SARGASSUM 4th. Edition

The genus *Sargassum*

Fifteen species of this large brown algal genus were recorded by Womersley for southern Australia; there is also a new species (*S. kendrickii*) not found in the Marine Flora. Some species are endemic (found nowhere else). They form the perennial canopy layer of many shallow water marine communities, providing food and refuges for invertebrates and fish, and changing the microclimate of understorey plants and animals.

Correct identification must necessarily rely on reproductive structures (receptacles), however, these are not always present on specimens. For this reason, the key below attempts to separate species largely on vegetative shape in the hope you can make a quick, but tentative identification, then go to the more technical descriptions, found in the Marine Flora, for verification. Commonest or more easily recognised species are therefore generally treated first.

Recent reclassification

Using DNA differences for 3 genes *Dixon *et al* have been able to reclassify Australian species in the Family: Sargassaceae, raising some species, previously in the three existing Sub-genera, to generic level. The key below, however, retains the names found in Womersley's Marine Benthic Flora so that information based on shape and structure can be found more easily. However, new combinations of names are provided in brackets and a list of species now recognised on www.Algaebase.org is placed as an appendix to this pictured key.

Common names

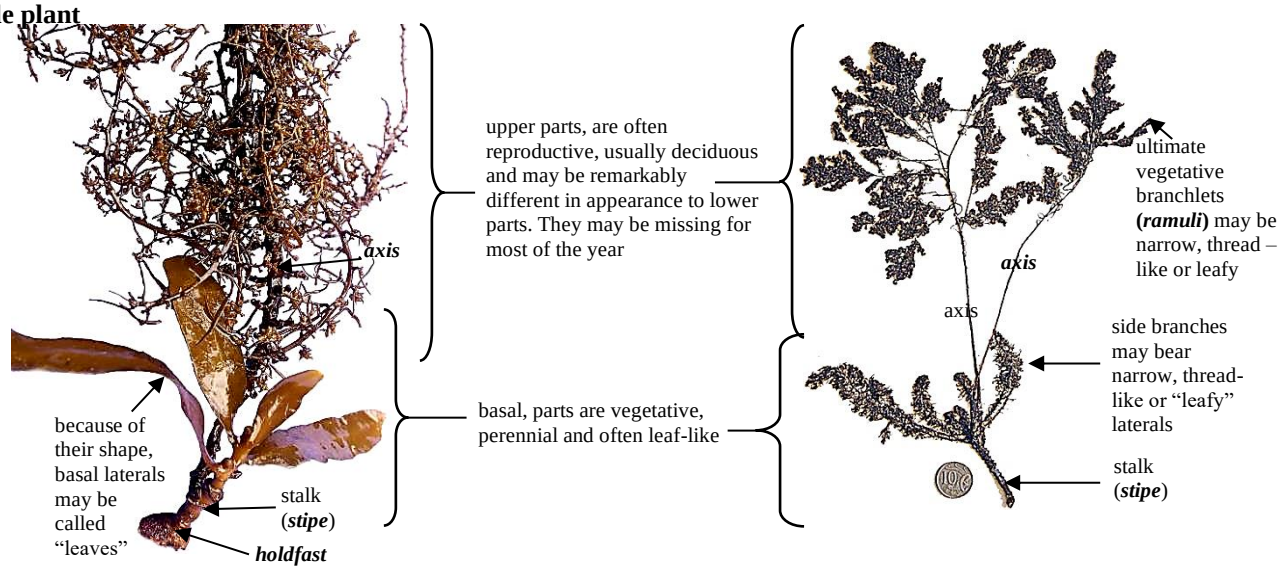
These have been suggested in Edgar, G, J. (2008) *Australian Marine Life. The plants and animals of temperate waters*. New Holland Australia

Scale and artefacts

The 10c piece in the images below is 24 mm across or almost 1 inch in diameter. Pressed specimens may distort slightly and are often dark in colour.

BASIC SHAPES (MORPHOLOGY) OF *SARGASSUM*

Whole plant



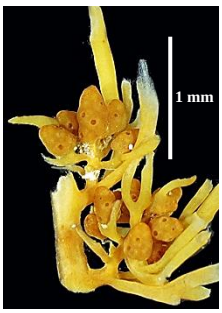
Types of axes

Upper parts: types of laterals

vegetative "leaves" and floats (*S. distichum*)

thread-like ultimate branchlets (ramuli) (*S. sonderi*)

tiny, fertile branchlets (receptacles) (*S. spinuligerum*)



branchlets (receptacles) with pits containing eggs and/or sperms (*S. sonderi*)

Basal parts: types of laterals

divided "leaves"

un-divided "leaves"

thread-like and obscurely divided laterals

*Dixon, R.R.M., *et al* (2012). A morphological and molecular study of austral *Sargassum* (Fucales, Phaeophyceae) supports the recognition of *Phyllotricha* at genus level, with further additions to the genus *Sargassopsis*. J. of Phycol. **48** (5):1119-1129

KEY TO *SARGASSUM* SPECIES BASED ON SUPERFICIAL FEATURES

1a. upper reproductive part of plants rarely seen; the common basal, vegetative part is branched like a candelabra from a stumpy stipe roughened with ***stiff stubs*** of denuded branches. Laterals may be slightly flattened in basal parts of the plant, but generally are wiry or thread-like. Figs 1-4.

…… *Sargassum* (*Phyllotricha*) *decipiens*
"Deciduous sargassum"

Sterile plants can be confused with *Acrocarpia* or *Caulocystis*

Fig. 1: typical candelabra-like appearance of basal parts

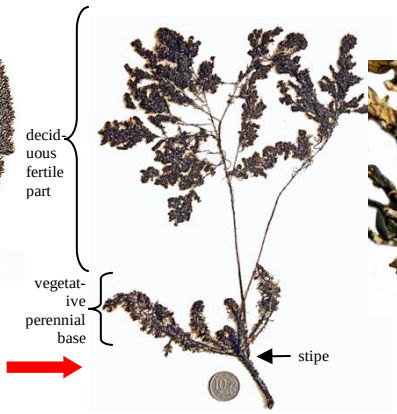


Fig. 2: *Sargassum* decipiens, whole plant with perennial base and fertile deciduous upper

Fig. 3: stiff stubs of denuded laterals in basal parts (arrowed)

Fig 4:upper fertile parts with dense ramuli and small floats developed in late winter

1b. ***not*** as above. Basal laterals are often leaf-shaped, although sometimes they are narrow

…… 2.

2a. main branches **(**axes) ***flat***, 5-10 mm wide, ***flanged*** (winged). Laterals leaf-shaped, from the edges of axes, ***narrow*** towards the plant tip. Floats 3-6 mm in diameter, on prominent stalks. Probably a sub-tropical relict species with a western distribution, only drift plants reaching Adelaide shores**.** Figs 5-8.

…… *Sargassum* (*Sargassopsis*) *decurrens*

Fig 8: *Sargassum decurrens*, whole plant, flat, flanged basal parts, narrow flanged upper parts with floats

Fig. 5: flat, flanged basal part

Fig. 6: upper laterals also leafy, with floats on prominent stalks

Fig. 7: upper laterals with branched clusters of fertile receptacles (arrowed)

2b. main branches (axes) compressed or angular or 3-sided or cylindrical, ***not*** truly flanged, less than 10 mm wide

…… 3.

3a. ***basal*** laterals leaf-shaped, ***divided***, and ***flat-branched*** (branched in one plane); axes compressed or angular or cylindrical; floats (if present) are ***small***, 1-3 mm in diameter

…… 4.

3b. ***basal*** laterals usually ***undivided***, broad and leaf-shaped; axes 3-sided, or angular to cylindrical; floats (if present) are large, 4-10 mm in diameter

…… 8.

4a. plant base is sturdy, up to 10 mm wide. Basal laterals are ***leaf-shaped*** with a ***broad central section*** 5-10 mm wide, and ***contrast markedly*** with upper ***fine***, short ultimate branchlets (ramuli) that are ***irregularly branched***. Figs 9-11.
……..……. *Sargassum* (*Sargassopsis*) *heteromorphum*
"Multi-shaped sargassum"

Fig. 9: detail of a basal lateral (divided "leaf") with broad parts

Fig. 10: detail of upper parts, with small floats, and fine, irregularly branched upper laterals (ramuli)

Fig. 11: *Sargassum heteromorphum*, whole plant

4b. plant base is relatively ***thin***, usually <10 mm wide. Basal laterals have a ***narrow*** central part, usually < 5mm wide, and either rapidly change ***or*** gradually merge in width into narrow ultimate branchlets (ramuli) towards plant tips **..... 5.**

5a. plant base is ***cylindrical*** and ***flexuous*** **..... 6.**
5b. plant ***base*** is compressed and ***stiff*** **..... 7.**

6a. stubs of denuded laterals point ***downwards*** (retroflex), leafy laterals have ***smooth edges***; upper laterals are hair-like, floats are usually ***present***. Figs 12-14. **……..……. *Sargassum* (*Phyllotricha*) *verruculosum***
"Common sargassum"

Fig. 12: basal laterals with narrow, divided parts, axes loosely zigzag, stubs of denuded laterals pointing downwards

Fig. 13: upper parts, floats and hair-like ultimate branchlets (ramuli)

Fig. 14: *Sargassum verruculosum*, whole plant, divided narrow basal laterals, hair-like upper laterals, flexuous main branches (axes)

6b. stubs of denuded laterals point outwards or upwards, leafy laterals have ***serrated edges***; floats are ***absent***. A species with western distribution only. Figs 15-18.
..... *Sargassum* (*Sargassopsis*) *kendrickii*
(a new species, not described in the Marine Flora)

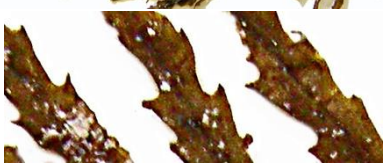


Fig. 15: upper, ***unbranched,*** narrow ultimate branchlets (ramuli) with serrated margins

Fig. 16: basal, leafy, flat, ***branched*** laterals with serrated margins (above, left)

Fig. 17: enlargement of marginal serrations (left)

Fig. 18: *Sargassum kendrickii*, whole plant

7a. axis to 6 mm wide, ***knobbly***, with prominent, lumpy stubs of denuded laterals. Laterals are divided into ***narrow*** (linear) branches at the plant base then grade ***gradually*** towards the plant tips into ***fine***, long, hair-like branchlets (ramuli). Floats (if present) are ***small***, 1-2 mm in diameter. Figs 19-22.

…….…….. *Sargassum* (*Phyllotricha*) *sonderi*

Fig. 19: knobbly axis

Fig. 20: narrowly divided basal laterals (below, left)

Fig. 21: uppermost hair-like branchlets (ramuli) (below)

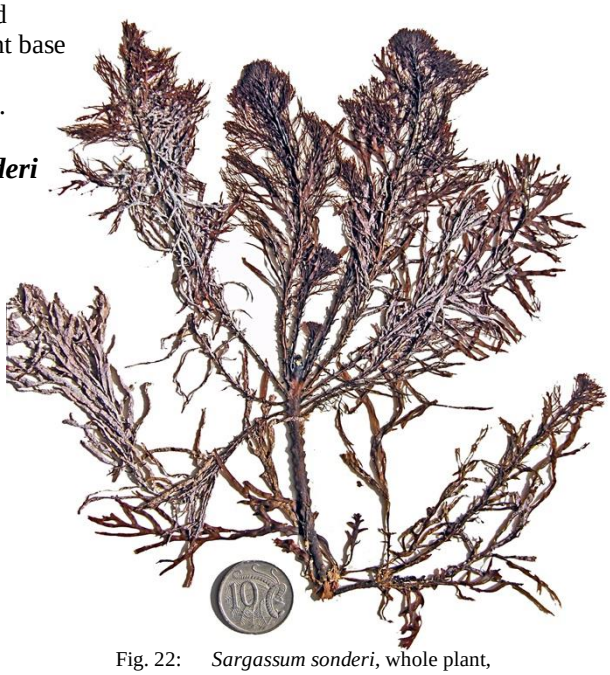


Fig. 22: *Sargassum sonderi*, whole plant, compressed, stiff, knobbly axis; divided basal laterals grading to hair-like ramuli near the plant tip

7b. axis 2-5 mm wide, with stubs of denuded laterals pointing ***downwards*** (retroflex). Young ***basal*** laterals at first undivided, soon dividing into ***lance-shaped*** opposite branches 2-6 mm wide; upper laterals (ramuli) narrow; there is a ***sharp change*** in size between basal and upper laterals towards the plant tip. Floats ***large***, 3-6 mm in diameter, sometimes with a long apical thread. Figs 23-26.

……. *Sargassum* (*Phyllotricha*) *varians*
"Variable sargassum"

Fig. 23: upper, narrow, ultimate branchlets (ramuli) and large floats (above)

Fig.24: basal, divided laterals of flat, thin, opposite segments (left)

Fig. 25: *Sargassum varians*, whole plant

Fig. 26: compressed main axis with downward-pointing stubs of denuded laterals

8a. axes ***3-sided***, basal laterals leaf-shaped, usually ***dark brown***, markedly larger than those of fertile (deciduous) upper parts
..... 9.

8b. axes ***not*** 3-sided, basal laterals usually ***lighter brown***, leaf-shaped or linear, slender and ***similar*** to those on upper parts
..... 13.

9a. "leaves" with varying degrees of incised or notched ***edges*** at the plant base, narrowing in width ***gradually*** towards the plant tip, where they are always ***deeply incised***. Figs 27-29.
Sargassum lacerifolium
"Lacerated sargassum"

Fig 27: variation in extent of incised or notched edges of ***basal*** laterals (upper row of images)

Fig 28: variation in incised edges of ***upper*** ultimate branchlets (ramuli)

Fig. 29: *Sargassum lacerifolium* whole plant, gradual narrowing of "leaves" upwards from the plant base

9b. "leaves" at the plant base ***not*** notched or incised but some with ***tiny*** marginal spines. There is a marked and ***immediate change*** above the plant base to narrow "leaves" that are ***not*** markedly incised
..... 10.

10a. ***basal*** "leaves" ***large***, ***wavy***, 20-30 mm wide, margins with varying numbers of ***tiny*** spines, ***upper*** ultimate "leaves" (ramuli) narrow and ***sparsely*** notched or with few spines. Figs 30-34.
Sargassum paradoxum

Fig. 30: wide, wavy basal "leaves"

Fig. 31: tiny spines on edges of a basal "leaf"

Fig. 32: upper "leaves"

Fig. 33: upper "leaves" and floats

Fig. 34: *Sargassum paradoxum*, whole plant, markedly different basal and upper "leaves"

10b. ***basal*** leaves ***smaller***, 5-15 mm wide, ***smooth*** (not wavy), often ***without*** spines, ***upper*** ultimate branchlets (ramuli) narrow, threadlike or cylindrical, spines ***absent*** **..... 11.**

⚠ for confident identification of species in the next steps, fertile upper parts with receptacles are needed

11a. laterals arise ***downwards*** (retroflex) **…… 12.**

11b. laterals arise at right angles or upwards. Upper ultimate branchlets (ramuli) leafy, but ***narrow*** and ***flat***, floats are absent or when present, 4-8 mm long and egg-shaped. Restricted to SE waters. Figs 35-38. **……..... *Sargassum vestitum***
"Surf sargassum"

Fig. 35, above: flat, undivided, spineless basal "leaves" (above)
Fig. 36 right: narrow, upper "leaves

Fig. 37: reproductive branchlets and two floats

Fig. 38: *Sargassum vestitum*, whole plant

12a. upper ultimate branchlets (ramuli) ***threadlike,*** about 1mm wide but lost as the branch ages, floats are ***spherical*** with an apical point and up to 10 mm in diameter. A common species in rock pools but also at depth. Figs 39-42.
..... *Sargassum fallax*
"Broad-leaved sargassum"

Fig. 39: undivided basal"leaves"

Fig. 40: upper branches, floats (slightly shrunken in this pressed specimen) with an apical point, downward-pointing (retroflex) branch (arrowed, right)

Fig. 41: upper thread like laterals (above)

Fig. 42: *Sargassum fallax*, whole plant (right))

12b. upper branchlets (ramuli) ***flat***, ***narrow*** but ***leaf-shaped***, up to 5 mm wide, ***distinct*** from the wide basal "leaves". Floats absent or few, 3-6 mm in diameter when present. Figs 43-45.
..... *Sargassum tristichum*

Fig. 43: smooth, undivided, basal "leaves"

Figs 44, 45: narrow, leafy upper branchlets (ramuli) with largely un-notched edges, angular axes, dark 3-cornered fertile branchlets (receptacles)

13a. all laterals ***linear*** (narrow with parallel sides), largely undivided, ***dark brown*** with few marginal spines. Plants widespread, often in rock pools and shallow rough water.
Figs 46-49. **..... *Sargassum linearifolium***

Fig. 46: basal "leaves"

Fig. 47: narrower upper "leaves", floats

Fig. 48: upper "leaves", clusters of fertile branchlets (receptacles)

Fig. 49: *Sargassum linearifolium*, whole plant

13b. lower "leaves" lance-shaped with ***serrated edges***, light brown.
..... 14.

⚠ for confident identification of species in the next steps, fertile upper parts with receptacles are needed

14a. plants ***loosely-branched***, laterals distinctly ***serrate*** ("holly-leaved"). Side branches generally occur in 2 rows from the edge of thin, angular axes, although more radially towards tips.
Figs 50-52. **…..…. *Sargassum distichum***

Fig. 50: thin, angular axes, alternate flat-branching pattern, serrate-edged lower "leaves",

Fig. 51: upper "leaves" with distinctly serrated edges, and floats with long stalks

Fig. 52: *Sargassum distichum*, whole plant

14b. plants more densely ***tufted***, branching pattern ***radial,*** "leaves" less distinctly serrate
..... 15 ... *Sargassum spinuligerum/podacanthum*

⚠ Identification of species in the next steps requires fertile upper parts with receptacles. They may in future prove to be variations of a single species

15a. lower “leaves” 35-70 (- 120) mm long and 5-12 mm wide; upper “leaves” with ***few*** marginal spines, 10-50 mm long and 0.5-7.0 mm wide. Fertile branchlets (receptacles) ***warty***, spines ***few*** or only ***tiny***.
Figs 53-56. ……. ***Sargassum spinuligerum***

Fig. 53: basal, “leaves”, elongate-lance-shaped laterals with few spines on edges

Fig. 54: elongate-lance-shaped upper “leaves”, dense clusters of fertile branchlets

Fig. 56: *Sargassum spinuligerum*, whole plant

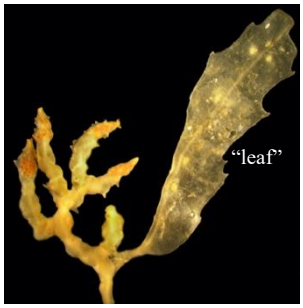


Fig. 55 (Left): two images of fertile branchlets (receptacles,) warty when dried (far left) and with fine spines and bumpy surface in a preserved (bleached) specimen (near left)

15a. lower “leaves” 10-40 mm long, and 3-5 mm (to 8mm) wide, upper “leaves” more ***regularly*** edged in spines, 10-20 mm long and 1-3 mm wide**.** Fertile branchlets (receptacles) only slightly warty and possess several ***large*** spines.
Figs 57-59. ..... ***Sargassum podacanthum***

Fig. 57: upper “leaves” distinctly serrated

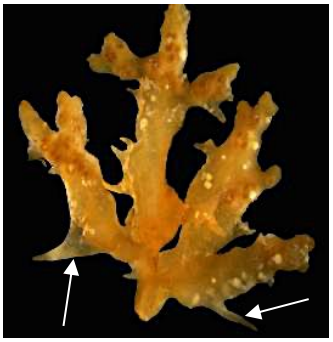
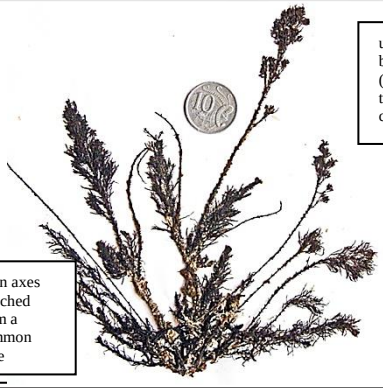


Fig. 58: preserved (bleached) fertile branchlets (receptacles), several large spines (arrowed)

Fig. 59: *Sargassum podacanthum*, whole plant

SARGASSUM LOOK-ALIKES

Cystoseira trinodis
Now considered as the genus *Sirophysalis*



main axes bunched from a common base

ultimate branches (ramuli) thin but compressed.

floats thin, compressed, embedded in ultimate branches (ramuli) often pinched along their length

sterile plants can be recognised from the numerous branch stubs on denuded main axes

floats look like a string of 3-4 beads ***when dried***

Caulocystis uvifera — floats spherical*

*Some workers consider this to be merely a single species (*C cephalornithos*) with variation in float shape

Caulocystis cephalornithos — floats spindle-shaped (narrowed at both ends)

Caulocystis— floats attach directly to the main axis

fertile ultimate branches cylindrical but bumpy and densely bunched

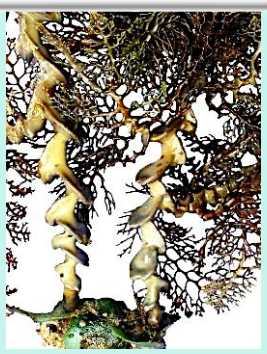
Acrocarpia robusta
— W Australia only

Wiry axes arise from a stumpy base.
Axes often covered with encrusting red algae

Acrocarpia paniculata

Acrocarpia — spirally arranged ultimate branches (ramuli). Floats absent

Cystophora — no leafy parts; stubs of side branches often point downwards and may give the axis a zigzag appearance; floats lack a terminal thread or leaf



fertile branches (receptacles) with bumps (conceptacles

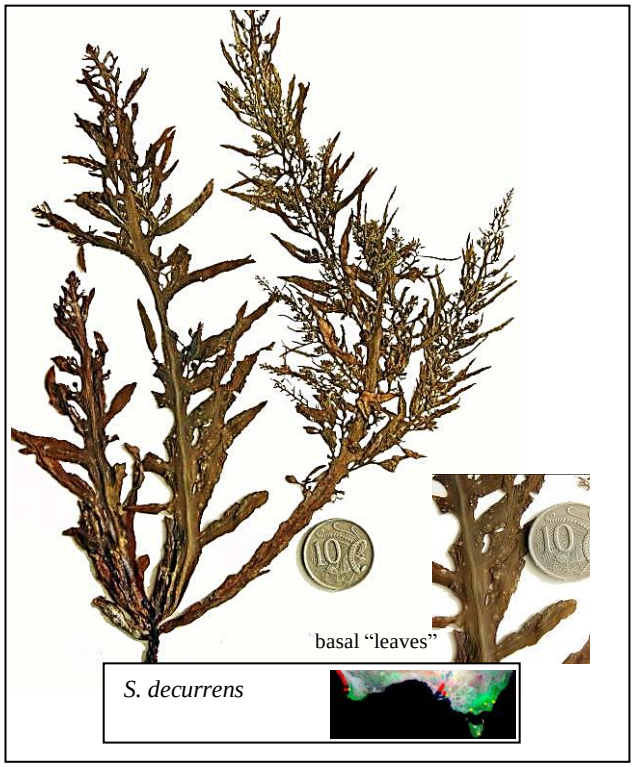
Baldock, R. N. (2024). *Sargassum*. 15 pages. *Algae Revealed*.

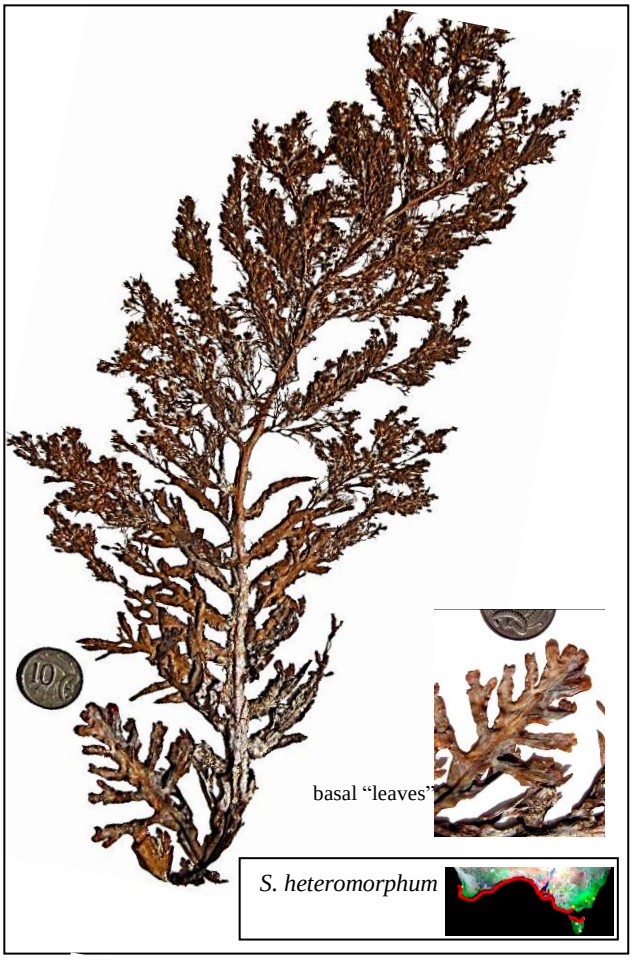
SOUTHERN AUSTRALIAN SPECIES OF *SARGASSUM* AT A GLANCE

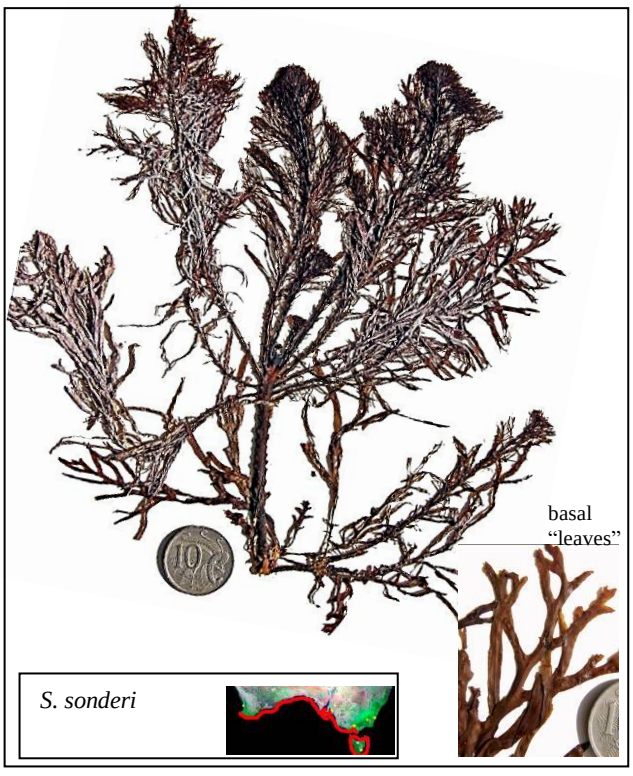
The groups below follow the sub-genera found in Womersley's Marine Benthic Flora as this provides a more accessible comprehensive treatment largely based on superficial features

I. SUB-GENUS: *PHYLLOTRICHA* (as Phyllotrichia in Womersley)

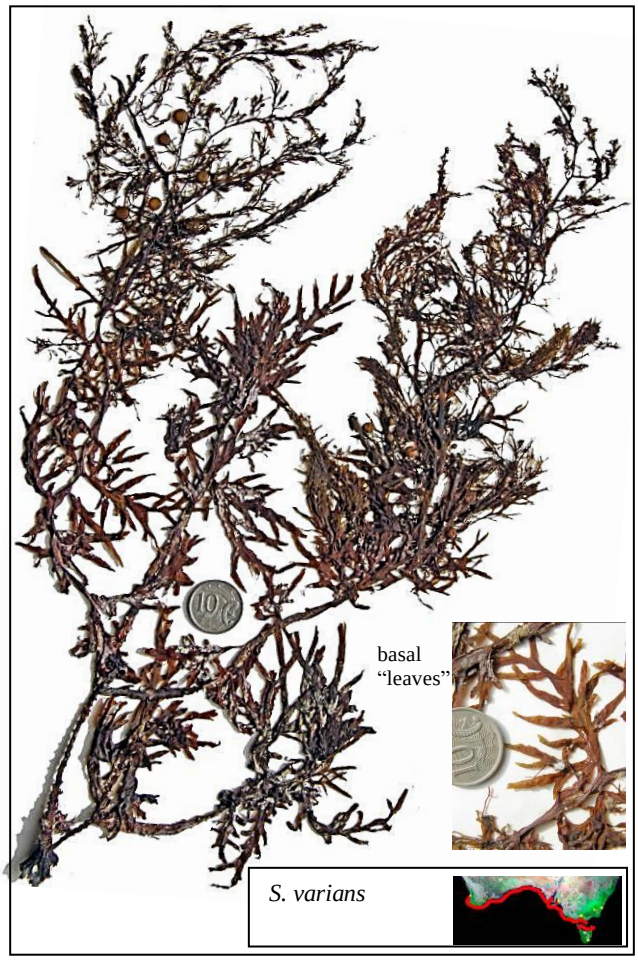
Lower "leaves" flat, divided, ultimate branches (ramuli) narrow, not leafy

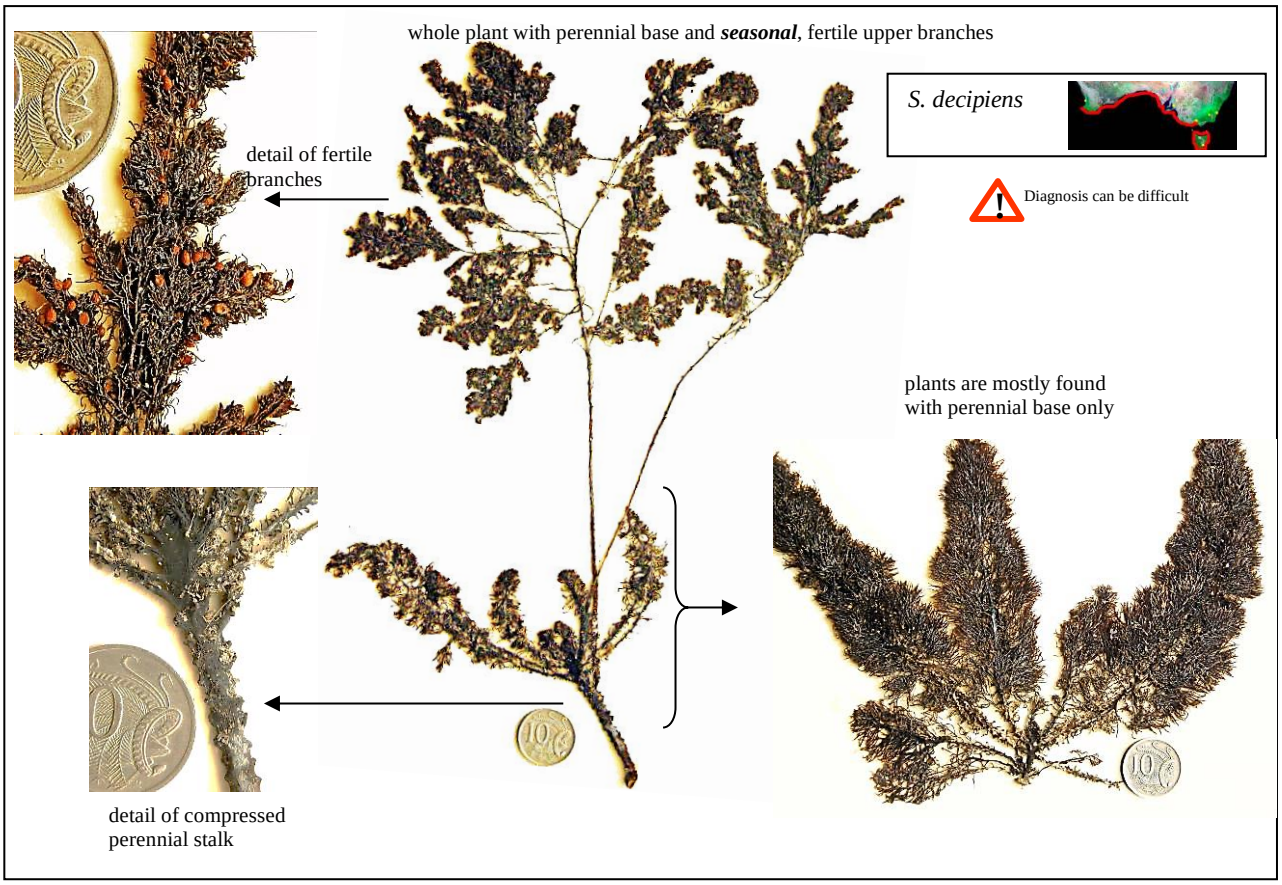






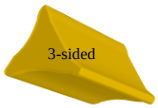
(*Phyllotricha* continued)

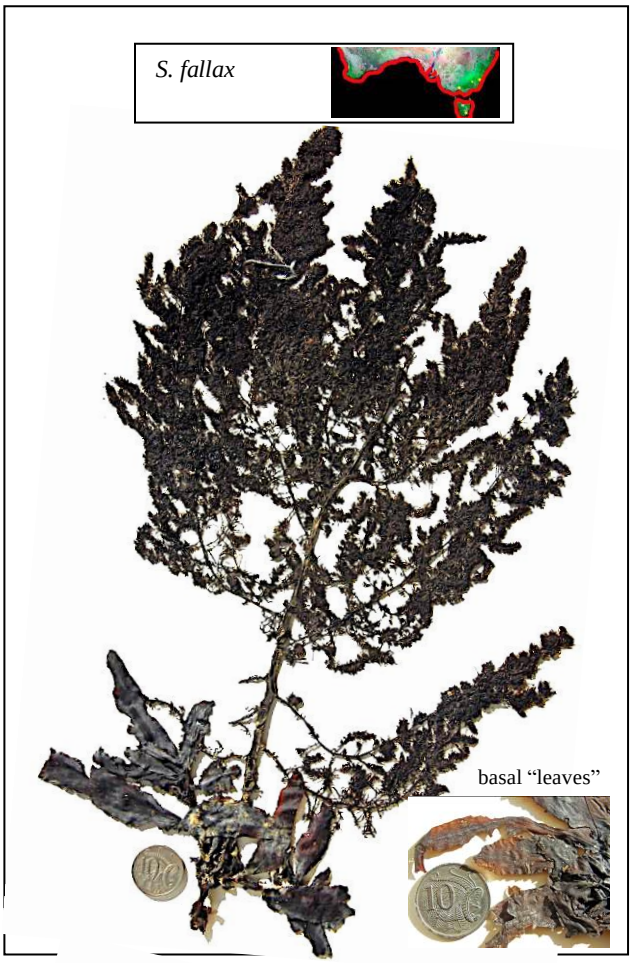


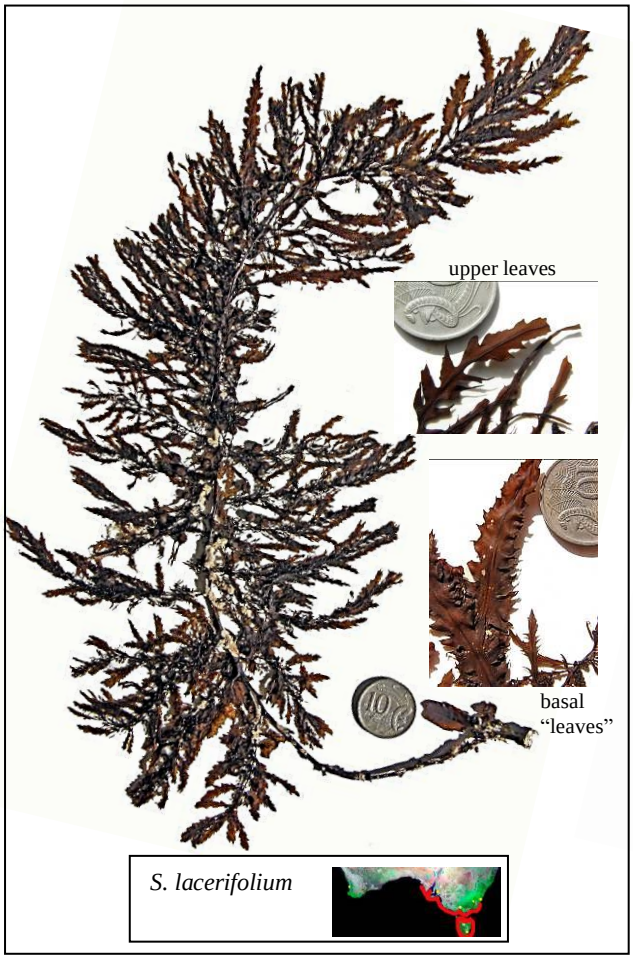


II. SUB-GENUS: *ARTHROPHYCUS*

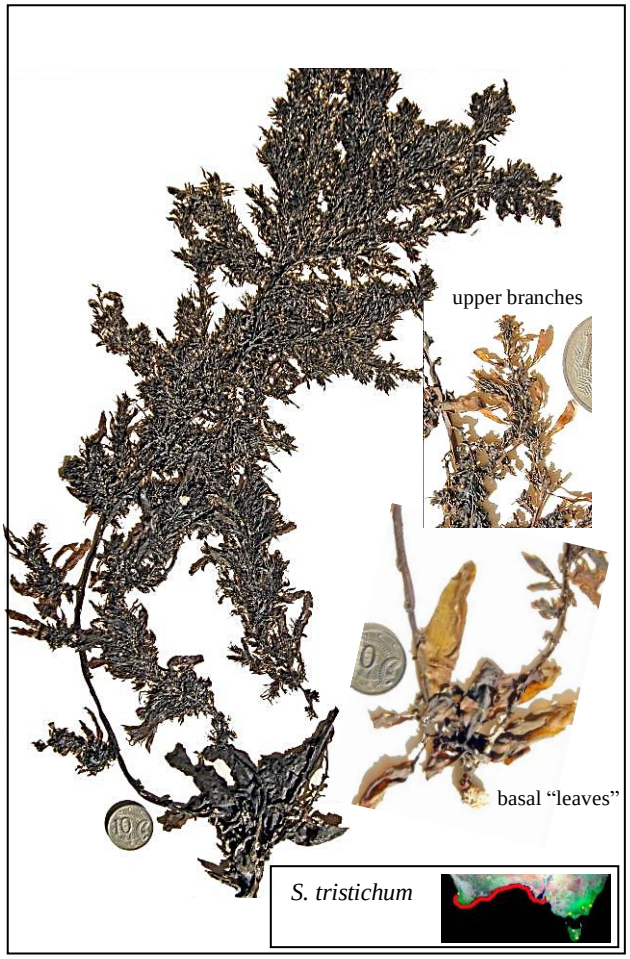
Lower "leaves" generally undivided and much larger than upper ones.
Axes 3-cornered in cross section





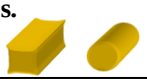


(*Arthrophycus,* continued)

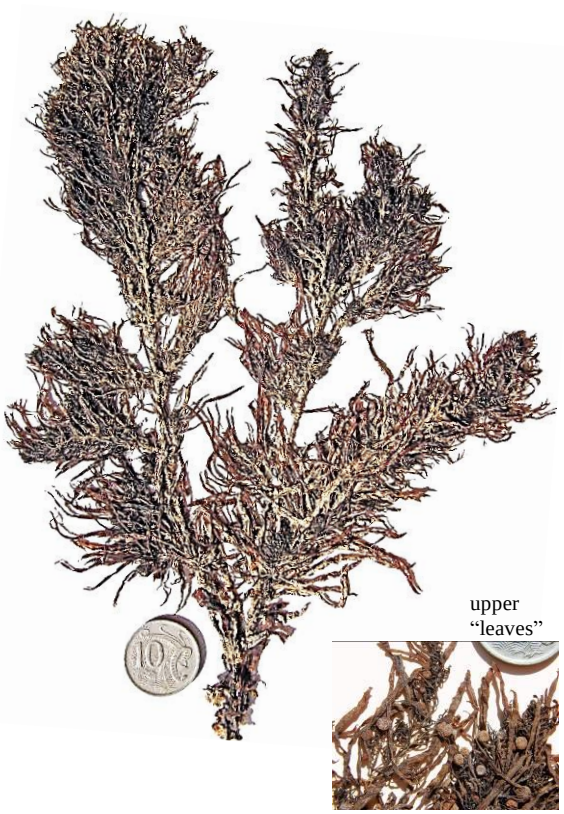


III. SUB-GENUS: SARGASSUM

lower "leaves" narrow about the same size as upper ones.
Axes angular or cylindrical but not 3-sided

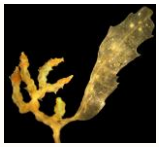


S. distichum

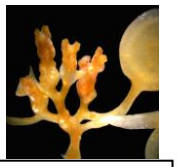


S. linearifolium


upper "leaves"



species difficult to separate without fertile branches (receptacles), see above



S. podocanthum

S. spinuligerum

LIST OF SPECIES WITH RECENT NAME CHANGES, INCLUDING AUTHORS

species in the key	page /s	name in Algaebase, if different
Sargassum decipiens (R Brown *ex* Turner) J Agardh	2, 11	*Phyllotricha decipiens* (R Brown *ex* TurnerR R M Dixon & Huisman
Sargassum decurrens (R Brown *ex* Turner) C Agardh	2, 10	*Sargassopsis decurrens* (R Brown *ex* Turner) Trevisan
Sargassum distichum Sonder	7, 14	
Sargassum fallax Sonder	6, 12	
Sargassum heteromorphum J Agardh	3, 10	*Sargassopsis heteromorpha* (J Agardh) R R M Dixon & Huisman
Sargassum kendrickii (N A Goldberg & Huisman)	3, 10	*Sargassopsis kendrickii* (N A Goldberg & Huisman) R R M Dixon & Huisman
Sargassum lacerifolium (Turner) C Agardh	5, 12	
Sargassum linearifolium (Turner) C Agardh	7, 14	
Sargassum podacanthum Sonder	8, 14	
Sargassum paradoxum (R Brown *ex* Turner) Gaillon	5, 12	
Sargassum sonderi (J Agardh) J Agardh	4, 10	*Phyllotricha sonderi* (J.Agardh)) R R M Dixon & Huisman
Sargassum spinuligerum Sonder	8, 14	
Sargassum tristichum Sonder	6, 13	
Sargassum varians Sonder	4, 11	*Phyllotricha varians* (Sonder)) R R M Dixon & Huisman
Sargassum verruculosum C Agardh	3, 11	*Phyllotricha verruculosa* (C Agardh) R R M Dixon & Huisman
Sargassum vestitum (R, Brown *ex* Turner) C. Agardh	6, 13	

Basal leaves of *Sargassum* in the upper sublittoral at Second Valley, SA