Pictured Key to common red algae of southern Australia: the Genera: *Laurencia* and *Chondrophycus*

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 sheet.

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

Artefacts Microscope images are usually blue stained, or have a black background. Branches of pressed specimens are often flattened, looking un-naturally compressed, preserved specimens yellow or brown

The key on the next page identifies species of *Laurencia*, and *Chondrophycus* belonging to the Family: Rhodomelaceae, Tribe: Laurencieae. These are red algae with narrow branches often found by reef walkers in the intertidal on rock platforms and in shallow water.

A third member of the Tribe, *Janczewskia*, is a warty parasite of *Laurencia* rarely seen. It is described in a separate Fact Sheet in this website.

Laurencia and *Chondrophycus* have these features:

- plants red to yellow in colour, branches cylindrical or slightly compressed, usually firm, but often drying gristly or tough
- 1-several main branches (axes) and shorter side branches arranged radially *or* in one flat surface *or* in rings
- fertile structures often bunched or clustered, unfortunately often changing the overall appearance of plants making species identification troublesome
- branch tips *blunt*. Hair tufts (*trichoblasts*) at tips are responsible for the growth of the branch (Fig. 3). In most species these are found in a dimple or pit.
- internal microscopic structure largely consisting of equal-sided cells (parenchyma)

in *Laurencia*.

- cross sections show a central thread ringed by ***4 cells*** (*pericentrals*), but only ***near branch tips.*** The pattern is later obscured by cells forming a cortication of large inner cells grading to small surface cells (Fig. 4)
- tetrasporangia mature in lines ***down*** branches (Fig. 5)

in *Chondrophycus.*

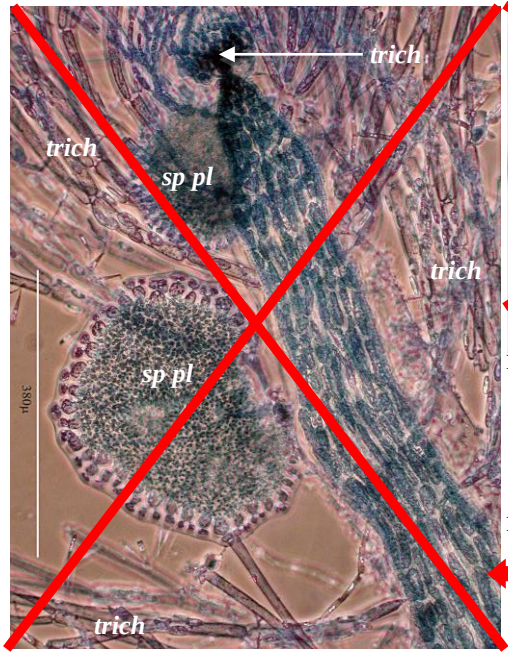
- early in development, a central filament and ***2 pericentral cells*** exist in *Chondrophycus* but these are practically impossible to detect because additional cortication similar to that in *Laurencia* obliterates this cell pattern very early in development
- tetrasporangia occur in lines of equal age ***across*** branches (Fig. 6)

Chondria (in a separate Tribe: Chondrieae) has similar branching patterns and tufts of trichoblasts at tips, but differs in having:

- ***5 well defined*** pericentrals, (Fig. 1)
- males with small plate shaped structures (Fig. 2)
- often, bright cell wall thickenings

A separate pictured key is provided for *Chondria* species elsewhere in Web pages

Obviously, many steps in the key will require microscope investigation, including cross sections of branches.



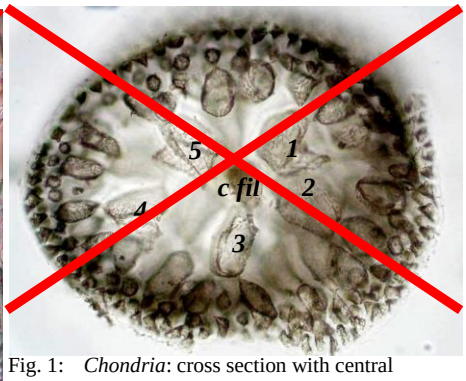


Fig. 1: *Chondria*: cross section with central thread (*c fil*) ringed by *5 well-defined* flanking pericentral cells (*1-5*): excluded from this key

Fig. 2: *Chondria* pointed tips ending in a tuft of "hairs" (trichoblasts, *trich*) that persist down the branch; plate-like male structure (spermatangial plate, *sp pl*): excluded from this key

Fig. 3: *Laurencia*, rounded tips with protruding tufts of trichoblasts

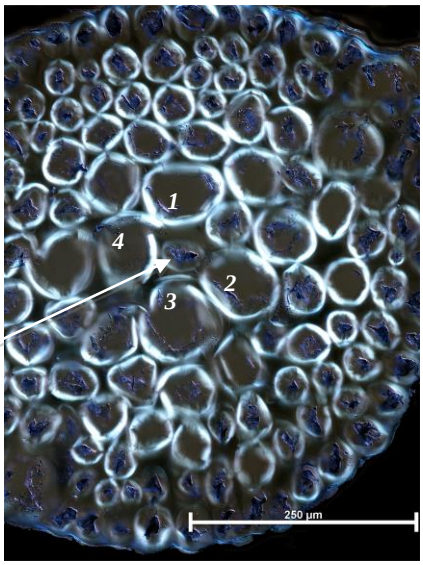


Fig. 4: *Laurencia shepherdii*, cross section near a branch tip, *poorly defined* central thread (*c fil*), ring of 4 cells (pericentral cells, *1-4*) becoming obscured by additional equal-sided cells (parenchyma)

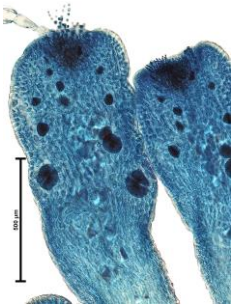


Fig. 5: *Laurencia*, tetrasporangia in lines ***down*** branches

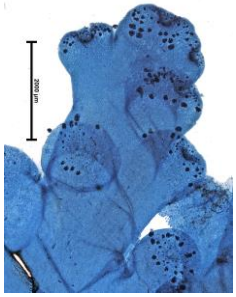


Fig. 6: *Chondrophycus*, tetrasporangia in lines ***across*** branches

Fig. 7: *Chondrophycus brandenii*, cross section showing little evidence of a central thread or flanking pericentral cells

1a. axes tough, gristly to wiry; short side branches soft, mostly unbranched, clustered, cylindrical, about 10 mm long, pinched at the base to such an extent they appear jointed.
Figs 8, 9
.....*Laurencia clavata*

1b. not as above ..... 2.

2a. plant flat-branched, branches slightly compressed or flat ..... 3.

2b. plant radially branched, branches cylindrical ..... 6.

3a. axes only slightly compressed, ~ 2 mm wide, side branches short near tips, increasing evenly in size down the axes; plant tough; fertile structures in grape-like clusters along branch edges and tips. Figs 10, 11.
…….*Laurencia botryoides*

3b. axes flat, branching less even from axis tip to base, grape-like clusters of fertile structures *absent*.
…….... 4.

4a. plants large (to 300 mm tall), axes thick (to 750 µm), side branches in irregular, alternating fans. Figs 12-14. ……. *Laurencia elata*

4b. plants smaller (to 120 mm tall), axes ≤ 700 µm thick, side branching regular, in 2 rows
……..…… 5.

5a. plants 50-130 mm tall; branches 1.5-4.0 mm wide. Figs 15, 16
…….. *Laurencia brongniartii*

5b. plants 30-50 mm tall, branches 0.5-1.0 mm wide, ***rare***, known only in one locality in Tasmania. Fig. 17-19. (see next page and the separate fact sheet for this species)
…….. *Laurencia distichophylla*

Fig. 14 *Laurencia elata*, near axis tips, thick, alternating, flat-branched side branches forming

Fig. 8: *Laurencia clavata*, tough main branches with clusters of soft, short side branches

Fig. 9: *Laurencia clavata*, detail of short tufts of soft, unbranched, side branches *pinched* at the base

Fig. 10: *Laurencia botryoides*: several equal axes, side branches increasing evenly in size down axes, some axes denuded at base

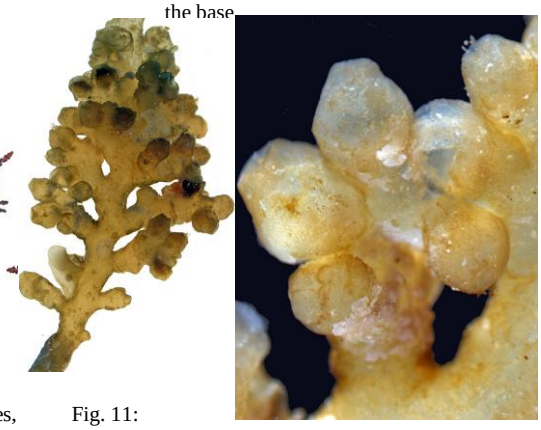


Fig. 11: *Laurencia botryoides*: two magnifications of grape-like reproductive structures (female cystocarps in these images)

Fig. 12: *Laurencia elata*

Fig. 13: *Laurencia elata*

Fig. 15 *Laurencia brongniartii*

Fig. 16 *Laurencia brongniartii*

Fig. 17 *Laurencia distichophylla*

Fig 18 *Laurencia distichophylla*, short branches with sporangia

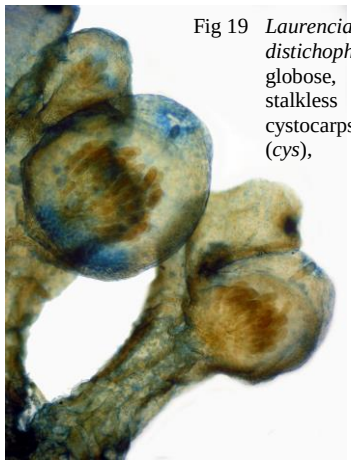


Fig 19 *Laurencia distichophylla*, globose, stalkless cystocarps (*cys*),

6a. plants often a tangled mass of narrow branches ~ 0.5 mm wide; outermost cells (epidermis) near the tips, seen under the microscope, form a bumpy surface. Figs 20-22.
……. *Laurencia aldingensis*

6b. plants with definite axes and side branches ≥ 1 mm wide, surfaces near tips under the microscope either slightly bumpy *or* smooth
…….……..……. 7.

7a. plants small, to 80 mm tall, grow on Tape-grass (*Posidonia*); wall thickenings of internal cells show up as bright flecks under the microscope. Figs 23-25.
……..… *Laurencia forsteri*

7b. plants usually over 80 mm tall, on rock, sea grass or algae, bright internal cell thickenings *absent*
…….…….. 8.

Fig. 20: *Laurencia aldingensis*

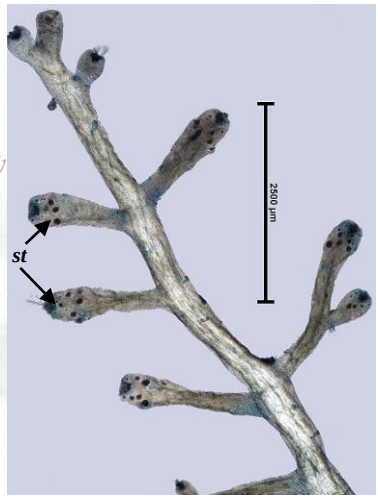


Fig. 21: *Laurencia aldingensis*, narrow branches, swollen sporangial structures (stichidia, *st)*

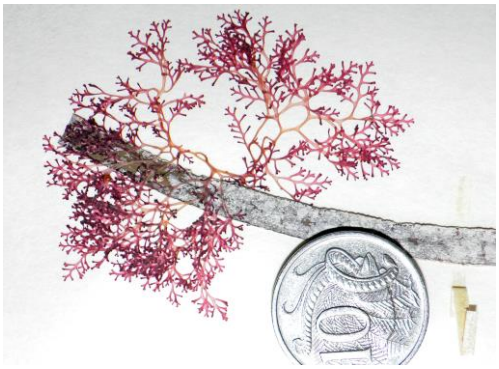


Fig. 23: *Laurencia forsteri* on a blade of Tape-grass, *Posidonia*

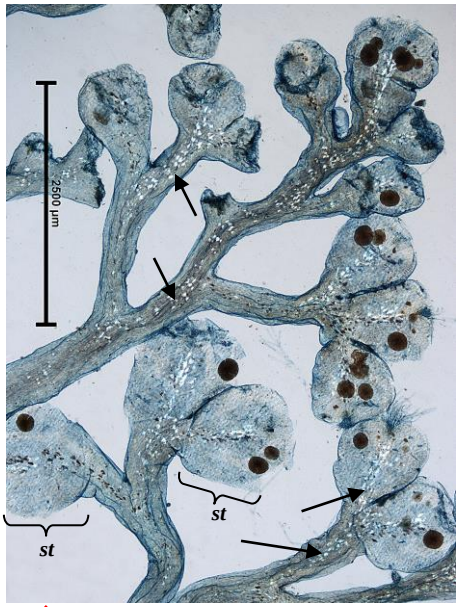


Fig. 24: *Laurencia forsteri* sporangial structures (stichidia, *st*), branches with bright flecks (arrowed)

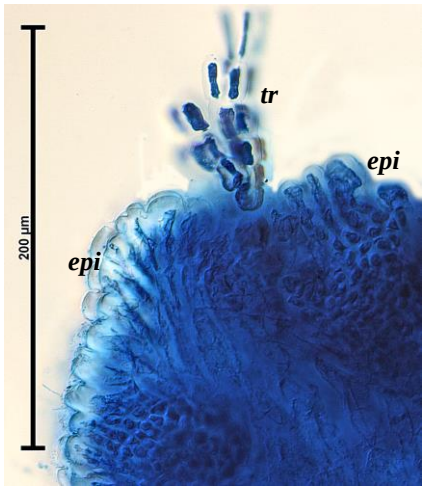


Fig. 22: *Laurencia aldingensis*, tip with branched "hair" (trichoblast, *trich*) emerging from a pit, outermost cells (epidermis, *epi*) forming a bumpy surface

Fig. 25: *Laurencia forsteri* , swollen tips containing female structures (cystocarps)

8a. plants soft to firm, not drying gristly ……..….. 9.
8b. plants firm, drying gristly …… 11.

9a. common, widespread globally; branching often dense; protruding surface cells near tips produce a microscopic bumpy surface, cells may be in rows. Figs. 26-29.
.....*Laurencia majuscula*
= *Laurencia dendroidea* according to Metti et al., 2013
9b. branching often more open; surface smooth ..... 10.

10a. uncommon; plants to 80 mm tall, axes 3-4 mm wide; branching irregular, tetrasporangia in lines ***across*** branches; outermost cells goblet-shaped in side view. Figs 6, 7, 30, 31.
…..…… *Chondrophycus brandenii*
10b. common; plants to 120 mm tall; axes ~ 2 mm wide; some branches almost opposite, ultimate branches often club-shaped, ~ 2 mm long tetrasporangia in lines ***down*** branches; outermost cells rounded in side view. Figs 4, 32-34.
……. *Laurencia shepherdii*

Fig. 26: *Laurencia majuscula*

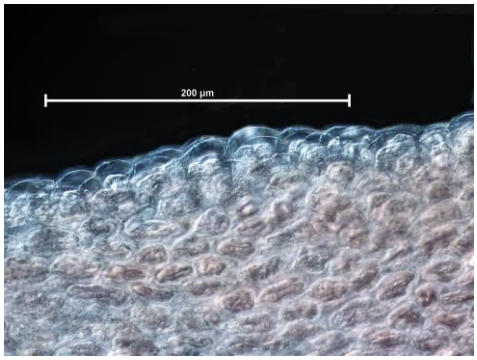


Fig. 27: *Laurencia majuscula*, view of an edge of an ultimate branch, with protruding cells forming a bumpy surface

Fig. 28: *Laurencia majuscula*, preserved (bleached) specimen, ultimate branches

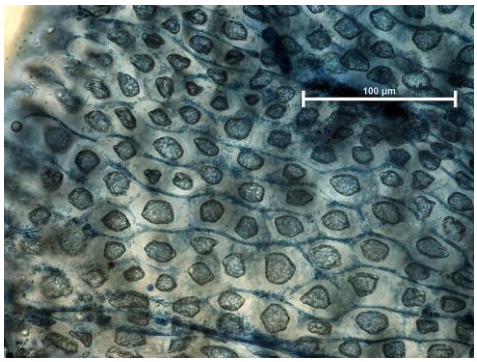


Fig. 29: *Laurencia majuscula*, surface view of cells in rows

Fig. 30: *Chondrophycus brandenii*

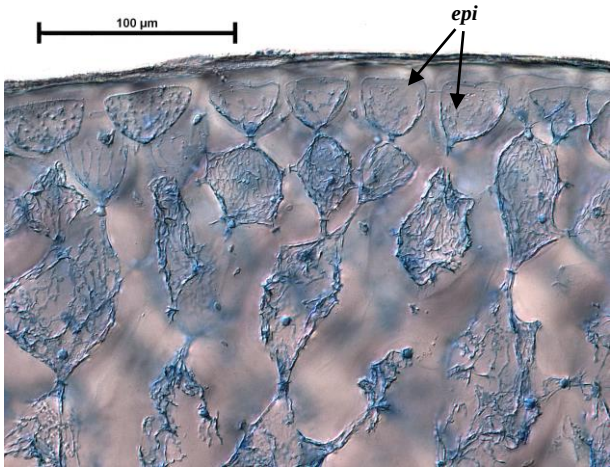
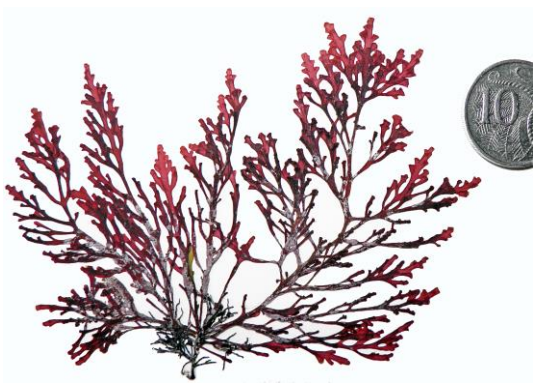


Fig. 31: *Chondrophycus brandenii* lengthwise sectional view of goblet-shaped outermost cells (epidermis, *epi*)



Figs 32, 33: *Laurencia shepherdii*, branching patterns

Fig. 34: *Laurencia shepherdii*, female structures (cystocarps, *cys*)

11a. plant with stout, swollen branches; axes ~3 mm wide, single and stubby when young, but later much-branched radially; ultimate branches mere nodules along branch edges; tetrasporangia minute, ringing the edges of pits, associated with tufts of hairs, ***running in lines*** down short branches. (These pits are equivalent to tips of condensed ultimate branches.) Figs 35-38.
…….. *Chondrophycus tumidus*

11b. plants less stout, ultimate branches less nodular, tetrasporangia not associated with lines of pits.
…….. 12.

Fig. 35: *Chondrophycus tumidus*

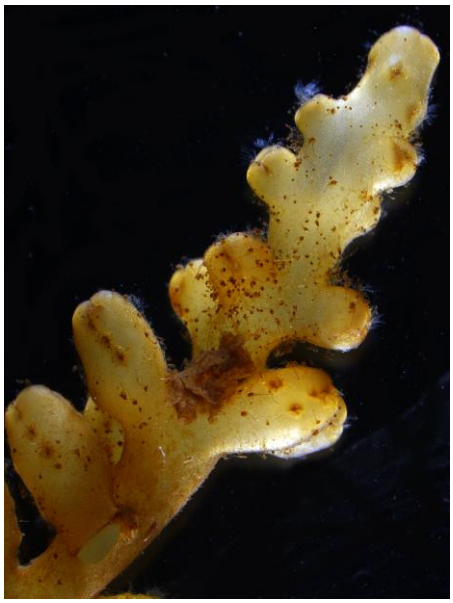


Fig. 36: *Chondrophycus tumidus*, tip of an axis with knobby ultimate branches

Fig. 37: *Chondrophycus tumidus*, detail of an ultimate branch of a sporangial plant with lines of pits containing clusters of minute tetrasporangia

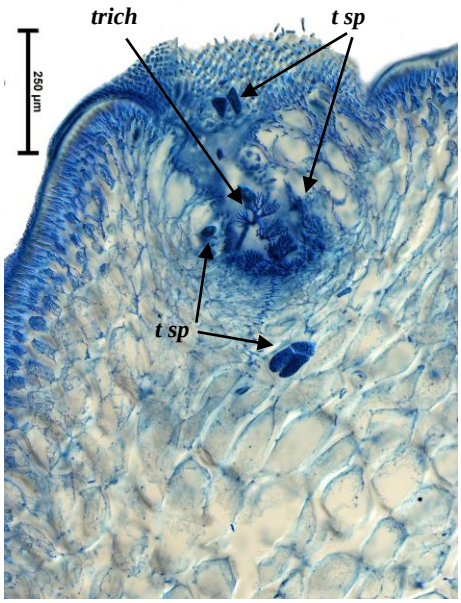


Fig. 38: *Chondrophycus tumidus*: section through a sporangial pit, branched hairs (trichoblasts, *trich*), tetrasporangia (*t sp*), around the pit margins (one displaced from the pit)

12a. plants relatively delicate, main branches ~1 mm wide, side branches ~ 0.5 mm wide …….. 13.

12b. plants relatively robust, main branches generally ≥ 2 mm wide ……17.

13a. plants often on Sea Nymph (*Amphibolis*), ultimate branches spreading, some in a cross-shaped pattern; surface cells in lengthwise view like palings in a fence. Figs 39-41 ... *Chondrophycus cruciatus*

13b. plants on rock or other algae, ultimate branches stubby, clustered or parallel; surface cells in lengthwise view either rounded *or* like palings in a fence ……..… 14.

14a. plants wiry with no axis dominant, branches about the same size, clusters of short side branches ***absent***. Figs 42-44. ……. *Laurencia filiformis* f. *filiformis*

14b. plants with one or several main branches (axes) and shorter side branches; ultimate branches may be clustered ……...…. 15.

15a. plants usually with a single axis ≈ 2 mm wide basally, and smaller branches of about equal size. Figs 45, 46 ..... *Laurencia filiformis* f. *dendritica*

15b. plants with several main branches ..... 16.

Fig. 39: *Chondrophycus cruciatus*, branches unnaturally flattened in this pressed specimen

Fig. 40: *Chondrophycus cruciatus*, preserved (bleached) specimen; ultimate branches in a cross pattern

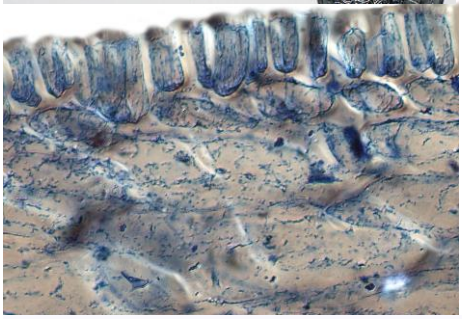


Fig. 41: *Chondrophycus cruciatus*, side view of surface cells looking like palings in a fence

Fig. 42: *Laurencia filiformis*, ultimate branches

Fig. 43: *Laurencia filiformis*, a densely branched plant

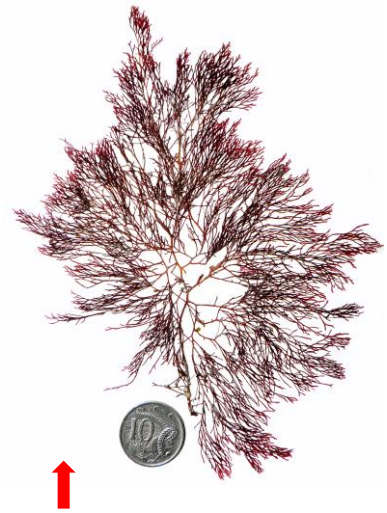


Fig. 44: *Laurencia filiformis* f. *filiformis*, a plant with more open branching but branches still of equal size

Fig. 45: *Laurencia filiformis* f. *dendritica*, with a single axis and equal-sized upper branches

Fig. 46: *Laurencia filiformis* f. *dendritica*, ultimate branches

16a. several main axes arise from an entangled base; branching pattern loose, relatively distant, except in the clusters of fertile tips. Figs 47, 48
..... *Laurencia heteroclada*
(as *Laurencia filiformis* f. *heteroclada* in the Flora)

16b. axes with short side branches of irregular lengths, ultimate branches stubby, clustered Figs 49-50.
..... *Laurencia tasmanica*

17a. branching relatively open; ultimate branch tips rounded; surface cells in lengthwise section *rounded*. Figs 51-53.
..... *Laurencia arbuscula*

17b. branching dense, ultimate branches flat-topped; surface cells in lengthwise section *fence-like*. Figs 54-56.
..... *Chondrophycus paniculatus*

Fig. 47: *Laurencia heteroclada*

Fig. 48: *Laurencia heteroclada*, fertile tips

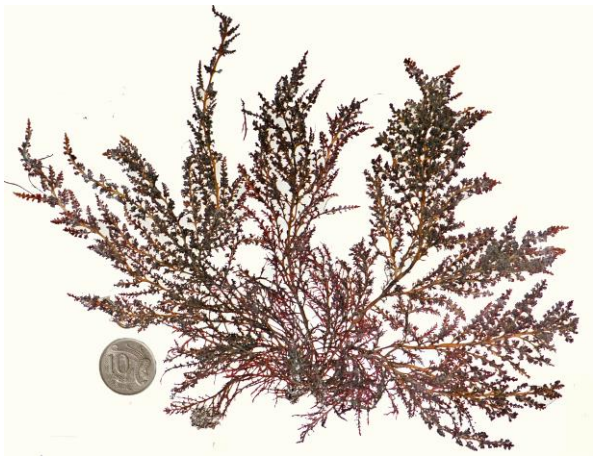


Fig. 49: *Laurencia tasmanica*

Fig. 50: *Laurencia tasmanica*, bunches of fertile sporangial branches

Fig. 51 *Laurencia arbuscula*

Fig. 52: *Laurencia arbuscula*, ultimate branches stubby with rounded tips, in clusters at ends of short side branches

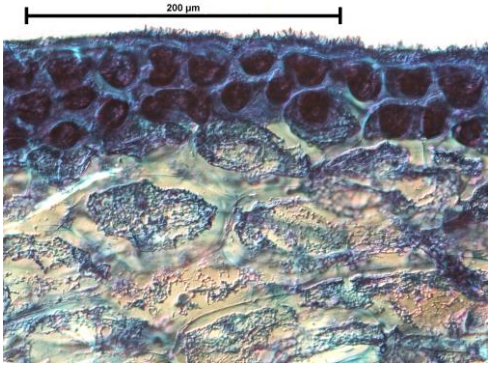


Fig. 53: *Laurencia arbuscula*, lengthwise section of coloured, rounded surface cells, and underlying colourless, elongate cells

Fig. 54: *Chondrophycus paniculatus*

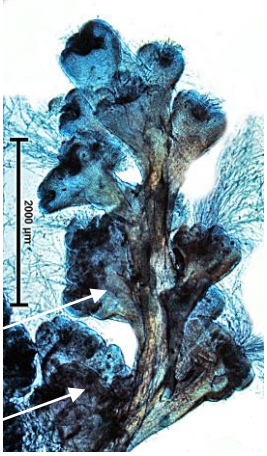


Fig. 55: *Chondrophycus paniculatus*, ultimate branches stubby, flat-topped, some below tips are warty (arrowed)

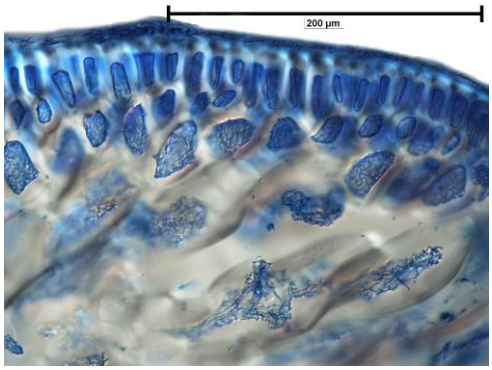


Fig. 56: *Chondrophycus paniculatus*, lengthwise section, surface cells coloured, fence-like, underlying cells colourless, elongate