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 “picted keys: slimy red algae” or “narrow branched red algae” or “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

“Algae Revealed” R N Baldock, State Herbarium S Australia, May 2013: Order: Nemaliales
4a. segments short, bead- or sausage-shaped, ~ 4 mm wide, tips rounded. Figs 3, 9-11.

\textit{Scinaia moniliformis}

Family: Scinaiceae, Galaxauraceae in the Flora

4b. segments long, thin, ~ 2 mm wide, tips pointed. Figs 12-14.

\textit{Scinaia arborealis}

Family: Scinaiceae, Galaxauraceae in the Flora

5a. outer layer (cortex) of compact cells

.................................................. 6.

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

.......................................................... 11.

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Fig. 9: \textit{Scinaia moniliformis}

Fig. 10: \textit{Scinaia moniliformis}, detail of segments

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

Fig. 12: \textit{Scinaia arborealis}

Fig. 13: \textit{Scinaia arborealis}, detail of constrictions at origin of forks and pointed tips

Fig. 14: \textit{Scinaia arborealis}, tissue squash, honeycomb pattern of outermost colourless cells, bulbous female reproductive organ

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both segmented \textit{Scinaia} species superficially resemble some other red segmented plants such as \textit{Erythroclonium}, \textit{Rhabdonia}, \textit{Coelarthrum}, and \textit{Wehervanbossea kaliformis}. The surface honey-comb pattern of cells in \textit{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.

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.

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.

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
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

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

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

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

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

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
14a. plant densely forked, short side-branches absent. Figs 34-36.

Liagora harveyana
Family: Liagoraceae

Liagora wilsoniana
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

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18a. plants usually of a single main branch (axis), densely fringed with short side branches. Figs 46, 47. 

\[ \text{Helminthocladia beugleholei} \]

18b. plants have several axes ……… 19.

19a. branching dense, distance between short side branches short. 

\[ \text{Helminthocladia densa} \]

19b. branching more open ………… 20.

20a. side branches absent or few, main branches forked, arising relatively large distances apart. 

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. 

\[ \text{Helminthocladia dotyi} \]

21b. plants usually > 70 mm tall, bases relatively slender ………… 22.

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. 

\[ \text{Helminthocladia australis} \]

22b. not as above; axes 1-3 mm wide ………… 23.

Fig. 46: Helminthocladia beugleholei 

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 

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: Helminthora 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