

## New Marine Chlorophyta from Southern Australia

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THE SPECIES DESCRIBED herein were collected during the making of a survey of the marine Chlorophyta of southern Australia (from southwest Western Australia to eastern Victoria, including Tasmania). An account of all the known species of this region will be published separately. The marine green algae of southern Australia are far from completely known. In addition to these new species, a number of others which are probably undescribed are known to the writer, but material or knowledge of these is inadequate for publication.

Certain of these new species are of interest in showing the occurrence of what are more typically tropical or subtropical genera in southern Australia where the algal flora has warm temperate affinities, which become cold temperate on Victorian and Tasmanian coasts. Two species each of *Chlorodesmis* and *Cladophoropsis*, and *Dasycladus densus* are representatives of subtropical genera.

Abbreviations of herbaria mentioned in the following text are as follows: University of Adelaide (AD), Melbourne National Herbarium (MEL).

### Order SIPHONALES

#### Family BRYOPSIDACEAE

##### *Bryopsis minor* n. sp.

Fig. 1

Fronds to 2 cm. high, tufted, much branched on all sides with numerous primary and secondary axes 150–350  $\mu$  thick, sometimes

naked near the base, attached by rhizoidal processes. Branchlets slender, almost linear, to 3 mm. long and 12–55  $\mu$  wide, contracted at their base. Older axes without prominent branch scars. Chloroplasts numerous, round, 4–7  $\mu$  across, with a prominent central pyrenoid.

Thallus ad 2 cm. altus, fasciculus, undique ramosi cum multibus primis et secundariis axibus, 150–350  $\mu$  diam. Ramuli tenues, fere lineares, ad 3 mm. long. et 12–55  $\mu$  diam., constricti ad basem. Chloroplasti multi, circuli, 4–7  $\mu$  diam., cum uno medio pyrenoido.

TYPE LOCALITY: On black buoy, American River inlet, Kangaroo Island, South Australia.

TYPE: AD (No. A 4124, H. B. S. Womersley, September 6, 1946).

DISTRIBUTION: Known only from the type locality.

Although the genus *Bryopsis* is in urgent need of monographic revision, based on liquid preserved material and cultural studies, *B. minor* is distinct from all known Australian species of *Bryopsis*, and appears to differ from extra-Australian species. The closest species in form is possibly *B. monoica* Funk (see Hamel 1931: 393) from the Mediterranean.

#### Family CAULERPACEAE

##### *Caulerpa ellistoniae* n. sp.

Fig. 2

Fronds to 25 cm. high. Surculus stout, 2–3 mm. thick, smooth. Stems stout and naked below, irregularly branched. Axis of upper branches compressed, 1–2 mm. wide, bearing distichous rows of ramenta. Ramenta close together, compressed, 4–8 mm. long, about 1 mm. wide, tapering to both base and apex,

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FIG. 1. *Bryopsis minor* n. sp. Habit of branch ( $\times 10$ ).

with the lower edge more or less straight, the upper curved.

Thallus ad 25 cm. altus. Surculus crassus, 2–3 mm. diam., teres. Caules crassi, nudi infra, irregulariter ramosi. Axis ramorum superiorum compressa, 1–2 mm. lata, cum distichis ramentis. Ramenta compressa, 4–8 mm. long., circa 1 mm. lata, fusiformia; labrum inferior plus minus directum, labrum superior flexum.

TYPE LOCALITY: Elliston, on the west coast of Eyre Peninsula, South Australia.

TYPE: AD (No. A 13,426 H. B. S. Womersley, January 13, 1951). Isotypes distributed under this number.

DISTRIBUTION: Known only from the type locality (H. B. S. Womersley, January 13, 1951 and February 14, 1954).

*C. ellistoniae* is most closely related to *C. scalpelliformis*, but differs in having branched erect fronds and in the size and shape of the ramenta. In the former the ramenta are straight on the lower edge and curved on the upper, while the opposite usually occurs in *C. scalpelliformis*.

*C. ellistoniae* has been found only at Elliston in the drift after rough weather, in January, 1951, and February, 1954. It probably grows in deep rock pools on rough reefs.

#### Family CODIACEAE

#### *Chlorodesmis australis* n. sp.

Fig. 3

Thallus to 1.5 cm. high, medium to dark green, in loose tufts. Branching only at the base, with up to 4 dichotomies close together. Filaments constricted immediately above each dichotomy, above linear and simple, 25–45  $\mu$  wide. Cell wall thin, slightly thickened at basal

constrictions. Base somewhat entangled, colourless, attached by short rhizoidal processes. Chloroplasts dense and numerous, round to ovoid, 1.4–2.7  $\mu$  across.

Thallus ad 1.5 cm. altus, viridis aut fusco-viridis, in fasciculis laxis. Rami solum ad basem dichotomi. Filamenta constricta supra omnia dichotoma, supra linearia et simplicia, 25–45  $\mu$  diam. Basis sub-implicata, sine colore, cum rhizoidis. Chloroplasti densi et multi, circuli aut ovati, 1.4–2.7  $\mu$  diam.

TYPE LOCALITY: Robe, South Australia (in pools at rear of rough reefs).

TYPE: AD (No. A 12,250, H. B. S. Womersley, August 28, 1949).

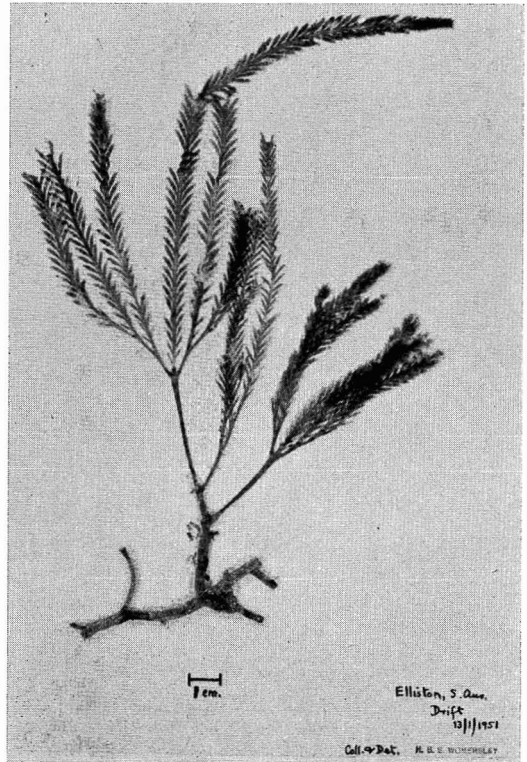


FIG. 2. *Caulerpa ellistoniae* n. sp. Type.

DISTRIBUTION: Known only from the type locality and from Pennington Bay, Kangaroo Island (H. B. S. Womersley, with *Chlorodesmis pusilla*, sub. no. A 7020), in pools at rear of rough reefs, January 1948.

This is a smaller plant with narrower filaments than any other species of *Chlorodesmis* (see Egerod 1952: 377 for the other species). It differs also in having the branching restricted to the basal region with constrictions just above each dichotomy.

*Chlorodesmis pusilla* n. sp.

Fig. 4

Thallus 0.5–1.5 cm. high, densely tufted, dark green, with a base of entangled colourless filaments with rhizoidal processes. Erect branches numerous, sparsely dichotomously or irregularly branched. Filaments 24–50  $\mu$  wide, linear but with undulate walls and usually constrictions shortly above the dichotomies, occasionally elsewhere. Cell wall thin, very slightly thickened at the constrictions. Chloroplasts dense, round to ovoid, 1–2.5  $\mu$  across.

Thallus 0.5–1.5 cm. altus, fasciculus, fuscoviridis, ad basem implicata filamenta sine colore et cum rhizoidibus. Rami erecti et multi, dichotomi aut irregulares. Filamenta 24–50  $\mu$  diam., linearia sed undulata, constricta supra dichotoma.

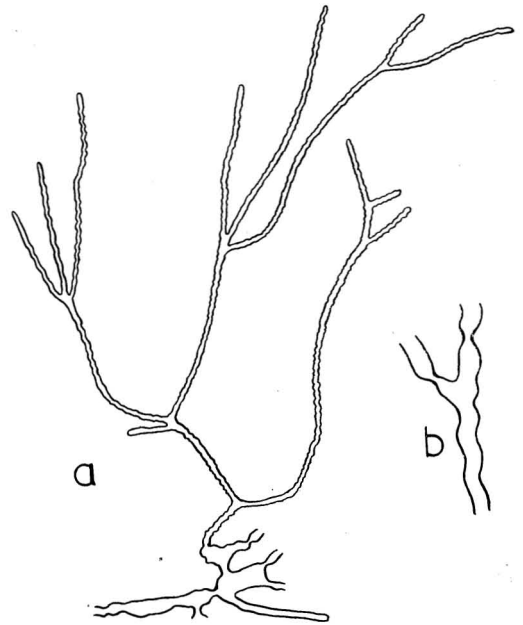


FIG. 4. *Chlorodesmis pusilla* n. sp. a, Plant with erect filaments arising from the rhizoidal base ( $\times 11$ ); b, part of a filament, showing undulating wall and constrictions above branch axil ( $\times 50$ ).

TYPE LOCALITY: Pennington Bay, Kangaroo Island, South Australia (in a shaded, rear pool on a rough reef).

TYPE: AD (No. A 7020, H. B. S. Womersley, January 4, 1948).

DISTRIBUTION: Known only from the type locality and from Vivonne Bay, Kangaroo Island (H. B. S. Womersley, No. A 15,460), in a shaded pool, south side of Ellen Point, August 29, 1950.

This species is similar to *C. australis* but forms more distinct and denser tufts, with branched erect filaments, and the cell walls are undulate.

Børgesen (1925: 77) separated *Pseudochlorodesmis* from *Chlorodesmis* on the lack of true dichotomous branching and the lack of constrictions above the point of branching. Branching which is not truly dichotomous is however found in *C. hildebrandtii* (see Egerod 1952, fig. 9), and *C. pusilla* shows similar branching. The two species here described, *C. pusilla* and *C. australis*, show constrictions

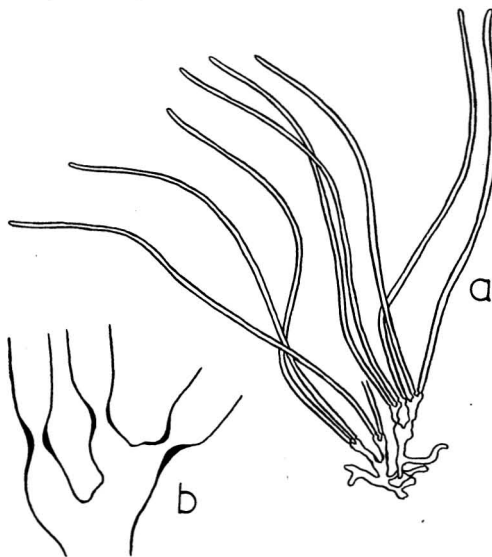


FIG. 3. *Chlorodesmis australis* n. sp. a, Habit of plant ( $\times 11$ ); b, detail of branching, showing constrictions above branch axil ( $\times 150$ ).

above each dichotomy in the basal filaments, and *C. pusilla* usually has constrictions above the upper branch axils. It seems likely that the characters separating *Pseudochlorodesmis* from *Chlorodesmis* may be of subgeneric rather than generic order.

*Pseudocodium australasicum* n. sp.

Figs. 5, 6

Thallus erect, subdichotomously or irregularly branched, to 6 cm. high, branches 1–2 mm. wide, compressed, branching partly (especially when young) in one plane, colour dark green. Holdfast small, of dense, colourless filaments. Thallus composed of a medulla of longitudinal, branched, coenocytic filaments, 13–28  $\mu$  thick, forming at the surface a cortical layer (12–27  $\mu$  wide) of short club-like branches, 4–7  $\mu$  wide, sub-palisade like; surface view of thallus showing ends of cortical branches, round to polygonal, 5–9  $\mu$  across, adhering together. Growth apical, by numerous longitudinal medullary filaments, slenderer than normal medullary filaments. Filaments with numerous nuclei and small discoid chloroplasts, 1–2.5  $\mu$  across.

Thallus erectus, subdichotome aut irregulariter ramosus, ad 6 cm. altus, rami 1–2 mm. lati, compressi; rami partim in una plana, fusco-viridis. Filamenta medullaria ramosa, 13–28  $\mu$  diam. Cortex 12–27  $\mu$  lata brevium, clavatorum ramorum (4–8  $\mu$  diam.)

TYPE LOCALITY: Point Sinclair (east end of Great Australian Bight) South Australia; uppermost sublittoral on a relatively calm reef near the old jetty.

TYPE: AD (No. A 13,618, H. B. S. Womersley, January 25, 1951). Isotypes distributed under this number.

DISTRIBUTION: Known only from the type locality and from a drift specimen about 10 miles east of Eucla, on the South Australian—Western Australian border (AD No. A 19,239, February 3, 1954).

*P. australasicum* is apparently a rare species. A small patch of a number of plants was found at Point Sinclair in January 1951, but

this could not be located in February 1954.

This is the second described species of *Pseudocodium*, the type being *P. devriesii* Weber van Bosse (1896: 209, pl. 1. See also Levring 1938: 14, fig. 7, pl. 4, fig. 10) from South Africa. In general structure and method of growth *P. australasicum* agrees well with *P. devriesii*, but differs in its smaller size and the less well developed layer of cortical palisade-like branch ends. The formation of the cortical layer shows more affinity with *Halimeda*, as noted by Weber van Bosse and Levring for *P. devriesii*, than with *Codium*, to which it is considered allied by Gepp and Gepp (1911: 3).

Order SIPHONOCLADALES

Family SIPHONOCLADACEAE

*Cladophoropsis magnus* n. sp.

Fig. 7

Thallus forming large tangled masses up to 50 cm. across and 7 cm. thick, with the

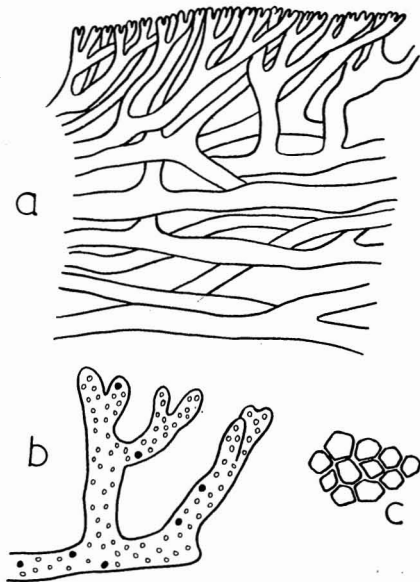


FIG. 5. *Pseudocodium australasicum* n. sp. a, Longitudinal section of thallus ( $\times 280$ ); b, detail of a medullary filament forming short cortical branches, showing nuclei and chloroplasts ( $\times 500$ ); c, surface view of cortical filaments ( $\times 500$ ).

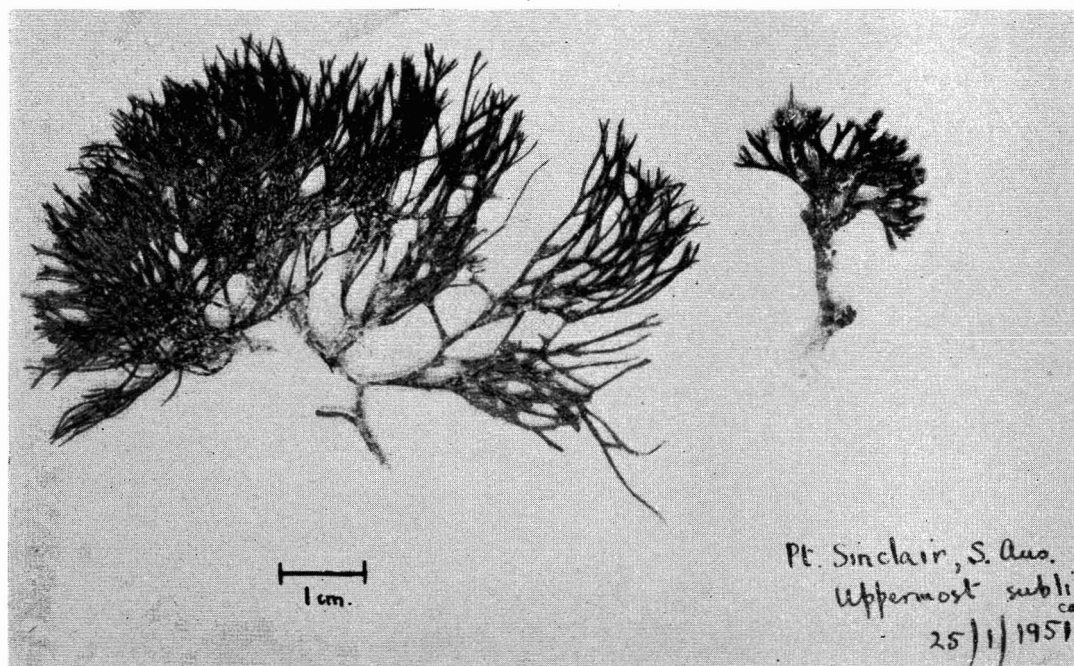


FIG. 6. *Pseudocodium australasicum* n. sp. Type.

filaments mostly erect in the upper part. Individual filaments several cm. long., 500–700  $\mu$  thick with a wall 6–10  $\mu$  thick, usually expanding slightly to a central thickest part from which clustered branches arise, one (rarely two) from each segment of the main filament. Cross septa close together in this branching region, far apart elsewhere. Lateral branches mostly simple, 170–350  $\mu$  wide, emitted from just below a septa, without a basal cross wall. Descending rhizoids absent.

Thallus magnus, ad 50 cm. latus et 7 cm. crassus. Filamenta plures cm. long., 500–700  $\mu$  diam., membrana 6–10  $\mu$  crassa, crassissima media parte cum pluribus ramis, unus ramus (interdum 2) segmento. Rami semper fere simplices, 170–350  $\mu$  diam., orti infra septum, sine septo ad basem. Rhizoides descendens non producentes.

TYPE LOCALITY: Smoky Bay, on the west coast of Eyre Peninsula, South Australia, drift.

TYPE: AD (No. A 13,615, H. B. S. Womersley, January 21, 1951). Isotypes distributed under numbers A 13,615, A 13,616.

DISTRIBUTION: Known only from Smoky and Denial Bays (in MEL), west coast of Eyre Peninsula.

*C. magnus* is one of the largest species of *Cladophoropsis*, especially in the size of the whole thallus. It shows some resemblance to *C. berpestica* (Montagne) Howe, which occurs on exposed coasts of Eyre Peninsula, but differs in its broader filaments, localisation of branching, and absence of descending rhizoids. Specimens in the Melbourne National Herbarium from Denial Bay, under the *nomen nudum* of *Cladophora tietkinsii* Sonder, show that Sonder had recognised this as a distinct species.

*Cladophoropsis bulbosa* n. sp.

Figs. 8, 9

Thallus erect, densely tufted, to 10 cm. high, arising from a matted bulbous base

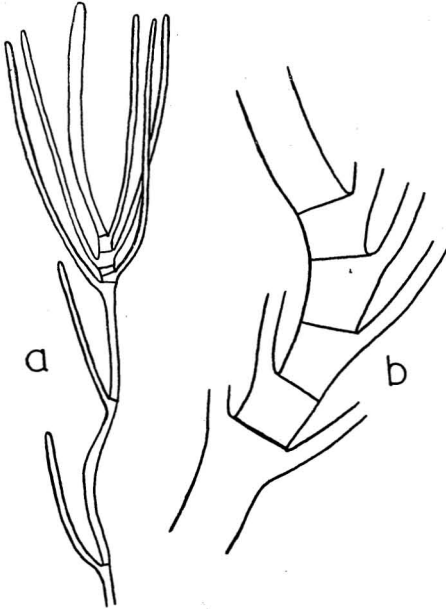


FIG. 7. *Cladophoropsis magnus* n. sp. *a*, A single filament showing branching ( $\times 2.5$ ); *b*, central part of a filament with crowded branches ( $\times 12$ ).

(1–2 cm. high) of entangled rhizoids. Upper filaments sparsely branched, of uniform width throughout, (300–) 400–570  $\mu$  wide; wall lamellate, 6–10  $\mu$  thick; main filaments without septa, lateral filaments with a single septum at their base. Rhizoidal basal filaments irregularly branched, sometimes swollen in places, 60–250  $\mu$  wide, with or without septa at base of branches.

Thallus erectus, fasciculus, ad 10 cm. altus, cum bulbo ad basem rhizoidum implicatorum (1–2 cm. altus). Filamenta interdum ramosa, linearia (300–) 400–570  $\mu$  diam., membrana lamellata, 6–10  $\mu$  crassa; filamenta prima sine septis, filamenta lateralia cum septo ad basem. Rhizoides irregulariter ramosi, interdum tumite, 60–250  $\mu$  lati.

TYPE LOCALITY: Queenscliff, Victoria.

TYPE: MEL (see Fig. 9).

DISTRIBUTION: Known only from the type locality and from Pennington Bay, Kangaroo Island (outer pools on rough reefs, AD No. A 2223, H. B. S. Womersley, January 25,

1944) and drift (AD No. 2818, H. B. S. Womersley, January 28, 1946).

This species had been recognised as distinct by Sonder, but never published. Sonder's specimen (called *Cladophora* (*Aegagropila*) *bulbosa*) (in MEL) is the best seen and is chosen as the type. Apparently it is a rare plant, known from only three collections. The habit and dimensions separate it readily from other described species of *Cladophoropsis*, which are listed by Papenfuss (1950: 211).

## Order DASYCLADALES

### Family DASYCLADACEAE

#### *Dasycladus densus* n. sp.

Figs. 10, 11

Fronds with 1–16 simple, erect axes, arising from a basal holdfast attached by short rhizoidal processes. Axes to 6 cm. high, 2–4 mm. thick, consisting of a central siphon (to 1 mm. broad) with a thick lamellate wall, bearing crowded whorls of branches, 10–12 branches per whorl. Branches with segments of 3 orders; primary segments producing from their apex 4 (3–5) secondary segments, these in turn forming 2 (–3) tertiary segments.

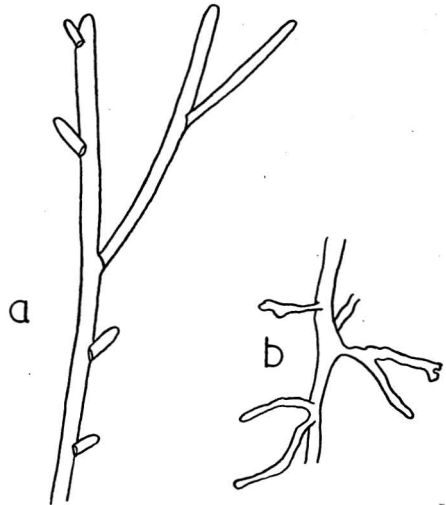


FIG. 8. *Cladophoropsis bulbosa* n. sp. *a*, Upper branch of thallus ( $\times 8$ ); *b*, rhizoidal base of a filament ( $\times 8$ ).

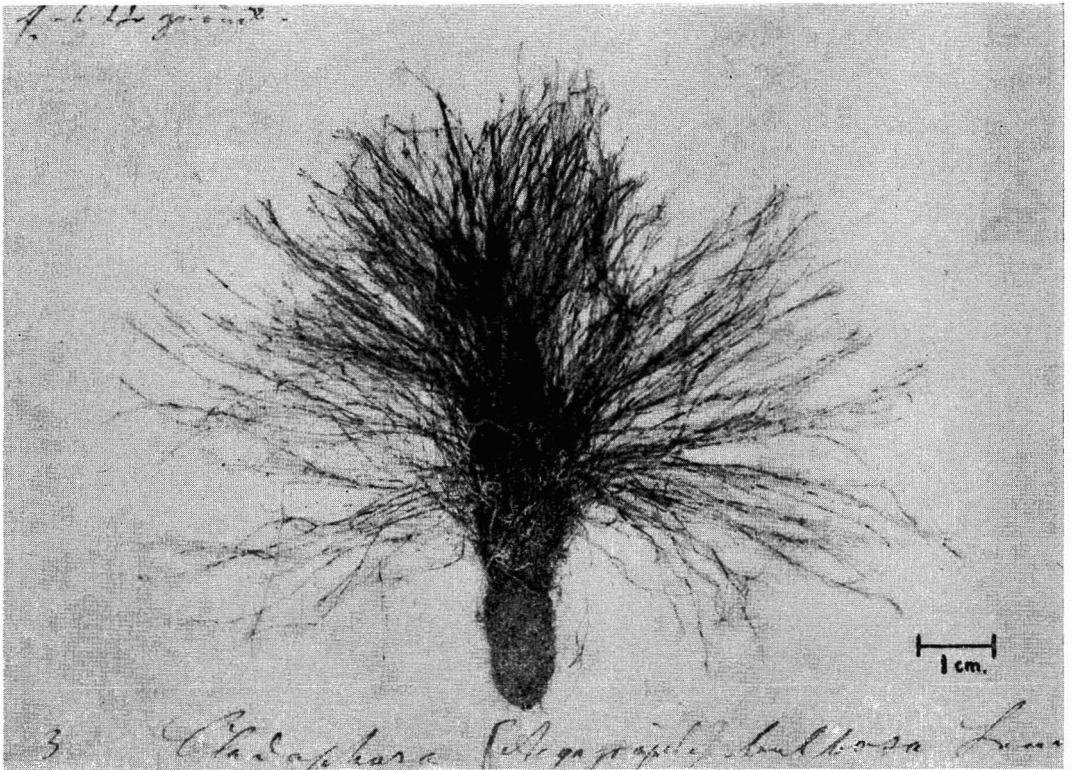


FIG. 9. *Cladophoropsis bulbosa* n. sp. Type.

Primary segments elongate to pyriform, 400–700  $\mu$  long and 200–400  $\mu$  wide, communicating with the axial siphon; secondary segments elongate—linear, 450–560  $\mu$  long and 120–200  $\mu$  wide; tertiary segments clavate, 130–400  $\mu$  long and 100–130  $\mu$  wide; secondary and tertiary segments often lost.

Thallus cum 1–16 simplicibus et erectis axibus, ex haptero ad basem. Axes ad 6 cm. alti, 2–4 mm. lati, compositi siphonis medii (ad 1 mm. diam.), cum membrana crassa lamellata, ferentes densa verticilla 10–12 ramorum. Rami cum segmentis trium ordinum; prima segmenta cum 4 (3–5) secundariis segmentis ad apicem; secundaria segmenta cum 2 (–3) tertiis segmentis. Prima segmenta longa ad pyriformem, 400–700  $\mu$  long.; 200–400  $\mu$  diam.; secundaria segmenta elongata, 450–560  $\mu$  long.; 120–200  $\mu$  diam.; tertia segmenta clavata, 130–400  $\mu$  long., 100–130  $\mu$

diam.; secundaria et tertia segmenta saepe defecta.

TYPE LOCALITY: Point Fowler, in the northeast part of the Great Australian Bight, South Australia. (Uppermost sublittoral in sandy hollows, with weak to moderate wave action.)

TYPE: AD (No. A 19,437, H. B. S. Womersley, February 6, 1954). Isotypes distributed under this number.

DISTRIBUTION: Known only from the type locality.

This is the only species of the typically tropical-subtropical genus *Dasycladus* known from southern Australia. It is closely related to the type species, *D. clavaeformis* (Roth) Agardh from the Mediterranean, Canary Islands and West Indian region, but differs in the size of the branch segments and in the rounded ends to the tertiary segments (the

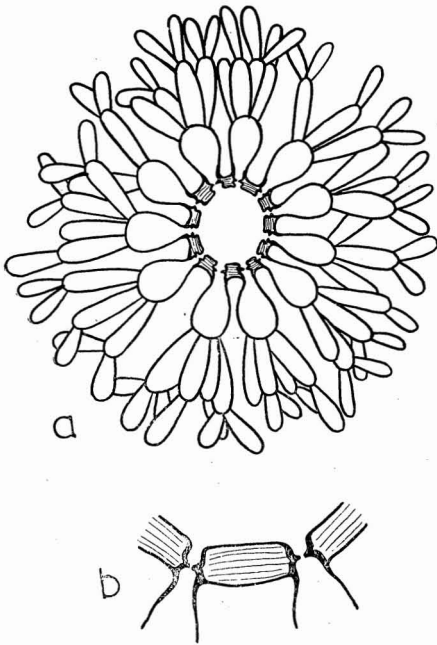


FIG. 10. *Dasycladus densus* n. sp. *a*, Cross section of the thallus showing whorl of branches (some secondary and tertiary segments lost) ( $\times 19$ ); *b*, part of central axis showing connection of primary segments ( $\times 85$ ).

latter being apiculate in *D. clavaeformis*). The reproduction of *D. densus* is at present unknown, but with such similarities in vegetative features there is little doubt that it should be placed in *Dasycladus*.

*Chlorocladus australasicus* Sonder (1871: 35, pl. 5, f. 1-6) from Cape Yorke, northern Australia, was distinguished from *Dasycladus* by the presence of cysts in the sporangia and differences in the branch whorls. The type of this species is in the Melbourne National Herbarium and agrees well with Sonder's figures; however, no cysts are apparent in the sporangia, i.e., in the spherical inflated cells on the ends of the primary segments. Until preserved or fresh specimens can be examined, it seems justified to refer *C. australasicus* to *Dasycladus* as Cramer (1887: 37) has done.

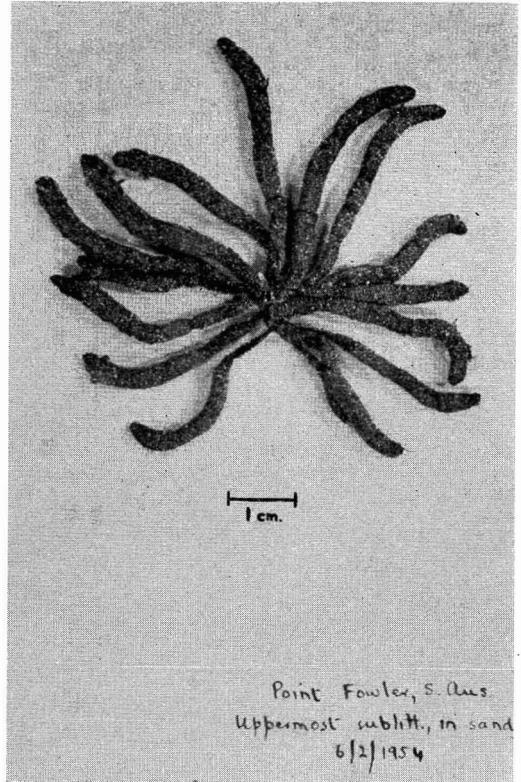


FIG. 11. *Dasycladus densus* n. sp. Type.

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