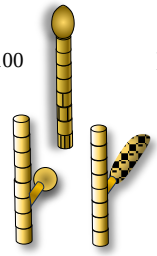
SPHACELARIA / HERPODISCUS

What are they?

Fifteen species of *Sphacelaria* are found in southern Australia, commonly growing on sea grasses and Brown algae. They have:

- brown, stiff, upright threads or filaments in tufts, up to about 100 mm tall
- prominent ***tip cells*** when growing actively (see opposite)
- lines of cells dividing lengthwise forming prominent bands along threads.
- 2 types of spore sacs on different plants may be present
- some species have diagnostic vegetative reproductive (propagules) by which they can be identified



Purpose of the key

Formal classification of algae relies on investigating microscopic reproductive features in detail. Fortunately, some algae grow in specific places and some have recognisable shapes that allow them to be sorted directly into the level of Genus or Family and so shortcut a systematic search through intricate and often unavailable reproductive features. This is why *Sphacelaria/Herpodiscus* is found with similar Brown algae in the search strategies "***Wiry brown algae"*** and also ***"Turf and fouling algae II: mat and turf species".***

Sphacelaria is a relatively large genus, specimens often found attached to other plants. Consequently it deserves the separate key to species found below.

Limitations

Unfortunately, microscopic investigation will be needed for definite identifications.

Images used below

These come from pressed specimens or the extensive slide collection of the algal unit, State Herbarium of S Australia, generated by the late Professor Womersley and his workers over some 60 years. Images with dark backgrounds have been taken using phase contrast or interference microscopy to highlight transparent structures. Other images may be stained dark blue.

Scale

The coin used as a scale is 23 mm or almost 1" across

Recent name changes

Classification in Womersley, H B S (1987) is followed as it continues to be the most complete and accessible description of species using solely shape and anatomy of plants. New combinations of names in ***Algaebase.org***, based on genetic markers and life cycles are listed in an appendix.

KEY

1a. rare, known from plants attached to *Cystophora botryocystis* at Brighton Victoria. Branching in *2 opposite rows.* Figs 1-3. see also the separate information sheet
.....*Sphacelaria spuria*

1b. branching forked, radial or irregular ..... 2.

2a. filaments ≤ 25µm across, plants usually ≤10mm tall ..... 3.

2b. filaments >25µm across, plants usually >10mm tall ..... 7.

3a. cells divide *across*, forming brick-wall patterns within the filament bands of cells (as in Fig. 2.); dark cells (pericysts) *present* ..... 4.

3b. cells divide across rarely or not at all; dark cells (pericysts) *absent* ..... 6.

4a. rare, only known on *Platythalia angustifolia*, WA. Figs 4-7. see also the separate information sheet
.....*Sphacelaria multiplex*

4b. more common and widespread, on larger Brown algae, some on seagrasses ..... 5.

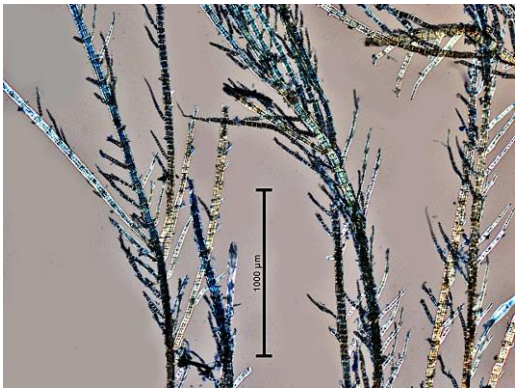


Fig. 1. *Sphacelaria spuria*: branching pattern

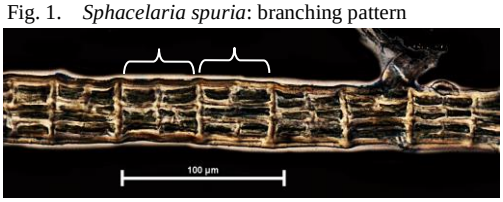


Fig. 2. *Sphacelaria spuria*: bands of cells, (two bracketed), some bands divided across

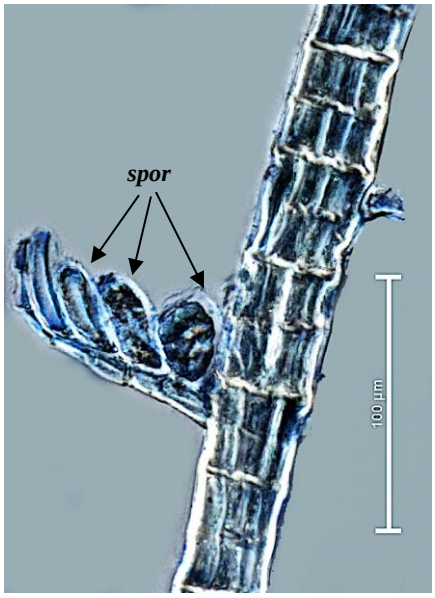


Fig. 3. *Sphacelaria spuria*: spore sacs with single compartments (***spor***) on short side branches

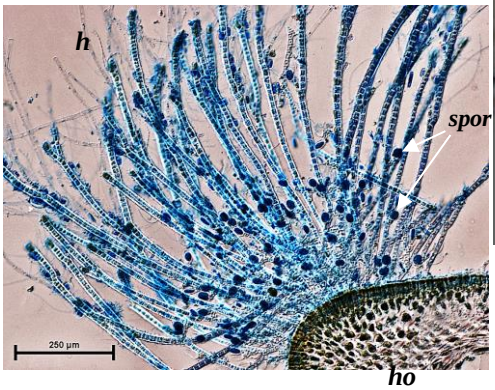


Fig. 7 *Sphacelaria multiplex*, cross section through the host (***ho***), dark stained spore sacs (***spor***), hairs (***h***)

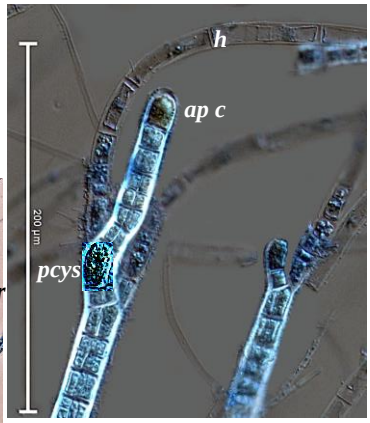


Fig. 4. *Sphacelaria multiplex* branch tips: hairs (***h***), prominent tip cell (***ap c***), dense pericyst (***pcys***)

Fig. 5. *Sphacelaria multiplex* multi-compartmented spore sacs, on small, side branches

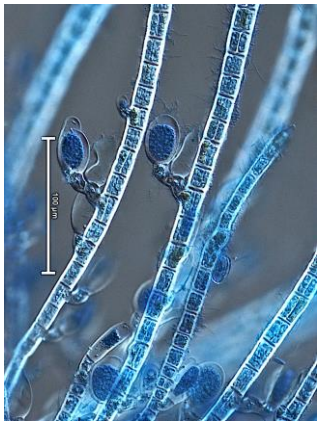


Fig. 6. *Sphacelaria multiplex* 1-3, single-compartmented spore sacs, on side branches

5a. plants form dense, light-brown patches on *Carpoglossum confluens*. From West Coast SA to Tasmania. Figs 8-11.
..... *Sphacelaria carpoglossi*

5b. plants form patches 1-3mm across on *Cystophora* spp. From near Pt Lincoln SA to Tasmania. Figs.12-14.
..... *Sphacelaria bracteata*

6a. plants form patches 1-3mm across on *Cystophora* spp. From near Pt Lincoln SA to Tasmania. Figs.12-14.
..... *Sphacelaria bracteata*

6b. rare. Plants form dense "turfs" 2-3mm tall, probably exclusively on *Cystophora monilifera*. From Rottnest I and near Busselton WA. Figs. 15-18.
see also the separate information sheet
..... *Sphacelaria chorizocarpa*

7a. cells divide *across*, forming brick-like patterns within the filament bands (as in Fig. 2.); dark cells (pericysts) *present* ..... 8.

7b. cells divide across rarely or not at all; dark cells (pericysts) *absent*; propagules (short 2- or 3-armed branches on stalks) found usually in summer are needed for confident species identification in this section of the key ..... 9.

Fig. 8. *Sphacelaria carpoglossi* forming patches 0.5-2mm across on the dark blades of *Carpoglossum*

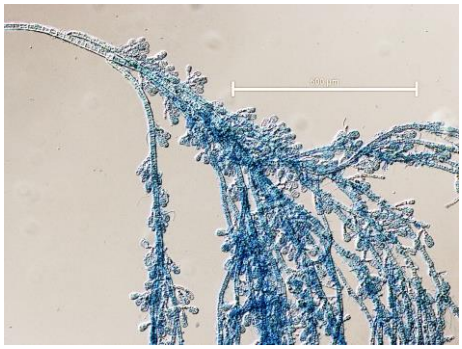


Fig. 9. *Sphacelaria carpoglossi*, dissected tuft: numerous short side branches bearing spore sacs arising at right angles

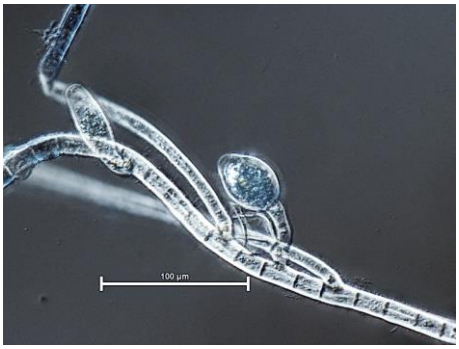
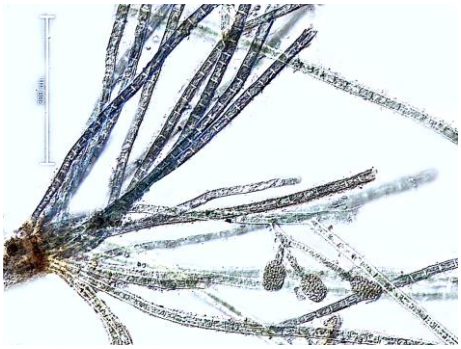
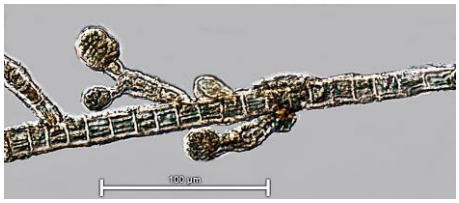


Fig. 10. *Sphacelaria carpoglossi*: young and mature single-compartmented spore sacs

Fig. 11. *Sphacelaria carpoglossi*: multiple-compartmented spore sacs forming in sequence on a short side branch





Figs 12-14: *Sphacelaria bracteata* on upper parts of *Cystophora racemosa*

Fig. 13. dissected plant with many-compartmented spore sacs

Fig. 14. detail of spore sacs and cell bands

Fig. 15: *Sphacelaria chorizocarpa* (arrowed) on *Cystophora monilifera*

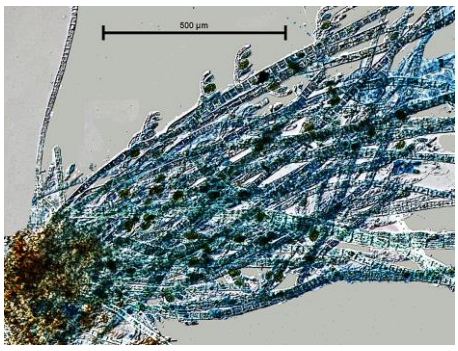


Fig. 16: *Sphacelaria chorizocarpa* torn from *Cystophora monilifera*

Fig. 17. *Sphacelaria chorizocarpa*: prominent tip cell

Fig. 18. *Sphacelaria chorizocarpa*: spore sacs

8a. plants densely tufted tall; branching *forked* or alternate; many-compartmented spore sacs on numerous short side branches at right angles to filaments. A New Zealand species found only on a drift *Cystophora monilifera* plant at Aldinga SA, but possibly more widespread. Figs 19-21.
..... *Sphacelaria implicata*

8b. plants form small clumps 2-6mm tall; branching *radial* or irregular, main filaments with short side branches; many-compartmented spore sacs on short side branches at acute angles to filaments. From upper Spencer Gulf SA to Tasmania usually on *Cystophora* spp. Figs 22-24.
..... *Sphacelaria reinki*

9a. plants form a low turf on rock, rarely grow on seagrasses
..... 10.

9b. plants usually grow on large algae or seagrasses
..... 11.

10a. maximum of 2-3 cells seen in side views of filament bands; propagules (short-armed branches on stalks, found usually in summer) triangular, 2(-3) armed, apex arms may initially bear a hair. Figs 25-27.
..... *Sphacelaria tribuloides*

10b. maximum of 4-5 cells seen in side-views of filament bands; propagules with 2 rounded arms. Figs 28-30.
..... *Sphacelaria brachygonia*

Fig. 19. *Sphacelaria implicata*: forked filaments, numerous side branches bearing sporangia

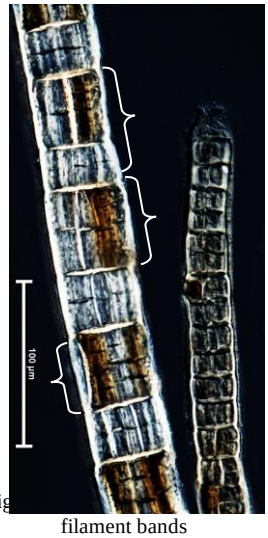


Fig. 20. *Sphacelaria implicata*: filament bands (bracketed) with cells dividing across; dense pericysts

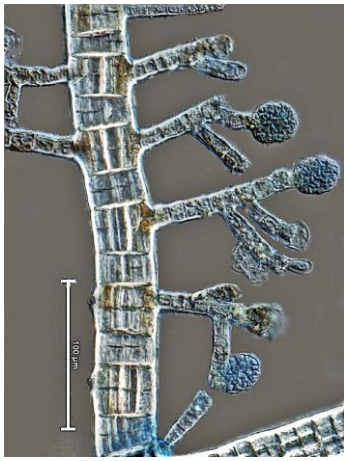


Fig. 21 *Sphacelaria implicata*: spore sacs on numerous short side branches at right angles to filaments

Fig. 22: *Sphacelaria reinki* on *Cystophora xiphocarpa*

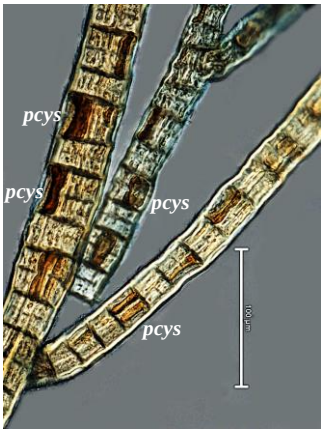


Fig. 23. *Sphacelaria reinki*: pericysts (***pcys***) prominent

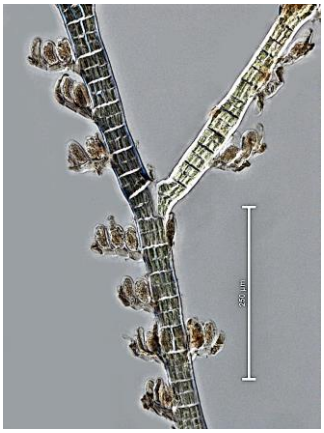


Fig. 24. *Sphacelaria reinki*: spore sacs on numerous short side branches at acute angles to threads

Fig.25: *Sphacelaria tribuloides*

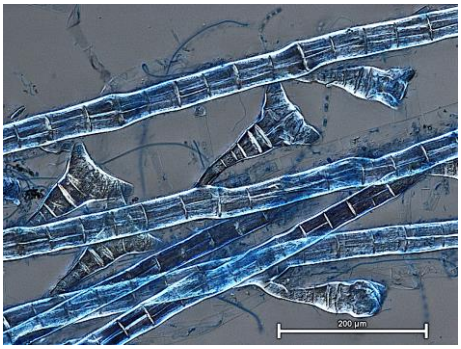


Fig. 26. *Sphacelaria tribuloides*: propagules in various aspects

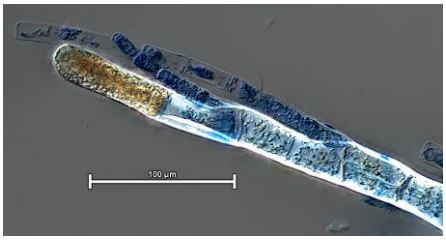
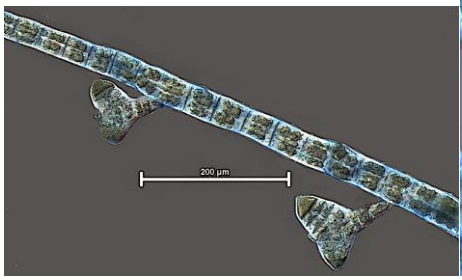


Fig. 27. *Sphacelaria tribuloides*: prominent tip cell; hairs



Figs 28-30: *Sphacelaria brachygonia*
Left: whole plants
Centre and right: two magnifications of propagules; prominent tip cells

11a. maximum width of mature filaments 25-30µm; plants, rarely on rock, form dense tufts on *Myriodesma harveyanum*; propagules (short-armed branches on stalks, found usually in summer) triangular, the two arms of mature propagules have prominent tip cells with angular internal walls. A Noumea species (on *Turbinaria*), found from the West Coast to Kangaroo I. SA, but possibly more widespread. Figs 31, 32.
..... *Sphacelaria novae-caledoniae*

11b. maximum width of mature filaments >25µm; plants on seagrass and large Brown algae, occasionally on rock ..... 12.

12a. propagules triangular, arms short and rounded or shortly conical. Figs 34-36.
..... *Sphacelaria novae-hollandiae*
From Indian, Atlantic & Pacific Ocean tropical waters, Rottnest I. WA to near Adelaide SA.

12b. propagules thin, arms 2-3, relatively thin and long ..... 13.

13a. maximum of 5-8 cells seen in side views of filament bands that are stubby (L:B ≤1); propagule arms 2, produced simultaneously, pinched basally, propagules often with a terminal hair. Figs 37-39.
…….…….. *Sphacelaria biradiata*
Common, on large algae and seagrasses from SW WA to Tasmania

13b. cell bands with max. of 5 cells across, L:B >1 …….. 14.

Fig. 31 *Sphacelaria novae-caledoniae*: dense tufts on upper parts of the dark fronds of *Myriodesma harveyanum* host (***ho***)

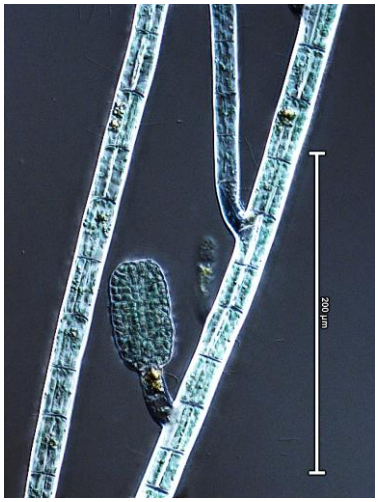


Fig. 32 *Sphacelaria novae-caledoniae*: multi-compartmented spore sac

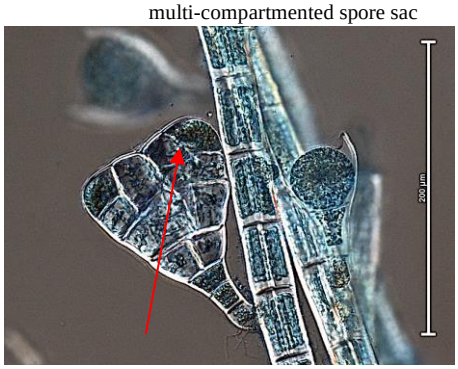


Fig. 33. *Sphacelaria novae-caledoniae* propagules: the two arms of the mature (LHS) propagule have prominent tip cells with angular internal wall (arrowed)

Fig. 34: *Sphacelaria novae-hollandiae*

Fig. 35. *Sphacelaria novae-hollandiae*: branching pattern; propagule

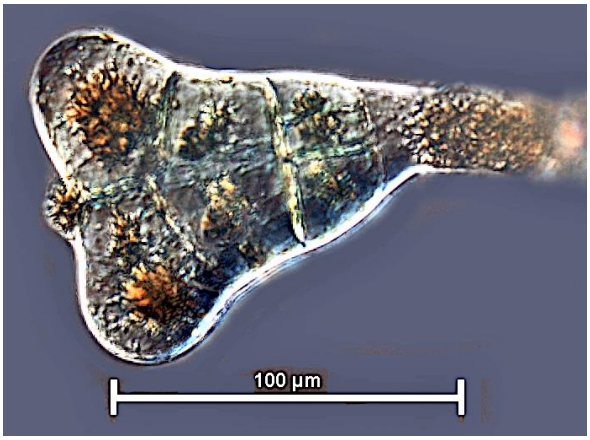


Fig. 36. *Sphacelaria novae-hollandiae*: propagule

Fig. 37 *Sphacelaria biradiata* on a blade of the seagrass *Posidonia*

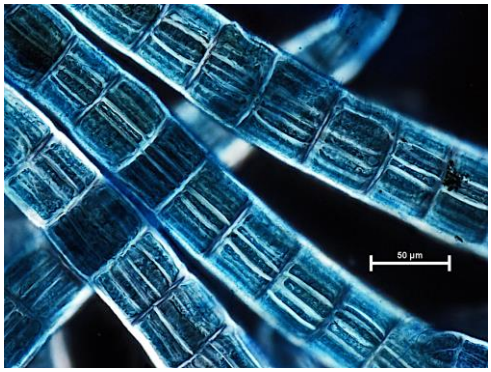


Fig. 38 *Sphacelaria biradiata*: cell bands with 5-8 cells seen in side views

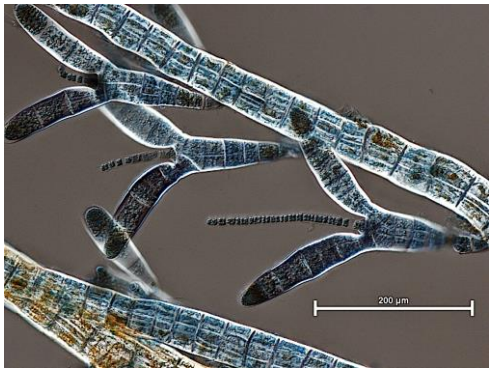


Fig. 39. *Sphacelaria biradiata*: three propagules with prominent terminal hairs

14a. filaments about the same width throughout the plant, maximum of 30-40µm wide, most branches reaching the same height; propagules thin, arms linear ≈ length of the stalk. Figs 40-44.
……. *Sphacelaria rigidula*
Commonest species in southern Australia on Brown algae and rock in intertidal pools, but also worldwide in temperate seas

14b. filaments broader towards the plant base, maximum of 40-80µm wide, branches consisting of continuously growing ones and shorter side branches; propagules with 3 (2-4) arms.
…….. 15.

15a. short branches usually spreading; propagule arms usually 3, produced successively, slightly pinched at the base. Figs 45-48.
……. *Sphacelaria cirrosa*
Widespread in temperate and subtropical seas; from Fremantle, WA to Port Jackson NSW, on large algae and seagrasses.

15b. branching radial or irregular; propagule arms usually 3, slender, narrow. Figs 49-51.
…….. *Sphacelaria fusca*
Widespread in temperate seas; and from SW WA to Victoria on stalks of *Caulocystis* and seagrass blades

Fig. 40. *Sphacelaria rigidula* from an intertidal rock pool: branches reaching the same height

Fig. 41. *Sphacelaria rigidula* on the wiry stalks of *Cystophyllum*

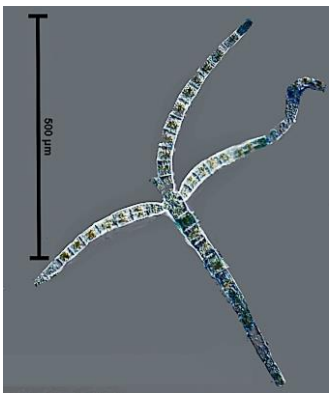


Fig. 42. *Sphacelaria rigidula*: a detached propagule with the 3 linear arms about the same length as the stalk

Fig. 43. *Sphacelaria rigidula*: multi-compartmented spore sacs

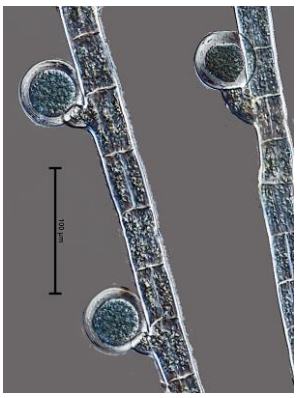


Fig. 44. *Sphacelaria rigidula*: single-compartmented spore sacs

Fig. 45: *Sphacelaria cirrosa* from a blade of seagrass

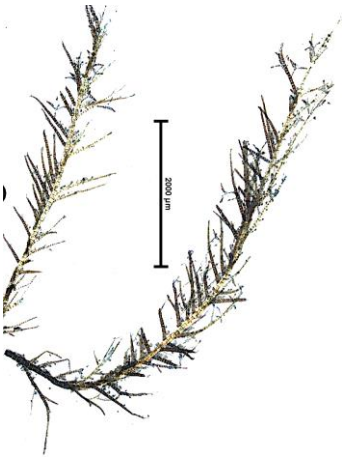


Fig. 46. *Sphacelaria cirrosa*: branching pattern

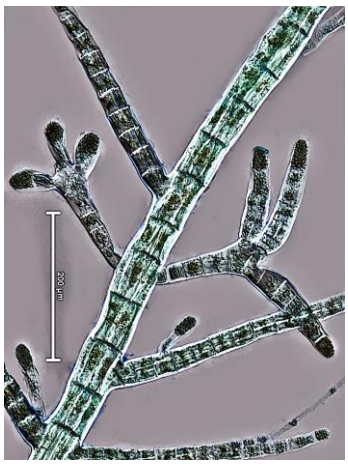


Fig. 47. *Sphacelaria cirrosa*: propagules

Fig. 48. *Sphacelaria cirrosa* spore sacs

Fig. 49. *Sphacelaria fusca* on blades of *Heterozostera*

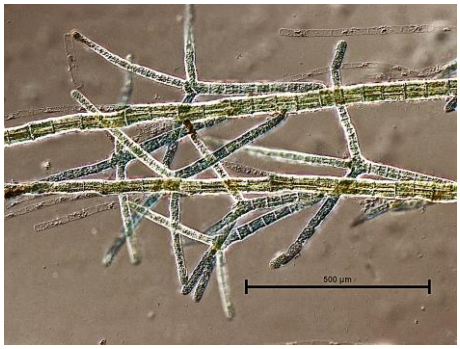


Fig. 50. *Sphacelaria fusca: cluster of propagules*

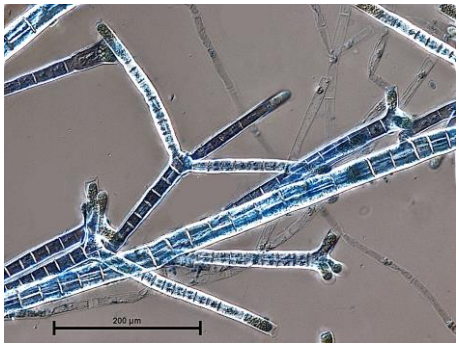


Fig. 51. *Sphacelaria fusca: developing and mature propagules*

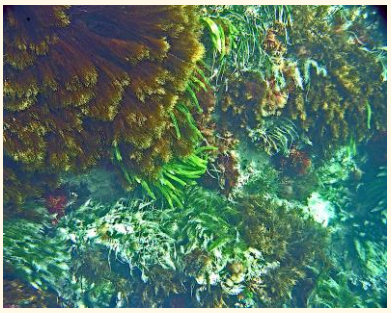
SPHACELARIA LOOK ALIKES

Members of the Families Stypocaulaceae and Cladostephaceae also have prominent tip cells and produce branched threads with bands of cells. Unlike *Sphacelaria* they generally grow as relatively large plants on rock, producing turfs in shallow waters.
In these Families, a sheath (cortex) of small cells develops, obliterating the original bands of cells.

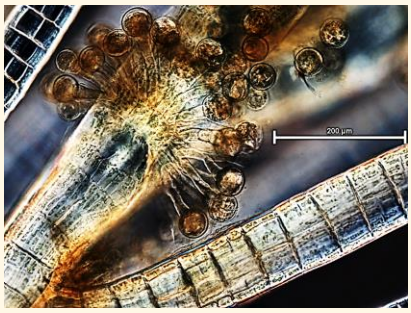
Family: Stypocaulaceae

Halopteris

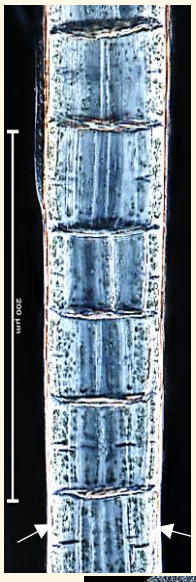
- 5 species
- filaments sheathed (corticated) with small, box-shaped cells



mat of stiff brown threads amongst Green algae in shallow water



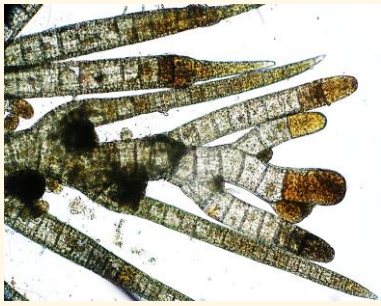
bunch of stalked, single-compartmented sporangia

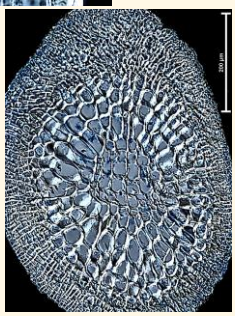


small-celled sheath (cortex) forming (arrowed)

Phloiocaulon

- 2 species
- filaments initially sheathed (corticated) with small, box-shaped cells, later infiltrated with numerous rhizoids forming a wide outer layer of equal-sized cells





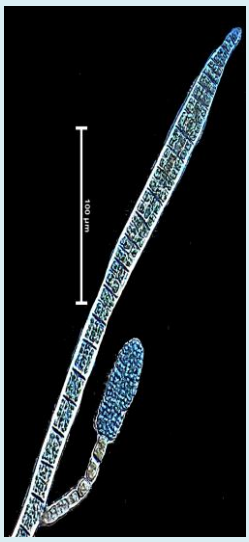
cross section

Family: Cladostephaceae

- filaments sheathed with small, box-shaped cells
- main branches (axes) densely ringed with short side branches

Cladostephus spongiosus

dense rings of short branches



short side branch with spore sac

Baldock, R. N. (2014). Pictured key to *Sphacelaria*. 7 pp. "Algae revealed". Adelaide. State Herbarium of SA

REFERENCES

- Draisma, S. G. A., Prud'Homme van Reine, E. F. & Kawai, H. (2010). **A revised classification of the Sphacelariales (Phaeophyceae) inferred from a *psb*C and *rbci* based phylogeny**. *European Journal of Phycology* 45(**3**): 308-326.
- Womersley, H. B. S. (1987) **The marine benthic flora of southern Australia Part II.** Adelaide. Handbook of the Flora & Fauna of South Australia

SPECIES IN THE KEY
with current name changes

species	author/s	page	name, if changed, in *Algaebase*	authors
Sphacelaria biradiata	Askenasy	4		
Sphacelaria brachygonia	Montagne	3		
Sphacelaria bracteata	(Reinke) Sauvageau	2	*Herpodiscus bracteatus*	(Reinke) Draisma, Prud'homme & H. Kawai
Sphacelaria carpoglossi	Womersley	2	*Herpodiscus carpoglossi*	(Womersley) Draisma, Prud'homme & H. Kawai
Sphacelaria chorizocarpa	Sauvageau	2	*Herpodiscus chorizocarpus*	(Sauvageau)) Draisma, Prud'homme & H. Kawai
Sphacelaria cirrosa	(Roth) C. Agardh	5		
Sphacelaria fusca	(Hudson) Gray	5		
Sphacelaria implicata	Sauvageau	5	*Herpodiscus implicatus*	(Sauvageau) Draisma, Prud'homme & H. Kawai
Sphacelaria multiplex	Womersley	3	*Herpodiscus multiplex*	(Womersley) Draisma, Prud'homme & H. Kawai
Sphacelaria novae-caledoniae	Sauvageau	1		
Sphacelaria novae-hollandiae	Sonder	4		
Sphacelaria reinkei	Sauvageau	4	*Herpodiscus reinkei*	(Sauvageau) Draisma, Prud'homme & H. Kawai
Sphacelaria rigidula	Kützing	3		
Sphacelaria spuria	Sauvageau	5	*Herpodiscus spurius*	(Sauvageau) Draisma, Prud'homme & H. Kawai
Sphacelaria tribuloides	Meneghini	1		