Pictured Key to some Filamentous Red Algae of southern Australia. Part V, 2nd Edition

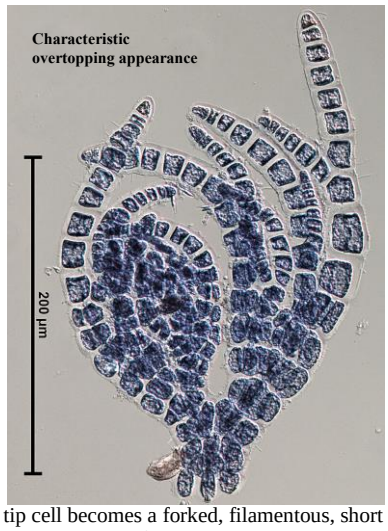
Red Algae. With some 800 species, many of which are endemic (found nowhere else), southern Australia is a major centre of diversity for red algae. Classification is based on detailed reproductive features. Many species unrelated reproductively have similar vegetative form or shape, making identification very difficult if the technical systematic literature is used.

This key Fortunately, we can use this apparent problem to advantage - common shapes or morphologies will allow you to sort ***some*** algae directly into the level of genus or Family and so shortcut a systematic search through intricate and often unavailable reproductive features. The pictured key below uses this ***artificial*** way of starting the search for a name. It's designed to get you to a possible major group in a hurry. Then you can proceed to the appropriate fact sheets within this website.

Scale: the coin used as a scale is 24mm or almost 1" wide.
Microscope images of algae are usually blue stained.

This key is *restricted* to algae in the Family: Dasyaceae. These have:-

- a basic ***filamentous construction***. Cells grow in a single line (algae are *uniseriate*), although this may be visible only near plant tips, or by cutting a cross section of to find a central filament microscopically
- at plant tips ***bands of cells*** (pericentral cells) equal in length to each filament cell may be produced. The banded appearance is later often obliterated by additional cells (cortical cells) running lengthwise
- branching occurs by ***"overtopping"*** A cell below a filament tip divides, and, growing past the original tip cell, continues the growth of the filament. The previous tip cell becomes a forked, filamentous, short side branch called a pseudo-lateral. Cells at the fork ***share a common cell wall***.
- there are ***flask-shaped*** mature female structures (cystocarps)
- tetrasporangia occur in special cigar-shaped branches (***stichidia***)



Check in the "algal look-alikes" panel at the end of this key to exclude other filamentous algae with cortication and bands of pericentral cells.
This key refers only to the ***filamentous*** members of the Dasyaceae. Others forming a network or meshwork of filaments are described in the key: "Red-mesh Algae."
The key below follows that in the Flora of southern Australia Part IIIC, and requires that plant tips and reproductive structures be viewed microscopically.

1a. plant flat-branched; forked side filaments (pseudo-laterals) alternate every 2 or more axial cells apart; > 6 pericentral cells in cross section …….. *Heterosiphonia* (21 spp)

1b. plant usually radially branched; forked side filaments (pseudo-laterals) occur 1-2 axial cells apart; < 6 pericentral cells in cross section …… *Dasya* (9 spp) ……..…..... 2

2a. plants appear woolly; unbranched hairs plentiful between naked, forked side filaments (see Fig. 2) ……..……...…...……..... 3.

2b. hairs rare or absent ……..……..... 8.

3a. naked, forked side filaments and hairs soft, arising from axes at acute angles, branched only basally, ending in a floppy thread (see Fig. 4) ……..……..……..…. 4.

3b. naked forked side filaments and hairs stiff, spreading, ending in a sharply pointed or conical cell ……..... 7.

4a. forked side branches and hairs narrowing gradually towards the tips (see Fig. 4) ……...……..... 5.

4b. basal 1-2 cells of naked side branches and hairs noticeably larger than following cells (see Fig. 9). ……..…… 6

5a. cross section of a mature axis shows a definite central filament surrounded by usually 5 pericentral cells; tetrasporangia with small outer rectangular cap cells. Figs 1-4 ……. *Dasya villosa*

5b. central filament and pericentral cells in cross section of mature axis obscured by rhizoids; tetrasporangia with irregular shaped cap cells Figs 5-8 …….. *Dasya extensa*

Fig. 1: *Dasya villosa*

Fig. 2. *Dasya villosa*: backlit to highlight the dense, hair-like, naked side branches and hairs

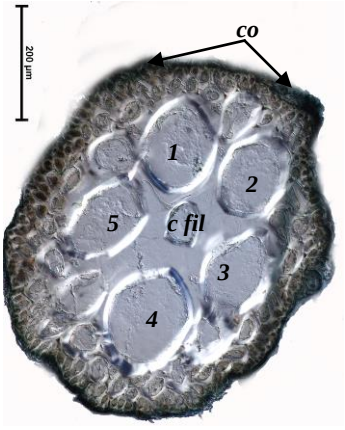


Fig. 3. *Dasya villosa*, cross-section: well-defined central filament (*c fil*), 5 pericentral cells (*1-5*); compact cellular wrappings (cortication, *co*)

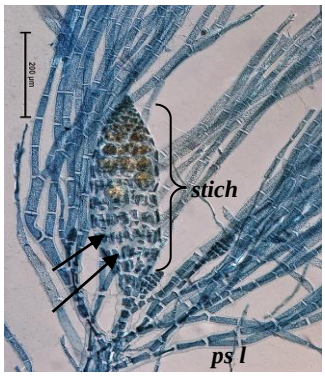


Fig. 4. *Dasya villosa*: tetrasporangial structure (stichidium, *stich*) with rectangular cap cells (arrowed); filamentous branches (pseudo-laterals, *ps l*) narrowing gradually from basal cells

Fig. 5: *Dasya extensa*

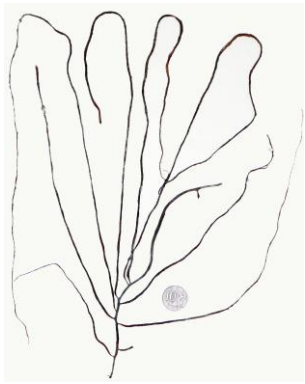


Fig. 6: *Dasya extensa*, denuded of filamentous branches

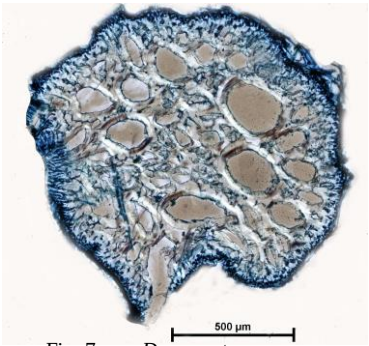


Fig. 7. *Dasya extensa*, cross section: pericentral cells obscure

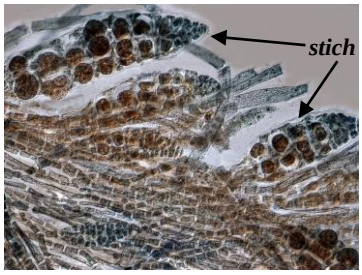


Fig. 8: *Dasya extensa*, tetrasporangial structures (stichidia, *stich*) with irregular cap cells

R N Baldock (2019): Filamentous algae Pt V, 2nd edition. 13 pp. *Algae Revealed*. Adelaide: State Herbarium of South Australia. flora.sa.gov.au/algae_revealed

6a. basal cells of naked filaments 45-65µm across, pairs or strings of small cells may occur in filaments; short branches bearing male spermatangia *egg-shaped*; tetrasporangia in rings of 5. Figs 9, 10 (plants similar in appearance to Fig 11 for *Dasya baldockii*)
..... *Dasya kraftii*

6b. basal cells of naked filaments 50-80 µm across, rarely pairs of small cells occur in filaments; short branches bearing male spermatangia *elongate*; tetrasporangia in rings of 6-7
..... *Dasya baldockii*

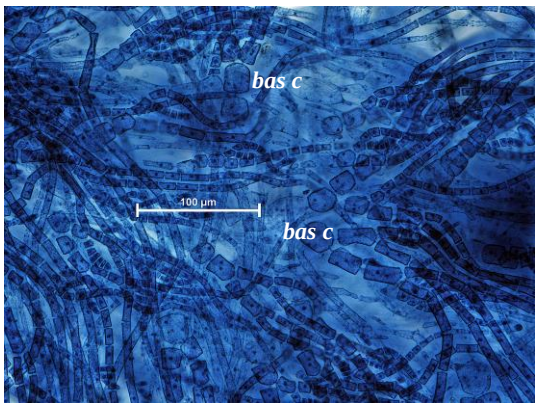


Fig.9. *Dasya kraftii*, surface view: large basal cells of naked, forked , filamentous branches

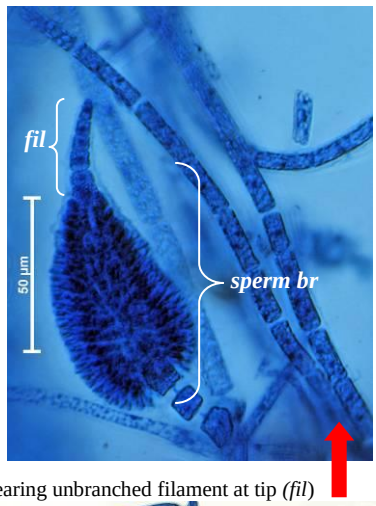


Fig. 10. *Dasya kraftii*: spermatangial branch (*sperm br*) bearing unbranched filament at tip *(fil)*

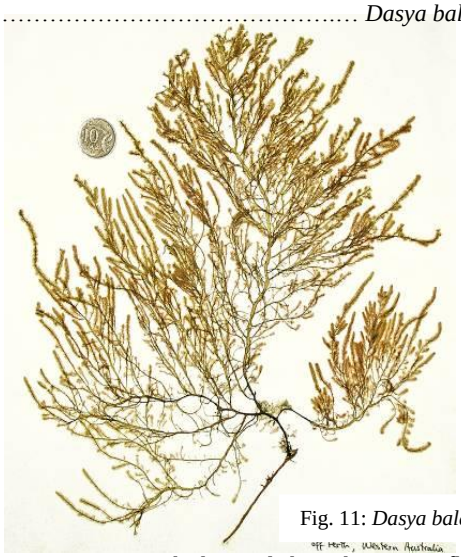


Fig. 11: *Dasya baldockii*

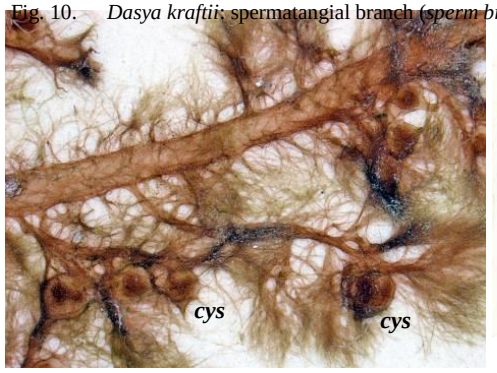


Fig. 12. *Dasya baldockii*: plant with flask-shaped mature female structures (cystocarps, *cys*)

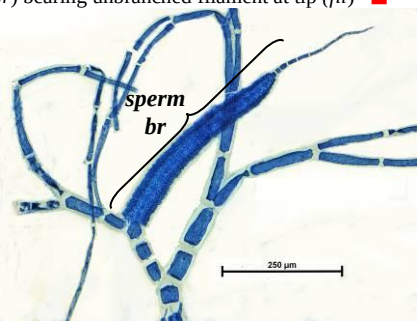


Fig. 13. *Dasya baldockii*: elongate spermatangial branch (*sperm br*) bearing unbranched filament at tip

7a. main axes with short side branches in one flat surface, naked filaments radially arranged, spreading, curved, basal cells 20-35 µm wide. Figs 14-16
..... *Dasya haffiae*

7b. plant with sparse, irregular branching, filaments forked, basal cells 50-60 µm wide, tips conical. Figs. 17-19
..... *Dasya wilsonii*

Fig. 14. *Dasya haffiae*, surface view corticated axis: stiff, forked, spreading, naked filamentous branches (pseudo-branches) and curved, unbranched hair-like branches arising radially

Fig. 15: *Dasya haffiae*

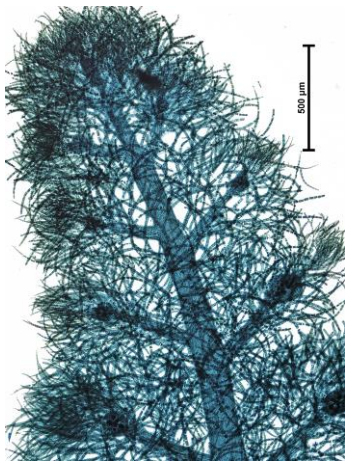


Fig. 16. *Dasya haffiae*: flat-branched, corticated side branches with dense, radially branched naked filamentous branches

Fig. 17. *Dasya wilsonis*: sparse, irregular branching

Fig. 18. *Dasya wilsonis*: detail of axes densely covered with naked, filaments

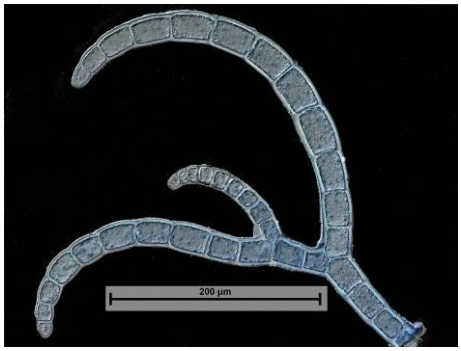


Fig. 19. *Dasya wilsonis*: naked, forked filament ending in a conical cell

8a. naked filaments coarse, 100-250 µm wide, if branched then only basally, rigid, tapering to a point, cells 1-3x longer than broad …….. 9.
8b. naked filaments thinner, 20-100 µm wide, basally branched 1-3 times, rigid or floppy, cells 2-8x longer than broad ……..…….. 10.

9a. axes slender, bands of pericentral cells visible for some distance from the axis tips; naked branched filaments occur along branches; tetrasporangial branches (stichidia) at tips of filaments. Figs 20-22 ……..…… *Dasya ceramioides*
9b. axes robust, pericentral bands not visible except at very tips; naked branched filaments in clusters at ends of short side branches, absent from axes; tetrasporangial branches at tips of corticated filaments. Figs 23, 24
……..…… *Dasya scopulifera*

Fig. 22. *Dasya ceramioides*: stichidia at tips of filaments

10a. axes well-corticated, obscuring pericentral cell bands except near tips of young side branches …….. 11.
10b. axes lightly corticated, pericentral cell bands visible for some distance from the axis tips ……..…… 13.

11a. naked branched filaments spreading, > 45° to the axes, rigid, branching every 1-2 cells; axis cross sections show definite pericentral cells ……..…… 12.
11b. naked branched filaments <45° to the axes, floppy, branching basally, often narrowing to long, fine cells; axis cross sections show indistinct or distinct pericentral cells …….. 18.

12a. side branches regularly arranged in 2 opposite rows along axes. Rigid, naked, forked filaments with blunt tips occur in tufts at branch ends, cells 3-5x longer than wide ……..…. *Dasya cliftonii*
12b. side branches irregularly spaced, radial. Rigid, naked forked filaments densely shroud axes and side branches, cells about 2x as long as wide, tip cell sharply pointed ……..….. *Dasya divergens*

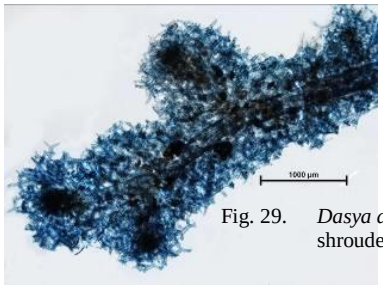


Fig. 29. *Dasya divergens*: detail of axes and branches densely shrouded in radially arranged, diverging naked filaments

Fig 20: *Dasya ceramioides*

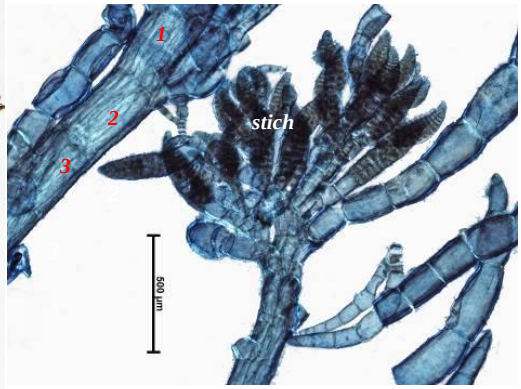


Fig 21. *Dasya ceramioides*: cluster of sporangial branches (stichidia, *stich*) at tips of filaments; bands of pericentral cells (*1, 2, 3*) visible some distance from plant tips

Fig 23: *Dasya scopulifera*

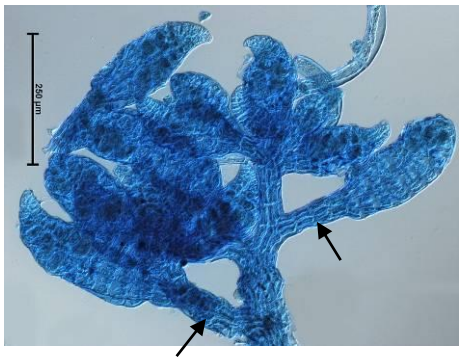


Fig 24. *Dasya scopulifera*: stichidia at tips of corticated filaments (arrowed)

Fig 25: *Dasya cliftonii*

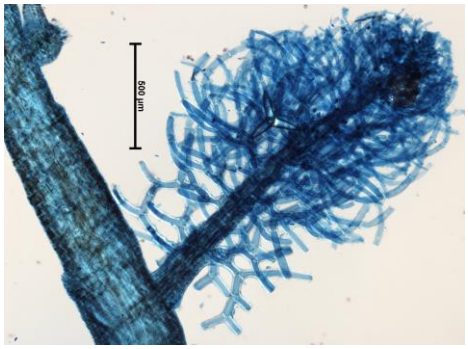


Fig 26. *Dasya* cliftonii: divergent side branch with tufts of rigid, spreading, naked branched filaments at tip

Fig. 27: *Dasya divergens*

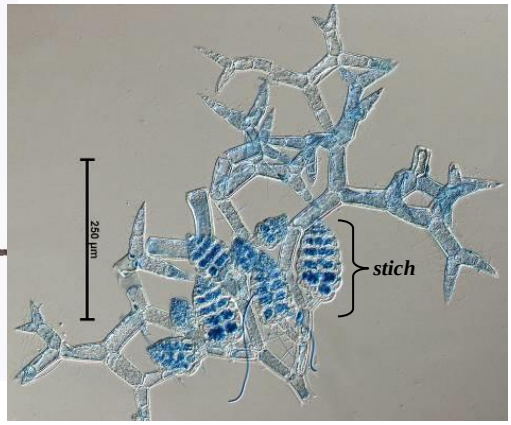


Fig. 30. *Dasya divergens*, detached naked filaments: divergent branching, pointed tips; sporangial stichidia (*stich*)

13a. width of naked branched filaments cells at forks <45µm ……..…… 14.
13b. width of naked branched filaments cells at forks >55µm …… 16.

14a. plants dark brown, numerous side branches narrowing rapidly at tips; branched filaments (pseudo-laterals) thin, 12-20 µm wide, cells 2-4x longer than wide, basal cell may be corticated. Figs 31, 32 ……..…….. *Dasya comata*
14b. plants dark red, with numerous forked long branches narrowing gradually; naked branched filaments (pseudo-laterals) thicker, 20-40 µm wide, cells 3-8x longer than wide.
……..…….. 15.

15a. forked long branches arise from near the plant base, *fringed* at least at their ends with naked filamentous tufts; end cells 3-4x long as wide. Figs 33-35
……..……. *Dasya crinita*
15b. long branches with numerous side branches, naked filamentous *tufts at tips*, end cells 6-8x long as wide. Figs 36, 37
…….. *Dasya hapalathrix*

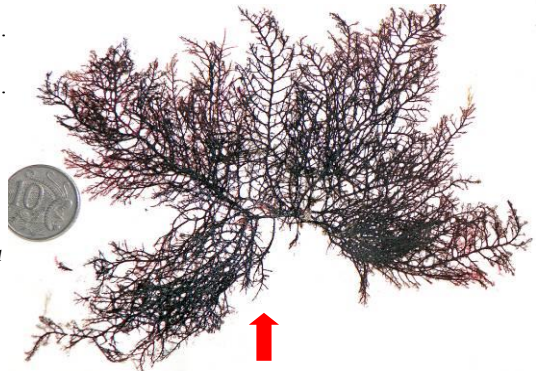


Fig. 31: *Dasya comata*

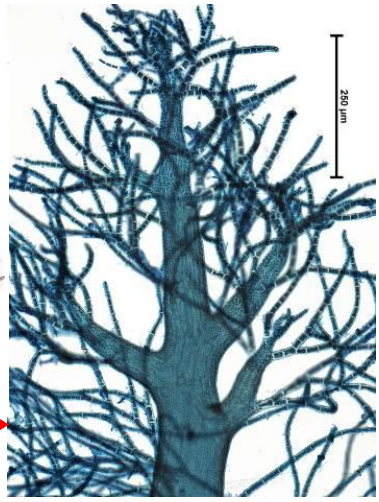


Fig. 32. *Dasya comata* tip: axes and side branches rapidly narrowing towards tips, naked branched filaments thin

Fig 33. *Dasya crinita:* beaked female structures (cystocarps) at tips of short side branches

Fig. 34: *Dasya crinita*

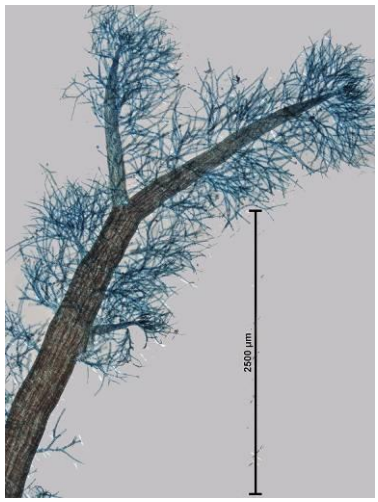


Fig. 35. *Dasya crinita*: branches narrowing gradually, fringed with naked filamentous tufts

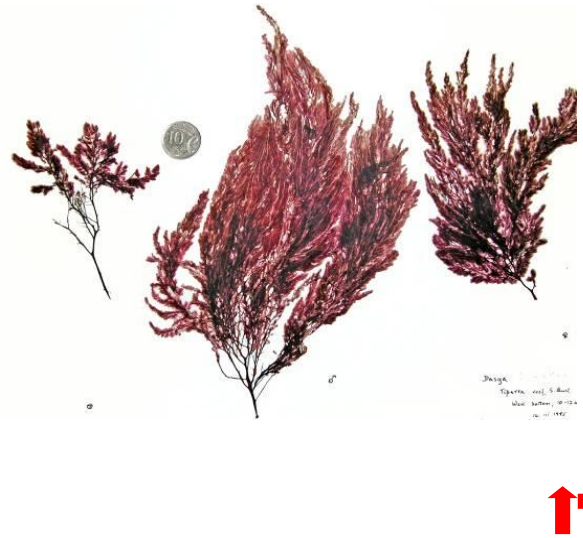


Fig 36: examples of branching patterns in *Dasya hapalathrix*

Fig 37. *Dasya hapalathrix*: dense naked filamentous branches at tips of main and short side branches

16a. plant robust; main branches conspicuous, side branches well-developed; naked branch filaments *widening* just above the base, ending in a blunt tip; tetrasporangia in rings of 6. Figs 38, 39
…….. *Dasya clavigera*

16b. plant slender or slightly robust, usually with long side branches; naked filaments tapering to a fine hair, tetrasporangia in rings of 4 or 5.
……..…… 17.

17a. plant slender, with many branches; basal cells of mature naked branched filaments 35-65µm wide; tetrasporangial branches (stichidia) with rings of 4 sporangia. Figs 40-42
……. *Dasya quadrispora*

17b. plant robust; main branches with radial side branches producing vague conical outlines except when denuded; basal cells of mature naked branched filaments 95-130 µm wide; tetrasporangial branches (stichidia) with rings of 5 sporangia. Figs 43-46
…….. *Dasya naccarioides*

Fig. 38. *Dasya clavigera*: main branches conspicuous, side branches well-developed

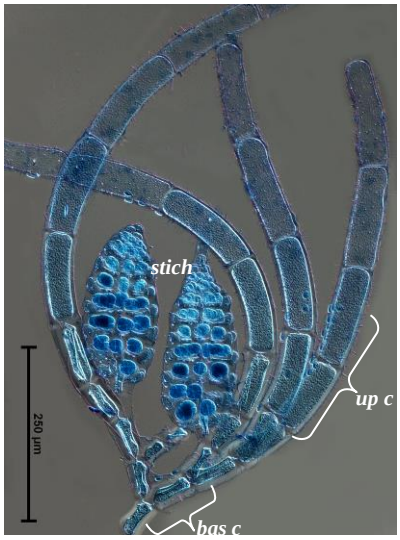
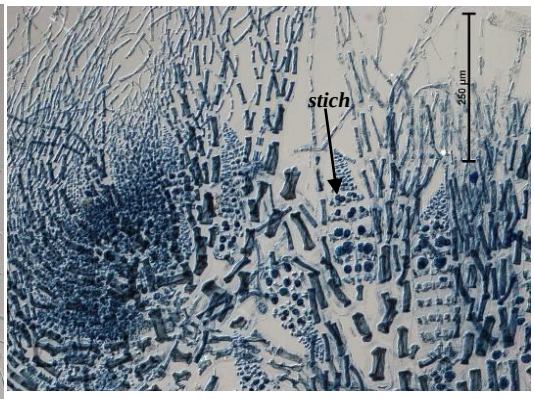


Fig. 39. *Dasya clavigera*, detached naked filaments: basal cells (*bas* c) narrower than upper ones (*up c*); stalked tetrasporangial branches (stichidia, *stich*) with rings of 6 sporangia

Fig. 40: *Dasya quadrispora*



Figs 41, 42. *Dasya quadrispora*: naked branched filaments with narrow basal cells tapering to fine hairs; stalked stichidia (*stich*) with sporangia in rings of 4

Fig. 43. *Dasya naccarioides*: main branches and side branches vaguely conical in outline

Fig. 44. *Dasya naccarioides*: denuded plant

Fig. 45. *Dasya naccarioides*: radially branched side branches

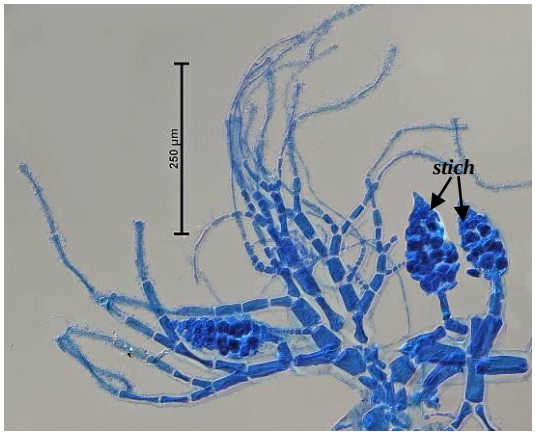


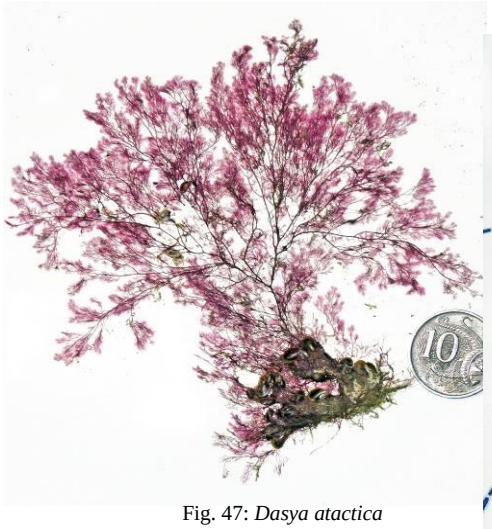
Fig. 46. *Dasya naccarioides*: detached mature naked branched filaments with wide basal cells; stalked stichidia (*stich*) with rings of 5 sporangia

18a. naked branched filaments mostly on every band (segment) of the axes; tetrasporangia in rings of 5 …….. 19.

18b. naked branched filaments on every second band (segment) of axes ……..…… 20.

19a. naked branched filaments 45-65 µm near the base, tapering to a blunt end, most cells 3-4x longer than wide; tetrasporangial branches (stichidia) sometimes with branched filaments at their tips; mature female structures (cystocarps) thick-walled, containing disc-shaped spores in chains Figs 47-51 ……..….. *Dasya atactica*

19b. naked branched filaments 20-30 µm near the base, tapering to slender, floppy ends, most cells 4-10x longer than wide; mature female structures (cystocarps) thin-walled, containing tear- or club-shaped spores. Figs 52-54 …….. *Dasya crescens*



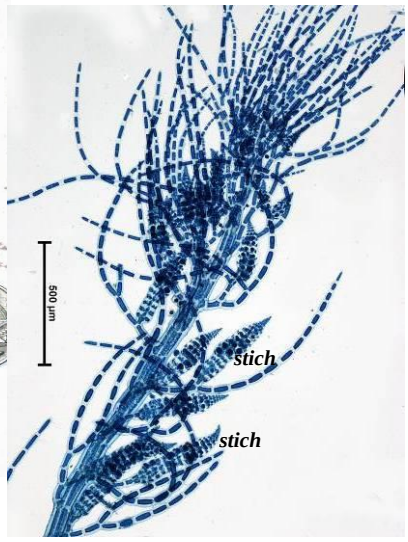


Fig. 47: *Dasya atactica*

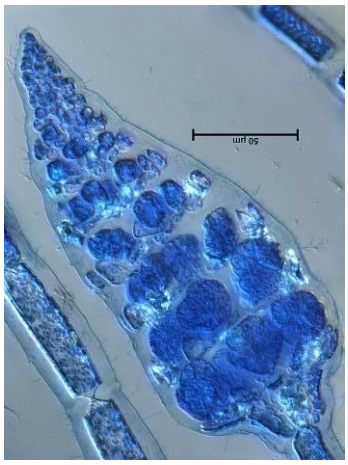


Fig 49. *Dasya atactica*, tetrasporangial branch (stichidium): sporangia in rings of 5

Fig 50. *Dasya atactica*: branched filaments at the tip of a stichidium

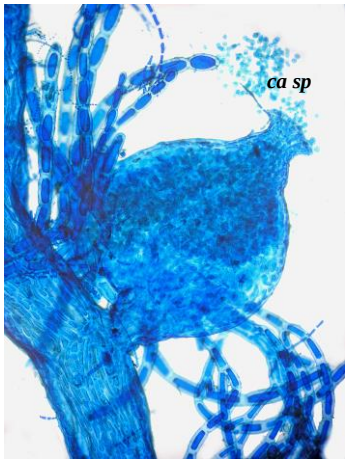
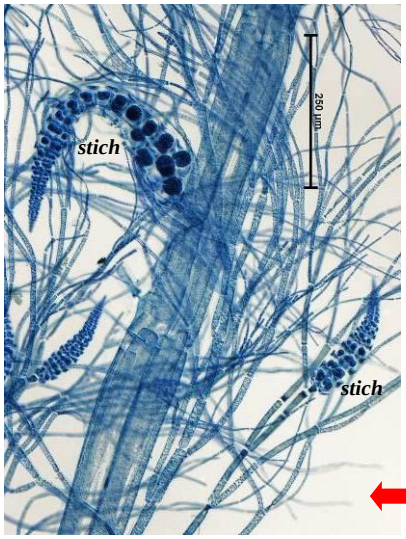


Fig 51. *Dasya atactica*: thick-walled cystocarp, with disc-shaped spores (*ca sp*) escaping

Fig 48. *Dasya atactica*: naked branched filaments on every segment of axes; stichidia (*stich*)

Fig. 52: *Dasya crescens*



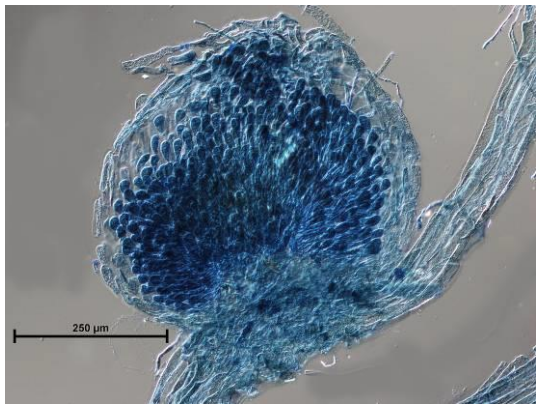


Fig. 53. *Dasya crescens*: thin-walled cystocarp with club-shaped carposporangia within

Fig. 54. *Dasya crescens*:narrow, naked branched filaments on every segment of axes; stichidia (*stich*)

20a. bands of pericentral cells exposed except at the very base of the plant; lower cells of naked branched filaments 20-40 µm wide; tetrasporangia in rings of 6; mature female structures (cystocarps) containing tear- or club-shaped spores. Figs 55-57 (next page) ……. *Dasya tenuis*

20b. bands of pericentral cells covered by additional corticating cells from the middle to lower plant parts; tetrasporangia in rings of 4; mature female structures (cystocarps) containing chains of disc-shaped spores …….. 21.

Fig 55: *Dasya tenuis*

Fig 56. *Dasya tenuis*: naked, branched filaments every second band along axes; stichidia (*stich*) with sporangia in rings of 4

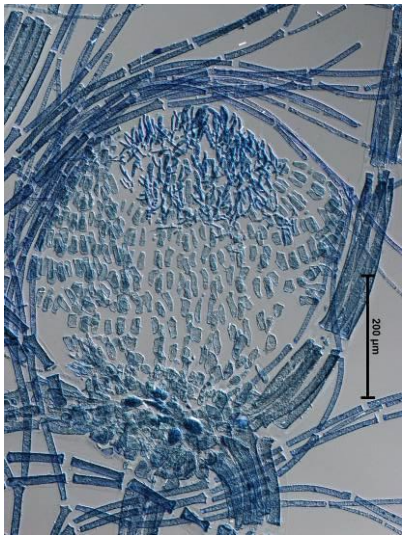


Fig 57. *Dasya tenuis*: thin-walled cystocarp with tear-shaped carposporangia being extruded through the pore

21a. lower cells of naked branched filaments narrow, 25-35 µm wide. Figs 58-63
…… *Dasya capillaris*

21b. lower cells of naked branched filaments wider, 35-90 µm wide. Figs 64-66 (next page)
……... *Dasya hookeri*

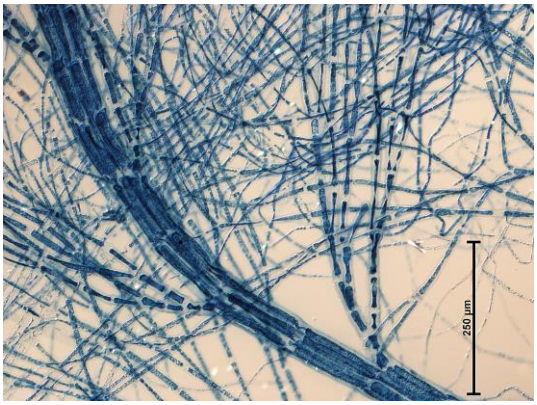


Fig. 58. *Dasya capillaris*: naked branched filaments on every second band or segment of axes

Fig. 59, 60. *Dasya capillaris* at two magnifications

Fig. 61. *Dasya capillaris*: branching pattern

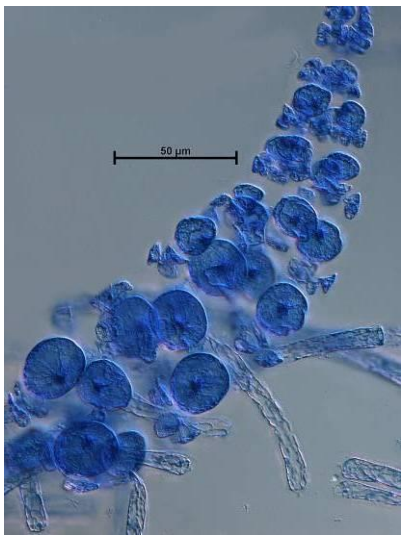


Fig. 62. *Dasya capillaris*: tetrasporangial branch (stichidium): young (undivided) sporangia in rings of 4

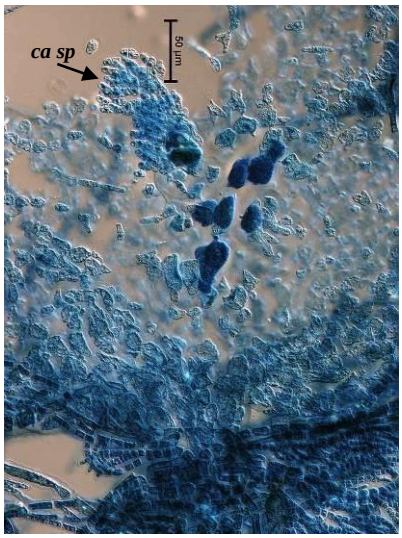


Fig. 63. *Dasya capillaris*: tissue squash of a mature female structure (cystocarp) with extruded, young carposporangia (*ca sp*)

Fig 64: *Dasya hookeri*

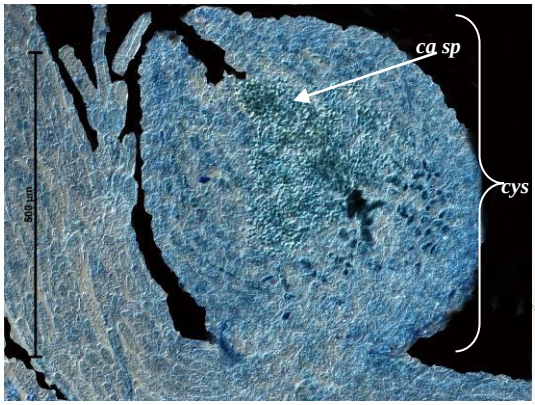


Fig 65. *Dasya hookeri*: mature female structure (cystocarp, *cys*); carposporangia (*ca sp*) disc-shaped, in chains

Fig 66. *Dasya hookeri*: beaked cystocarps with escaping carposporangia; axes heavily coated (corticated)

Fig.67. *Dasya hookeri*: tetrasporangial structure (stichidium); tetrasporangia in rings of 4

The genus: *Heterosiphonia* (flat-branched)

22a. plant not corticated, bands of cells equal in length to the cells of the central filament (pericentral cells) visible throughout the plant ……. 23.

22b. plant corticated with cells additional to and masking the bands of pericentral cells, at least at the base of the plant ……..… 26.

23a. branched filaments (pseudo-laterals) arising every 4-7 axial cells apart, clearly banded with distinct pericentral cells. Figs 68, 69 …… *Heterocladia microcladioides*

23b. branched filaments without banding (a single cell wide except at the very base), arising every 2(-3) axial cells apart ……..……. 24.

24a. each central filament cell ringed with 4 cells (pericentral cells) of equal length. Figs 70-72 ……..…… *Heterosiphonia callithamnium*

24b. each central filament cell ringed with 7-11 pericentral cells ……..… 25.

Fig. 68: *Heterosiphonia microcladioides*

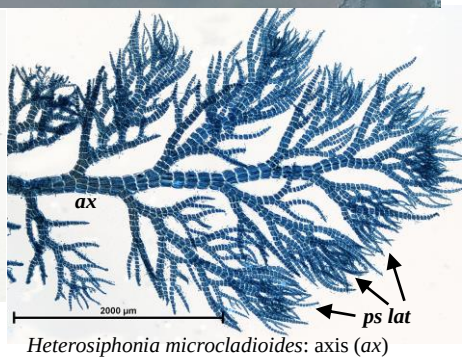


Fig. 69. *Heterosiphonia microcladioides*: axis (*ax*) and branched filaments (pseudo-laterals, *ps lat*) with uncorticated bands of pericentral cells for most of their length

Fig. 70: *Heterosiphonia callithamnium* on stems of seagrass

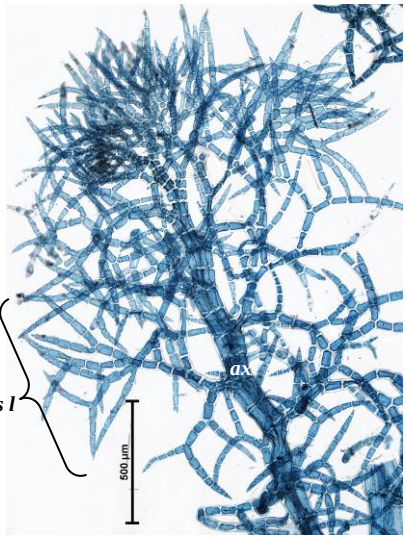


Fig. 71: *Heterosiphonia callithamnium:* axis (*ax*) with bands of 4 pericentral cells; branched filaments (pseudo-laterals, *ps lat*) 1 cell wide except at their bases

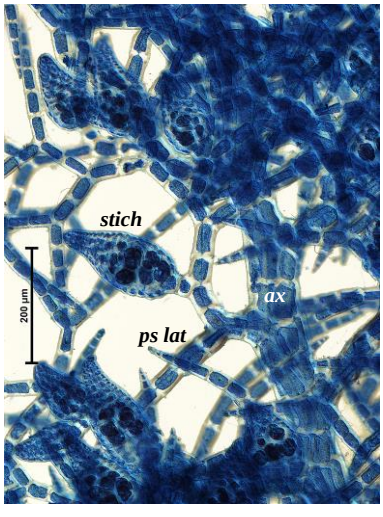


Fig. 72: *Heterosiphonia callithamnium*: branched filaments (pseudo-laterals, *ps* lat) 2 axial cells apart; tetrasporangial branches (stichidia, *stich*)

25a. plants small, to 30 mm tall; main branches 150-250 µm wide; encircling (pericentral) cells 7-8 per axis cell. Figs 73, 74.
…… *Heterosiphonia australis*

25b. plants larger, to 120 mm tall, usually growing on other plants; main branches 300-870 µm wide; encircling (pericentral) cells 8-11 per axis cell. Figs 75-77.
……. *Heterosiphonia wrangelioides*

Fig. 73:: *Heterosiphonia australis*

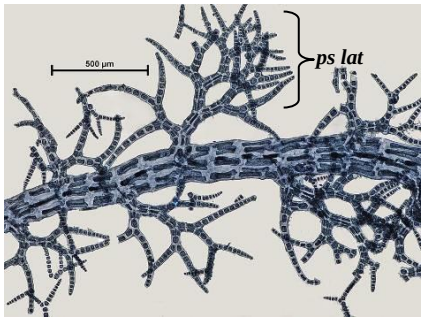


Fig. 74: *Heterosiphonia australis*: axis with bands of 7 pericentral cells (4-5 showing in side view); branched filaments (*ps lat*), naked except at base

Fig. 75: *Heterosiphonia wrangelioides*

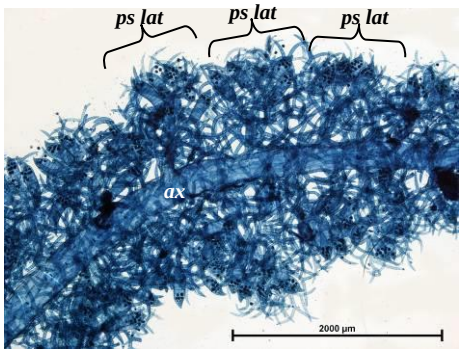


Fig. 76. *Heterosiphonia wrangelioides*: wide main branch (axis, *ax*) and dense branched filaments (*ps lat*)

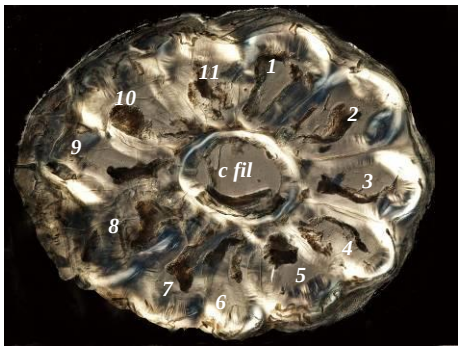


Fig. 77. *Heterosiphonia wrangelioides*: cross section of axis: central filament (*c fil*) encircled by 11 pericentral cells (*1-11*)

26a. naked branched filaments 2-3 axial bands apart; axis bases coated with additional small, elongate cells running lengthwise and obscuring bands of pericentral cells
…….…… 27.

26b. naked branched filaments 3-7 bands apart on axes; axis bases without additional cells
…….... 28.

27a. branching feather-like (pinnate); branch bases densely coated with additional small cells running lengthwise and obscuring the bands of pericentral cells. Figs 78, 79
…….. *Heterosiphonia muelleri*

27b. branching somewhat feather-like (pinnate); branches with bands of pericentral cells visible for most of their length, obscured with additional small, e cells only at the very bases. Plant base slightly swollen. Figs 80-82
…….. *Heterosiphonia crassipes*

Fig. 78:*Heterosiphonia muelleri*

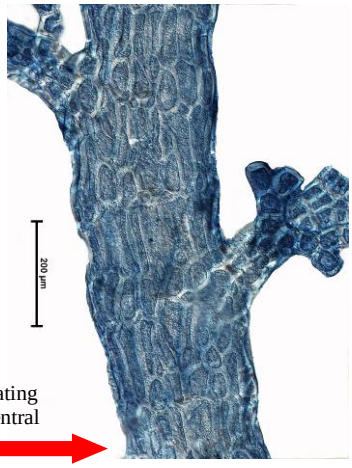


Fig. 79. *Heterosiphonia muelleri*: additional short cells coating the axis bases and obscuring the underlying pericentral cells (arrowed)

Fig. 80. *Heterosiphonia crassipes*: several axes arising from a swollen base

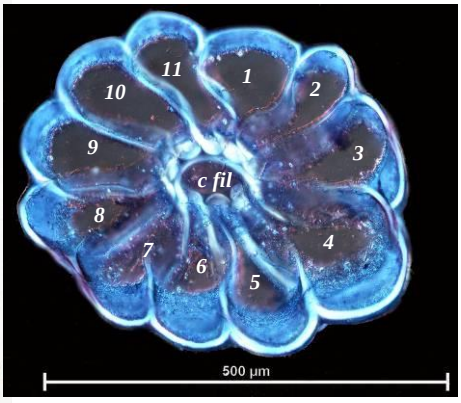


Fig. 81. *Heterosiphonia crassipes*: cross section: central filament (*c fil*); 11 pericentral cells (*1-11*)

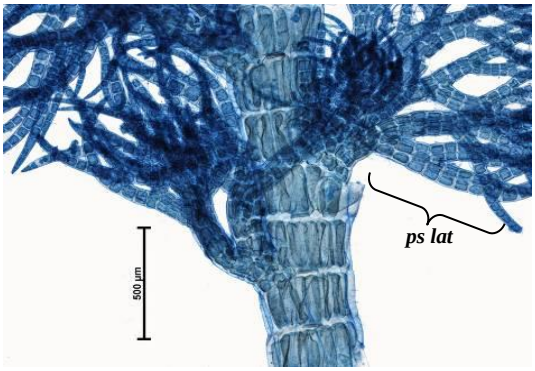


Fig. 82. *Heterosiphonia crassipes*: axis and side branches with prominent bands of 11 pericentral cells (*no* additional coating (corticating) cells); filamentous side branches (pseudo-laterals, *ps lat*) arising 2 axial bands apart

28a. tips of branched filaments conical and pointed, >85 µm wide; 13 pericentral cells in each axial band; filaments protrude at right angles to thickened axis bases Figs 83-85
…….. *Heterosiphonia curdieana*

28b. tips of branched filaments taper to fine filaments, <85 µm wide; 8-12 pericentral cells in each axial band, although these may be rapidly obscured by corticating threads …… 29.

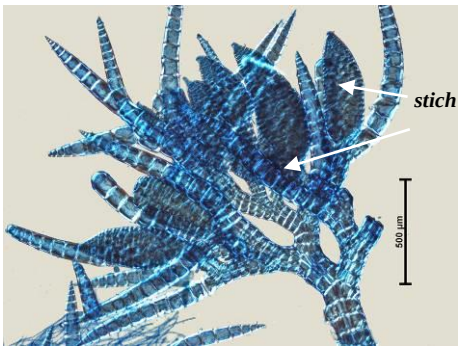


Fig. 83. *Heterosiphonia curdieana*: pointed branched filaments; sporangial structures (stichidia, *stich*)

Fig. 85. *Heterosiphonia curdieana*: filaments at right angles to the axis bases (arrowed)

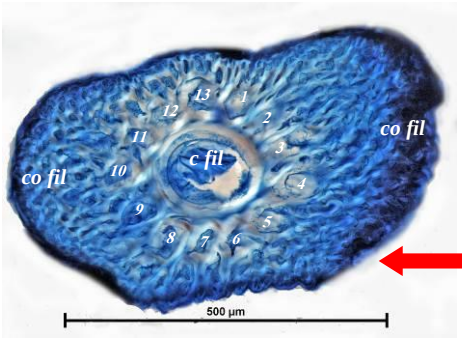


Fig. 84. *Heterosiphonia curdieana*, cross section axis base: central filament (*c fil*); pericentral cells (*1-13*); cortication of filaments (*co fil*)

29a. *prominent* bands of pericentral cells in the side, branched filaments, bands on main branches (axes) *obscured* by additional corticating cells; cross sections of old axes show 8-10 *distinct* pericentral cells. Figs 86-89
..... *Heterosiphonia gunniana*

29b. bands of both pericentral cells of short branched filaments (pseudo-laterals) and main axes *obscured* by additional corticating cells; pericentral cells in cross sections of old axes *indistinct*. Figs 90-92
..... *Heterosiphonia lawrenciana*

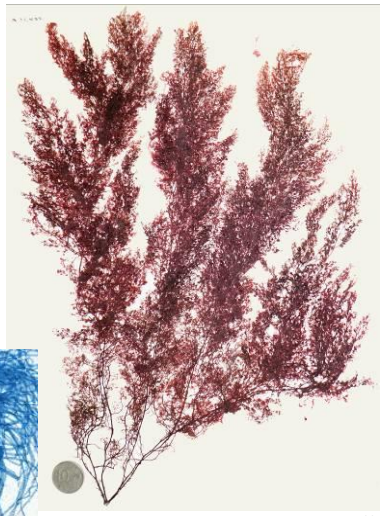


Fig. 86: *Heterosiphonia gunniana*: diffuse form

Fig. 87. *Heterosiphonia gunniana*: tufted form

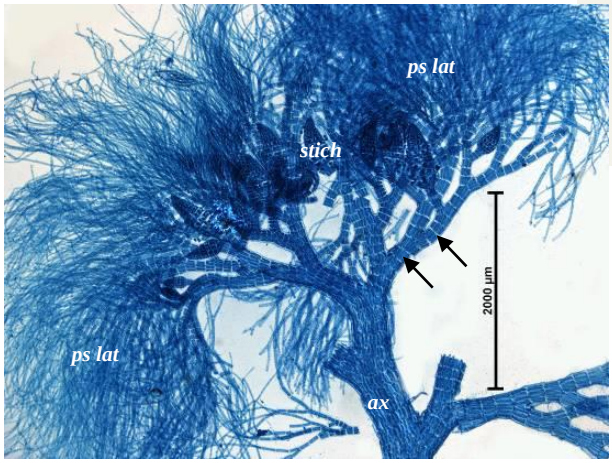


Fig. 88. *Heterosiphonia gunniana*: side branches (pseudo-laterals, *ps lat*) ending in fine threads, bands of pericentral cells *distinct* (arrowed) bands on main branches (axes, *ax*) obscured by additional corticating cells; sporangial structures (stichidia, *stich*)

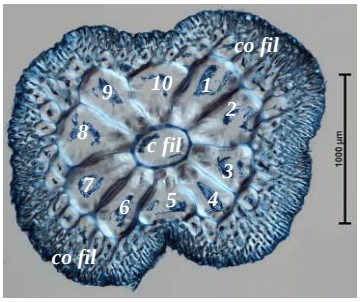


Fig. 89. *Heterosiphonia gunniana* cross section of axis : central filament (*c fil*); distinct pericentral cells (*1-10*); cortication of filaments (*co fil*)

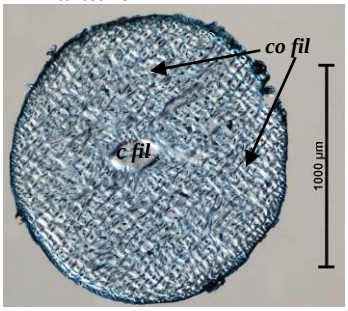


Fig. 90. *Heterosiphonia lawrenciana* cross section of axis: central filament (*c fil*); mass of corticating filaments (*co fil*)

Fig. 91. *Heterosiphonia lawrenciana*: two forms of plants

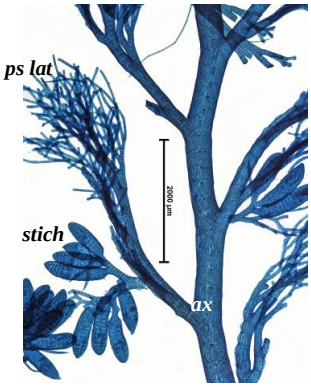


Fig. 92. *Heterosiphonia lawrenciana*: both side branches (pseudo-laterals, *ps lat*) ending in threads and axes (*ax*) completely covered by corticating cells; stichidia (*stich*)

Look-alike algae: Corticated and filamentous algae superficially resembling the Dasyaceae

1. Filamentous Rhodomelaceae

Some members of this Family resemble the Dasyaceae as they have:-

- distinct bands of cells (pericentral cells) exactly matching the length of axial cells
- flask-shaped mature female structures (cystocarps)
- sporangia in special cigar-shaped branches (stichidia)

The genus *Doxodasya* particularly resembles *Dasya*.

In contrast, the Rhodomelaceae when actively growing have terminal, delicate, naked, branched filaments called ***trichoblasts***, which, in one genus, *Polysiphonia*, are colourless.

In the Rhodomelaceae, growth is in a direct line and not by overtopping as occurs in the Dasyaceae. .

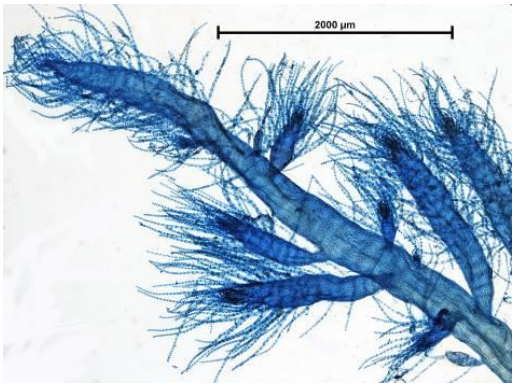
Polysiphonia senticulosa: filaments with bands of pericentral cells; one sporangium per band in special branches (stichidia)

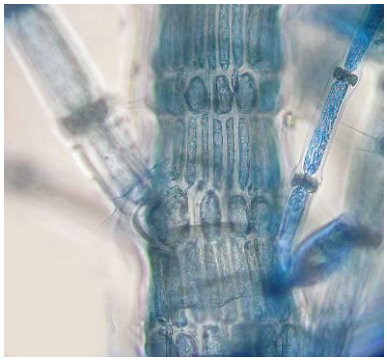
Polysiphonia decipiens: colourless trichoblasts at branch tips

2. Filamentous *Spyridia*

Some *Spyridia* species have banded axes and tufts of filaments resembling *Dasya*. However, close inspection shows that, unlike *Dasya*, they have distinctive narrow rings of cells about the filaments.

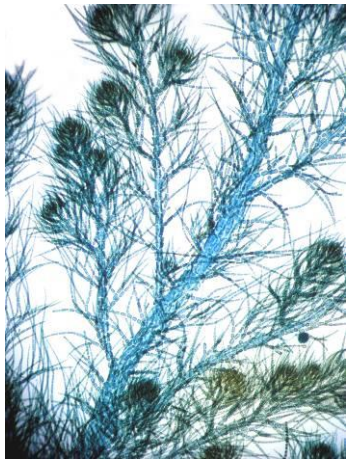
Also, tetrasporangia are single and not formed in stichidia, and cortication of the axes initially consists of uniform bands of small cells alternating with long ones.





Spyridia: axis with alternating bands of long and small cells; filaments with rings of narrow rings of small cells

Spyridia squalida: axis with a banded appearance and side branches with tufts of filaments

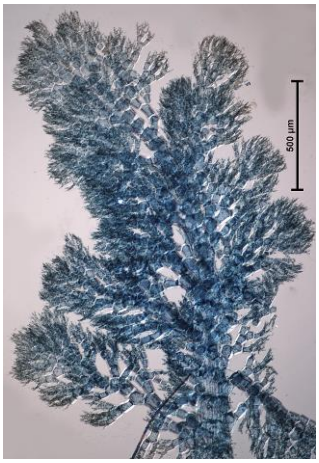


Doxodasya hirta: corticated filaments, branched trichoblasts and hairs resembling pseudo-branches of *Dasya*

3. Some Callithamnieae

Some members of this Tribe of the Famil: Ceramiaceae, for example, *Hirsutithallia*, have short side branches of naked cells from each axial cell and numerous filaments that could be mistaken for the pseudo-laterals and hairs of the Dasyaceae. There are no pericentral cells, however. Tetrasporangia are single on the branches, not in stichidia. The thickening of the axis is produced by a sheath of loose filaments and not compact corticating cells as occurs in the Dasyaceae.

Hirsutithallia angustata



Hirsutithallia tincta