PICTURED KEY TO COMMON RED ALGAE OF SOUTHERN AUSTRALIA: *LAURENCIA* AND *CHONDROPHYCUS* 2ND Edition.

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, commencing two pages on, 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* and rarely seen. It is described in a separate Fact Sheet in this website.

Laurencia and *Chondrophycus* have these features:

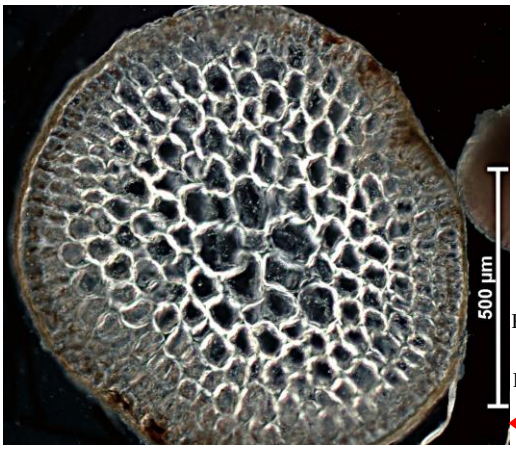
- plants red to yellow in colour, branches cylindrical or slightly compressed, usually firm, but often drying gristly or tough
- 1-several main branches (axes) and shorter side branches arranged radially *or* in one flat surface *or* in rings
- *blunt* branch tips (not pointed)
- microscopic hair tufts (*trichoblasts*) at tips, responsible for the growth of the branch (Fig. 1), mostly found in a dimple or pit.
- fertile structures often bunched or clustered (Fig. 2), unfortunately often changing the overall appearance of plants making species identification troublesome
- rarely in species, thickenings in cell walls that catch the light, appearing as bright flecks under the microscope (Fig. 2)
- an internal microscopic structure, when seen in cross section, largely of equal-sided cells (parenchyma)

In the genus *Laurencia*

- cross sections show a central thread ringed by ***4 cells*** (*pericentrals*), but only ***near branch tips.*** This pattern is quickly obscured by production of additional cells (Fig. 4)
- outermost (epidermal) cells of ***fresh*** material often possess brightly coloured bodies (*corps en cerise*, Fig. 3)
- surface views of outermost cells show several connections (cross connections) to neighbours (in addition to internal ones connecting them to core cells) (Fig. 5).
- tetrasporangia mature in lines ***down*** branches (Fig. 5)

Fig. 1: *Laurencia*, rounded tips with protruding tufts of trichoblasts

Fig. 2: *Laurencia forsteri*, ball-shaped female structures; bright flecks along branches are due to cell wall thickenings



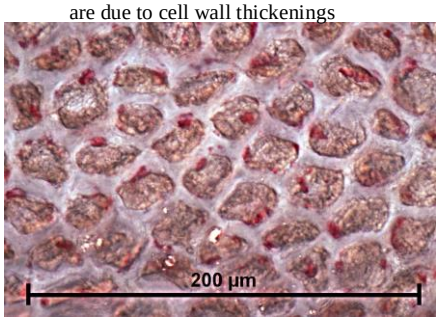


Fig. 3: *Laurencia*, surface view of cells with brightly coloured bodies (*corps en cerise*)

Fig. 4: *Laurencia*, central arrangement of 4 pericentral cells about a central thread becoming obscured by additional cells

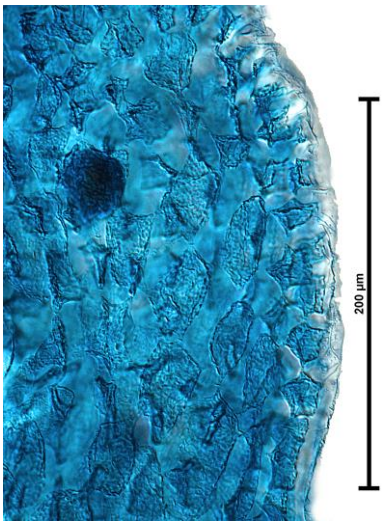


Fig. 5: *Laurencia forsteri*, outer (epidermal) cells with cross connections

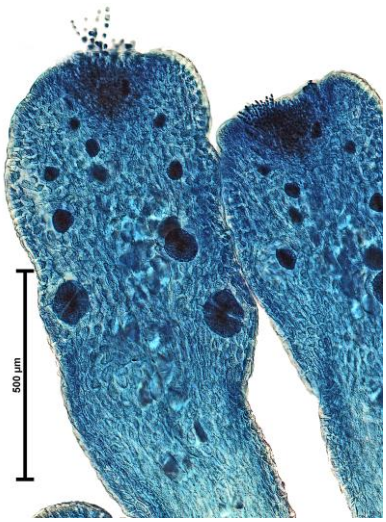


Fig. 6: *Laurencia forsteri*, tetrasporangia maturing in lines ***down*** branches

Baldock, R.N. (2019). Pictured key to common red algae of southern Australia: *Laurencia* and *Chondrophycus*. 2nd Edition. 9 pp. *Algae Revealed*. State Herbarium, S Australia. flora.sa.gov.au/algae_revealed

In the genus *Chondrophycus*

- early in development, a central filament and ***2 pericentral cells*** exist in *Chondrophycus* but these are practically impossible to detect because additional cells quickly obliterate this cell pattern (Fig. 7)
- outer (epidermal) cells do ***not*** contain bright coloured bodies (*corps en cerise*)
- outermost cells do ***no***t have cross connections. Viewed in cross section they appear more like palings in a fence than do those of *Laurencia*
- tetrasporangia occur in lines of equal age ***across*** branches (Fig. 8)

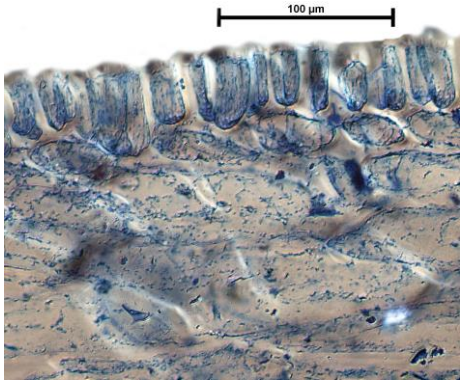


Fig. 7: *Chondrophycus brandenii*, cross section showing little evidence of a central thread or flanking pericentral cells

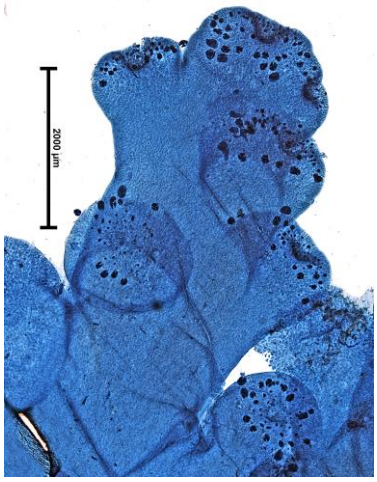


Fig. 8: *Chondrophycus brandenii*, tetrasporangia in lines ***across*** branches

Fig. 9: *Chondrophycus cruciatus*, cross section (left) showing outermost (epidermal) cells, like palings in a fence

Look-alike alga - *Chondria*

Chondria belongs to a separate Tribe to both *Laurencia* and *Chondrophycus* but has a similar branching pattern and tufts of trichoblasts at tips.

It differs in the following ways

- in cross sections of branches, there is a ***well-defined*** central thread ringed by ***5 distinct cells*** (pericentral cells) (Fig. 10)
- branch tips are sometimes pointed, not blunt (Fig. 11)
- in male plants a unique, small, ***plate-*** or ***disc-shaped*** structure bears the fertile cells (Fig. 11)
- distinctive microscopic, ***bright cell wall thickenings*** are common (Figs 12, 13)

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

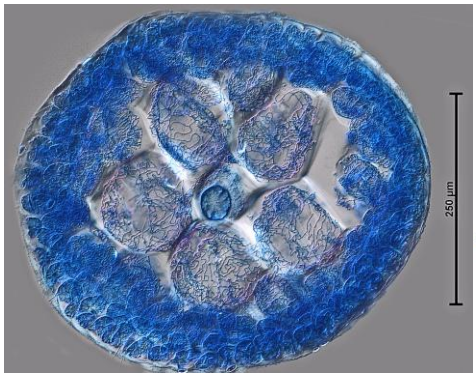


Fig. 10: *Chondria arcuata*, cross section, distinct central thread and 5 pericentral cells

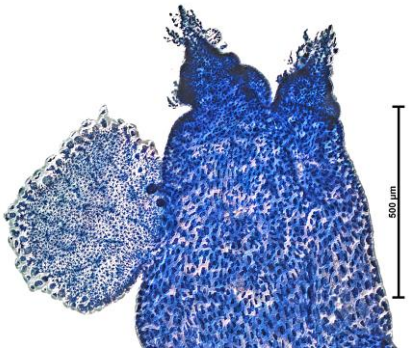


Fig. 11: *Chondria fusifolia*, two pointed branch tips with hairs tufts (trichoblasts), special male flat disc

Fig. 12: *Chondria hieroglyphica*, extensive cell wall thickenings seen in lengthwise view of a branch

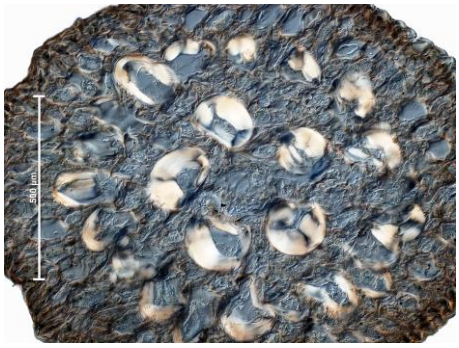


Fig. 13: *Chondria subfasciculata*, cross section, bright cell wall thickenings in pericentral and other cells

Baldock, R.N. (2019). Pictured key to common red algae of southern Australia: *Laurencia* and *Chondrophycus*. 2nd Edition. 9 pp. *Algae Revealed*. State Herbarium, S Australia. flora.sa.gov.au/algae_revealed

PICTURED KEY

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 14, 15. Widespread.
.....*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 occur in ***grape-like clusters*** along branch edges and tips. Figs 16, 17. Confined to SE Australia.
……..*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 wide), side branches in irregular, alternating fans. Figs 18-20. Common and widespread.
…….. *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 21, 22. Widespread in tropical and Australian temperate waters ……... *Laurencia brongniartii*

5b. plants 30-50 mm tall, branches 0.5-1.0 mm wide; ***rare***, known only in one locality in Tasmania. Fig. 23-25 (next page). Possibly rare, known from Tas. and NSW only in Australia and north island of NZ.
……..*Laurencia distichophylla*

Fig. 20: *Laurencia elata*, near axis tips, thick, alternating, flat-branched side branches forming

Fig. 14: *Laurencia clavata*, tough main branches with clusters of soft, short side branches

Fig. 15: *Laurencia clavata*, detail of short tufts of soft, unbranched, side branches *pinched* at the base

Fig. 16: *Laurencia botryoides*: several equal axes, side branches increasing evenly in size down axes, some axes denuded at base

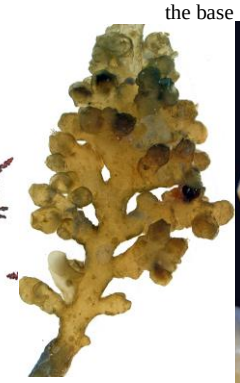


Fig. 17: *Laurencia botryoides*: two magnifications of grape-like reproductive structures (female cystocarps in these images)

Fig. 18 *Laurencia elata*

Fig. 19: *Laurencia elata*

Fig. 21: *Laurencia brongniartii*

Fig. 22: *Laurencia brongniartii*

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Fig. 23: *Laurencia distichophylla*

Fig 24: *Laurencia distichophylla*, short branches with sporangia

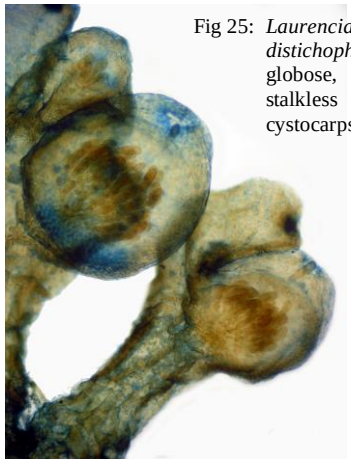


Fig 25: *Laurencia distichophylla*, globose, stalkless cystocarps

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 26-30. Common, but recorded from W and central S Australia only.
……. *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 31-33 (next page). Common and widespread.
……..… *Laurencia forsteri*

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

Fig. 26: *Laurencia aldingensis*

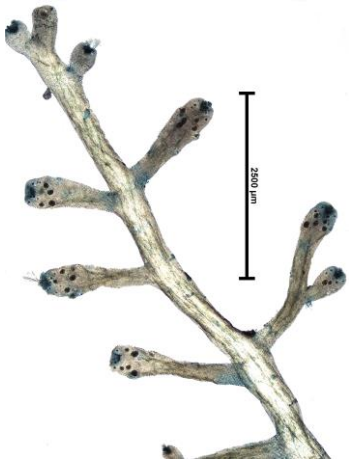


Fig. 27: *Laurencia aldingensis*, narrow branches, ending in swollen sporangial structures (stichidia)

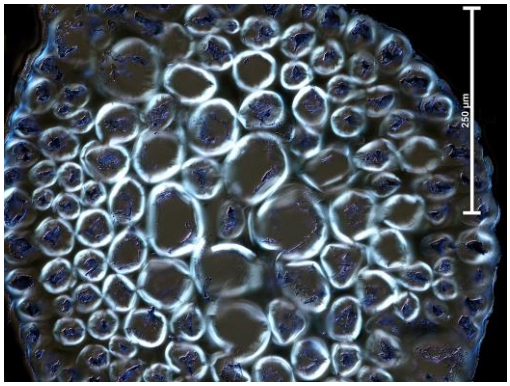


Fig. 28: *Laurencia aldingensis*, cross section

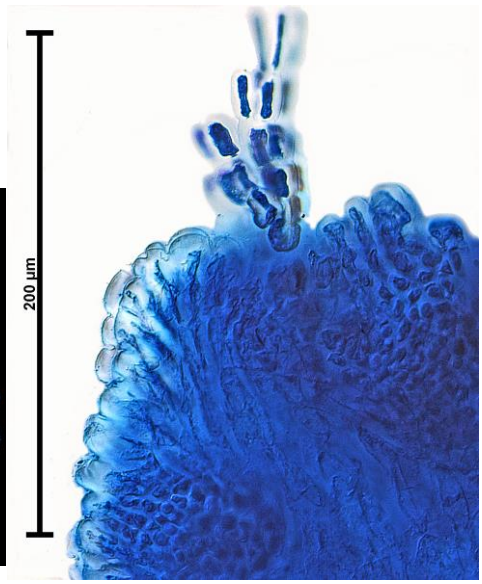


Fig. 29: *Laurencia aldingensis*, tip with branched "hair" (trichoblast) emerging from a pit, outermost cells forming a bumpy surface

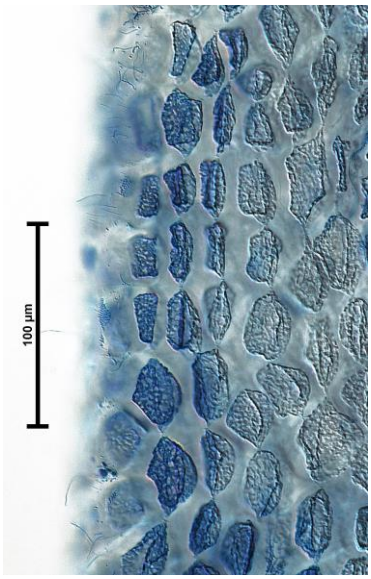


Fig. 30: *Laurencia aldingensis*, surface cells with lengthwise connections

Fig. 31: *Laurencia forsteri* on a blade of Tape-grass, *Posidonia*

Fig. 32: *Laurencia forsteri* , swollen tips containing female structures (cystocarps)

(stichidia), branches with bright flecks due to cell wall thickenings

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 when viewed. Figs. 34-37. Widespread usually in sheltered habitats.
.....*Laurencia majuscula*
§*Laurencia dendroidea* according to Metti et al., 2013

9b. branching often more open; cells near tips form a ***smooth*** surface ..... 10.

Fig. 34: *Laurencia majuscula*

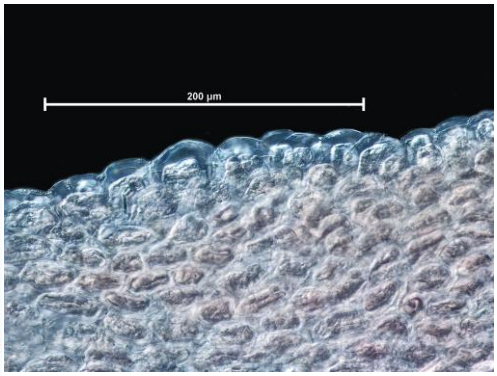


Fig. 35: *Laurencia majuscula*, view of an edge of an ultimate branch, with protruding cells forming a bumpy surface

10a. uncommon; plants to 80 mm tall, axes 3-4 mm wide; branching irregular, tetrasporangia in lines ***across*** branches; outermost cells goblet-shaped in section view. Figs 7, 8, 38, 39.
Possibly rare, from W to central S Australia.
…..…… *Chondrophycus brandenii*

10b. 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 40 - 42 (next page). Common and widespread in shallow water.
……. *Laurencia shepherdii*

Fig. 36: *Laurencia majuscula*, preserved (bleached) specimen, ultimate branches

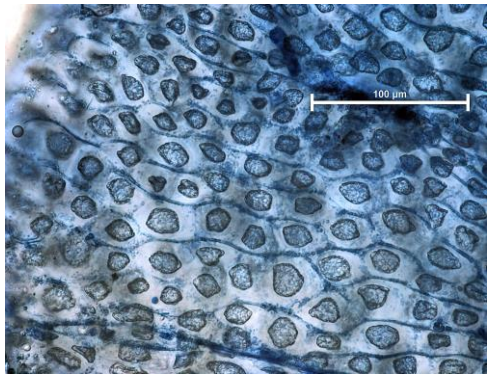


Fig. 37: *Laurencia majuscula*, surface view of cells in rows

Fig. 38: *Chondrophycus brandenii*

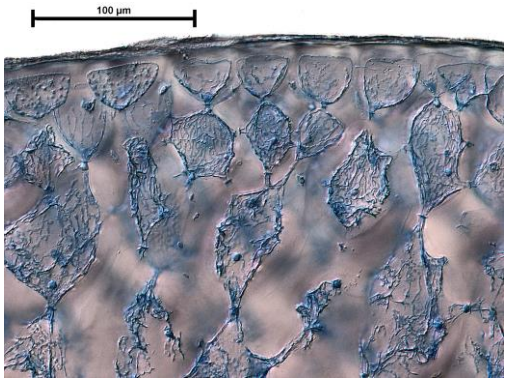
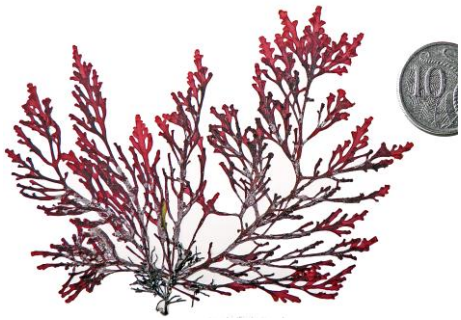


Fig. 39: *Chondrophycus brandenii* lengthwise sectional view of goblet-shaped outermost cells (epidermis)

§Metti, Y., Millar, A.J.K., Cassano, V., Fujii, M.T. (2013). Australian *Laurencia majuscula* (Rhodophyta, Rhodomelaceae) and the Brazilian *Laurencia dendroidea* are conspecific. *Phycological Research* 68: 98-104.



Figs 40, 41: *Laurencia shepherdii*, branching patterns

Fig. 42: *Laurencia shepherdii*, preserved (bleached) specimen, plant tip with swollen female structures (cystocarps) (right)

11a. plant axes ~3 mm wide, single and stubby when young, but later much-branched radially with stubby side branches. True ultimate branches are mere nodules along branch edges. Tetrasporangia are 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 43-46. Widespread near low tide level on moderately rough coasts.
…… *Chondrophycus tumidus*

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

Fig. 43: *Chondrophycus tumidus*

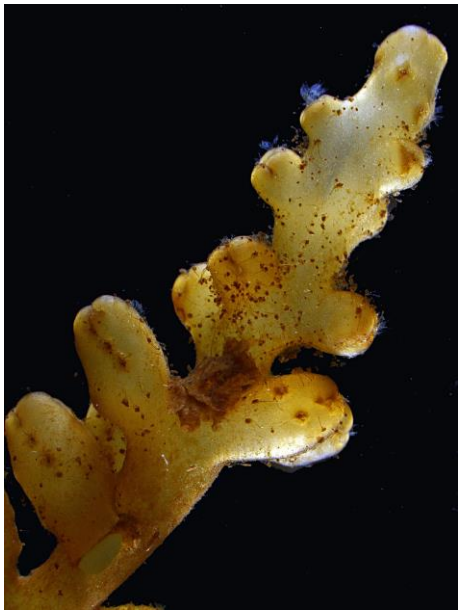


Fig. 44: *Chondrophycus tumidus*, tip of an axis with knobby side branches

Fig. 45: *Chondrophycus tumidus*, detail of a side branch of a sporangial plant with lines of pits containing clusters of minute tetrasporangia

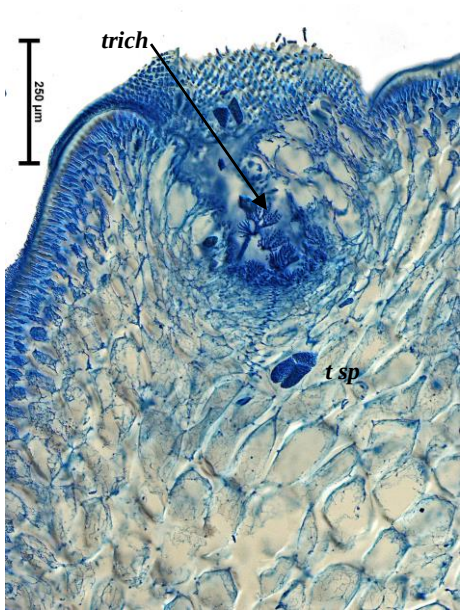


Fig. 46: *Chondrophycus tumidus*: section through a sporangial pit, branched hairs (trichoblasts, ***trich***), tetrasporangia (***t sp***), around the pit margins (one displaced from the pit)

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 47-49. In isolated localities across southern Australia; also tropical Indian Ocean. …… *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 50-53. Widespread on rock or seagrass in moderate water movement. ……. *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 54, 55 (next page). On rock or jetty piles in moderate to rough water. ..... *Laurencia filiformis* f. *dendritica*

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

Fig. 50: *Laurencia filiformis*, f. *filiformis* ultimate branches

Fig. 47: *Chondrophycus cruciatus*, branches unnaturally flattened in this pressed specimen

Fig. 48: *Chondrophycus cruciatus*, preserved (bleached) specimen; ultimate branches spreading, some in a cross pattern

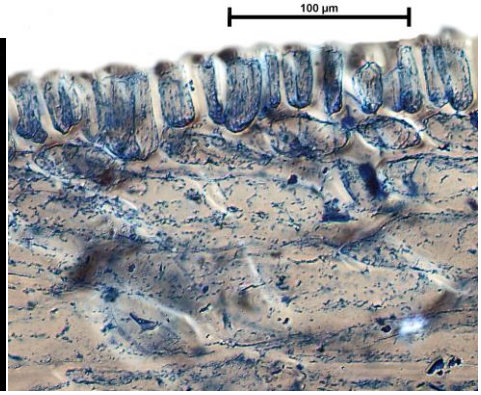


Fig. 49: *Chondrophycus cruciatus*, sectional view of surface cells look like palings in a fence

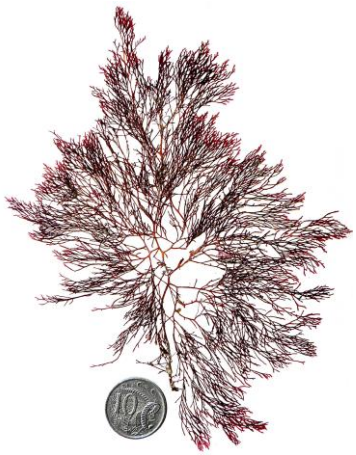


Fig. 51: *Laurencia filiformis*, plant with open branching but branches still of about equal size (above, left)
Fig. 52: a densely branched plant (above)
Fig. 53: plant with cell wall thickenings showing as bright flecks under the microscope (left)

Fig. 54: *Laurencia filiformis* f. *dendritica*, with a single axis and equal-sized upper branches

Fig. 55: *Laurencia filiformis* f. *dendritica*, ultimate branches of about equal sizes

16a. several main axes arise from an entangled base; branching loose, relatively distant, except in the clusters of ultimate branches.at tips. Figs 56, 57. On rock in rough water.
..... *Laurencia heteroclada*
(as *Laurencia filiformis* f. *heteroclada* in the Flora)

16b. axes with short side branches of irregular lengths, ultimate branches stubby, clustered. Figs 58, 59. Widespread in the intertidal or shallow water; can be confused with *C. arbuscula*.
..... *Laurencia tasmanica*

Fig. 56: *Laurencia heteroclada*

Fig. 57: *Laurencia heteroclada*, fertile tips

Fig. 58: *Laurencia tasmanica* (left)
Fig. 59: bunches of fertile sporangial branches (right)

17a. branching relatively open; ultimate branch tips rounded; surface cells in lengthwise section ***rounded.*** Figs 60-63. Widespread near low tide on sheltered coasts; can be confused with *C. tasmanica*.

…… *Laurencia arbuscula*

17b. branching dense, ultimate branches flat-topped; surface cells in section view are in a ***fence-like*** layer. Figs 64-66. From the Great Australian Bight to Victoria and widespread in the tropics and Mediterranean.

…… *Chondrophycus paniculatus*

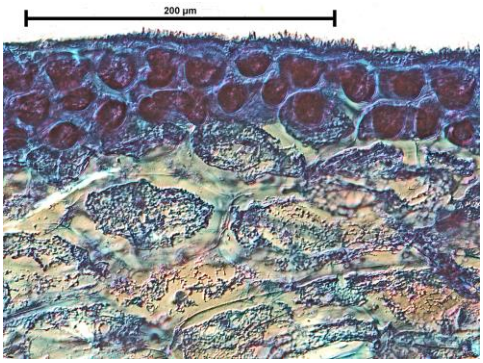


Fig. 60: *Laurencia arbuscula*, ultimate stubby branches, tips rounded, clustered at ends of short side branches (left)

Figs 61, 62: two plants, variation in branching patterns (above, right)

Fig. 63: lengthwise section, outermost cells (epidermis) rounded, inner cells colourless, elongated (right)

Fig. 64: *Chondrophycus paniculatus*

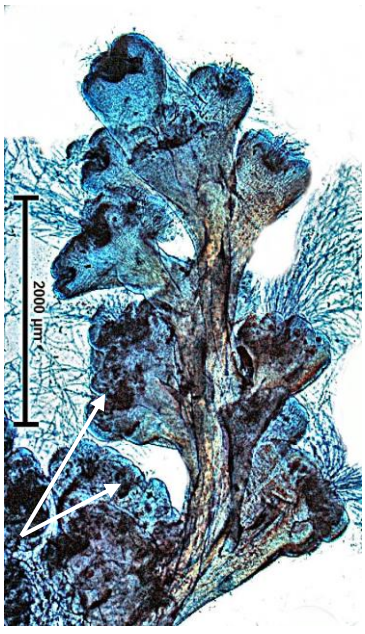


Fig. 65: *Chondrophycus paniculatus*, ultimate branches stubby, flat-topped, some below tips are warty (arrowed)

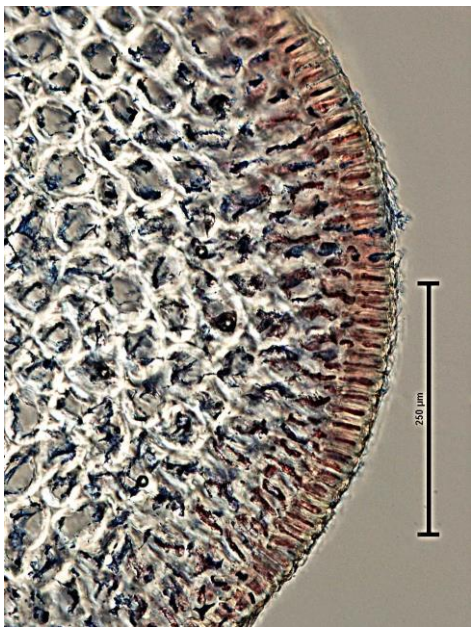


Fig. 66: *Chondrophycus paniculatus*, section, surface cells coloured, fence-like, underlying cells colourless and with bright cell wall thickening