

PICTURED KEY TO THE SOUTHERN AUSTRALIAN SPECIES OF *SARGASSUM* 2nd Ed.

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. They can be used by ecologists to determine the health of ecosystems.

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

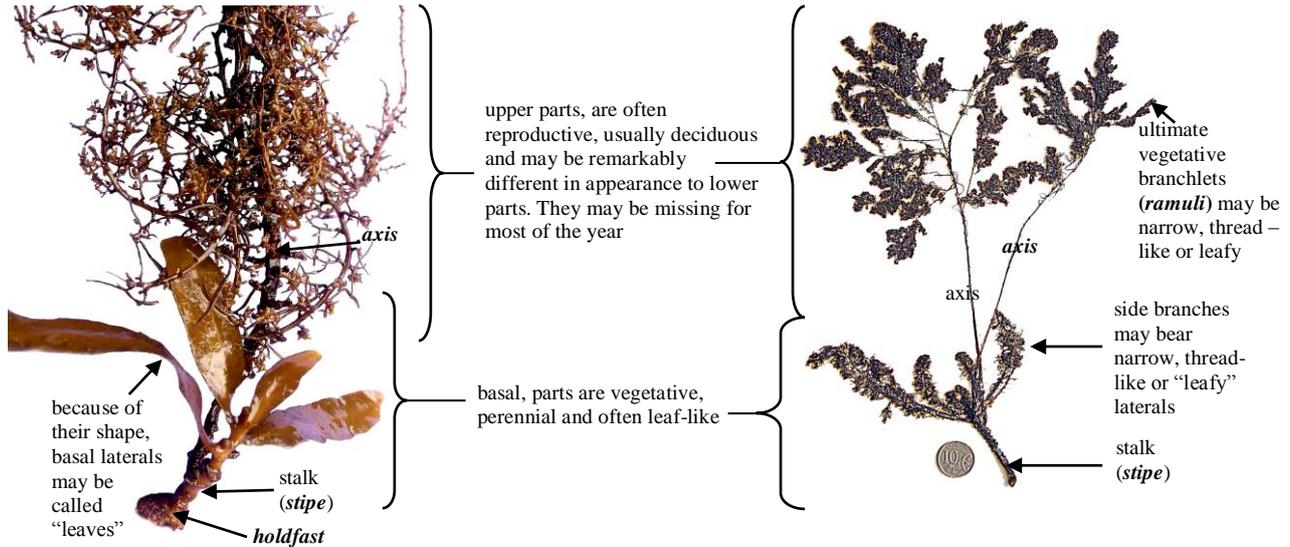
Using DNA differences for 3 different gene sources *Dixon *et al* have been able to reclassify Australian species in the Family: Sargassaceae. The key below, however, retains the names found in Womersley's Marine Flora so that information about identification based on shape and structure can be found more easily. New combinations of names are placed in brackets.

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 darken in colour.

BASIC SHAPES (MORPHOLOGY) OF *SARGASSUM*

Whole plants



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"

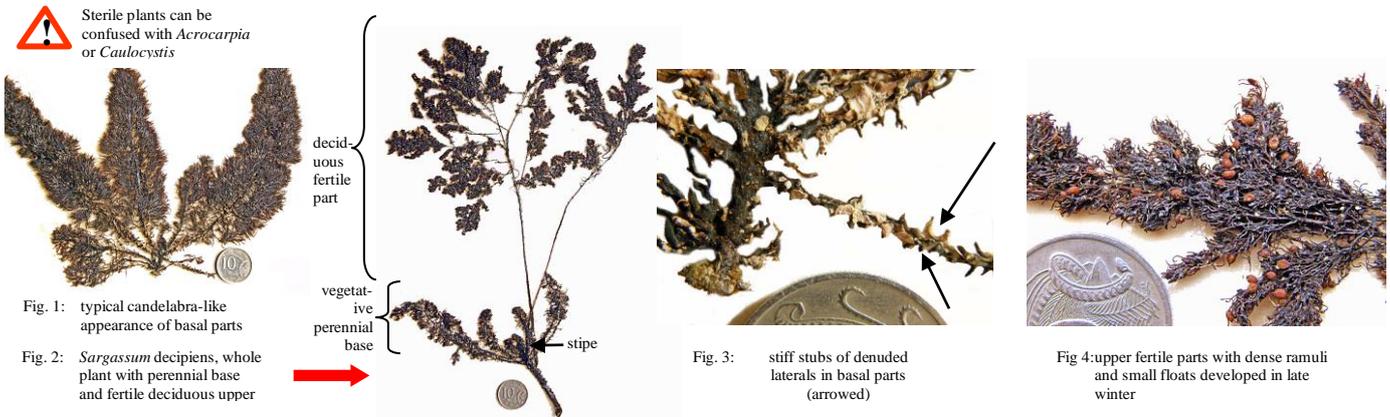


thread-like and obscurely divided laterals

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

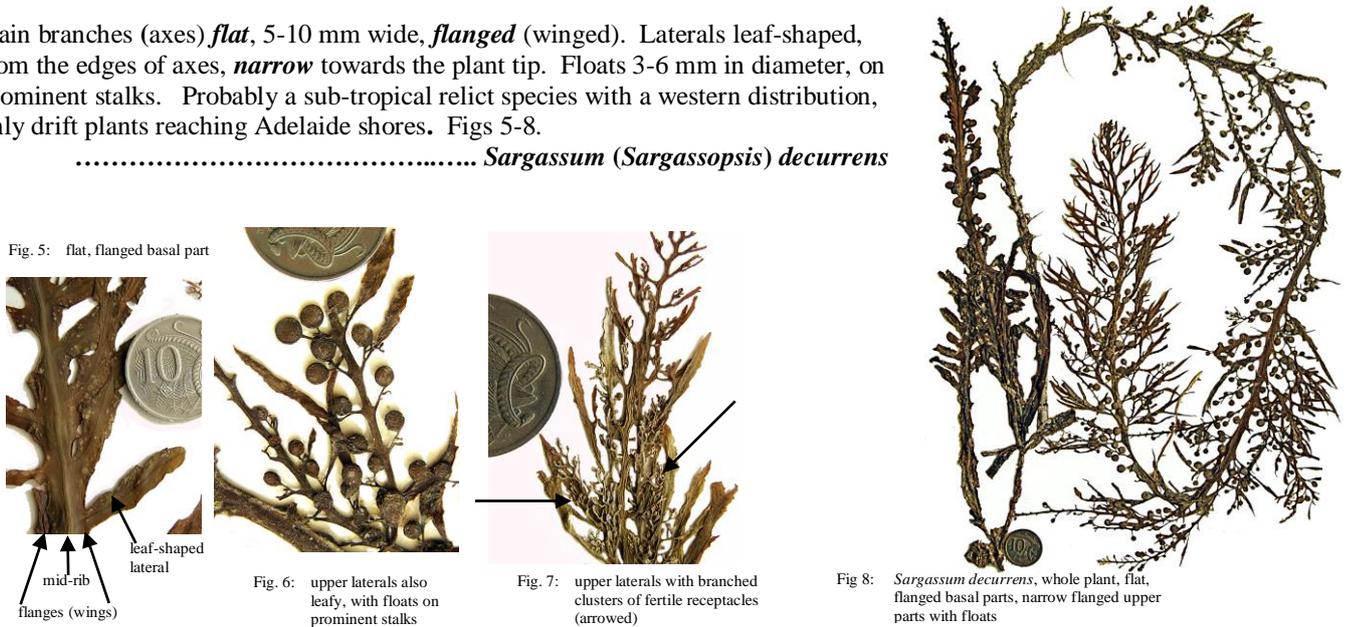
KEY TO SARGASSUM SPECIES BASED ON SUPERFICIAL FEATURES

- 1a.** the upper reproductive part of plants is 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*



- 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*



- 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*



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*



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



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)

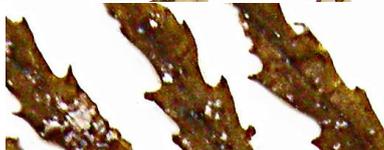


Fig. 17: enlargement of marginal serrations (left)



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)

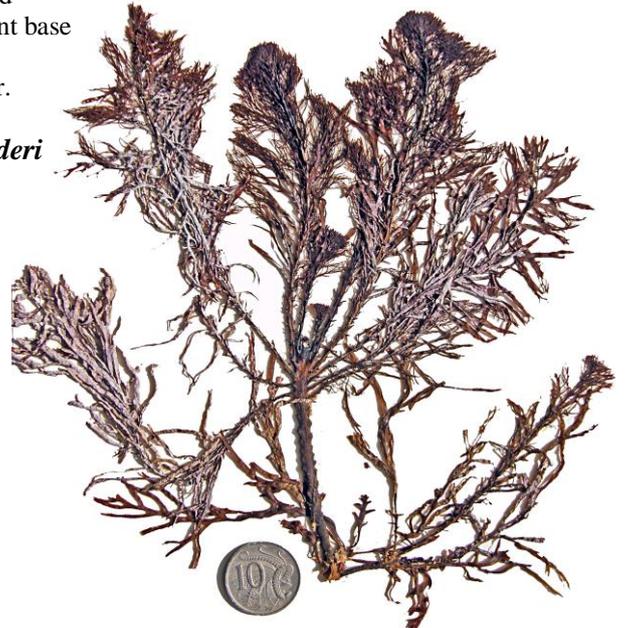


Fig. 22: *Sargassum sonderi*, whole plant, compressed, stiff, knobbly axis; divided basal laterals grading to hair-like ramuli near the plant tip

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*



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***

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*



Fig. 35: flat, undivided, spineless basal "leaves" (above)



Fig. 36: 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*



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"



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



Fig. 45: *Sargassum tristichum*, whole plant

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

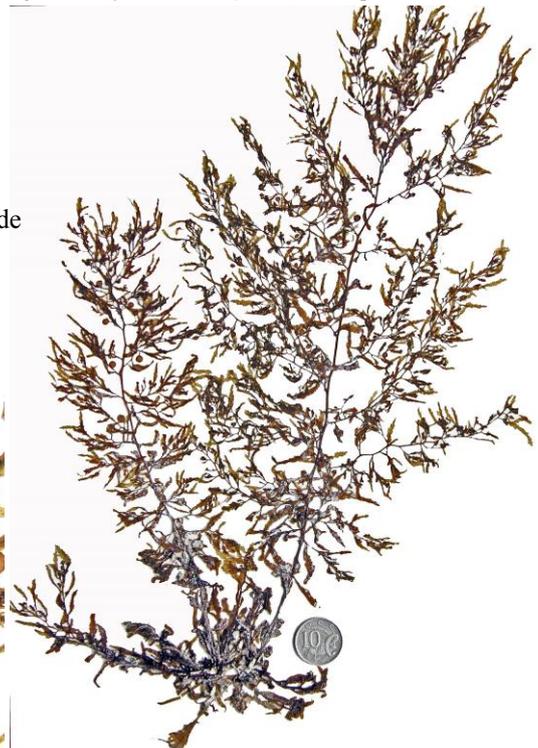


Fig. 52: *Sargassum distichum*, whole plant

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: cluster of warty, dried, fertile branchlets (receptacles) (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, but possess several *large* spines.

Figs 57-59. *Sargassum podacanthum*



Fig. 57: upper leaves distinctly serrated



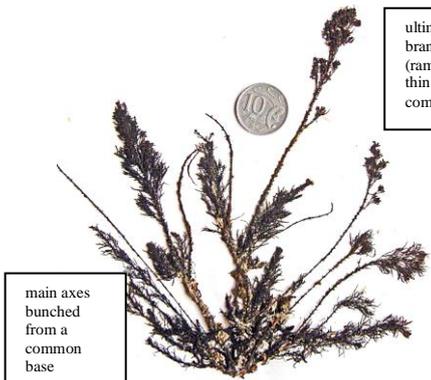
Fig. 58: preserved (bleached) fertile branchlets (receptacles), several large spines (arrowed)



Fig. 59: *Sargassum podacanthum*, whole plant

SARGASSUM LOOK-ALIKES

Cystoseira (Sirophysalis) trinodis



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



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

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






Caulocystis uvifera — floats spherical*

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

***Caulocystis* — floats attach directly to the main axis**

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



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 leaf parts; stubs of side branches often point downwards and give the axis a zigzag appearance; terminal thread absent on floats**






fertile branches (receptacles) with bumps (conceptacles)