Pictured Key to some common filamentous red algae of southern Australia. Part I: algae with naked filaments

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

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 with

- *threads* (filaments) of exposed (naked) cells, growing in a single line (monosiphonous algae)
- no compact wrappings (cortication) of *regularly* arranged cells around axes, although in some, loose rhizoids or scattered rings of cells can be seen under the microscope.

Being naked separates them from other filamentous Families such as the Rhodomelaceae, and Tribes in the Ceramiaceae such as the Ptiloteae and Spyrideae.

Confused? Check in the "algal look-alikes" panel at the end of this key to exclude any filamentous algae with regular or compact cortication.

The naked filaments of most species are only visible with the aid of a strong magnifying glass, or a microscope

1a. plants microscopic; cells disc- or egg-shaped, often spaced irregularly, in a single line within a relatively wide common gelatinous sheath; adjacent cells ***not*** connected. Figs 1-3.
..... *Stylonema*, *Chroodactylon*
Family: Acrochaetiaceae

1b. plants small to large (about 10-300 mm tall); cells disc- or box- shaped, or forming long cylinders, regularly spaced, in single lines or 2-3 cells within a thin sheath; adjacent cells connected or without thin cytoplasmic connection.
..... 2.

2a. filaments 1 cell wide at plant base, 2-3 cells wide above, unbranched; cells disc- or box-shaped, stacked tightly together; whole cells function as reproductive structures Figs 4-7
..... *Bangia, Erythrotrichia*

2b. filaments 1 cell wide, branched, additional thread-like rhizoids may form a loose, intertwined wrapping at the plant base; cells box- or cylindrical-shape; specialised cells and branches form reproductive structures (see Fig. 8, for example)
..... 3.

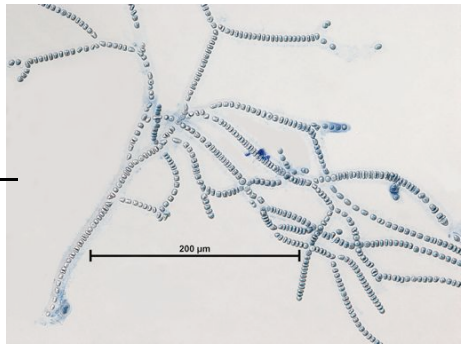


Fig. 1: *Stylonema alsidii*

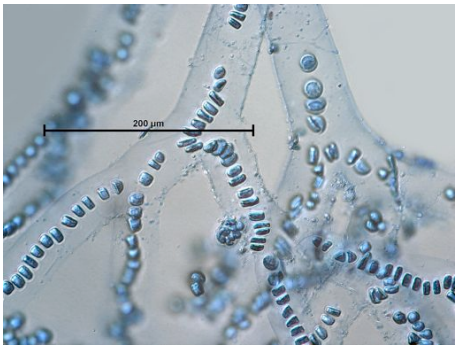


Fig. 2. *Stylonema alsidii*: *detail of irregularly spaced disc-shaped cells without cytoplasmic connections*

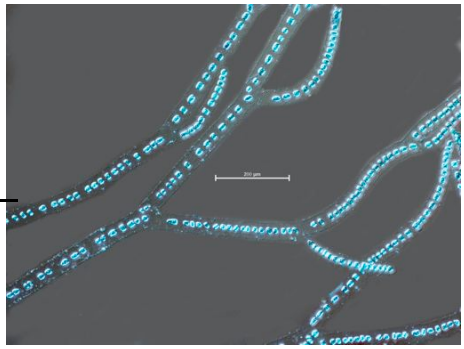


Fig. 3: *Chroodactylon ornatum*

Fig. 4: *Bangia atropurpurea brevisegmenta* on a mussel shell

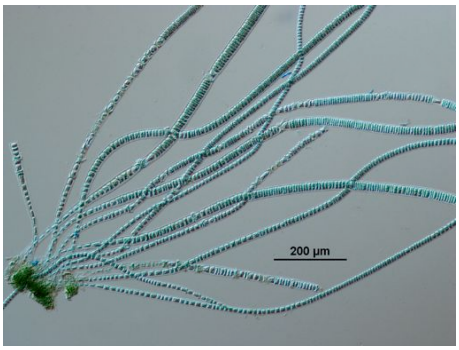


Fig. 5: *Bangia atropurpurea*

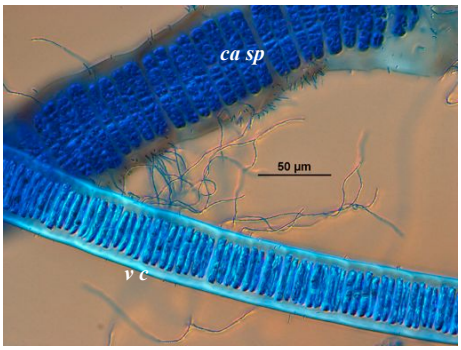


Fig. 6 *Bangia atropurpurea brevisegmenta*: vegetative cells (*v c*) with tightly packed disc-shaped cells; mature female stage forming numerous spores (carposporangia, *ca sp*)

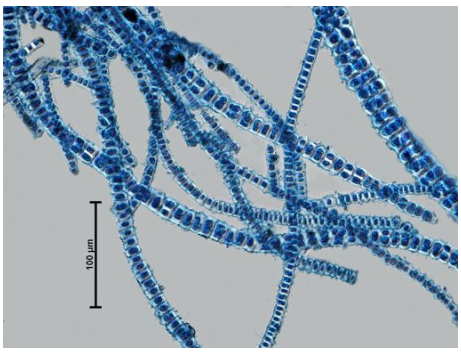


Fig. 7: *Erythrotrichia carnea*

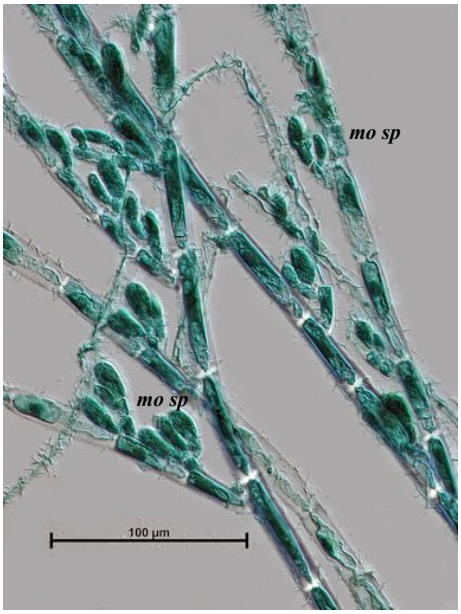


Fig. 8. *Audouinella* (*Colaconema*) *daviesii*: filaments branched; cells long, cylindrical, ending in a hair; sporangia single-celled (monosporangia, *mo sp*), clustered, on short stalks, differentiated from vegetative cells

3a. plants small; cells mostly small (except at very base of plant), < 150 µm wide, plants small, delicate, generally < 200 mm tall; mature female reproductive structures (cystocarps) a mass of naked spores
……..…… 4.

3b. cells mostly large, >150 µm wide, plants generally >200 mm tall, female reproductive structures partly enclosed in a fencelike barrier of cells (involucre).
……..... 8.

4a. special asexual structures of 1-4 cells present ……...…… 5.

4b. tetrasporangia only produced
……..……..……..... 6.

5a. clusters of cigar-shaped single-celled spores usually produced; species grow on or in other organisms including sponges. Fig. 8. …….*Audouinella* (*Colaconema*) 23 species; Family: Acrochaetiaceae

5b. tetrasporangia, many-celled spores (polysporangia) or single-celled propagules produced; plants often on other algae (epiphytic). Figs 9-12.
…….…… *Mazoyerella* Family: Ceramiaceae; Tribe: Monosporae 5 genera, separated on propagule and female reproductive features

6a. plants tiny, delicate, of both creeping threads and upright parts; tetrasporangia stalked, female structure single Figs 16-20 (next page).
…….....……..…… 7.

6b. plants small, tufted, tetrasporangia stalkless; female structures paired. Figs 13-16.
..... *Callithamnion* (10 species) Family: Ceramiaceae; Tribe: Callithamnieae

Fig. 9. *Mazoyerella arachnoidea*, with numerous stalked propagules

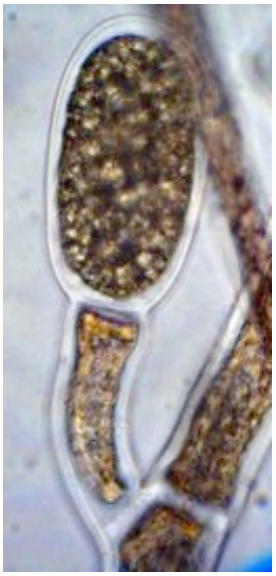


Fig. 10. *Mazoyerella arachnoidea*: stalked propagule)

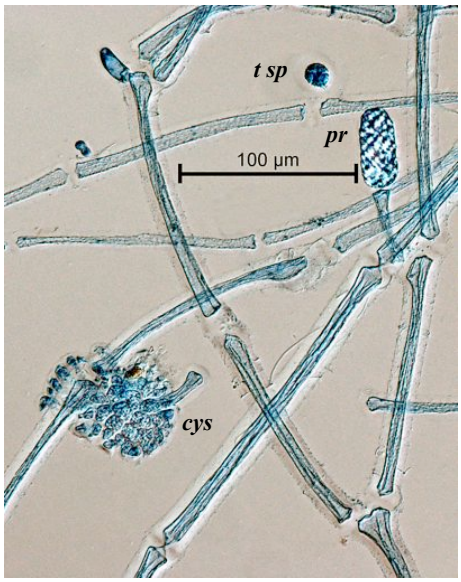


Fig. 11. *Mazoyerella arachnoidea*: tetrasporangium (*t sp*), propagule (*pr*) and cystocarp (*cys*)

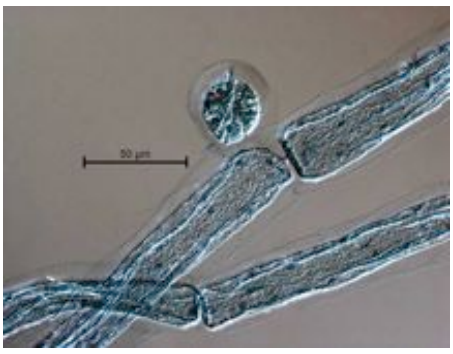


Fig. 12. *Mazoyerella australis*: detail of polysporangium

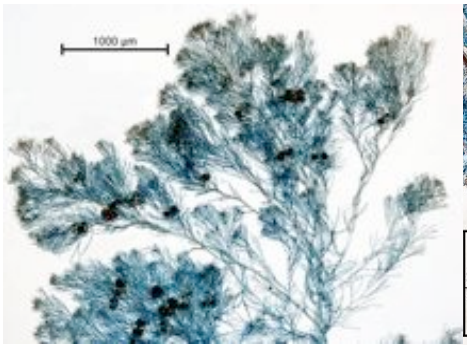


Fig. 13: *Callithamnion pseudobyssoides*

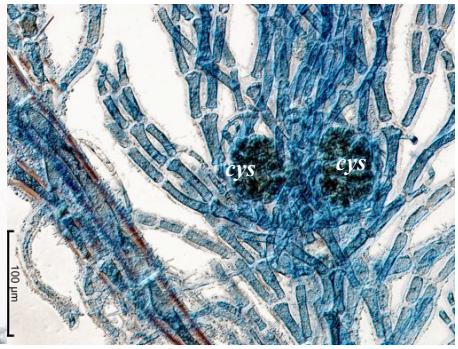


Fig. 14. *Callithamnion confertum*: paired female structures (cystocarps, *cys*), naked (involucre ***absent)***

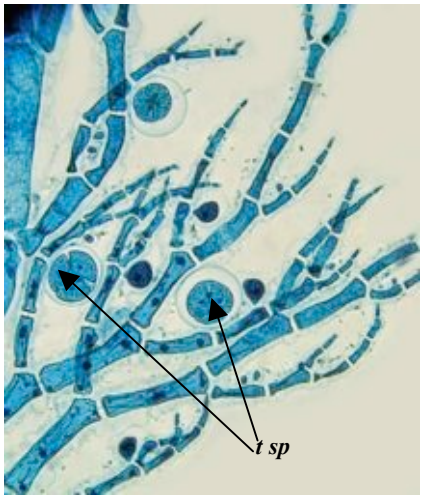


Fig.15. *Callithamnion circinnatum*: small cells and stalkless (sessile) tetrasporangia (*t sp*)

7a. upright parts with rings of extremely thin branched hairs at tips; mature female structures (cystocarps) with fence-like row of protective cells (involucre) Figs 17-19 (next page)
…… *Anotrichium tenue* Family Ceramiaceae;Tribe: Griffithsieae (see below, also)

7b. thin branched rings of hairs ***absent***. Figs 20, 21 (next page)
…….. *Spermothamnion* Family: Ceramiaceae; Tribe: Spermothamnieae 6 genera differing in female reproductive structures

Fig.16: *Callithamnion circinnatum*

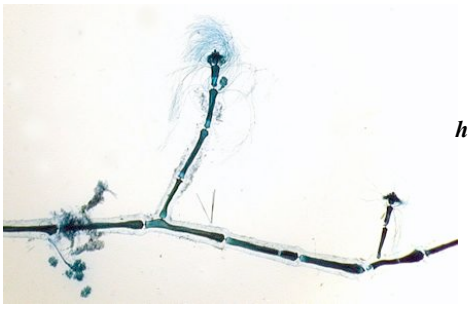


Fig 17. *Anotrichium tenue*: plant with creeping and upright filaments

8a. axes excessively hairy and/or wrapped in thin, loose rhizoids obscuring the cells of axis filament. …… 9.

8b. excessive superficial rhizoid and hair covering ***absent*** at least for most of the plant length …… 10.

9a. axes excessively hairy with long, unbranched filaments exceedingly thin compared to the large axial cells Figs 22, 23
…….…….. *Warrenia comosa*
Family: Ceramiaceae; Tribe Warrenieae

9b. axes felty with dense rhizoids, side filaments naked, of 2 types:- continuously growing ones with prominent rounded tip cells; filaments of limited growth sharply pointed, with straight or hooked barbs. Figs 24-26
……. *Camontagnea*
2 species (part of the Family: Acrochaetiaceae)

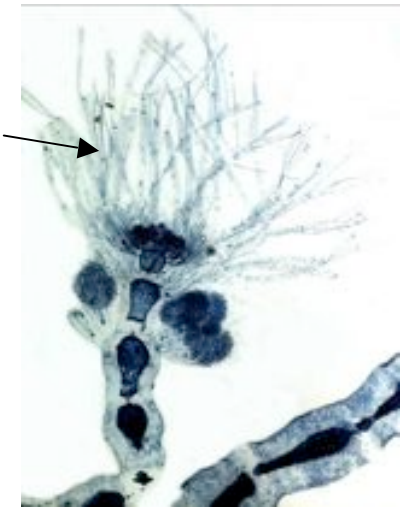


Fig 18. *Anotrichium tenue*: male plant tip with rings of fine hairs (*h*); stalked heads of spermatangia

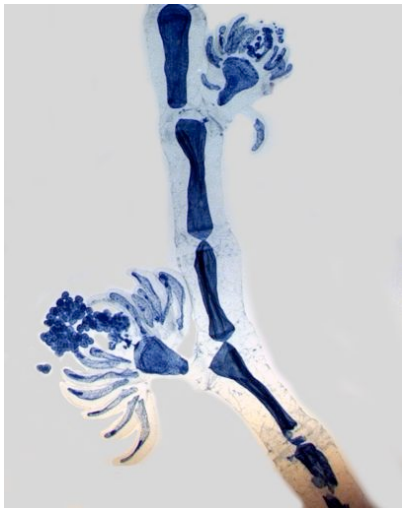


Fig 19. *Anotrichium tenue*: mature female structures slightly flattened to display the fence-like cells of the involucre

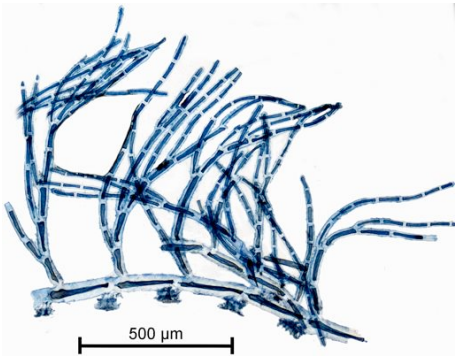


Fig. 20. *Spermothamnion pinnatum*: creeping thread with attachment pads (haptera, *hp*), giving rise to upright threads

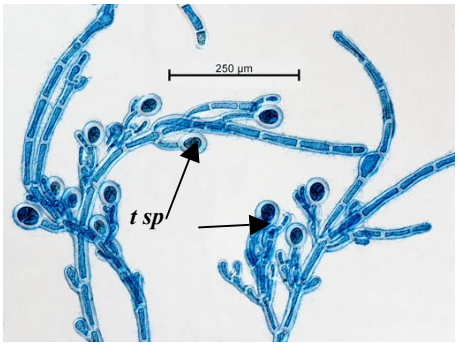


Fig. 21 *Spermothamnion pinnatum*: thread tips with tetrasporangia (*t sp*) on stalks

Fig. 22: *Warrenia comosa*

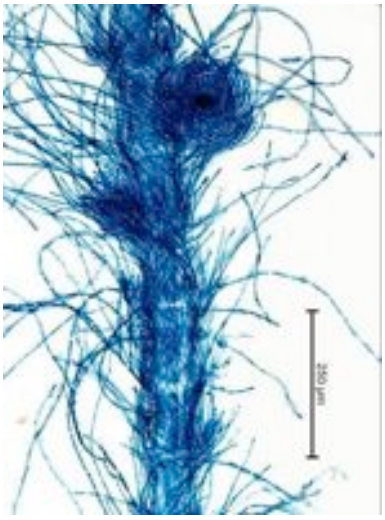
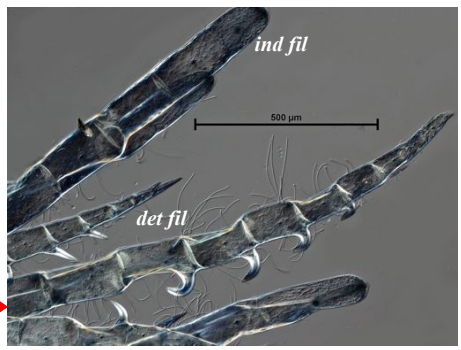


Fig. 23. *Warrenia comosa*: central thread cells apparent beneath rhizoids

Fig. 24: *Camontagnea hirsuta*

Fig. 25. *Camontagnea hirsuta*: axis filament covered with rhizoids, side filaments naked

Fig. 26. *Camontagnea oxyclada*: continuously growing filament (indeterminate filament, *in fil)* with prominent tip cell; filament of limited growth (*det fil*) pointed, and with straight and hooked barbs



10a. stalkless sporangia and male heads in basket-like or claw-like branchlets. (see Figs 29, 31)
…… 11.
10b. sporangia and male heads not as above
…… 12.
Family: Ceramiaceae; Tribe: Griffithsieae

11a. plants delicate and densely forked**, *or***, large-celled and branched on one side. Figs 27-29
…… *Bornetia* (2 species)
Family: Ceramiaceae, Tribe: Bornetieae
11b. plants large-celled, lower axes ropey with twisted rhizoids ; polysporangia present. Figs 30-33 …. *Involucrana meredithiana*
Family: Ceramiaceae, Tribe: Sphondylothamnieae

Fig. 27. *Bornetia tenuis*: (rare)

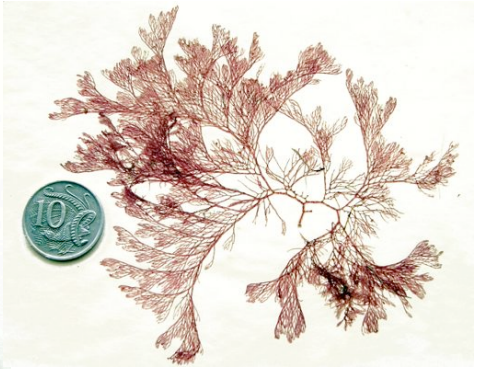


Fig. 28: *Bornetia binderiana*

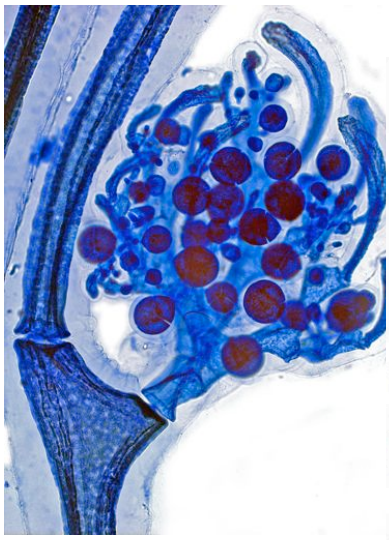


Fig. 29: *Bornetia binderiana*

Fig. 30: *Involucrana meredithiana*

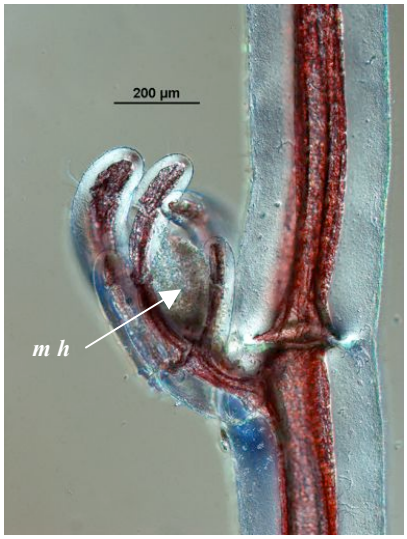


Fig. 31. *Involucrana meredithiana*: male head (*m h*) in claw-like side branchlets

12a. cells large, often visible to the unaided eye, branching usually forked; some species with inflated cells, and bead-like; tetrasporangia on numerous, obscure microscopic branches in constrictions between cells. Figs 34-36 (next page)
..... *Griffithsia* (10 species)
see also the separate Web page
"*Griffithsia* at a glance"

12b. cells smaller, branching forked or tufted, not bead-like; tetrasporangia on short stalks. Figs 37-39 (next page)
..... *Anotrichium* (6 species)
see also the separate Web page
"*Anotrichium* at a glance"

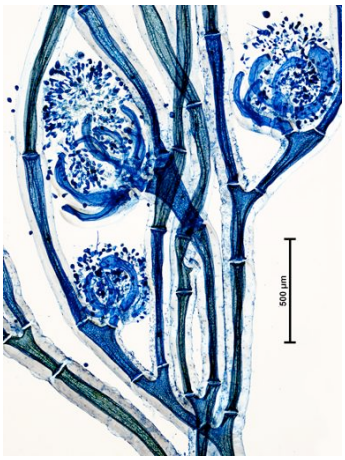


Fig. 32. *Involucrana meredithiana*: basket-like branches around mature female structures (cystocarps)

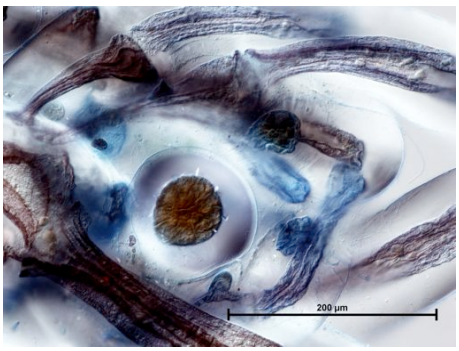


Fig. 33. *Involucrana meredithiana*: stalkless polysporangium in a branchlet

Fig. 34: *Griffithsia teges*

Fig. 35: *Griffithsia monilis*

Fig. 36. *Griffithsia ovalis*: tetrasporangia clustered on minute branches in the gap between cells

Fig. 37: *Anotrichium licmophorum*

Fig. 38: *Anotrichium elongatum*

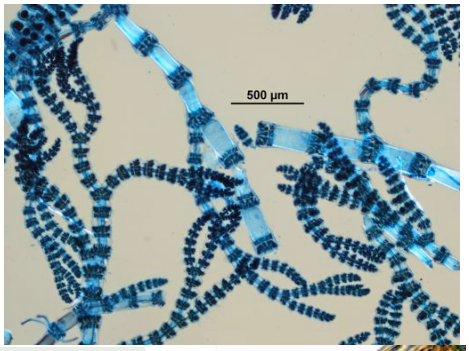
Fig. 39. *Anotrichium elongatum*: stalked tetrasporangia on one side of a branch fork

Look-alike algae

Some algae although thread-like are wrapped (corticated) with regular or close-fitting cells.
Unfortunately these may be visible only under the microscope. Two major ones are shown below: these and others are treated in separate pictured keys

Ceramium, Spyridia

Upper parts of axial cells or cells of filamentous side-branches are ringed with closely attached, small corticating cells.
See the separate Web page: "Filamentous red algae of Southern Australia Part IV: nodally-corticated algae"



Polysiphonia

Cells equal in length to axial cells (pericentral cells)
form bands along the axes.
See the separate Web page: "Filamentous red algae of southern Australia Part VII: Tribe: Polysiphonieae, Family: Rhodomelaceae" (in preparation)