARTHROCLADIA

Frond filiform, terete or ligulate, usually > 15 cm; no whorled arrangement of pigmented hairs; unilocular sporangia sunk in peripheral layer of thallus. . . . . DESMARESTIA

53. Assimilatory filaments clothing entire frond 54

Assimilatory filaments present only at frond apices; frond surface consisting of small-celled layer bearing sporangia in sori; sporangia almost always unilocular; sori contain paraphyses and often show a spiral or whorled arrangement; frond psdueodichotomously branched; branches terminate in apical cell. . . . . SPERMATOCHNUS

54. Assimilatory filaments > 6 cells in length - - - - - - - - - - - - 55

Assimilatory filaments < 6 cells in length - - - - - - - - - - - - 58

55. Frond filiform, ± constant in diam., not markedly mucilagenous - - - - - - - - - - - - - - - 56

Frond filiform, irregular in diameter, becoming distended, markedly mucilagenous - 57

56. Assimilatory filaments 6-8 cells in length; axes profusely branched . . . . . ACROTHRIX

Assimilatory filaments > 12 cells in length; axes sparsely branched . . . . . MYRIOCLADIA

57. Apical cell of assimilatory filaments regularly spherical and 20-35 μ diam.; unilocular and plurilocular sporangia present, latter multiseriate, siliquose or branched and borne at bases of assimilatory filaments . . . . . LIEBMANNIA

Apical cell of assimilatory filaments irregularly spherical and not > 15-20 u diam.; only unilocular sporangia known. .MESOGLOIA

58. Assimilatory filaments 2-3 cells in length, lacking prominent apical cell; frond always becoming hollow but with narrow bore and not distended; unilocular sporangia in sori irregularly distributed over frond surface; frond texture soft; branches terminate in apical cell. . . . . STILOPSIS

Assimilatory filaments c. 5 cells in length and consisting of narrow cells capped by large ± spherical cell; frond solid but may become hollow; unilocular sporangia present but not in very distinct sori; frond texture firm; branches terminate in short filaments . . . . . SPHAEROTRICHIA

59. Assimilatory filaments clothing axes from apex to base 60

Assimilatory filaments absent or present only at frond apices. . 64

60. Morphological boundary between assimilatory filaments and axes very sharp - 61

Morphological boundary between assimilatory filaments and axes ± indistinct - 63

61. Assimilatory filaments 7 cells in length; thallus soft and mucilagenous - 62

Assimilatory filaments 7 cells in length; thallus tough, cartilagenous, dark brown, solid, bearing many and long primary branches but relatively few secondary and tertiary branches; unilocular sporangia borne at bases of assimilatory filaments and apparantly sunk in peripheral layers of frond; plurilocular sporangia unknown on macrothallus; . . . . . CHORDARIA

62. Frond ± richly branched, branches long; frond 10–30 cm; cells of axes 20 x diam. in length; unilocular sporangia borne at bases of assimilatory filaments; plurilocular sporangia unknown on macrothallus; epilithic, sometimes epiphytic. . . . . SAUVAGEAUGLOIA

Frond ± sparsely branched, branches short; frond 2–20 cm; cells of axes 4–8 x diam. in length; unilocular sporangia borne at bases of assimilatory filaments; plurilocular sporangia uniseriate or multiseriate, borne laterally on or at apices of assimilatory filaments; plants epiphytic on Zostera leaves . . . . . CLADOSIPHON

63. Frond ± richly branched, branches long; frond 10–50 cm, dark olive-brown; assimilatory filaments in tufts which are pedicellate on axes; plants epilithic on stones, often in sandy or pebbly areas; sporangia as in Cladosiphon . . . . . EUDESME

Frond ± sparsely branched, branches short; frond 2–20 cm, yellow-brown; assimilatory filaments single or in small tufts borne directly on axes, not pedicellate; often epiphytic on Zostera . . . . . CLADOSIPHON

64. Frond apices each crowned with a prominent tuft of hairs; apices sometimes swollen; assimilatory filaments absent; thallus filiform or flattened, with many axial filaments – – 65

Frond apices lacking tuft of hairs; apices attenuate, never swollen; assimilatory filaments present but only distal parts of branches, peripheral tissue layer of most of frond composed of small epidermal cells; thallus filiform with only 3–5 axial filaments; unilocular and plurilocular sporangia present, latter uniseriate and branched or unbranched, c.6 loculi; sporangia in prominent sori scattered throughout frond; sori contain colourless hairs and paraphyses. . . . STILOPHORA

65. Frond filiform, or if flattened, $\leq$ 3 mm broad; branch apices often swollen and bearing branched paraphyses; reproductive bodies borne on paraphyses and thus confined to apical regions; only unilocular sporangia known on macrothallus– – – – – – 67

Frond flattened, $>$ 3 mm broad; branch apices never swollen; reproductive bodies borne in sori over surface of thallus; only plurilocular micro- and megagametangia known on macrothallus. . . . . CUTLERIA

66. Frond filiform, terete; assimilatory filaments absent but paraphyses present crowded together with, and just proximal to, tufts of hairs at frond apices; paraphyses branched and with large apical cells; frond alternately or irregularly branched, 10–45 cm, soft but not mucilagenous; unilocular sporangia borne on paraphyses; plurilocular sporangia unknown on macrothallus. . . SPOROCHNUS

Frond filiform, ligulate; axis forms midrib on which two lateral wings of tissue are produced; assimilatory filaments absent but paraphyses similar to those of Sporochnus present at frond apices; frond 10–30 cm, dichotomously branched; unilocular sporangia borne on paraphyses; plurilocular sporangia unknown on macrothallus . . . . . CARPOMITRA

67. Thallus a black, leathery, epilithic crust. . . . . BATTERSIA

Thallus another form - 68

68. Thallus spherical, hollow and epibiotic . . . . . COLPOMENIA

Thallus another form 70

69. Thallus filiform, $\not>$ 2 mm diam.; soft or catilagenous but not massive; some species only slightly parenchymatous and may appear filamentous on a casual examination; thallus solid, sometimes hollow in older tissues. 70

Thallus another form 8 5

70. Axes branched throughout length. 71

Axes unbranched or branched only at base 81

71. Thallus with apical growth due to activity of large prominent growing cell at apex of every branch 72

Thallus with diffuse growth; no prominent apical cells . . . 75

72. Vertical cell divisions very scarce, thallus almost filamentous; plants 1-2 mm, endophytic in Carpomitra . . . . . SPHACELLA

Vertical cell division abundant; frond articulate. 73

73. Lateral branches borne between the cross walls of one articulation; plants small, seldom exceeding 5 cm; commonly epibiotic; commonly showing vegetative reproduction by means of propagula . . . . . SPHACELARIA

Lateral branches borne straddling a cross wall between two adjacent articulations, plants usually $>$ 5 cm; usually epilithic; never forming propagula. 74

74. Plant axes repeatedly branched; ultimate branches alternate, borne directly on axes. . . . . HALOPTERIS

Plant axes branched once or twice; ultimate branches in whorls around axes, borne on secondary thickening which encases axes . . . . . CLADOSTEPHUS

75. Plant apices monosiphonous for 3-many cells, parenchyma developing in proximal parts of frond. 76

Plants parenchymatous from apex to base 79

76. Reproductive structures never immersed in parenchyma. . . . 77

Reproductive structures mostly immersed in parenchyma . . . . . STICTYOSIPHON

77. Reproductive structures terminal (pedicellate) on or intercalary in monosiphonous parts of plants; plants usually > 5 cm 78

Reproductive structures (unilocular sporangia) usually in opposite, sessile pairs on monosiphonous and parenchymatous parts of plant; plants seldom 5 cm, commonly epiphytic on Plumaria elegans . . . . . ISTHMOPLEA

78. Reproductive structures (monosporangia) pedicellate and laterally borne on monosiphonous parts of frond, rarely intercalary and then only singly; branching rather irregular; plurilocular sporangia intercalary. . . . . HAPLOSPORA

Reproductive structures (monosporangia) always intercalary in monosiphonous parts of frond and usually in short chains of 2 or 3; branching mainly opposite and unequal; plurilocular sporangia intercalary TILOPTERIS

79. Branches terminating in a hair or pseudohair. 80

Branch apices lacking a terminal hair but often with a small apical cell; thallus 15-50 cm, c. 1 mm diam., richly branched, branching irregular; hairs present, randomly scattered over thallus surface; in T.S. young thallus consists of 4-celled medulla with peripheral layer 1 or 2 cells thick of small cortical and epidermal cells; mature thallus becomes hollow and has thicker cortex; unilocular sporangia scattered over and sunk in cortical layer; plurilocular sporangia unknown on macrothallus; epiphytic on Chordaria, Fucus, Cystosira etc.; oldest plants may produce exserted unilocular sporangia and short adventitious filaments . . . . . DICTYOSIPHON

Cystoseira

80. Thallus hollow, tubular; branching usually opposite, branches attenuate at apices and bases; sporangia and hairs in sori. sori encircling thallus in equidistant rings; unilocular sporangia exserted on thallus surface; plurilocular sporangia unknown on macrothallus . . . . . STRIARIA

Thallus solid though may become tubular in old plants; branching not usually opposite; branches seldom attenuate at bases; sporangia and hairs randomly scattered; unilocular and plurilocular sporangia sunk in thallus; anatomically, mature thallus in T.S. resembles young Dictyosiphon; epiphytic on various algae or epilithic estuarine. . . . STICTYOSIPHON

81. Axes bearing short uniseriate lateral branches of ± limited growth 82

Axes lacking laterals of limited growth. 84

82. Lateral branches of constant length (c.8 cells); laterals evenly distributed over axes; thallus up to 3 cm, solitary or gregarious; thallus c. 1 mm diam, solid; hairs present plurilocular sporangia cylindrical or fusiform, uni or biseriate, mixed with and in length equal to laterals of limited growth; unilocular sporangia unknown; epiphytic on Sauvageaugloia griffithsiana . . . . . BUFFHAMIA

Lateral branches of variable length. 83

83. Lateral branches simple and patchily distributed over axes (usually more numerous and longer distally); thallus up to 1 cm, usually gregarious; hairs present; plurilocular sporangia cylindrical or conical and usually multiseriate but very variable; unilocular sporangia present; sporangia usually sessile and borne on axes but occasionally on laterals and prostrate tissue; epiphytic on Scytosiphon and other algae . . . . . MYRIOTRICHIA

Lateral branches bearing short branches and evenly and densely distributed over axes; thallus up to 4 cm, solitary or gregarious; hairs present; plurilocular sporangia cylindrical uni- or biseriate and borne terminally on laterals; unilocular sporangia borne on laterals; sporangia pedicellate; epiphytic on Zostera . . . . . LEBLONDIELLA

84. Thallus articulate, attenuate proximally and distally, not exceeding 1.5 cm; each frond terminates in hair and laterally borne hairs tend to be crowded distally; fronds gregarious; plurilocular sporangia formed by transformation of young (monosiphonous) tissue or borne in sori (sessile) on sides of frond or in clusters (pedicellate) at bases of fronds; plurilocular sporangia uni-multiseriate; unilocular sporangia unconfirmed ; epiphytic on Cystoseria, other algae, Zostera. . . . . GIRAUDIA

Thallus not articulate, cylindrical, often exceeding 1.5 cm; hairs randomly distributed; fronds solitary or gregarious; plurilocular sporangia sunk in epidermal layer of frond, multiseriate, subspherical; unilocular sporangia also sunk in frond; sporangia not in clusters or sori; epiphytic on Alaria, Chorda, other algae . . . . . LITOSIPHON*

85. Thallus tubular, hollow 86

Thallus another form 88

86. Frond unbranched or branched only at base. 87

Frond branched throughout; branching usually opposite, branches attenuate at apices and bases; sporangia and hairs in sori, sori encircling thallus in equidistant rings; unilocular sporangia exserted on thallus surface; plurilocular sporangia unknown on macrothallus . . . . . STRIARIA

87. One plastid per vegetative cell; frond usually constructed at intervals; plurilocular sporangia uniseriate and forming dense irregular patches on frond surface; sporangia mixed with cylindrical or pyriform paraphyses consisting of single cell; unilocular sporangia unknown on macrothallus; epilithic or epizoic, sometimes estuarine . . . . . SCYTOSIPHON

Many plastids per vegetative cell; frond unconstricted; sporangia in small sori mixed with multicellular hairs; unilocular and plurilocular sporangia present, sessile or pedicellate, latter multiseriate; spilithic, epiphytic or epizoic, never estuarine . . . . . ASPEROCOCCUS

88. Thallus delicate, fewer than 10 cells in T.S.; frond flattened, membranous. 90

Thallus massive and, if flattened, never membranous, frond > 10 cells thick in T.S. 97

* If unilocular sporangia are borne from and sunk in cortical tissues, this is Dictyosiphon eckmanii.

89. Frond branched. 90

Frond unbranched 94

90. Frond with midribs; growth due to line of apical cells; branching dichotomous; asexual plants bear tetrasporangia in sori on either side of midrib and on both sides of frond; sexual plants dioecious and bearing oogonia or plurilocular male gametangia in sori; epilithic and sublittoral . . . . . DICTYOPTERIS

Frond without midrib. 91

91. Frond with growth due to single apical cell; hairs lacking . . 92

Frond with growth due to line of apical cells; hairs present in distinct horizontal or concentric bands. 93

92. Frond 3 cells thick in T.S. from base to apex; branching dichotomous; frond translucent, yellow brown and sometimes faintly irridescent; asexual plants bear tetrasporangia randomly distributed on both sides of frond; sexual plants dioecious and bearing oogonia or plurilocular male gametangia in sori . . . . . DICTYOTA

Frond > 3 cells thick at base; otherwise as Dictyota. .DILOPHUS

93. Frond fan-shaped, dark brown, opaque, stiff, sometimes irridescent; thallus not > 15 cm; only primary branches present; hairs in concentric bands along frond; apical edge of frond incurved; asexual plants bear tetrasporangia, scattered or in groups, on frond surface between bands of hairs; sexual plants monoecious with oogonia in zones between bands of hairs and transversed by longitudinal files of plurilocular male gametangia . PADINA

Frond ligulate; pale yellow-brown, translucent, soft, not irridescent; thallus > 15 cm; primary, secondary and tertiary branches present; hairs in horizontal bands; apical edge not incurved; tetrasporangia scattered or in groups close to bands of hairs; sexual plants dioecious with oogonia or plurilocular male gametangia scattered or in groups close to hairs . . . . . TAONIA

94. One plastid in each vegetative cell; fron uaully strap-shaped or ribbon shaped; plurilocular sporangia uniseriate and forming dense irregular patches on frond surface; unilocular sporangia unknown on macrothallus; epilithic or epizooic on Balanus, sometimes estuarine . . . . . .PETALONIA

Many plastids in each vegetative cell 95

95 Thallus fan-shaped, dark-brown, opaque, stiff sometimes irridescent hairs present in conspicuous concentric bands. . . . . PADINA

Thallus leaf-like or ribbon-like with basal holdfast; frond pale-brown or olive, soft; hairs usually present, irregularly scattered over frond; unilocular sporangia scattered over and partly immersed in frond; plurilocular sporangia variable in shape but usually conical or subspherical, isolated or in sori and partly sunk in thallus; epiphytic or epilithic . . . . . PUNCTARIA*

*Includes Desmotrichum

96. Frond button-shaped, with central holdfast . . . . . HIMANTHALIA

Frond not button-shaped, with basal holdfast 98

97. Frond simple or split at distal end but not truly branched; growth intercalary; plants usually of sublittoral zone. . . 98

Frond branched, usually dichotomously; growth apical; plants usually of eulittoral zone. 101

98. Frond cylindrical, simple, sometimes very long (up to 8 m), often gregarious; frond clothed with hairs, mucilagenous; unilocular sporangia and clavate unicellular paraphyses produced in dense layer on surface of frond; gametangia unknown on macrothallus; epilithic, usually on small stones . . . . . CHORDA

Frond flattened 99

99. Frond with cryptostomata and hairs 100

Frond lacking cryptostomata and hairs; frond leathery, dark brown, mucilagenous; stipe tough and holdfast root-like; unilocular sporangia and clavate unicellular paraphyses produced in irregular patches on frond; gametangia unknown on macrothallus . . . . . LAMINARIA

100. Frond with conspicuous midrib; stipe cylindrical; holdfast root-like; unilocular sporangia borne on sporophylls produced as lateral outgrowths of stipe; plants of very exposed shores . . . . . ALARIA

Frond lacking midrib; stipe flattened; holdfast tuberous, inflated and warty; unilocular sporangia not on sporophylls; plants of shelter or only moderate exposure. . . . . SACCORHIZA

101. Frond flattened. 102

Frond cylindrical. 105

102. Frond with midrib; cryptostomata and hairs present; holdfast discoid; air-bladders sometimes present; fertile regions (receptacles) are metamorphosed branch apices and consist of many flask shaped cavities (conceptacles) containing oogonia and/or antheridia; branching dichotomously; 8 eggs in each oogonium; species monoecious and dioecious. . . . . FUCUS

Frond lacking midrib 103

103. Thallus with large air-bladders borne singly and at intervals along frond; branching dichotomously; receptactles on small lateral branches; plants dioecious; 4 eggs per oogonium . . . . . ASCOPHYLLUM

Thallus lacking air-bladder. 104

104. Thallus > 15 cm; frond consists of long dichotomously branched receptacles arising from centre of small button-shaped vegetative tissue; plants dioecious; 1 egg per oogonium; plants of lower eulittoral zone. . . . . HIMANTHALIA

Thallus < 15 cm; consists of dichotomously-branched and channelled frond with terminal receptacles; plants monoecious; 2 eggs per oogonium; plants of upper eulittoral zone and littoral fringe . . . . . PELVETIA

105. Thallus distinctly dichotomously branched 106

Thallus falsely alternately branched, irregular or pinnate. . . 107

106. Holdfast discoid; frond button-shaped with long dichotomously branched receptacle; plants dioecious. . . . . .HIMANTHALIA

Holdfast creeping, rhizomatous; frond dichotomously branched bearing terminal, unbranched receptacle; plants monoecious but distal conceptacles entirely male and proximal ones entirely female; 1 egg per oogonium . . . . . BIFURCARIA

107. Frond finely branched and frequently spiny; branching alternate, irregular; air bladder very small, simple, subspherical and intercalary; receptacle apical, nodose and often branched . . . . . CYSTOSEIRA

Frond strongly branched, never spiny; branching alternate, pinnate; air bladder compound and articulate in construction, siliquose and terminal or subterminal; receptacles lateral, simple . . . . . HALIDRYS