# Pictured Key to some common red algae of southern Australia: the Order: Nemaliales

**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 making identification very difficult if the technical systematic literature is used or specimens are sterile.

**This key** Fortunately, sometimes shapes or morphologies alone will allow you to sort ***some*** algae directly into the level of Genus or species 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 an appropriate fact sheet or the *Marine Benthic Flora of southern Australia*.

**Scale:** The coin used in photos as a scale is 24mm or almost 1" wide.

**Artefacts** Microscope images of algae are usually blue stained, or have a black background. Branches of pressed specimens are often flattened and look un-naturally compressed.

- the key below gathers together only southern Australian species of the Order: Nemaliales, a group that has been more comprehensively described by Huisman, J M *et al* in the *Algae of Australia* series (CSIRO, 2006). It follows recent name changes found in Huisman, but includes, also, those of the *Marine Benthic Flora of southern Australia* so they can be looked up in the Fact Sheets found elsewhere in this Website.
- some Nemaliales can be identified quickly using "*pictured keys: slimy red algae*" or "*narrow branched red algae*" and "*groups at a glance: beaded red algae*" in this Website.
- unfortunately, microscopic examination of tissue squashes or cross sections is necessary for accurate identification of many groups.
- members of Nemaliales have a core of fine, branched threads and a thin rind or cortex of loosely arranged or compact small cells. The latter may be in chains, short, outward-facing tufts, or a pavement of 6-sided cells (see Figs 1-3).
- Some plants are slimy, others limey with a coating impregnated with calcium carbonate that effervesces when acid is added.

1a. branching regularly forked, each fork pinched top and bottom into *segments*; surface cells closely packed …….. 2.

1b. branching forked or irregular *not* pinched into segments although dried specimens may appear so due to fractures in the branches; surface cells closely packed or not ……..... 5.

2a. plants calcified, effervescing in acid ……..... 3.

2b. plants *not* calcified ……..... 4.

3a. segments pink, outermost layer (cortex) of small, coloured cells, with 2 layers of large, colourless cells underneath. Figs 4-7.
……. *Dichotomaria obtusata*
Family: Galaxauraceae

3b. segments grey, cortex of small cells radiating outwards from core mass of threads. Figs 8a, 8b (next page)
……*Tricleocarpa cylindrica*

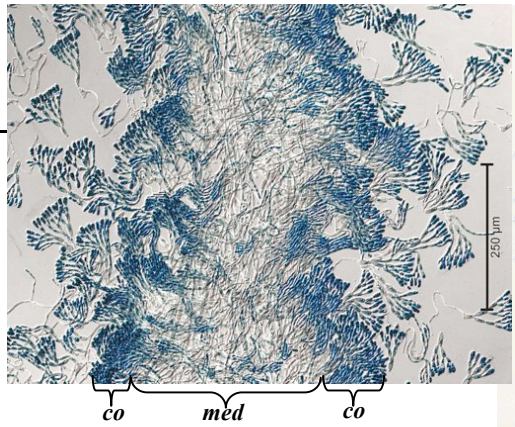



Fig. 1: *Helminthocladia beaugleholei*, tissue squash, core (medulla, *med*) of threads, surface layer (cortex, *co*) of loose chains of outwardly pointing cells

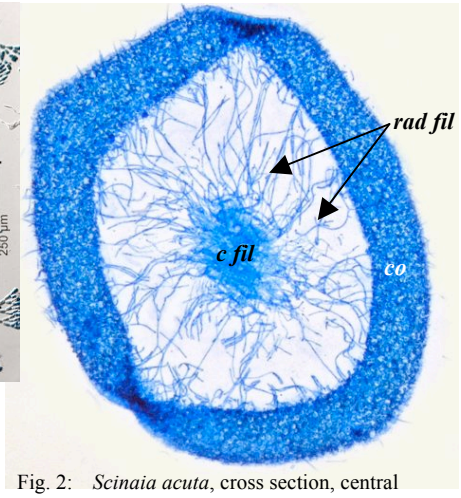



Fig. 2: *Scinaia acuta*, cross section, central mass of threads (*c fils*), radiating threads (*rad fil*), surface layer of compact cells (cortex, *co*)

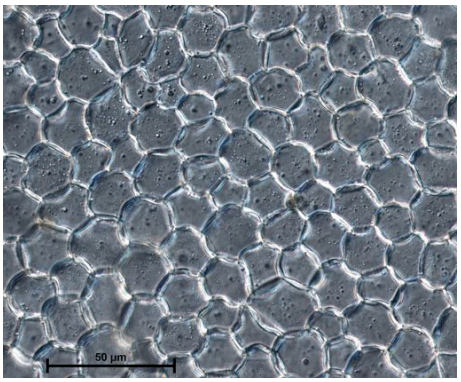



Fig. 3: *Scinaia moniliformis*, surface view of compact, colourless, 6-sided outer cells

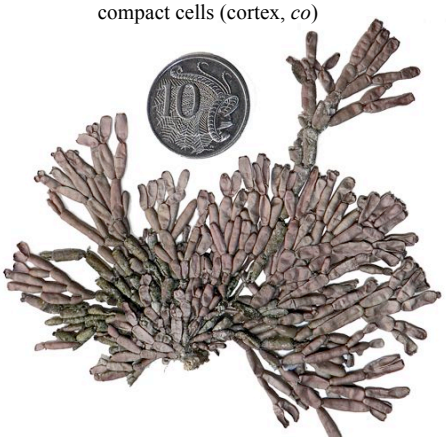


Fig. 4: *Dichotomaria obtusata*

Fig. 5: *Dichotomaria obtusata*, detail of segments

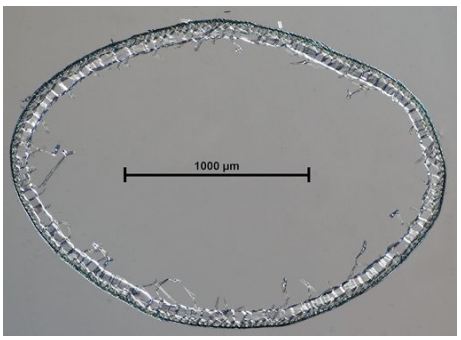



Fig. 6: *Dichotomaria obtusata*, cross section, core with threads (most removed in preparing the slide), outer layers (cortex)

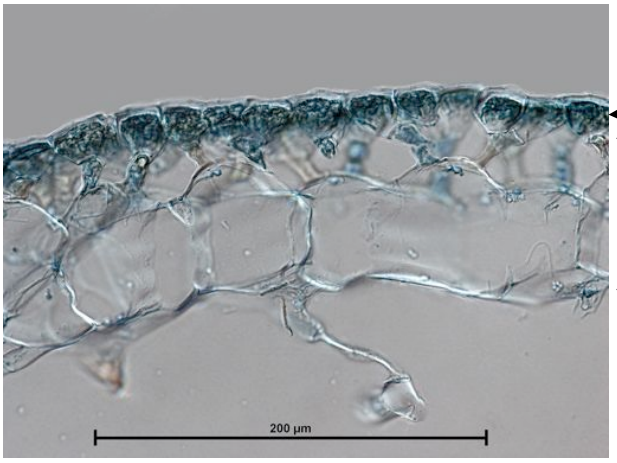



Fig. 7: *Dichotomaria obtusata*, outermost layers, outer cortex (*o co*) of pairs of small, pear-shaped, coloured cells, inner 2 layers (*in co*) of large, colourless cells, often merging together at their edges

4a. segments short, bead- or sausage-shaped, ~ 4 mm wide, tips rounded. Figs 3, 9-11.
…….…… *Scinaia moniliformis*
Family: Scinaiaceae, Galaxauraceae in the Flora

4b. segments long, thin, ~ 2 mm wide, tips pointed. Figs 12-14.
……. *Scinaia arborealis*
Family: Scinaiaceae, Galaxauraceae in the Flora

5a. outer layer (cortex) of compact cells ……..….. 6.

5b. outer layer (cortex) of loosely arranged, microscopic bunches of cells ……..... 11.

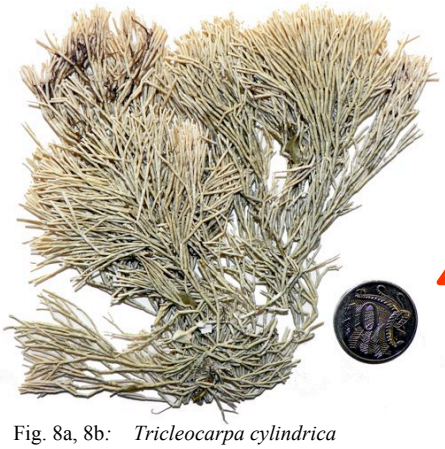


Fig. 8a, 8b: *Tricleocarpa cylindrica*

Tropical. Found in southern Australia only at Rottnest I., near Perth W.A.
Could be mistaken for a coralline red alga (see the appropriate pictured key for coralline algae).

Fig. 9: *Scinaia moniliformis*

Fig. 10: *Scinaia moniliformis*, detail of segments

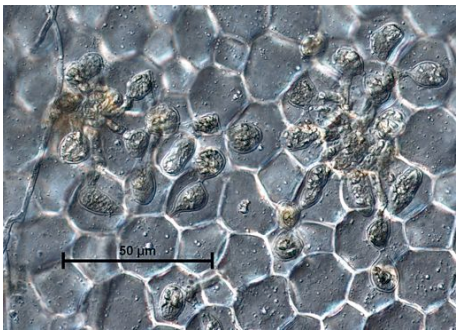



Fig. 11: *Scinaia moniliformis*, surface view focussed through the honeycomb-like outermost layer to the bunches of coloured cells beneath

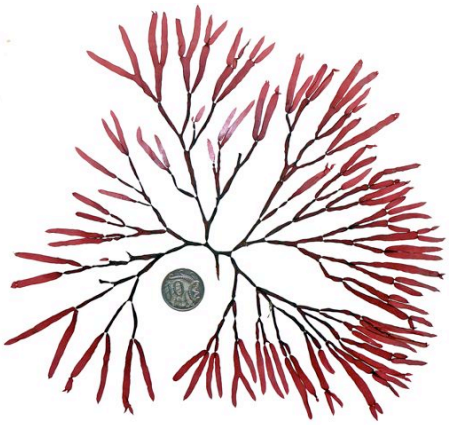


Fig. 12: *Scinaia arborealis*

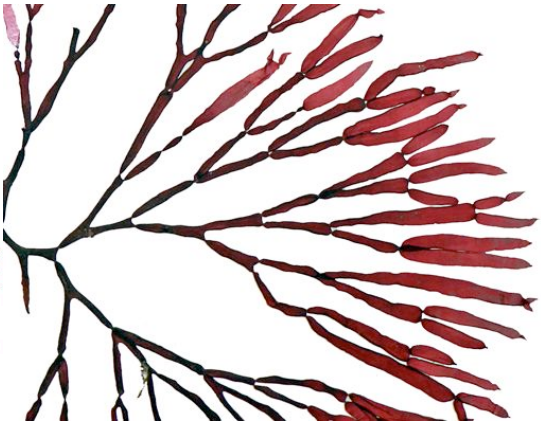


Fig. 13: *Scinaia arborealis*, detail of constrictions at origin of forks and pointed tips

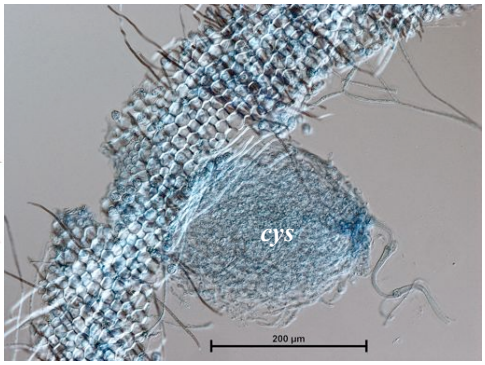



Fig. 14: *Scinaia arborealis*, tissue squash, honey-comb pattern of outermost colourless cells, bulbous female reproductive organ

both segmented *Scinaia* species superficially resemble some other red segmented plants such as *Erythroclonium*, *Rhabdonia*, *Coelarthrum*, and *Webervanbossea kaliformis*.
The surface honey-comb pattern of cells in *Scinaia* is a useful distinction, but check identifications against species in "*southern Australian groups at a glance: bead-like red algae*"

6a. plants soft throughout, but may dry gristly .....……... 7.
6b. plants rare, gristly only in lower parts. Fig. 15.
…….. *Scinaia proliferata*
Family: Scinaiaceae

7a. plant slimy, forked from the base; cortex consists of tufts of small, outwardly-pointing, coloured cells; mature branches may be hollow. E. Aus. states only. Figs 16, 17.
…….. *Nothogenia fastigiata*
Family: Scinaiaceae
7b. plants not slimy, repeatedly forked
……..…….. 8.

8a. surface cells (cortex) of colourless balloon-shaped or 6-sided cells (utricles) ……..…….. 9.
8b. surface cells small, coloured …….10.

9a. tips *rounded*; surface view of outer layers shows large, 6-sided, colourless cells of about the same size, with small coloured cells lying beneath. Figs 18-21.
…….. *Scinaia tsinglanensis*
Family: Scinaiaceae
9b. tips *pointed*; surface view of outer layers shows larger colourless cells loosely ringed with small, coloured cells. Figs 2, 22-24 ….. *Scinaia acuta*
Family: Scinaiaceae; as *S. australis*
Family: Galaxauraceae in the Flora

Fig. 15: *Scinaia proliferata*

Fig. 16: *Nothogenia fastigiata*

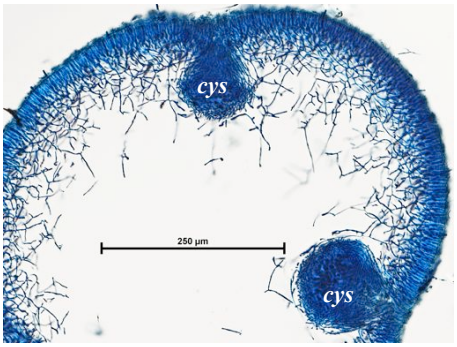



Fig. 17: *Nothogenia fastigiata*, cross section of a hollow branch, with 2 female structures (cystocarps, *cys*)

Fig. 18: *Scinaia tsinglanensis*

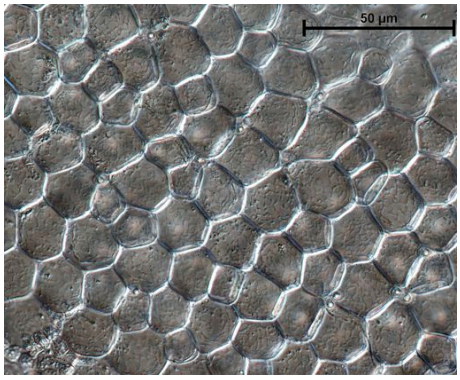



Fig. 19: *Scinaia tsinglanensis*, surface cells

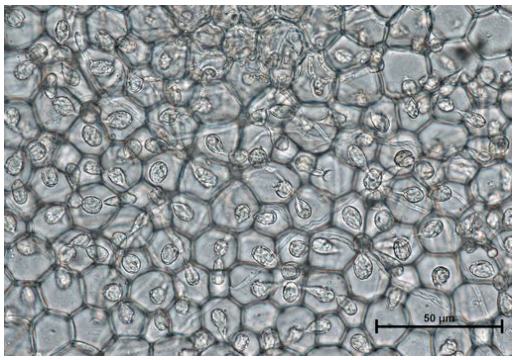



Fig. 20: *Scinaia tsinglanensis*, surface focussed to show underlying small coloured cells

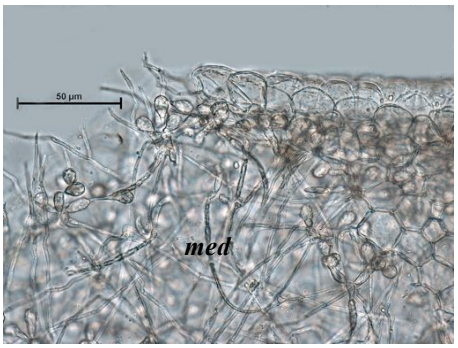



Fig. 21: *Scinaia tsinglanensis*, tissue squash, inner core of threads (medulla, *med*) ending in bunches of 2-3 club-shaped coloured cells beneath larger, colourless, outermost cells

Fig. 22: *Scinaia acuta*

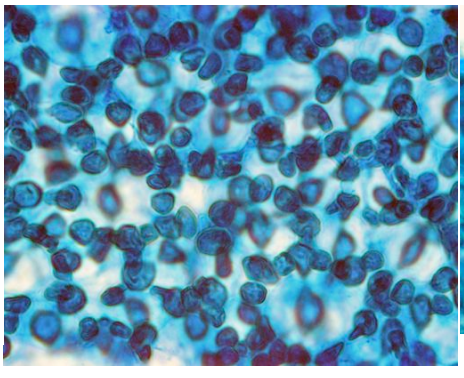


Fig. 23: *Scinaia acuta*, surface view showing coloured cells ringing the outermost colourless (un-focussed) cells

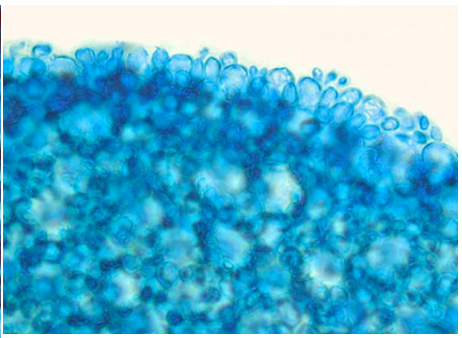


Fig. 24: *Scinaia acuta*, oblique view with cell rings (rosettes) and protruding, colourless bubble-shaped surface cells

10a. upper branches flat, basally cylindrical, hairy; small, coloured surface cells often paired, underlain with 3-5 layers of large, colourless cells; sexual plants with microscopic surface spines. Figs 25-27.
…….…. *Dichotomaria spathulata*
Family: Galaxauraceae

10b. upper branches cylindrical or compressed, not hairy, centre parts of threads ending in branched chains of outward-pointing coloured cells
…… 11.

11a. plants limey (effervescing in acid), some with an obvious chalky surface
…….…….. 12.

11b. plants *not* limey, some are slimy, branch edges appear fuzzy …….... 15.

12a. plants slightly limey; surface layers of prominent tufts of branched cell chains *not* pinched between cells
…...……..... 13.

12b. plants limey; surface layers of short branched chains *pinched* between each cell ……... 14.

13a. always on *Codium duthieae* (a green velvet-weed); forked branches ≤ 10 mm apart; surface cells egg-shaped. Figs 28-30.
…….…… *Ganonema codii*
Family: Liagoraceae
As *Liagora codii* in the Flora

13b. sometimes on other algae; forked branches ~ 20 mm apart; surface cells cylindrical. Figs 31-33 (next page).
……*Ganonema farinosa*
Family: Liagoraceae
as *Liagora farinosa* in the Flora

Fig. 25: *Dichotomaria spathulata*

Fig. 26: *Dichotomaria spathulata*

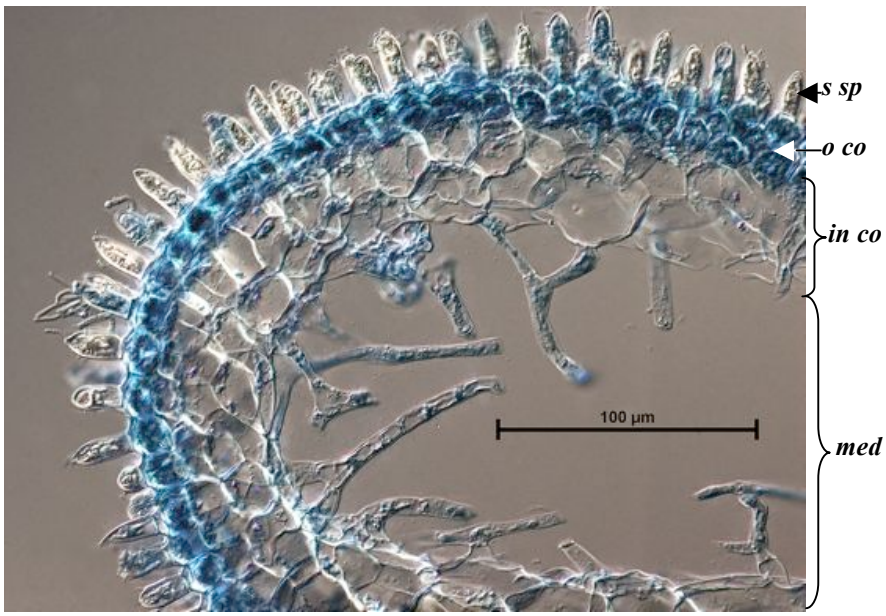



Fig. 27: *Dichotomaria spathulata*, cross section, female plant; surface spines (*s sp*), coloured surface cells (*o co*),) layers of colourless cells (*in co*), core of threads (*med*)

Fig. 28: *Ganonema codii*, on a piece of host *Codium duthieae*

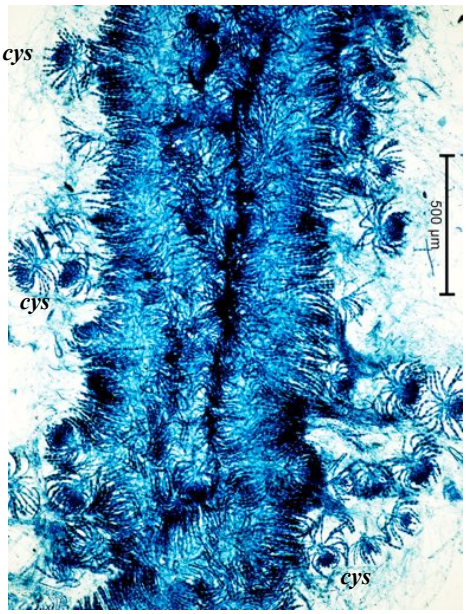



Fig. 29: *Ganonema codii*, tissue squash, mass of threads ending in chains of surface cell *in tufts*; displaced female reproductive organs (cystocarps *cys*)


Fig. 30: *Ganonema codii*, extracted surface tuft showing chains of cylindrical to egg-shaped cells

Fig. 31: *Ganonema farinosa*

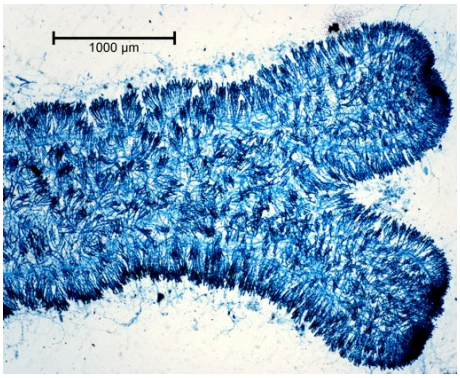



Fig. 32: *Ganonema farinosa*, tissue squash, mass of threads ending in tufts of surface cells

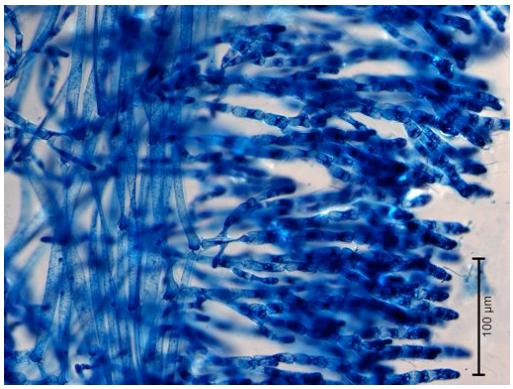



Fig. 33: *Ganonema farinosa*, tissue squash, threads ending in chains of cylindrical surface cells

14a. plant densely forked, short side-branches *absent*. Figs 34-36.
……..…….. *Liagora harveyana*
Family: Liagoraceae

14b. plant irregularly forked, short side-branches prominent. Figs 37-39.
..……. *Liagora wilsoniana*

Fig. 34: *Liagora harveyana*, with chalky surface

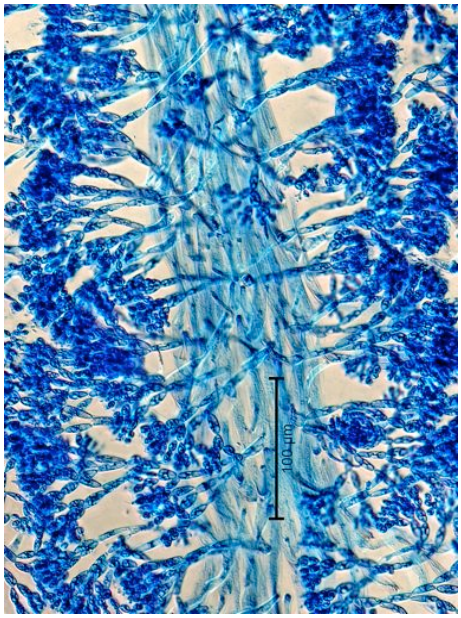



Fig. 35: *Liagora harveyana*, tissue squash, central threads ending in beaded tufts

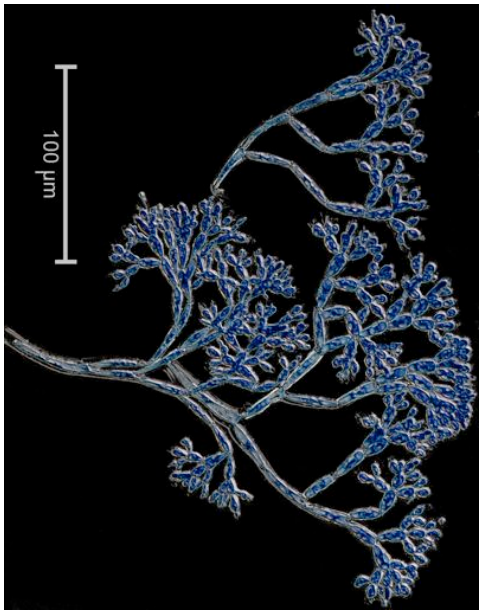



Fig. 36: *Liagora harveyana*, extracted thread ending in bead-like cells

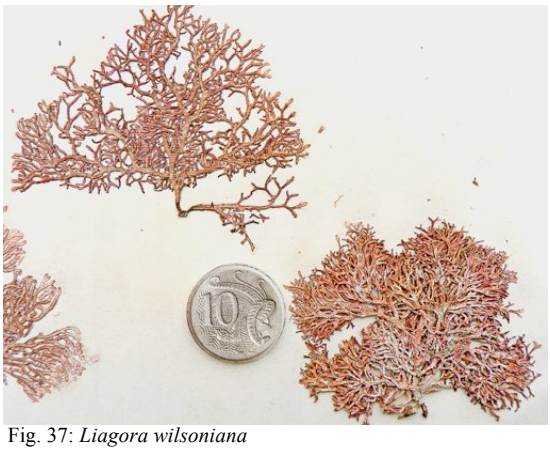


Fig. 37: *Liagora wilsoniana*

Fig. 38: *Liagora wilsoniana*, detail of short side branches

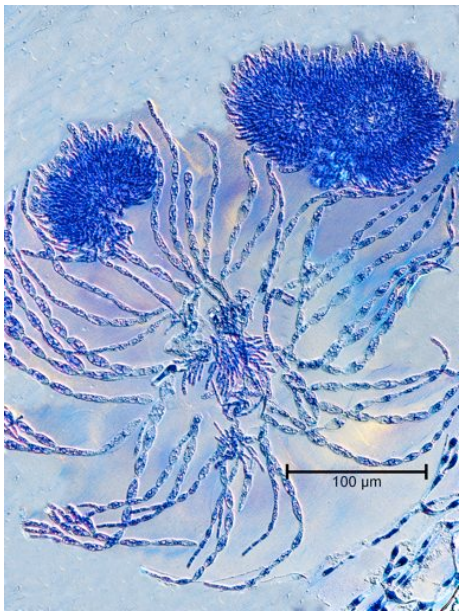



Fig. 39: *Liagora wilsoniana*, extracted surface bead-like chains of cells surrounding female reproductive structures (cystocarps, *cys*)

Valid separation of genera of the Liagoraceae shown below requires investigation of early female stages, for example, the number of cells in the carpogonial branch, and whether they are in a straight or curved line. Although plants are often fertile, microscope investigation can be difficult.
Vegetative features found below are not always reliable diagnostic criteria.
You should refer to the full descriptions of species in the Fact Sheet section of the Website for valid identifications.

15a. main branches worm-like and forked from mainly near the base. Figs 40, 41.
……. *Nemalion helminthoides*
Family: Liagoraceae

15b. main branches not as above, regularly forked *or* with short side branches
…… 16.

16a. internally, only a narrow core of threads ~ 20% of the total width of the branch. (see Fig. 42)
…….... 17.

16b. internally, a broad core of threads (see Fig.1)
…… 18.

17a. rare; 30 mm tall, rose-red, numerous, irregular side branches. Fig. 42 (no image of whole plant available)
…… *Gloiophloea rosea*
Family: Scinaiaceae

17b. 100 mm tall, red; forked 10-15 times. Figs 43-45.
…….. *Gloiophloea scinaioides*

Fig. 40: *Nemalion helminthoides*

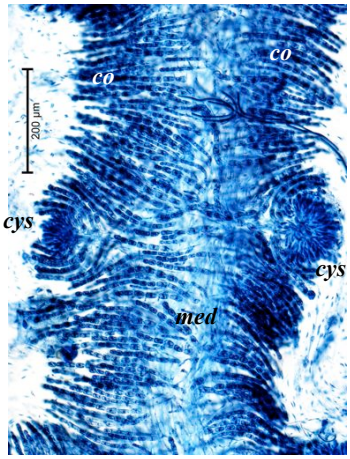



Fig. 41: *Nemalion helminthoides*, tissue squash, narrow core of twisted threads (medulla, *med*), outer layers (cortex, *co*) of chains of coloured cells, clusters of spores (cystocarps, *cys*)

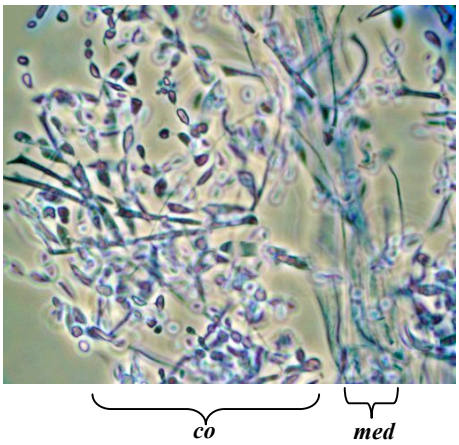



Fig. 42: *Gloiophloea rosea*, tissue squash, narrow core (medulla, *med*), wide outer layers (cortex, *co*)

Fig. 43: *Gloiophloea scinaioides*

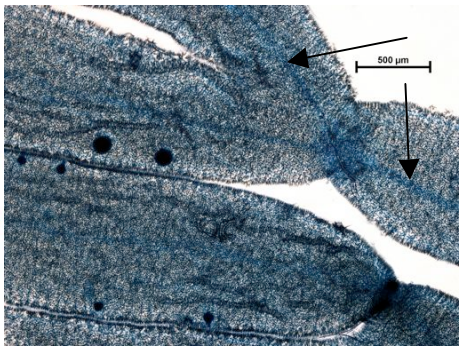



Fig. 44: *Gloiophloea scinaioides*, surface view, narrow core of twisted threads (arrowed) seen through surface tufts of coloured cells

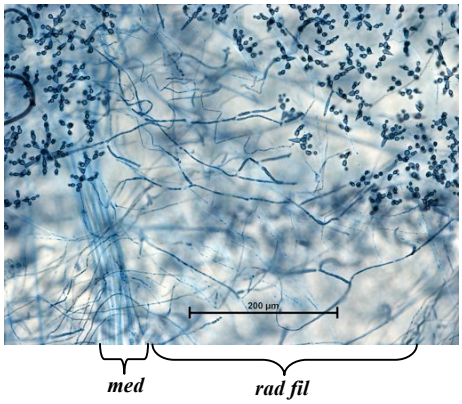



Fig. 45: *Gloiophloea scinaioides*, tissue squash, narrow medulla (*med*) and broad outer layers of radiating threads (*rad fil*) ending in short tufts of small. coloured cells (*co*)

18a. plants usually of a single main branch (axis), densely fringed with short side branches. Figs 46, 47.
..…….. *Helminthocladia beaugleholei*
18b. plants have several axes ...…… 19.

19a. branching dense, distance between short side branches short. Figs 48, 49
…..…… *Helminthocladia densa*
19b. branching more open ……...… 20.

20a. side branches absent or few, main branches forked, arising relatively large distances apart.
…….. 21.
20b. side branches long or short, arising close together …….. 19.

21a. plant ≤ 70 mm tall, with several forked branches arising from a swollen base, short side branches *absent* or basally stubby. Fig. 50.
……*Helminthocladia dotyi*
21b. plants usually > 70 mm tall, bases relatively slender …… 22.

Fig. 46: *Helminthocladia beaugleholei*

Fig. 47: *Helminthocladia beugleholei*, detail of branching pattern

Fig. 48: *Helminthocladia densa*

Fig. 49: *Helminthocladia densa*, detail of dense branching pattern

Fig. 50: *Helminthocladia dotyi*, swollen base arrowed

22a. main branches (axes) 2-10 mm wide, side-branches long, numerous or few, stubby branches at plant base; surface tip-cells larger than cells directly beneath. Figs 51-53.
…….. *Helminthocladia australis*
22b. not as above; axes 1-3 mm wide
…….. 23.

Fig. 51: *Helminthocladia australis*, old, denuded plant

Fig. 52: *Helminthocladia australis*

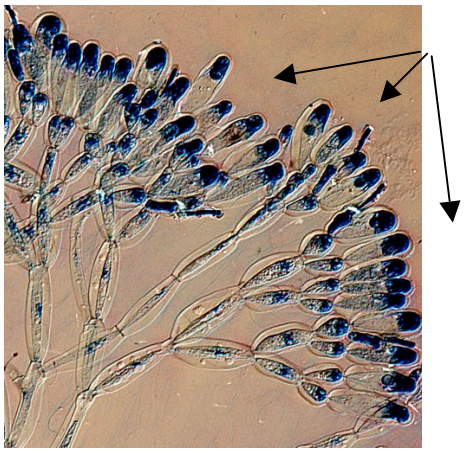
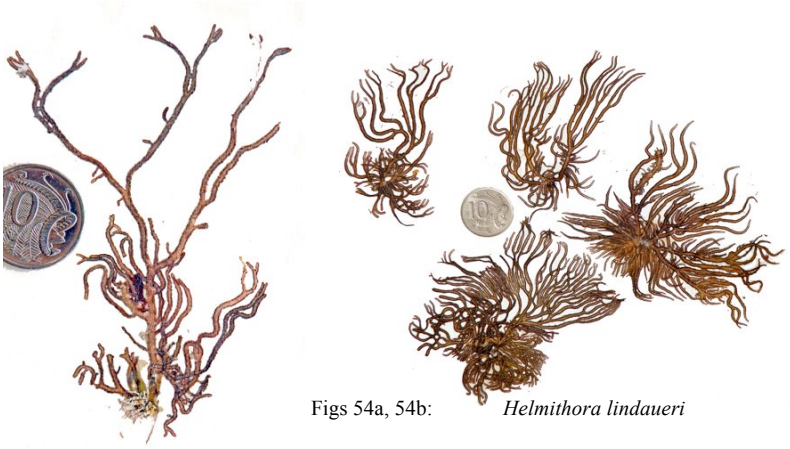


Fig. 53: *Helminthocladia australis*, larger tip cells (arrowed) of surface tufts

23a. plants small, 20-100 mm tall; main branches forked, short side-branches largely basal. Figs 54a, 54b.
…….. *Helminthora lindaueri*

23b. plants larger, 30-250 mm tall, density and length of shorter side branches is variable, depending on calm or rough-water conditions, Figs 55-57.
……..… *Helminthora australis*



Figs 54a, 54b: *Helmithora lindaueri*

Fig. 55: *Helminthora australis*, calm-water form

Fig. 56: *Helminthora australis*, detail of branching pattern in the calm-water form

Fig. 57: *Helminthora australis*, detail of branching pattern in the rough-water form