Pictured Key to some common filamentous red algae of southern Australia. Part VIII: axes with irregular cortication.

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 Tribes: Ptiloteae and Rhodocallideae of the Family: Ceramiaceae These have:-

- a basic ***filamentous construction***. Cells initially grow in a single line (algae are *uniseriate*), although this is visible generally only near branch tips. In a cross section, a prominent central filament can be seen under the microscope
- cross walls of filaments may slope (are ***oblique***)
- tip cells cut off cells alternately that eventually form flattened rings of 2-10 cells (periaxial cells), seen in cross section about the central filaments
- branching generally occurs in one flat surface so that plants are feathery or comb-like (pinnate) in outline
- additional, closely-packed, ***irregularly arranged*** cells wrap around (corticate) and obscure the central filament. These are generally equal-sided (parenchymatous) in shape and may grow more in one flat surface, producing compressed or thin, ribbon-shaped branches
- reproductive structures are usually in exposed positions within naked filaments

The key below follows that in the Flora of southern Australia Part IIIC, and requires that plant tips and reproductive structures be viewed microscopically.

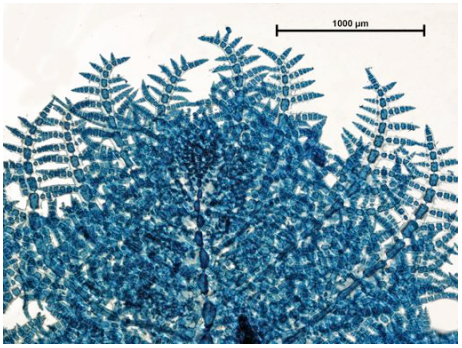
1a. central filament prominent; plant tips crowded with over-arching, flat-branched, naked side filaments ending in sharp points; side branches alternate, flat-branched once or twice (bi-pinnate), producing a comb-like effect. Figs 1-4 ……..…….. *Ptilota hannafordii*

1b. central filament rapidly obscured by equal-sided corticating cells; tip cells blunt (obtuse) …… 2.

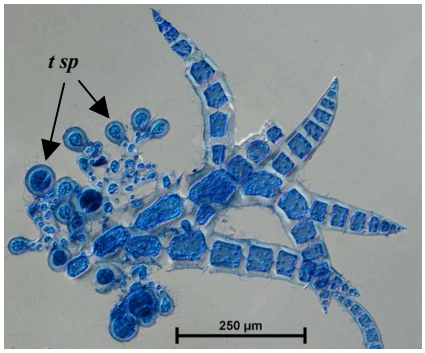
2a. branches compressed, alternate, ***linear***, tips pointed, edged with ***minute spines***; rings of 4 (peri-axial) cells about the central filament rapidly obscured by numerous rhizoids; ***tetrasporangia*** in pebble-like masses directly on the surface of short side branches; mature female structures at tips of branches. Figs 5-9. ..... *Rhodocallis elegans*

2b. edges of compressed branches smooth, tetrasporangia and cystocarps in exposed branched filaments. ……..…… 3.

Figs 1, 2 two magnifications of *Ptilota hannafordii* plants



Figs 3. *Ptilota hannafordii* plant tip; over-arching, flat-branched (pinnate) side filaments; prominent central filaments



Figs 4. *Ptilota hannafordii*: dissected side filaments; tetrasporangia (*t sp*)

Fig. 5: *Rhodocallis elegans*, plant tips

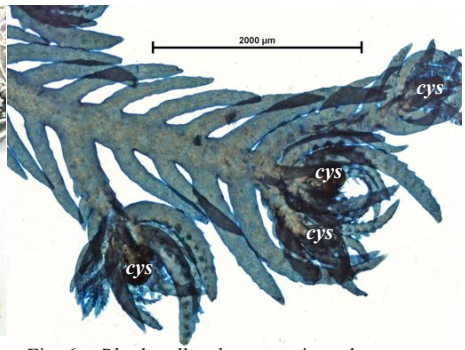


Fig. 6. *Rhodocallis elegans*: spiny, alternate side branches; cystocarps (*cys*) at tips, wrapped in filaments

⚠ the position of this species in this genus has yet to be confirmed

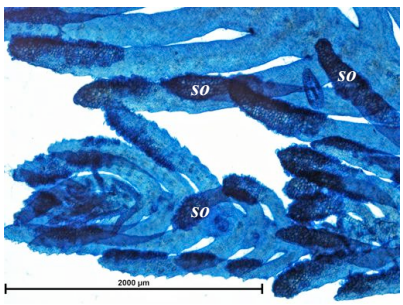


Fig. 7. *Rhodocallis elegans*: spiny side branches; surface pebble-like clusters (sori, *so*) of tetrasporangia

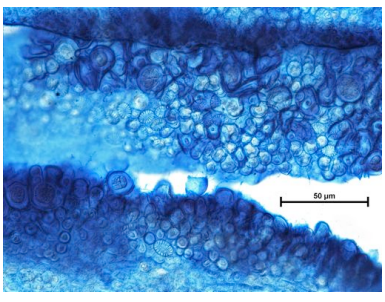


Fig. 8. *Rhodocallis elegans*: detail of pebble-like tetrasporangial clusters

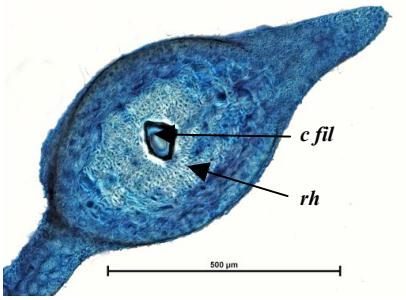


Fig. 9. *Rhodocallis elegans*, cross section: central filament (*c fil*); dense rhizoids (*rh*)

3a. side branches ending in exposed filaments with ***oblique*** end walls; central filament and 2(-4) lateral flanking (peri-axial) cells prominent in cross sections of axes; tetrasporangia and cystocarps near ends, of branched filaments. Figs 10-13.
..... *Euptilota articulata*

3b. branches corticated almost to the tips, filament end walls obscured; central filament and 4-11 lateral flanking (peri-axial) cells prominent only in cross sections of young axes, later obscured by rhizoids; tetrasporangia and cystocarps in tufts of filaments along branch edges ..... 4.

4a. compressed side branches linear, but tapering to a point, tetrasporangia and mature female structures (cystocarps) in tufts of naked filaments on upper edges of side branches. Figs 19-27 (next page).
..... *Psilothallia*…… 5.

4b. compressed side branches often irregularly arranged, bases running into broad, thick axes; tetrasporangia and mature female structures (cystocarps) in stubby filament tufts with broad, corticated bases, scattered along branch edges. Figs 14-18.
..... *Diapse ptilota*

Fig.10: *Euptilota articulata*

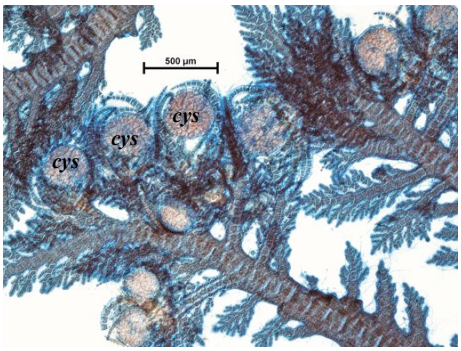


Fig. 11. *Euptilota articulata*: mature female structures (cystocarps, *cys*) wrapped in a few filaments, at tips of side branches

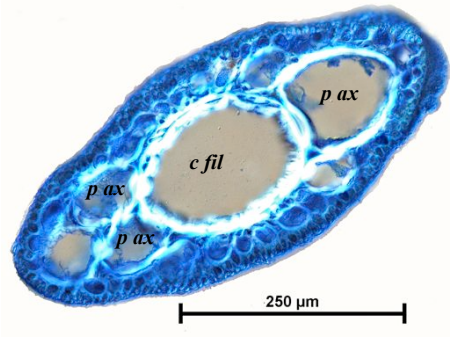


Fig. 12. *Euptilota articulata*, cross section: central filament (*c fil*); 3 flanking cells (peri axial cells *p ax*)

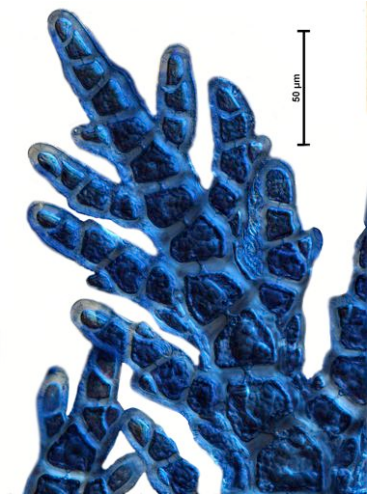


Fig. 13. *Euptilota articulata*, tip of side branch: flat-branched filaments with oblique end walls

Fig. 14: *Diapse ptilota*, plant tips

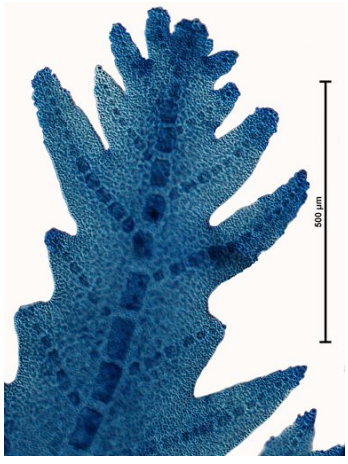


Fig. 15. *Diapse ptilota* axis tip: heavily stained central filaments apparent under corticating cells reaching tips of branches

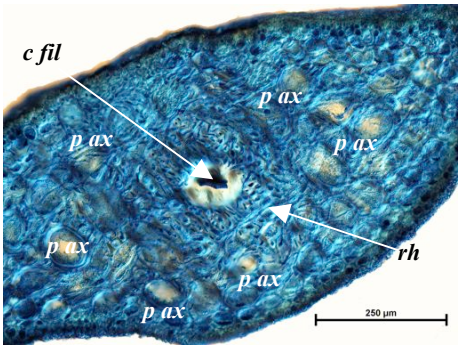


Fig. 16. *Diapse ptilota* cross section: central filament (*c fil*); flanking (periaxial) cells (*p ax*) becoming obscured by numerous rhizoids (*rh*)

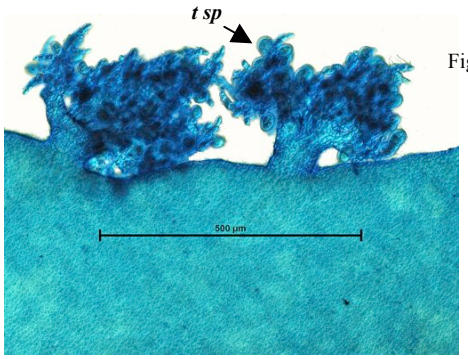


Fig. 17. *Diapse ptilota*, edge of a side branch: tetrasporangia (*t* sp) in tree-like clusters

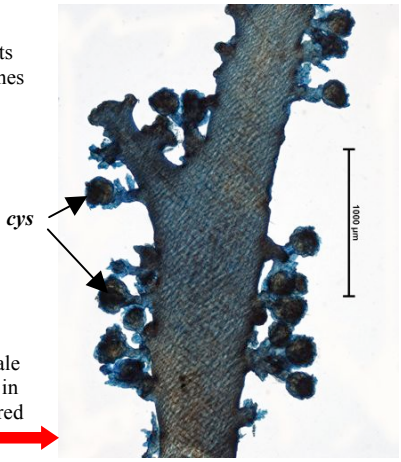


Fig. 18. *Diapse* ptilota: mature female structures (cystocarps, *cys*) in stubby filament tufts scattered along branch edges

5a. possibly rare (W Aust, Cape Northumberland, SA); side branches more cylindrical than compressed, obscurely banded (striate), tips ringed with tufts of fine, branched filaments becoming denuded below; tetrasporangia in minute branched tufts mainly on upper branch edges. Figs 19-22.
…….. *Psilothallia striata*

5b. from W Aust to Victoria; side branches compressed, broad basally, not banded; tetrasporangia in pod-shaped clusters standing out from branch margins. Figs 23-27.
…… *Psilothallia siliculosa*

Fig. 19: *Psilothallia striata*

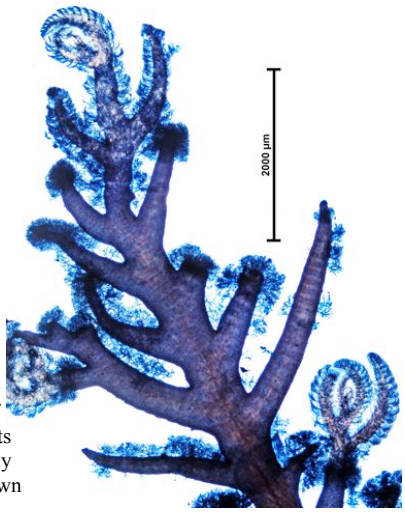


Fig. 20. *Psilothallia striata*: faintly banded branches and rings of filament tufts progressively denuded down the plant

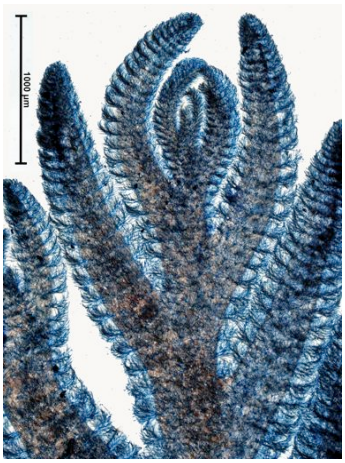


Fig. 21. *Psilothallia striata* branch tips: rings of filament tufts

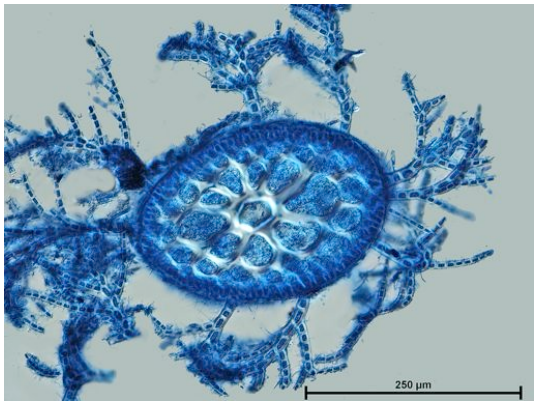


Fig. 22. *Psilothallia striata* cross section; central filament surrounded by about 8 periaxial cells that form the basal cells of outwardly-growing filament tufts

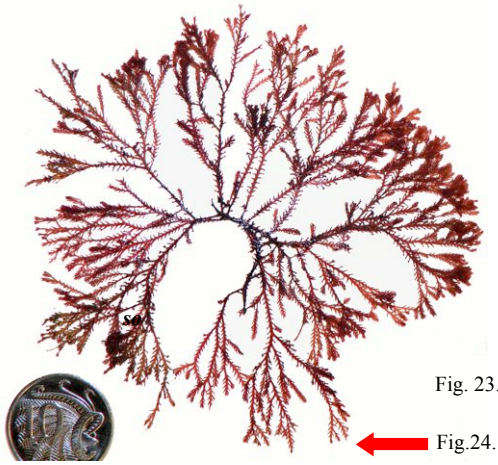


Fig.24. *Psilothallia siliculosa*: whole plant

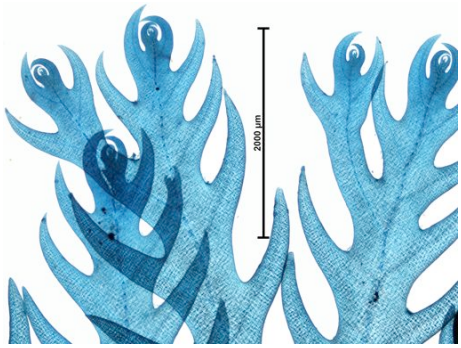


Fig. 23. branch tips: stained central filaments visible beneath equal-sided coating (corticating) cells

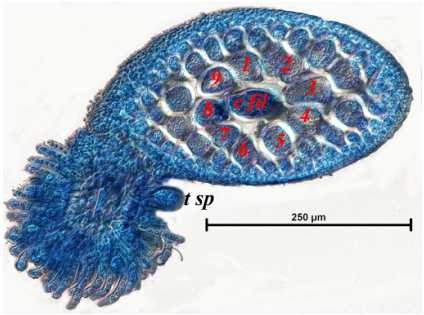


Fig. 25. *Psilothallia siliculosa*: cross section: central filament (*c fil*); 9 (periaxial) cells (*1-9*); filament tuft bearing tetrasporangia (*t sp*)

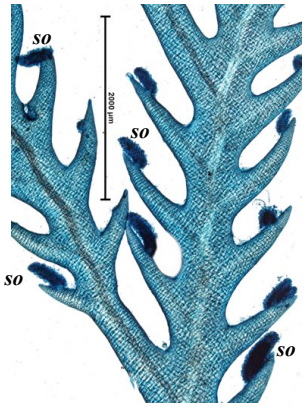


Fig.26. *Psilothallia siliculosa*: pod-shaped clusters (sori, *so*) of tetrasporangia near tips of side branches

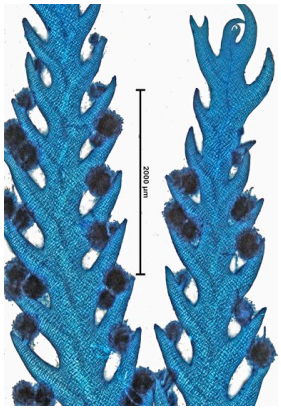


Fig. 27. *Psilothallia siliculosa*: mature female structures (cystocarps) near tips of side branches

LOOK-ALIKE ALGAE

Comb-like algae superficially resembling the Rhodocallideae and Ptiloteae

1. *Phacelocarpus*

Species in this genus have comb-like, flat, branching patterns, compressed axes, and a central filament resembling *Psilothallia, Diapse* and *Rhodocallis*.

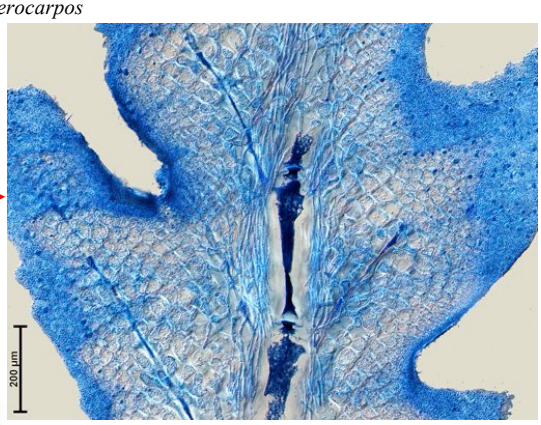
When inspected under the microscope:

- they ***lack*** any naked filament tufts. There is a single, obscure tip cell.
- ***all*** reproductive organs occur as swellings with distinct walls, mostly on short stalks, in the angle between axes and flat side branches
- windows cut lengthwise along axes show a central filament wreathed in rhizoids, a middle layer of large, equal-sided cells (parenchyma) grading to small cells in outer layers

mature female reproductive structures (cystocarps) in *Phacelocarpus peperocarpos*

plant tip of *Phacelocarpus peperocarpos*

window cut lengthwise in the axis of *Phacelocarpus apodus* revealing the central filament and large inner cells



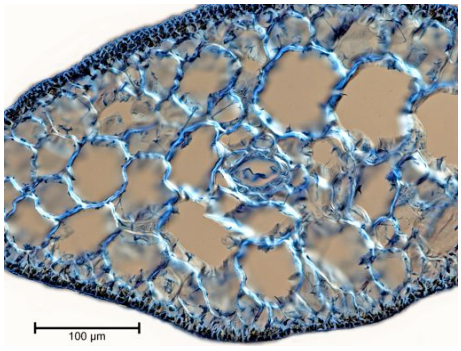
2. *Delisea*

Species in this genus also have flat, comb-like branching patterns, compressed axes and central filaments resembling *Psilothallia, Diapse* and *Rhodocallis*.

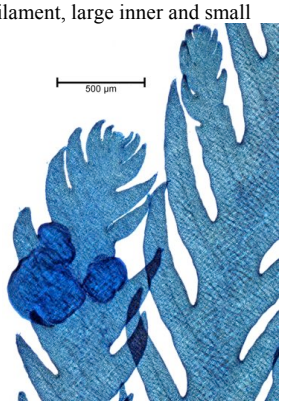
They differ in having:

- ***no*** rings of flanking (periaxial) cells in cross sections of axes
- middle layers of large, irregularly arranged parenchyma
- mature female reproductive organs with distinct walls, ***embedded*** in branch ***tips***
- male and tetrasporangia in patches (sori) on the surface of blades

tips of *Delisea plumosa*: central filaments visible; mature female reproductive structures(cystocarp)



cross section of *Delisea pulchra* revealing the large central filament, large inner and small outer cells



Delisea plumosa: male reproductive structures forming swellings near plant tips