Records of Marine Algae from South-Eastern Queensland. IV. Caulerpa.

BY
A. B. CRIBB, M.Sc.
Department of Botany
University of Queensland

THE UNIVERSITY OF QUEENSLAND PRESS
BRISBANE
23rd APRIL, 1958
The fronds vary from broadly elliptic to ligulate, 0.5 — 4 (8) cm. long, 1.5 — 4 mm. diam., sessile to distinctly stalked, simple, forked or proliferated, with the margins smooth or more rarely with regularly or irregularly placed small mucronate teeth.

The separation of \textit{C. parvifolia} Harv., from \textit{C. brachypus} rests on the smaller size, thinner rhizome, and more linear blade of the former. However, in view of the variation found in southern Queensland plants, and the recognized variability of \textit{C. brachypus}, the elevation to specific rank of the taxon usually designated as \textit{C. parvifolia} is regarded as unwarranted, and it is here regarded as a form of \textit{C. brachypus}. \textit{C. simplex} Leving (1938) from South Africa is doubtfully distinct from this form.
Hab.: Usually growing amongst other algae in sublittoral fringe and in pools on semi-exposed and exposed rocky shores.

_Austr. distr._: Qd. (Pt. Lookout—Mrs. G. Y. McKeon, Caloundra, Noosa Heads, Heron Is.), N.S.W. (Kiama, Byron Bay).

_EXTRA-Austr. distr._: Japan, Malayan Arch.

_Caulerpa serrulata_ (Forssk.) J. Ag. emend. Boerg. var. _boryana_ (J. Ag.) Gilbert.

Gilbert 1942, p. 15; Taylor 1950, p. 59, pl. 30, fig. 2.

_C. freycinetii_ C. Ag. var. _de Boryana_ Weber-van Bosse 1898, p. 315, pl. 25, fig. 10-11.

Hab.: Lower littoral sandy pools and upper sublittoral.

_Austr. distr._: Qd. (Elliott Hds.—Mrs. G. Y. McKeon, Redcliffe Is. near Mackay).

_EXTRA-Austr. distr._: Red Sea, Guadeloupe, Malayan Arch., Bikini.

_Caulerpa cupressoides_ (Vahl.) C. Ag. var. _lycopodium_ (J. Ag.) W.-v. Bosse

Weber-van Bosse 1898, p. 335, pl. 27, fig. 9-14, pl. 28, fig. 10-12.

Hab.: In sandy lower littoral shallow lagoon.

_Austr. distr._: Qd. (Wellington Pt., C. Gloucester—Lucas 1931, Dunk Is.—Lucas 1931).

_EXTRA-Austr. distr._: Widely distributed in warm seas.

_Caulerpa serrularioides_ (Gmelin) Howe

Howe 1905, p. 576; Svedelius 1906, p. 114, fig. 7-10; Boergesen 1913, p. 133, fig. 106; Taylor 1928, p. 103, pl. 12, fig. 5; Eubank 1946, p. 417, fig. 2, d, e; Dawson 1956, p. 38, fig. 22.

_C. plumaria_ (Forssk.) C. Agardh 1822, p. 436; Weber-van Bosse 1898, p. 294, pl. 24, fig. 4-6, 10.

Hab.: Upper sublittoral or in lower littoral rock pools on sheltered to semi-exposed shores.

_Austr. distr._: Qd. (Elliott Hds.—Mrs. G. Y. McKeon, Tannum near Gladstone, Brampton Is.—V. May 1951, Low Is.).

_EXTRA-Austr. distr._: Widely distributed in warm seas.

_Caulerpa taxifolia_ (Vahl) C. Ag.

Pl. 1, fig. 8-11; pl. 2, fig. 1-5.

C. Agardh 1822, p. 435; Weber-van Bosse 1898, p. 292; Svedelius 1906, p. 112; Boergesen 1913, p. 131, fig. 104-105; Yamada 1934, p. 67, fig. 36-37; Eubank 1946, p. 417, fig. 2 f, g.

_C. crassifolia_ (C. Ag.) J. Agardh 1872, p. 13; Howe 1905, p. 574; Svedelius 1906, p. 109; Vickers 1908, pl. 40; Boergesen 1913, p. 130 fig. 102-103; Taylor 1928, p. 96, pl. 12, fig. 10, 21; Rayss 1941, p. 112, fig. 5-9.

_C. pinnata_ (L.) Weber-van Bosse 1898, p. 289, pl. 24, fig. 1-3.

_Caulerpa taxifolia_ and _C. crassifolia_ appear to have been distinguished mainly on the nature of the pinnules, those of _C. taxifolia_ being narrow and typically contracted at the base, while those of _C. crassifolia_ are generally broader, more
strongly compressed, and not contracted at the base except in the forma **mexicana** (Sond.) J. Ag.

Eubank (1946) suggested that the two may be cospecific, and from an examination of Queensland specimens I find myself of the same view. Further weight is lent to this view by the fact that specimens of the one collection from Caloundra sent to Professor W. R. Taylor and the late Professor F. Boergesen, both acknowledged authorities on tropical algae, were assigned by each to a different one of these two species.

As Svedelius (1906) has emphasised, "to point out a link . . . . between two otherwise well distinct forms does not necessarily prove that these extreme forms belong to the same species". However, here there seems to be not merely an occasional intermediate form, but a large number of plants intermediate between the two "species". In addition to evidence from the Queensland plants there are several generally accepted records of specimens which it seems might be placed by one author in **C. taxifolia** and by another in **C. crassifolia**. For instance, there seems to be little difference, apart from gross size, between the **C. taxifolia** of Yamada (1934) and the **C. crassifolia** f. **mexicana** of Taylor (1928); the **C. taxifolia** of Boergesen (1913), with pinnules apparently not contracted at the base, seems to differ only slightly from the **C. pinnata** f. **pectinata** (i.e. **C. crassifolia**) in pl. 24, fig. 3 of Weber-van Bosse (1898); **C. taxifolia** var. **asplenioidees** in Pl. 178 of Harvey (1860) seems to be distinguished from **C. crassifolia** var. **mexicana** in pl. 40, fig. 4 of Vickers (1908) by the often distinct contraction of the pinnule base; such contraction, however, is claimed by Weber-van Bosse (1890) and by Taylor (1928) to be characteristic of **C. crassifolia** f. **mexicana**.

Two apparently distinct forms of the species occur on the south Queensland coast, a small one (designated for the present as **form a**) from exposed or semi-exposed rocky shores and pools, and a larger one (**form b**) rooting in sand-mud in bay or estuarine localities.

Plants of **form a** have fronds mostly (1) 2-6 (11) cm. high and (2) 3-4 (5) mm. diam. The pinnules vary from distinctly to not at all contracted at the base, from almost straight to strongly sickle-shaped, from more or less rounded to distinctly mucronate at the apex, and from 250-700 μ in diameter. Plants with the narrowest pinnules approach **C. sertularioidees** while in the broader forms the pinnules may be only about 3 diam. long and similar to **C. crassifolia** f. **mexicana**.

The larger plants (**form b**) from bay and estuarine localities have fronds usually 6-25 cm. long, 1-1.5 cm. diam. with pinnules 750-1250 μ broad. As in **form a** there is considerable variation in the pinnules as regards length in proportion to breadth and degree of contraction at the base. In general, the pinnules are more widely spaced than in **form a**, being separated usually by a distance equal to \( \frac{1}{2} \) the diameter of the pinnule.

**Austr. distr.**: Qd. (Queensland generally in one form or another. **Form a**:- Pt. Lookout—Mrs. G. Y. McKeon, Caloundra, Noosa Heads. **Form b**:- Moreton Bay, Nerang R. estuary).

**Extra-Austr. distr.**: Very widely distributed in warm seas.

**Caulerpa racemosa** (Forssk.) J. Ag. var. **clavifera** (Turn.) W.-v. Bosse.

Weber-van Bosse 1898, p. 361, pl. 33, fig. 1-4.

The name is used here in the sense of Weber-van Bosse (1898) except that
the f. *microphysa* W.–v. Bosse, which Feldmann (1955) has shown to be a distinct species, is excluded.

Though very common in northern Queensland, this variety is rare in south Queensland where it is known at present by only a single collection from Caloundra.

**Hab.**: In S. Qd. in lower littoral pool on exposed shore.

**Austr. distr.**: Qd. (Caloundra, Heron Is., Bowen—Lucas 1931, Low. Is.).

**Extra-Austr. distr.**: Widely distributed in warm seas.

*Caulerpa racemosa* (Forssk.) J. Ag. var. *laetevirens* (Mont.) W.–v. Bosse

Pl. 3, fig. 1-7.

Weber-van Bosse 1898, p. 366, pl. 33, fig. 8, 16-22; Boergesen 1913, p. 147, fig. 125; Taylor 1950, p. 64.

*C. laetevirens* Montagne 1845, p. 16; Svedelius 1906, p. 124, fig. 19-22.

*C. cylindracea* Sonder 1845, p. 50; Harvey 1858, pl. 30

The population on the south Queensland coast assigned to var. *laetevirens* is a very variable one. The majority of plants agree well with previous descriptions and figures of specimens of that variety, having the cylindric to cylindroclavate ramuli imbricate and arranged in several rows. However, there are also numerous plants (Pl. 3, fig. 3-5) which show, in whole or in part, fronds with ramuli either opposite or alternate in only two rows. Some of these collections might reasonably be assigned to the var. *corynephora* (Mont.) W.–v. Bosse. In two of them (Pl. 3, fig. 6-7) at least some of the erect axes are either naked or provided with only scattered ramuli, and such plants approach the var. *lamourouxii* (Turn.) W.–v. Bosse and var. *gracilis* (Zan.) W.–v. Bosse. This serves to emphasise the statement of Eubank (1946), that “the boundaries which delimit certain “species” of *Caulerpa*, and the categories within such species, are undefinable at present”.

**Hab.**: Rooting in sand, or on rocks amongst other algae, in sheltered and semi-exposed positions.

**Austr. distr.**: Qd. (Redcliffe, Scarborough, Dunwich, Noosa Heads, Tannum near Gladstone, Ball B. near Mackay, Brampton Is.—V. May 1951, P. Denison—Lucas 1931); W. Aust.

**Extra-Austr. distr.**: Ceylon, Malayan Arch., Philippines, Bikini, West Indies.

*Caulerpa racemosa* (Forssk.) J. Ag. var. *peltata* (Lamx.) Eubank Pl. 4, fig. 5.

Eubank 1946, p. 421, fig. 2, r, s.

*C. peltata* Lamouroux 1809, p. 145, pl. 3, fig. 2; Weber-van Bosse 1898, p. 373, pl. 31, fig. 9, 10, 11, pl. 32, fig. 8, 9; Taylor 1928, p. 100, pl. 12. fig. 9, 13, fig. 13; Boergesen 1925, p. 112, fig. 47, 48.

The ramular discs are without marginal dentation, though occasionally undulate. They proliferate usually from the margin, rarely from the centre of the disc.

**Hab.**: Sub-littoral fringe and lower littoral pools on exposed and semi-exposed rocky shores.
Austr. distr.: Qd. (Miami, Pt. Lookout—M. Pulley, Caloundra, Heron Is., Low Is.); N.S.W. (Fingal).

Extra-Austr. distr.: Widely distributed in warm seas.

_Caulerpa lentillifera_ J. Ag. Pl. 4, fig. 1-4; pl. 5, fig. 1-17.

J. Agardh 1837, p. 173; 1872, p. 142; Weber-van Bosse 1898, p. 380, pl. 34, fig. 1, 2; Eubank 1946, p. 418, fig. 2, k, l; Taylor 1950, p. 67.

Under this name there are recorded here three populations which at present appear to be distinguishable but which may be found eventually to be connected by intermediates. The plants are not at present assigned to named varieties or forms since authentic specimens of _C. lentillifera_ are not available to me, and since the limits of the closely related species within the Pedicellatae of J. Agardh are not entirely clear.

**Form a** (Pl. 4, fig. 1; pl. 5, fig. 1-7).

These specimens show characters somewhat intermediate between those recorded by Weber-van Bosse (1898) for _C. lentillifera_, essentially a tropical species, and _C. papillosa_ J. Ag. from the southern region of Australia.

_C. lentillifera_ is reported to have vesicles in ± 8-10 rows, with a diam. of 1.25-1.5 mm. and 2-3 times the height of the cylindric or subconic pedicel. _C. papillosa_ is reported to have vesicles in 12, 16 or more rows, smaller than those of _C. agardhii_ (which W.-v. Bosse gives as .75 mm. diam.), and with a diameter 1-2 times the height of the oblong or elliptic pedicel.

In the southern Queensland plants the fronds are 2-18 cm. long, simple or branched, with the vesicles either regularly or irregularly in 9-12 rows, mostly .65-1 mm. diam., generally globose or subglobose near the base of the frond but usually subpyriform or subovoid above. In the lower part of the frond the pedicel is mostly cylindro-conic and with a length of $\frac{1}{3}$- $\frac{2}{3}$ the vesicle diam.; above it is cylindro-conic to cylindro-ellipsoid with a length of usually $\frac{1}{4}$-1 times the diam. of the vesicle.

It is here considered that the affinities of the plants lie more with _C. lentillifera_ than with _C. papillosa_ which is possibly to be regarded as a variety of _C. lentillifera_.

May (1951) records _C. papillosa_ from Brampton Is. off the Queensland coast. I have not seen the specimen on which this record is based, and it may prove to be similar to the plants recorded here.

_Hab._: Lower littoral shallow lagoons or pools in sand-mud flats.

Austr. distr.: Qd. (Wellington Pt., Redcliffe Is. near Mackay).

**Form b** (Pl. 4, fig. 13; pl. 5, fig. 8-11).

The fronds are simple or branched, to 14 cm. high, bearing 6-8 usually regular, sometimes irregular, rows of globose to obovoid vesicles 1-2 mm. in diam. The vesicle wall varies from very membranous to rather rigid. The vesicles are borne on a subhemispheric to subconic pedicel with a length of usually $\frac{1}{4}$-$\frac{1}{2}$ the diameter of the vesicle.

This form may be assignable to _C. kilneri_ J. Ag. (_C. lentillifera_ var. _Kilneri_ (J. Ag.) W.-v. Bosse 1898), a comparatively little-known species described from Whitsunday Island off the north Queensland coast. From Weber-van Bosse's
account it seems to be distinguished from *C. lentillifera* mainly by its vesicle pedicels which tend towards conic rather than towards subcylindric as in *C. lentillifera*. If this *form b* is to be identified with *C. kilneri* then that species cannot be maintained as more than a variety or form of *C. lentillifera*.

In their often subhemispheric pedicels the plants of *form b* show some affinity with *C. agardhii* Weber-van Bosse, described also from a north Queensland specimen, but seem to differ from that species, at least as reported by Weber-van Bosse from the single collection, by their larger vesicles (.7 mm. diam. in *C. agardhii*) arranged in fewer rows (about 12 in *C. agardhii*).

This form also shows considerable resemblance to *C. vesiculifera* Harvey (1863) (Syn. *C. ethelae* Weber-van Bosse 1898, see Womersley 1956) which has a low conical vesicle pedicel, and it is difficult to see on what grounds Weber-van Bosse maintains both *C. kilneri* and *C. vesiculifera* as distinct species. From her account, the only difference appears to be that *C. vesiculifera* has a slightly shorter pedicel and that its vesicles often tend to be oblong while those of *C. kilneri* are subglobose to ovoid.

*Hab.*: Mainly on semi-exposed rocky shores in sublittoral fringe and particularly in lower littoral rock pools.

*Austr. distr.*: Qd. (Caloundra, Noosa Heads, Ball Bay near Mackay).

*Form c* (Pl. 4, fig. 4; pl. 5, fig. 12-17.)

The erect fronds to 4 cm. high are simple or branched. The vesicles are similar in size to those of *form b*, being .9-1.8 mm. diam., but are rather irregularly arranged in approximately 6-8 rows. The pedicel shape is somewhat intermediate between that of *form a* and *form b* being conic to cylindro-conic, or rarely sub-ellipsoid near the apex of the frond.

*Hab.*: On dead coral, upper sublittoral.

*Austr. distr.*: Qd. (Heron Is.).


**Acknowledgments**

The author is indebted to his wife, to Professor D. A. Herbert, Department of Botany, University of Queensland, and to Dr. S. T. Blake, Queensland Herbarium, for reading the manuscript and making a number of suggestions for improvement.

**References**


PLATE 1.

Fig. 1-7: Caulerpa brachypus f. parvifolia, x 6.
Fig. 8-11: Caulerpa taxifolia, x 4. Form b from bay and estuarine habitats.
PLATE 2.
Fig. 1-5: Caulerpa taxifolia, x 14. Form a from exposed and semi-exposed rocky shore.
PLATE 3.

Fig. 1-7: Caulerpa racemosa var. laevigata, x 6.
PLATE 4.

Fig. 1 - 4: *Caulerpa lentillifera*; fig 1, form a, x 6; fig. 2 - 3, form b, x 6; fig. 4, form c, x 3.
Fig. 5: *Caulerpa racemosa* var. *pellata*, x 3.
PLATE 5.
Fig. 1-17: Caulerpa lentillifera; fig. 1-7, form a x 23; fig. 8-11, form b, x 23; fig. 12-17, form c, x 15.