FILAMENTOUS RED ALGAE

PART I: algae with naked filaments (2nd edition)

This key is *restricted* to algae with

- *threads* (filaments) of exposed (naked) cells, growing in a single line (monosiphonous)
- no compact wrappings (cortication) of *regularly* arranged cells around axes, although in some, loose rhizoids 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 where the filaments are corticated or have pericentral cells ringing each filament cell.

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

In some groups illustrated below, dense side filaments mask the central or axial filament. For this reason, they are also included in the Webpage **"felty ropey stringy furry fuzzy fluffy red algae"** in case they are not recognised as belonging to Part I.

Images

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

The images below of them may be stained blue.

Scale

The coin used as a scale is 24 mm or about 1 inch in diameter

Names

follow Womersley (1998) with recent changes from *Algaebase* added

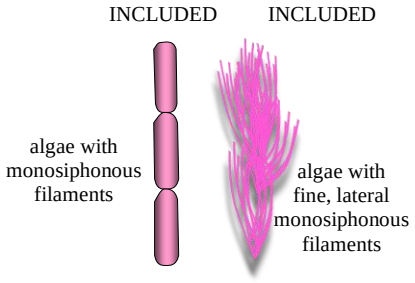
KEY

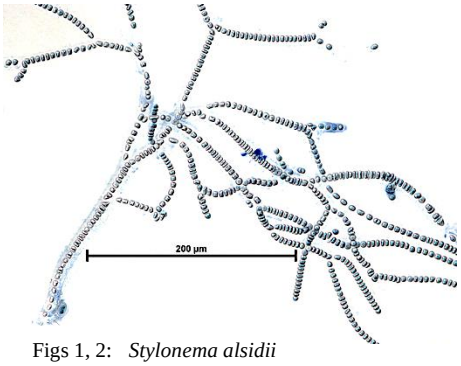
1a. plants microscopic; cells disc- or egg-shaped, often spaced irregularly, in a single line within a relatively wide common gelatinous sheath; adjacent cells ***not*** connected. Figs 1-3.
..... *Stylonema*, *Chroodactylon*
Family: Acrochaetiaceae

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 wide 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 4-8.
..... *Bangia*, *Erythrotrichia*

2b. filaments one 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 opposite)
..... 3.





Figs 1, 2: *Stylonema alsidii*
irregularly spaced disc-shaped cells without cytoplasmic connections

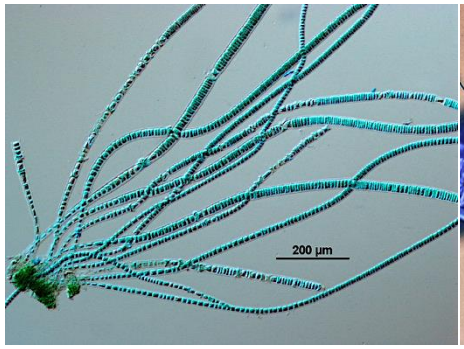


Fig. 5: *Bangia atropurpurea*

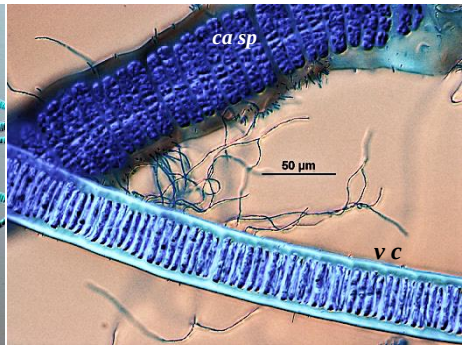


Fig. 6: *Bangia atropurpurea* subsp. *brevisegmenta*: vegetative cells (***v c***) with tightly packed disc-shaped cells; mature female stage forming numerous spores (carposporangia, ***ca sp***)

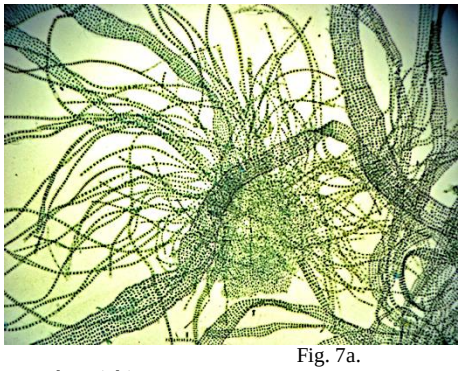


Fig. 7a.

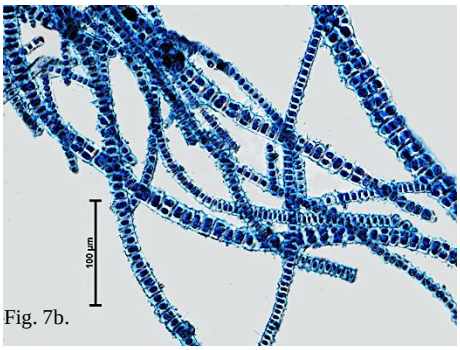
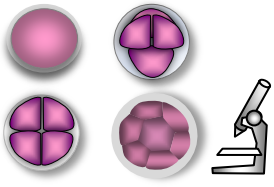


Fig. 7b.

Erythrotrichia carnea
Figs 7a, b: filaments of single and several cell rows wide
8: detail of a filament, some cells bearing ball-shaped spores (monospores, ***mo sp***)



some possible spore structures (sporangia)

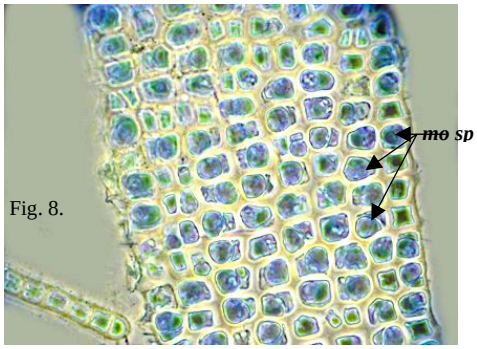


Fig. 8.

3a. long branches consist of filaments swathed in dense rhizoids and a cover of naked filaments giving the plant a felty or fuzzy appearance ……. 4.

3b. branches near plant tips are naked, generally forked (dichotomous), rhizoidal coatings if present are ropey and usually confined to bases of main branches (axes) ……..…… 5.

4a. plants fuzzy or fluffy due to dense, naked, filamentous, hair-like laterals that ***overtop plant tips***. Axes may be wrapped in dense rhizoids. Tetraspores or polyspores may occur. …… Figs 9-12.

Go to filamentous red algae Part XIV Tribe Spongoclonieae

4b. axes excessively hairy with long, unbranched filaments exceedingly thin compared to the large axial cells, short laterals in opposite pairs Figs 13-15 ...……..... *Warrenia comosa* Family: Ceramiaceae; Tribe Warrenieae

4c. axes felty with dense rhizoids, side filaments naked, of 2 types: - continuously growing ones with prominent rounded tip cells and filaments of limited growth, sharply pointed, with straight or hooked barbs. Figs 16-18. ……. *Camontagnea* 2 species (part of the Family: Acrochaetiaceae)

Fig. 9: *Spongoclonium fasciculatum* pressed specimen

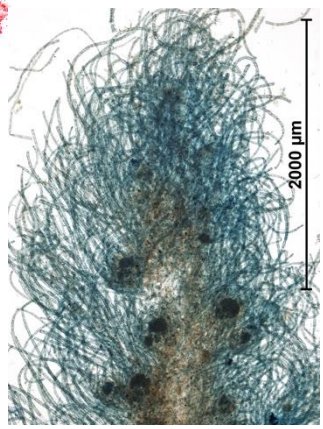


Fig. 10: *Spongoclonium conspicuum* Plant tip overtopped by lateral filaments

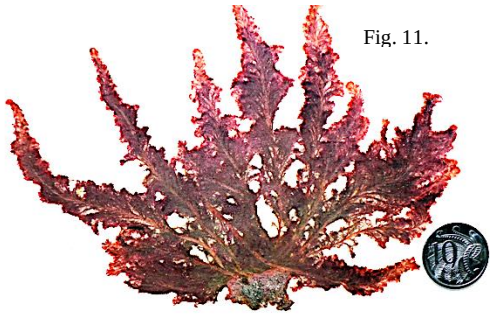


Fig. 11.

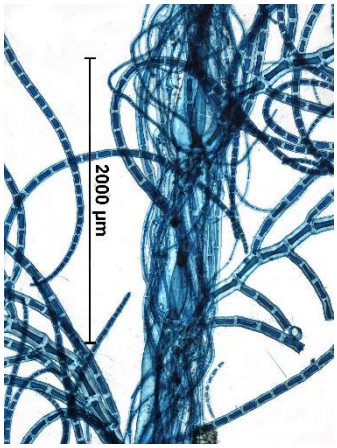


Fig. 12.

Lophothamnion hirtum (as *Pleonosporium hirtum* in *Algaebase*)
Fig. 11: pressed specimen
12: detail of axis swathed in rhizoids,

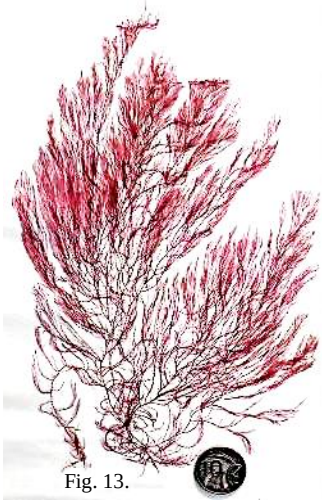


Fig. 13.

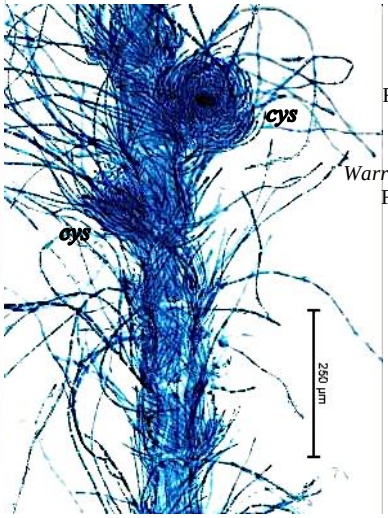


Fig. 14.

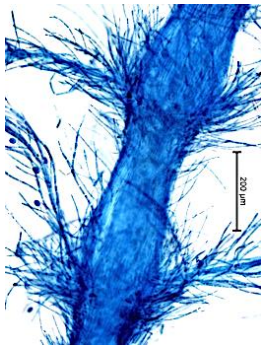


Fig. 15.

Warrenia comosa
Fig. 13: pressed specimen
14: central thread cells just visible beneath rhizoids, and dense, very fine filaments. Female reproductive structures (cystocarps, ***cys***)
15: laterals arise as paired bunches of broader, branched filaments

Fig. 16.

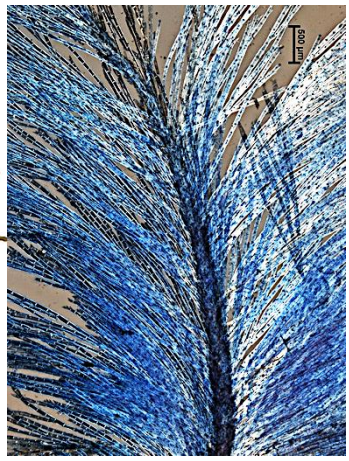


Fig. 17.

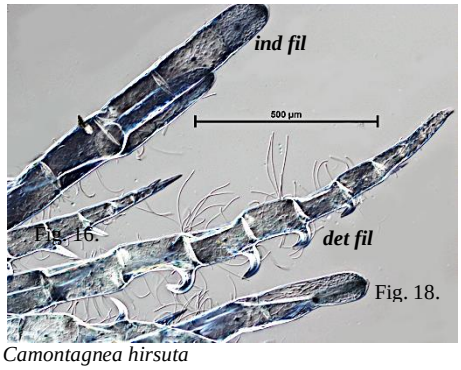


Fig. 16.

Fig. 18.

Camontagnea hirsuta
Fig. 16: pressed specimen
17: axis filament covered with rhizoids, side filaments naked, stiff, spreading
18: continuously growing filament (indeterminate filament, *ind fil)* with prominent tip cell; filament of limited growth (*det fil*) pointed, and with straight and hooked barbs

5a. plants small, delicate, generally < 200 mm tall. Cells mostly small (except at very base of plant), < 150µm wide, tall; mature female reproductive structures (cystocarps) a mass of naked spores
…… 6.

5b. plants generally >200mm tall. Cells mostly large, >150µm wide, female reproductive structures partly enclosed in a fencelike barrier of cells (involucre).
…… 8.

6a. special asexual structures of 1- 4 cells (propagules) present ……..…….…. 7.

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

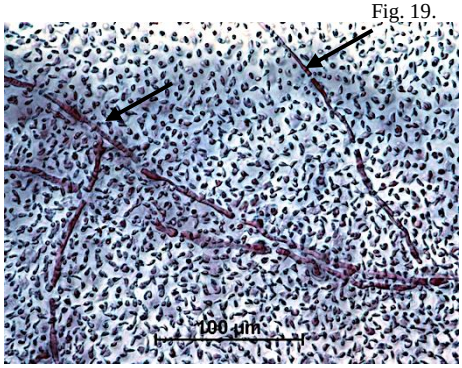
7a. species grow on or in other organisms including sponge. Clusters of cigar-shaped single-celled spores usually produced. Figs 19, 20.
…… *Audouinella*
(as *Colaconema* in *Algaebase*)
23 species; Family: Acrochaetiaceae

7b. tetrasporangia, many-celled spores (polysporangia) or single-celled propagules produced; plants often on other algae (epiphytic). Figs 21-25.
……..…. *Mazoyerella*
Family: Ceramiaceae; Tribe: Monosporeae
5 genera, separated on propagule and female reproductive features

6a. plants tiny, delicate, have creeping threads and upright parts; tetrasporangia are stalked, female structures single.
…….....……..…… 7.

6b. plants small, tufted, tetrasporangia stalkless; female structures paired. Figs 26-29. (next page)
..... *Callithamnion* (10 species)
Family: Ceramiaceae, Tribe: Callithamnieae
go to Part XIII: Tribe Callithamnieae

Fig. 19.



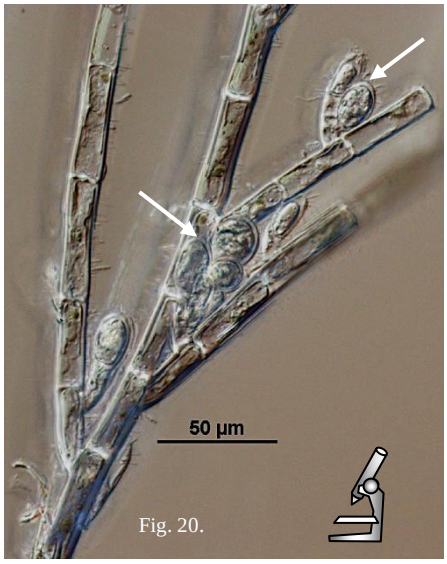
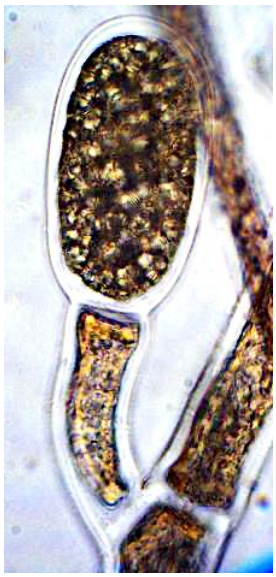


Fig. 20.

Audouinella
Fig. 19: filaments (arrowed) on the surface of the red algal host, *Gloiosaccion*
20: erect filaments of *Audouinella daviesii* with bunches of monosporangia (arrowed)

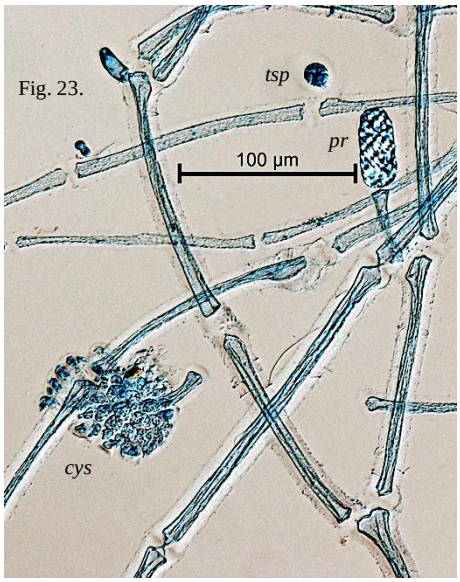
Fig. 21.

Fig. 22.



Mazoyerella arachnoidea
Fig. 21: delicate branched filaments, stalked propagules
22: stalked propagule
23: tetrasporangium (*tsp*), propagule (*pr*) and cystocarp (*cys*)

Fig. 23.



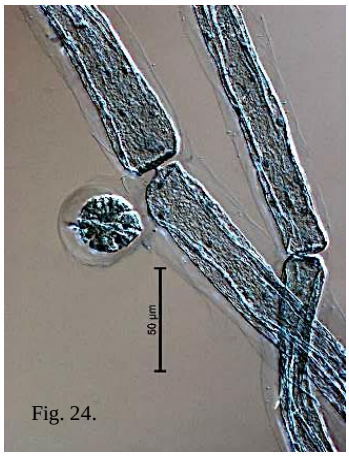


Fig. 24.

Mazoyerella australis
Fig. 24: detail of a polysporangium
25: propagule, stalk with a broad apex (arrowed) in this species

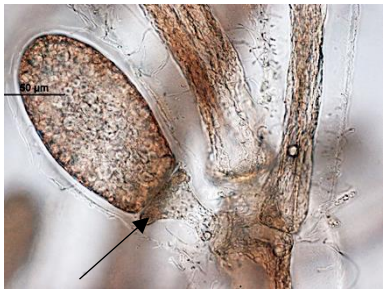


Fig. 25.

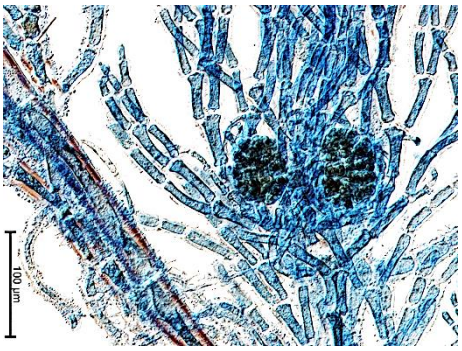


Fig. 26: *Callithamnion confertum*
(as *Aglaothamnion confertum* in Algaebase)

Fig. 27.

Callithamnion circinnatum
(as *Aglaothamnion circinnatum* in Algaebase)
Fig. 27: densely branched pressed specimen
28: small cells and stalkless (sessile) tetrasporangia (*t sp*)

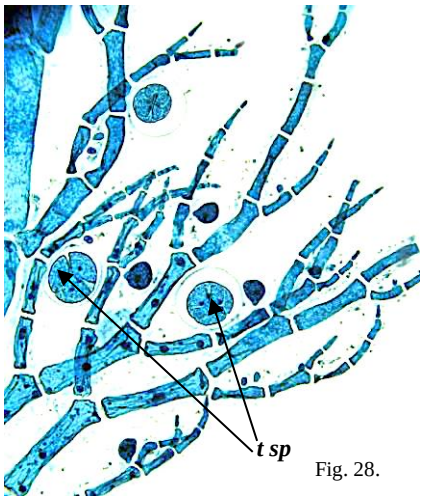


Fig. 28.

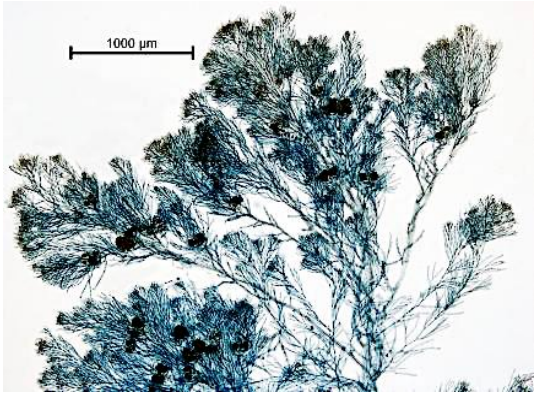


Fig. 29 *Callithamnion pseudobyssoides* (as *Aglaothamnion pseudobyssoides* (in *Algaebase*)
Pressed specimen

7a. tips of upright parts ringed with thin branched hairs at tips; mature female structures (cystocarps) with fence-like row of protective cells (involucre) Figs 30-32.
……. *Anotrichium tenue*
Family Ceramiaceae;Tribe: Griffithsieae

7b. thin branched rings of hairs ***absent***. Figs 33-34.
…….. *Spermothamnion*
Family: Ceramiaceae; Tribe: Spermothamnieae

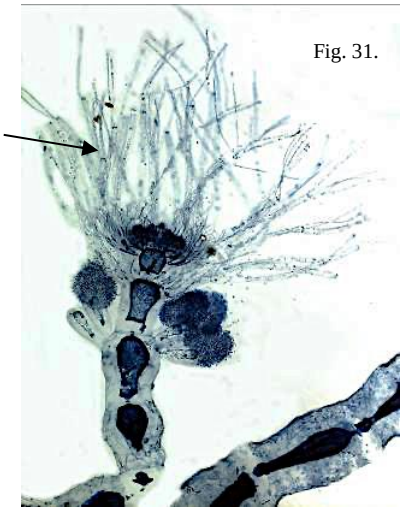


Fig. 31.

Fig. 32.

Anotrichium tenue:
Fig. 30: plant with creeping and upright filaments
31: male plant filament tips with rings of fine hairs (*h*), stalked spermatangial heads (*sp*)
32: mature female structures slightly flattened and displaying fence-like cells of the involucre

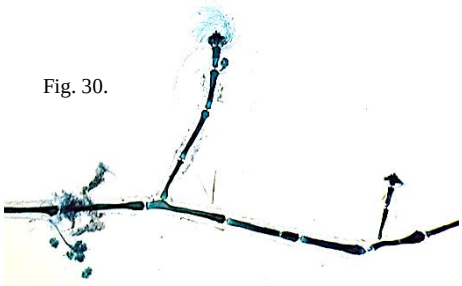


Fig. 30.

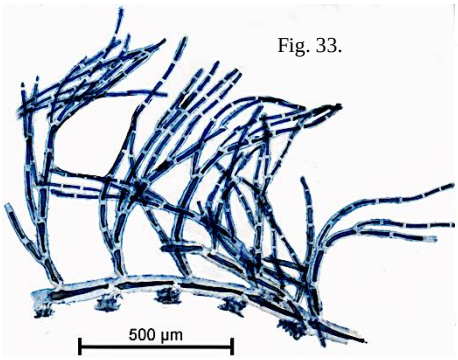


Fig. 33.

Spermothamnion pinnatum
Fig. 33: creeping thread with attachment pads (haptera, *hp*), giving rise to upright threads
34: thread tips with tetrasporangia (*t sp*) on stalks

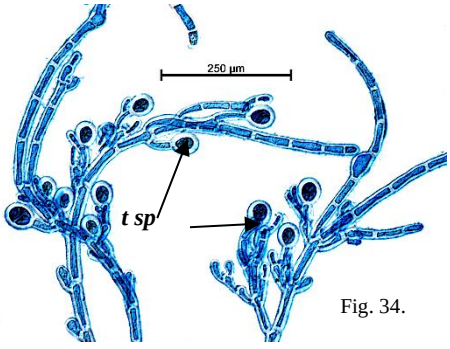


Fig. 34.

8a. stalkless sporangia and male heads in basket- or claw-like branchlets.
…… ……. 9.

8b. sporangia and male heads not as above. Figs 34-39 (next page)
…….. 10.
Family: Ceramiaceae; Tribe: Griffithsieae

9a. plants delicate and densely forked, or, large-celled, branched on one side. Figs 35-37.
……. *Bornetia* (2 species)
Family: Ceramiaceae, Tribe: Bornetieae

9b. large-celled, lower axes ropey with twisted rhizoids ; polysporangia present. Figs 38-41 …. *Involucrana meredithiana*
Family: Ceramiaceae, Tribe: Sphondylothamnieae

Fig.35: *Bornetia tenuis*

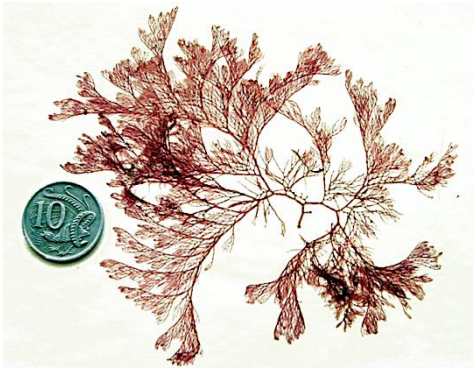


Fig. 36: *Bornetia binderiana*

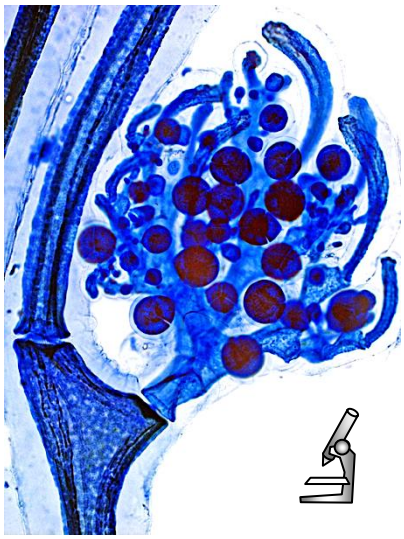


Fig. 37: *Bornetia binderiana*: sporangia in claw-like side branchlet

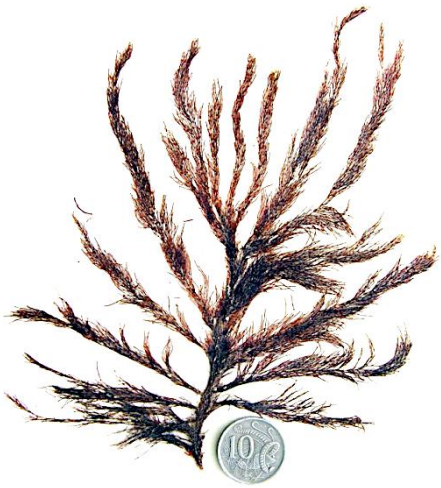


Fig. 38: *Involucrana meredithiana*

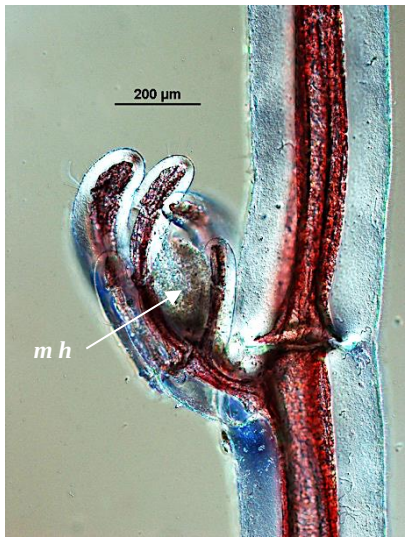


Fig. 39: *Involucrana meredithiana* male head (*m h*) in claw-like side branchlet

10a. cells large, often visible to the unaided eye, branching usually forked; some species with inflated cells, bead-like; tetrasporangia on numerous, obscure microscopic branches in constrictions between cells. Figs 42-44. (next page)
..... *Griffithsia* (10 species)
see also the separate Web page
"*Griffithsia* at a glance"

10b. cells smaller, branching forked or tufted, not bead-like; tetrasporangia on short stalks. Figs 45-47. (next page)
..... *Anotrichium* (6 species)
see also the separate Web page
"*Anotrichium* at a glance"

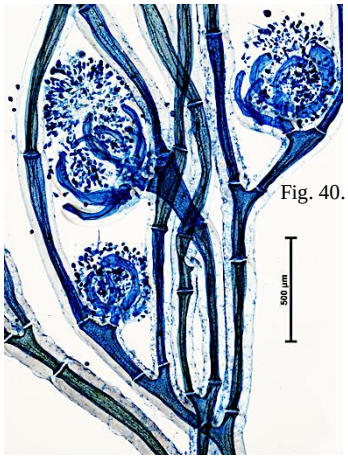


Fig. 40.

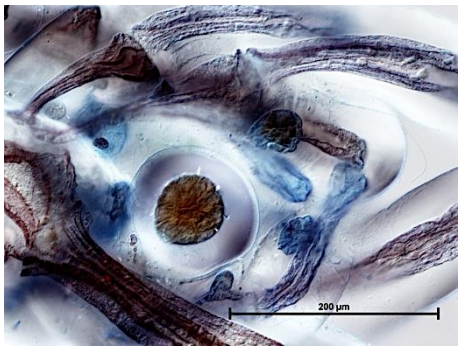


Fig. 41.

Involucrana meredithiana
Fig. 40: basket-like branches around mature female structures (cystocarps)
41: stalkless polysporangium in a branchlet

Fig. 42: *Griffithsia teges*

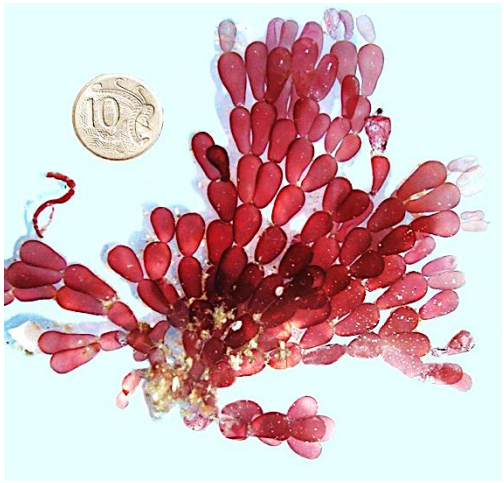


Fig.43 (above): *Griffithsia monilis*

Fig. 44 (right): *Griffithsia ovalis*: tetrasporangia clustered on minute branches in constrictions between large vegetative cells

Fig. 45: *Anotrichium licmophorum*

Anotrichium elongatum
Fig. 46: pressed specimen

47: stalked tetrasporangia on one side of a branch fork

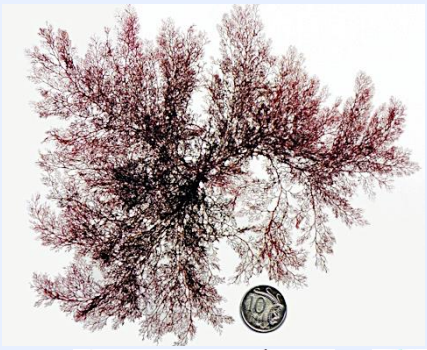
Fig.

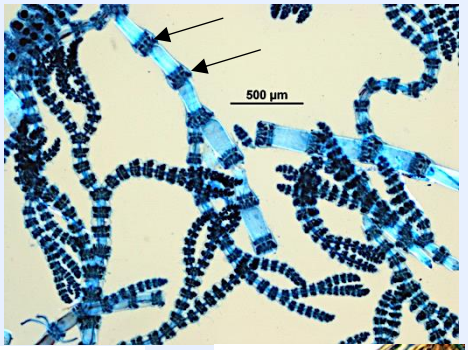
LOOK-ALIKE ALGAE

Some other filamentous algae are superficially like those above. But, under the microscope, their filaments can be seen to be wrapped (corticated) with regular or close-fitting cells and are not naked like those of the species in this key.
As examples of these, "look-alike" algae, two large genera possessing cortication are illustrated in this panel.

Ceramium, Spyridia

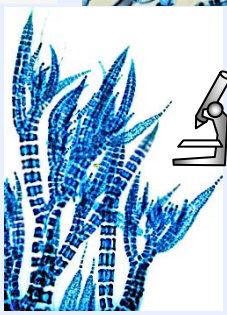
Upper parts of axial cells or cells of filamentous side-branches are ringed with closely attached, small corticating cells (arrowed)
See
Filamentous red algae Part IV: nodally-corticated algae"

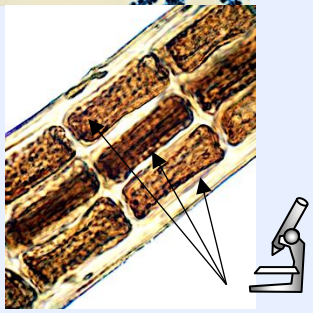




Polysiphonia

Cells equal in length to axial cells (pericentral cells, arrowed) form bands along the axes.
See
Filamentous red algae Part VI: Tribe: Polysiphonieae, Family: Rhodomelaceae"





SPECIES ILLUSTRATED IN THE KEY

Group	Author/s	page	Name in *Algaebase*	Author/s
Anotrichium elongatum	(Harvey) Baldock	6		
Anotrichium licmophorum	(Harvey) Baldock	6		
Anotrichium tenue	(C. Agardh) Nägeli	4		
Audouinella daviesii	(Dillwyn) Woelkerling	3	*Colaconema daviesii*	(Dillwyn) Stegenga
Bangia atropurpurea	(Mertens *ex* Roth) C.Agardh	1		
Bangia atropurpurea subsp. *brevisegmenta*	Womersley	1		
Bornetia binderiana	(Sonder) Zanardini	5		
Bornetia tenuis	Baldock & Womersley	5		
Callithamnion circinnatum	Womersley	4	*Aglaothamnion circinnatum*	(Womersley) Cormaci, G.Furnari & Alongi
Callithamnion confertum	Womersley	4	*Aglaothamnion confertum*	(Womersley) Cormaci, G.Furnari & Alongi
Callithamnion pseudobyssoides	AP.Crouan & H. Crouan	4	*Aglaothamnion pseudobyssoides*	(AP.Crouan & H. Crouan) Halos
Camontagnea hirsuta	(Wollaston) Woelkerling & Womersley	2		
Camontagnea oxyclada	(Montagne) Pujals	3		
Chroodactylon		1		
Erythrotrichia carnea	(Dillwyn) J.Agardh	1		
Griffithsia monilis	Harvey	6		
Griffithsia ovalis	Harvey	6		
Griffithsia teges	Harvey	6		
Lophothamnion hirtum	(Hooker f. & Harvey) Womersley	2	*Pleonosporium hirtum*	(Hooker f. & Harvey) Laing
Involucrana meredithiana	(J.Agardh) Baldock & Womersley	5		
Mazoyerella arachnoidea:	(Harvey) Gordon-Mills & Womersley	3		
Mazoyerella australis	(Harvey) Huisman & Womersley	3		
Spermothamnion pinnatum	E.M.Gordon	4		
Spongoclonium conspicuum	Sonder	2		
Spongoclonium fasciculatum	J. Agardh	2		
Stylonema alsidii	(Zanardini) K.M.Drew	1		
Warrenia comosa	(Harvey) Harvey *ex* Schmitz & Hauptfleisch	2		

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