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A NEW MARINE VAUCHERIA FROM AUSTRALIA

John L. Blum and H. B. S. Womersley

A NEW MARINE VAUCHERIA FROM AUSTRALIA [1]

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OF THE NUMEROUS marine and brackish-water species of *Vaucheria*, only one, *V. dichotoma* (L.) Ag. (May, 1938) has as yet been recorded in the flora of Australia. While vegetative material of other species can be found, the absence of sex organs generally renders it impossible to identify the material precisely. In 1953 and 1954, fruiting material belonging to a species which is as yet unknown elsewhere was collected by H. B. S. Womersley. It is apparently related to *V. litorea* Hofm. and Agardh, which is known from the coasts of northern Europe and the United States. It is smaller in nearly every dimension, however, and has other peculiarities, particularly the absence of a reflexed oogonium, which separates it from that species as well as from the other species of the section Piloboloideae, to which it belongs.

The writers wish to acknowledge their indebtedness to Dr. Tyge Christensen of the University of Copenhagen, who obtained material of *V. litorea* in the field purposely for our study. Without this preserved material, the delimitation of *V. glomerata* sp. nov. would have proven much more difficult and insecure.

VAUCHERIA **glomerata** sp. nov.[2] Vegetative filaments 19.5–50 μ diam., oogonia borne at the ends of non-reflexed branches, the oogonium subtended by an empty cell-like space. Oospore terminal, not filling the oogonium, with a pigmented body of protoplasm present at the base of the oogonium. Antheridia borne at the ends of branches, each subtended by an empty, elongate, cell-like space, with one terminal and one or two lateral cylindrical papillate openings. Oogonia radially symmetrical, 86–131 $\times$ 142–235 μ, oospores spherical to obovate, 85–129 $\times$ 104–157 μ, the wall of the mature oospore rather thick, the pigmented body at the base of the oogonium 21–49 $\times$ 20–45 μ. Antheridia fusiform or cylindric, 18–29 $\times$ 117–208 μ.

Type locality: Port Willunga, St. Vincent's Gulf, South Australia. Type: In Adelaide University Herbarium No. A. 19,793. *H. B. S. Womersley*, 26-IX-1954. Isotypes under the same name have been distributed to the Herbarium of the New York Botanical Garden, University of California at Berkeley, British Museum of Natural History, London, and the University of Lund, Sweden, as well as to the Australian herbaria.

Vaucheria glomerata is known only from the type locality. It forms dark green mats up to 10 cm. across and 2 cm. high. These mats, associated with considerable mud and sand, are found along shaded edges of uppermost sublittoral pools (where they are just exposed at extreme low tide) on the outside edge of the reef between Port Willunga and Aldinga.

COMPARATIVE ACCOUNT OF VAUCHERIA GLOMERATA AND V. LITOREA.—*Oogonial branches.*—There is great uniformity in the length of the oogonial branch in *V. glomerata*, in contrast to the condition in *V. litorea*, which exhibits much variability in this dimension. The upper end of the oogonium of *V. glomerata* is nearly or quite filled by the oospore, which is usually spherical when young. As maturity approaches, the oospore may become distinctly egg-shaped and thick-walled (fig. 2). The wall at maturity consists of three layers, of which the outer is smoother and thinner than the others. The inner surface of the median wall and the outer surface of the inner wall are irregularly roughened, and a space is sometimes visible here (fig. 6). The contents of the mature oospore are usually opaque.

A separate cell 41–72 μ long and similar in position to the "suffultory cell" of the antheridium is formed regularly below the oogonium (fig. 1–4). Figure 5 shows two oogonia which lack this subtending cell.

The presence of a separate protoplasmic mass within the oogonium and below the oospore is a characteristic shared by *V. litorea*, *V. patagonica* Hylmö, and the much smaller *V. glomerata*. In these species, this mass is located a short distance from the oospore. It eventually acquires a thin wall and becomes nearly spherical or short-cylindric. According to Dangeard (1939), who worked on *V. litorea*, it contains a number of degenerating chloroplasts, but no studies have been made of the nuclei of this interesting structure.

Antheridial branches.—The antheridia of *Vaucheria glomerata* are usually borne on special narrow filaments which arise from the larger vegetative filaments in a variety of ways. If the male organs are borne laterally on a vegetative filament, they may be present as a single antheridium (fig. 7, 9) or as a glomerate, cymose cluster of two to four (fig. 7–9). If they are terminal, they may be borne in a somewhat similar cluster, or else in a

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[2] VAUCHERIA **glomerata** sp. nov. Filamenta vegetativa 19.5–50 μ diam., oogoniis apices ramulorum non reflexos occupantibus, per spatium vacuum celluliforme subtendis; oosporis terminalibus, oogonium non plane complentis, cellula chlorophyllosa quoque inculdente partem inferiorem oogonii plane occupante; antheridiis in apice ramulorum sitis, per spatium vacuum elongatum celluliforme subtendis, apice et processibus 1–2 lateralibus cylindricis papillis foecundationis praeditis; oogoniis symmetricalis, 86–131 $\times$ 142–235 μ, oospora globosa ad obovata, 85–129 $\times$ 104–157 μ, membrana oosporae maturae satis crassa, cellula chlorophyllosa antipod. 21–49 $\times$ 20–45 μ, antheridia cylindrica, 18–29 $\times$ 117–208 μ.

Fig. 1–17.—Fig. 1–9., 12–14. *Vaucheria glomerata* sp. nov.—Fig. 1–5. Oogonial branches.—Fig. 6. A small portion of the oospore wall, showing the three layers. The oogonial wall is not shown.—Fig. 7–9, 12. Antheridial branches of cotype material collected September 26, 1954.—Fig. 10, 11. Antheridial branches of material collected November 1, 1953, presumed to be *V. glomerata*.—Fig. 13, 14. Former antheridial branches of cotype material of *V. glomerata*, as they appear after the disintegration and disappearance of the antheridia.—Fig. 15–17. Antheridia of *V. litorea*. ×100.—Fig. 6 ×450; all other figures ×120.

sympodial system with markedly elongated branches.

In 1953, a collection was made at the type locality of material which may or may not belong to *Vaucheria glomerata*, the principal difference between this and the type collection herewith described being in the antheridial plants. In the 1953 collection, the majority of the antheridia are terminal and relatively isolated from each other by the elongation of the antheridial filament below the suffultory cell of each antheridium (fig. 10)—hence resembling the antheridial filaments of *V. litorea* (Christensen, 1952) or of *V. longicaulis* (Taylor, 1952), and none of the glomerate antheridial branches are present. In the type collection, the glomerate branches predominate, and growth of the vegetative filaments of the male plants is essentially monopodial, save for occasional antheridia which are borne sympodially, but more or less in a cluster, at the ends of the filaments (fig. 12). While the branching of the vegetative filament is monopodial in both collections, the antheridial filament which it bears branches only sympodially. Hence there is a pronounced morphological difference between the vegetative filaments and the antheridial filaments, a difference which is accentuated in both collections by an obvious diminution in filament size at the point where a vegetative filament becomes an antheridial filament. This diminution is as evident in the terminal antheridial filaments of the 1953 material (fig. 10, 11) as in the clustered lateral branches of the 1954 material (fig. 7–9). In view of these fundamental similarities in habit of growth, it seems probable that we are dealing here with a single entity, and that the differences between the two collections may be due to some environmental condition.

In the type collection, numerous old antheridial branches which have lost their antheridia are to be seen. Their form is distinctive and has not been observed in other species (fig. 13, 14).

The filaments of *V. glomerata* are normally non-septate as in other species of the genus. Occasionally in filaments which bear oogonial branches (fig. 5), and more commonly in filaments bearing antheridia or antheridial branches, cross-walls are formed which divide the filament into two or more cells joined end to end. The most unusual example of this tendency found was a filament, illustrated in fig. 9, which was divided into ten short cells, many or possibly all of which at one time bore antheridia. At both ends of this series the filament continued on as a typical non-septate coenocyte. Both of the single antheridia borne on this filament lacked a suffultory cell at their bases. In view of this peculiarity, the presence of the unexpected cross walls in the main filament might be explained by the assumption that the division which cut off the antheridium occurred within the main filament, the upper segment of which henceforth represents the suffultory cell in spite of its diameter and its relatively thicker walls. It is noteworthy that septate filaments are also mentioned in the description of *V. patagonica* Hylmö.

Vaucheria litorea, in the Danish collection sent to us by Dr. Christensen, fits the description of Nordstedt (1879) in nearly all details. Our measurements of this material are as follows: veg. diam. 39–93 μ, oogonial diam. 144–220 μ, oogonial length 299–400 μ, oospore 169 $\times$ 142–210 μ, length of the cell subtending the oogonium ca. 52 μ, mass of protoplasm below the oospore 61 $\times$ 71–143 μ, length of oogonial branch 377–1287 μ, antheridia 60–72 $\times$ 637–1521 μ, suffultory cell of the antheridium 32–50 $\times$ 45–52 μ, length of lateral papillae 13–52 μ. The subtending empty cell was found so regularly below the mature oogonium in the Christensen material (fig. 18–21, 25) that the type which appears in Nordstedt's Plate 2, Figure 1 would be distinctly unusual in this material.

Figures 22–25 illustrate successive stages in the development of the oogonial branch in *V. litorea*. The mass of protoplasm formed at the basal end of the oogonium is originally irregular in shape, or fits closely the base of the oogonium in which it is found (fig. 23, 24). Later it becomes rounded or subcylindric, and a thin wall is formed around it (fig. 21, 25). It is highly pigmented and opaque, and lacks the oil which is so abundant in the oospore. In early stages of development, a lenticular fertilization area becomes visible at the distal end of the oogonium (fig. 23, 26). The pore remains faint but persistent (fig. 26), unlike the condition in *V. glomerata* and *V. longicaulis* (Taylor, 1952). The oospore is occasionally somewhat withdrawn from the oogonial wall (fig. 19, 21) in the distal end of the oogonium, again unlike the condition in *V. glomerata*.

The antheridia of *V. litorea* are the largest in the genus, certain of them exceeding 1.5 mm. in the Christensen material. They are usually straight or very slightly curved and possess highly opaque contents. They open by 3–7 pores which are at the ends of conical papillae, in contrast to the cylindrical papillae of *V. glomerata*. One of these pores is regularly terminal. The empty suffultory cell subtending the antheridium is in this material consistently very short, its length approximately equalling its width, whereas in *V. glomerata* its length is usually two to three times its width.

Material of *V. litorea* examined: South Sealand, Denmark, under *Scirpus maritimus* in the northeast corner of the bay Praestø Nor, *T. Christensen* 6388, 10-X-1954.

SUMMARY

Vaucheria glomerata sp. nov., a Piloboloidean species related to *V. litorea*, is described. The new

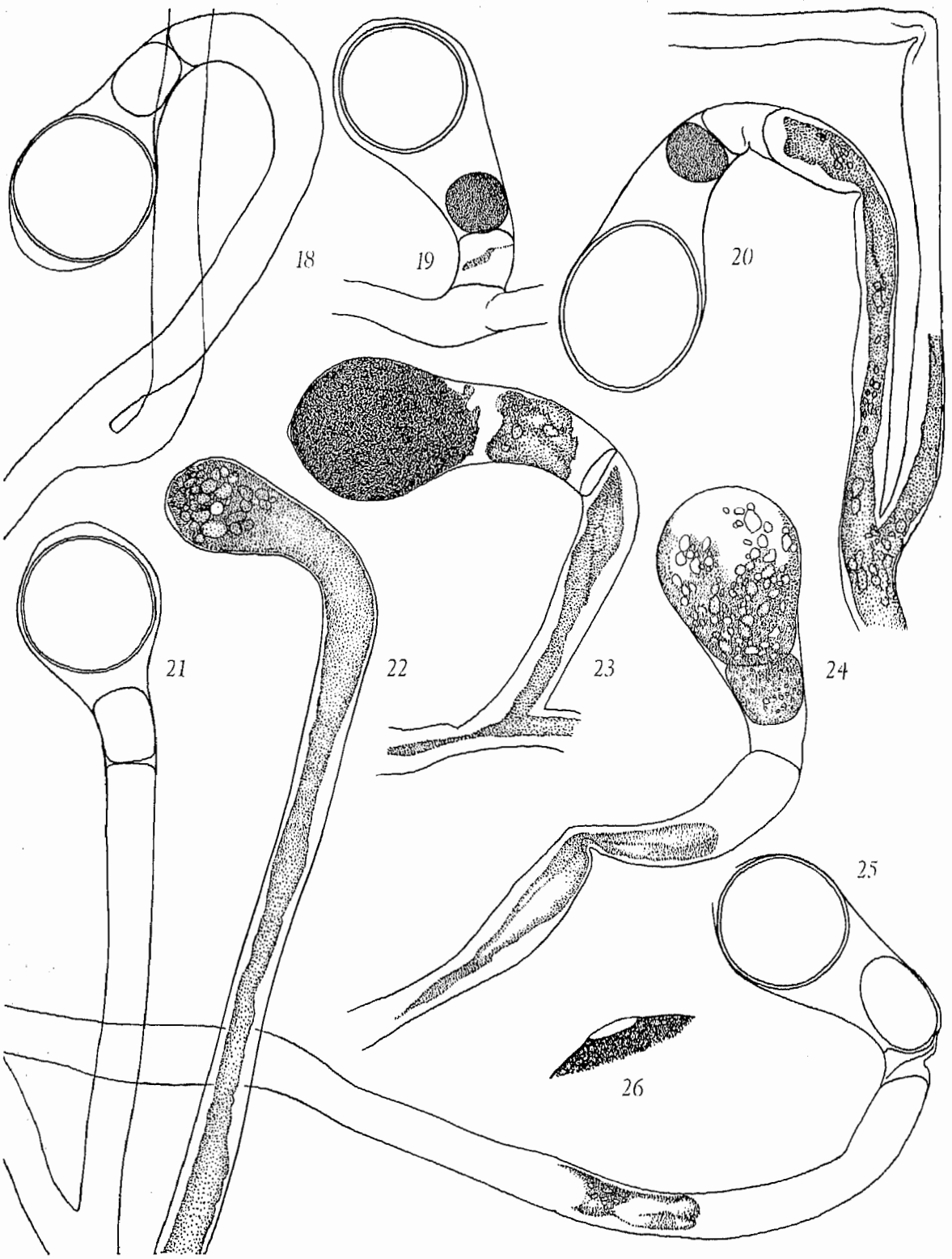

Fig. 18–26. *Vaucheria litorea*.—Fig. 18–25. Oogonial branches. ×120.—Fig. 18–21, 25. Mature oogonia with oospores. —Fig. 22–25. Different successive stages in oogonial development.—Fig. 26. Fertilization pore of the oogonium shown in fig. 23, ×600.

species is remarkable in possessing antheridia which are borne in glomerate clusters. A comparative study of a Danish collection of *V. litorea* was undertaken as an aid in the delimitation of *V. glomerata*, and notes are presented on *V. litorea*.

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New Marine Chlorophyta from Southern Australia

H. B. S. WOMERSLEY[1]

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

Thallus ad 2 cm. altus, fasciculus, undique ramosi cum multibus primis et secondariis axibus, 150–350 μ diam. Ramuli tenues, fere lineares, ad 3 mm. long. et 12–55 μ diam., constricti ad basem. Chloroplasti multi, circuli, 4–7 μ 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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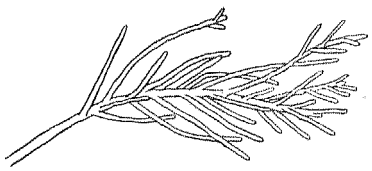

FIG. 1. *Bryopsis minor* n. sp. Habit of branch (× 10).

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 μ 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 μ 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 μ diam. Basis sub-implicata, sine colore, cum rhizoidis. Chloroplasti densi et multi, circuli aut ovati, 1.4–2.7 μ 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).

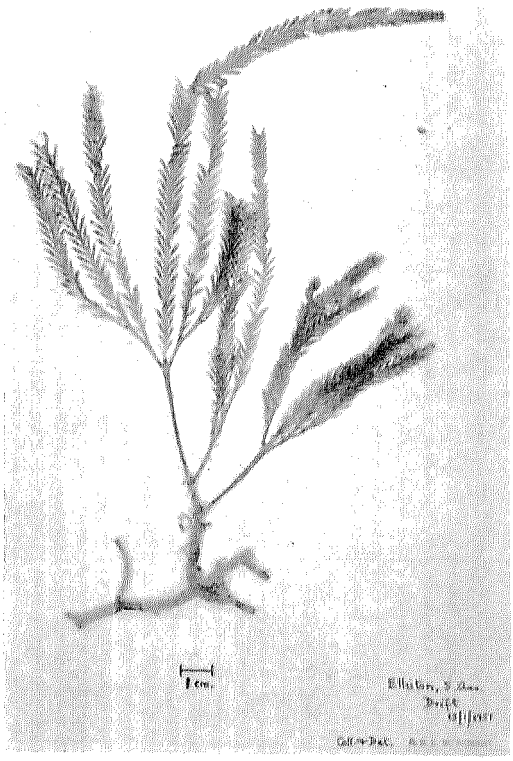

FIG. 2. *Caulerpa ellistoniae* n. sp. Type.

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 μ 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 μ across.

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

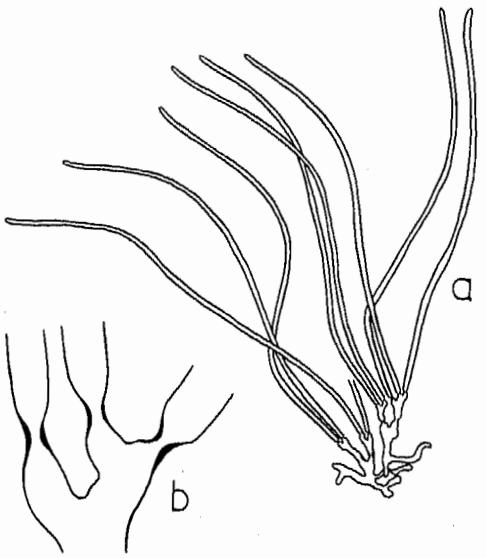

FIG. 3. *Chlorodesmis australis* n. sp. *a*, Habit of plant (× 11); *b*, detail of branching, showing constrictions above branch axil (× 150).

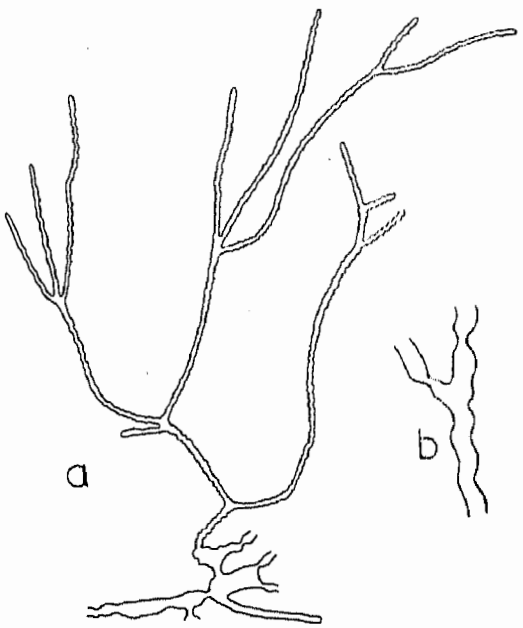

FIG. 4. *Chlorodesmis pusilla* n. sp. *a*, Plant with erect filaments arising from the rhizoidal base (× 11); *b*, part of a filament, showing undulating wall and constrictions above branch axil (× 50).

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

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 μ thick, forming at the surface a cortical layer (12–27 μ wide) of short club-like branches, 4–7 μ wide, sub-palisade like; surface view of thallus showing ends of cortical branches, round to polygonal, 5–9 μ 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 μ 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 μ diam. Cortex 12–27 μ lata brevium, clavatorum ramorum (4–8 μ 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

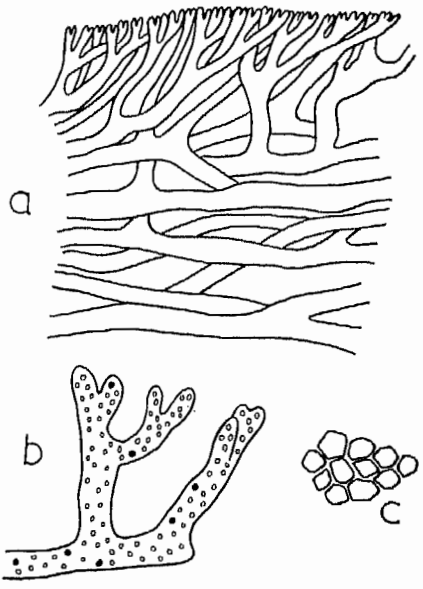

FIG. 5. *Pseudocodium australasicum* n. sp. *a*, Longitudinal section of thallus (× 280); *b*, detail of a medullary filament forming short cortical branches, showing nuclei and chloroplasts (× 500); *c*, surface view of cortical filaments (× 500).

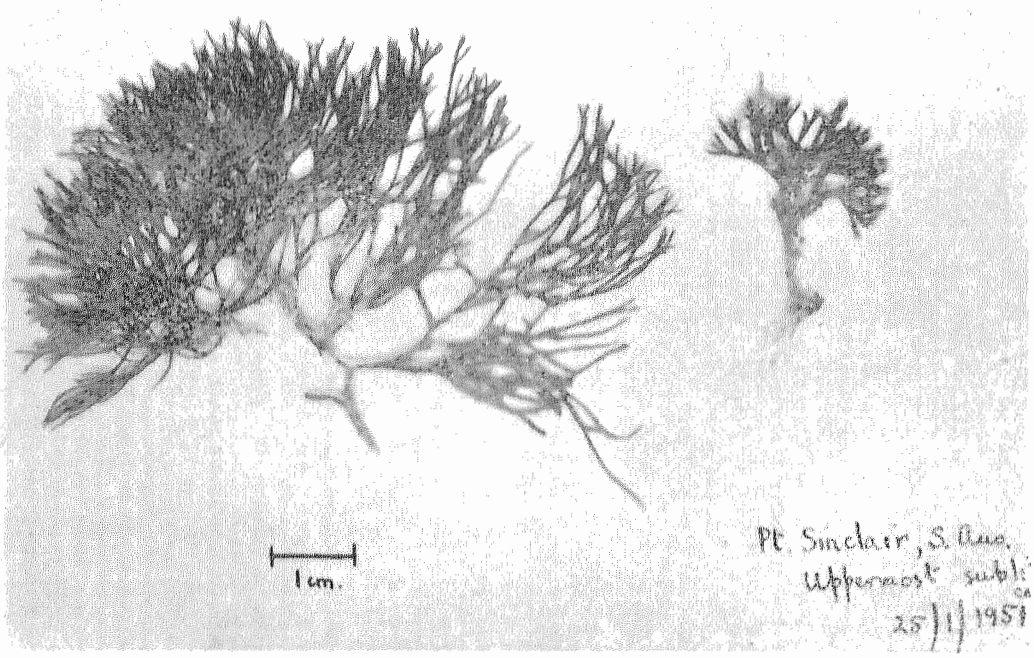

FIG. 6. *Pseudocodium australasicum* n. sp. Type.

filaments mostly erect in the upper part. Individual filaments several cm. long., 500–700 μ thick with a wall 6–10 μ 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 μ 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 μ diam., membrana 6–10 μ crassa, crassissima media parte cum pluribus ramis, unus ramus (interdum 2) segmento. Rami semper fere simplices, 170–350 μ 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. herpestica* (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

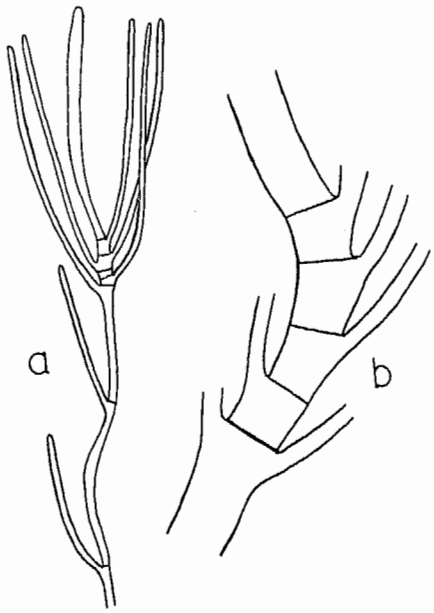

FIG. 7. *Cladophoropsis magnus* n. sp. *a*, A single filament showing branching (× 2.5); *b*, central part of a filament with crowded branches (× 12).

(1–2 cm. high) of entangled rhizoids. Upper filaments sparsely branched, of uniform width throughout, (300–) 400–570 μ wide; wall lamellate, 6–10 μ 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 μ 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 μ diam., membrana lamellata, 6–10 μ crassa; filamenta prima sine septis, filamenta lateralia cum septo ad basem. Rhizoides irregulariter ramosi, interdum tumite, 60–250 μ 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.

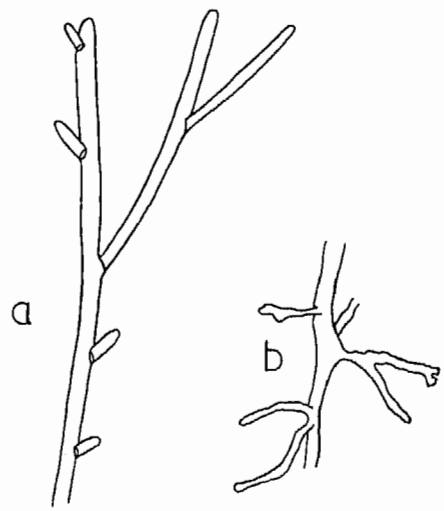

FIG. 8. *Cladophoropsis bulbosa* n. sp. *a*, Upper branch of thallus (× 8); *b*, rhizoidal base of a filament (× 8).

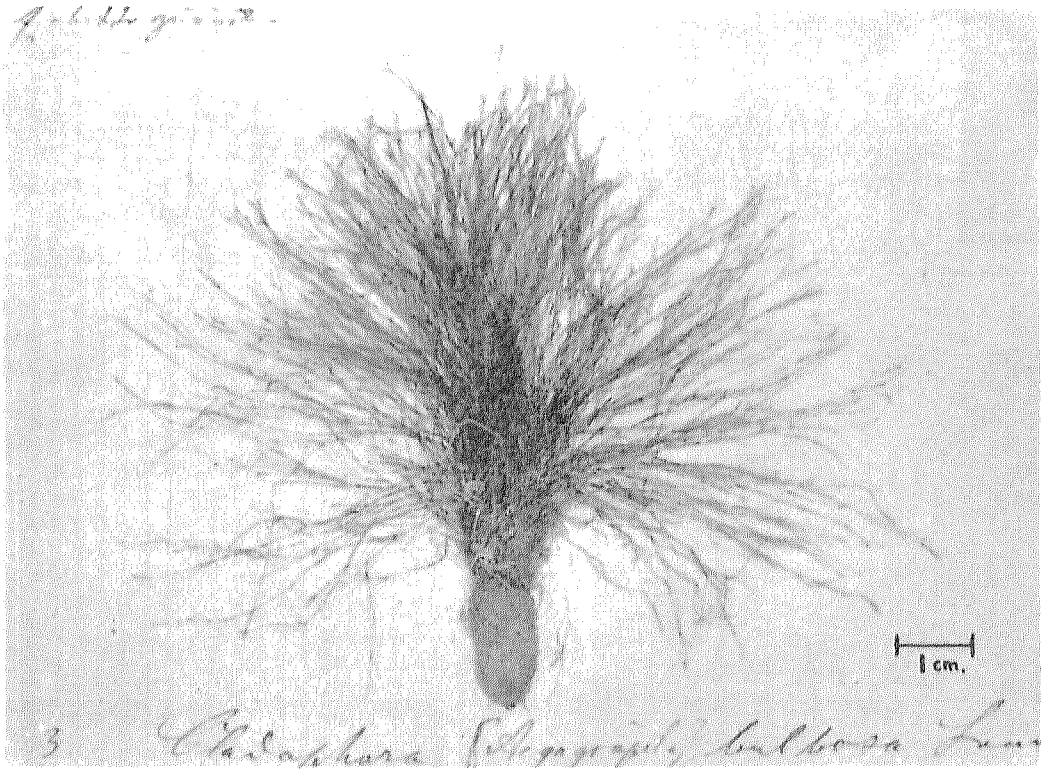

FIG. 9. *Cladophoropsis bulbosa* n. sp. Type.

Primary segments elongate to pyriform, 400–700 μ long and 200–400 μ wide, communicating with the axial siphon; secondary segments elongate—linear, 450–560 μ long and 120–200 μ wide; tertiary segments clavate, 130–400 μ long and 100–130 μ 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) secondariis segmentis ad apicem; secondaria segmenta cum 2 (–3) tertiis segmentis. Prima segmenta longa ad pyriformem, 400–700 μ long.; 200–400 μ diam.; secondaria segmenta elongata, 450–560 μ long.; 120–200 μ diam.; tertia segmenta clavata, 130–400 μ long., 100–130 μ diam.; secondaria 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

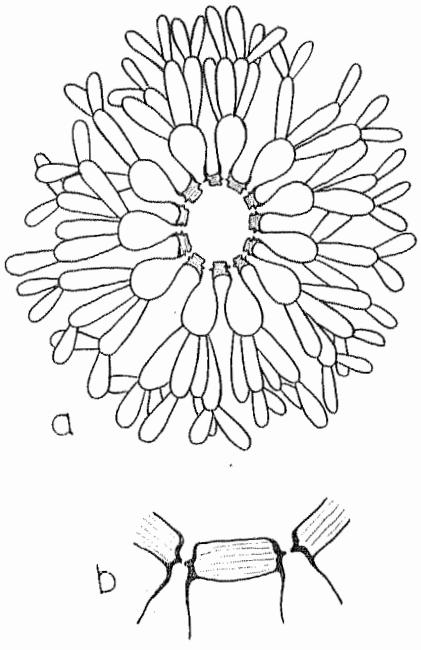

FIG. 10. *Dasycladus densus* n. sp. *a*, Cross section of the thallus showing whorl of branches (some secondary and tertiary segments lost) (× 19); *b*, part of central axis showing connection of primary segments (× 85).

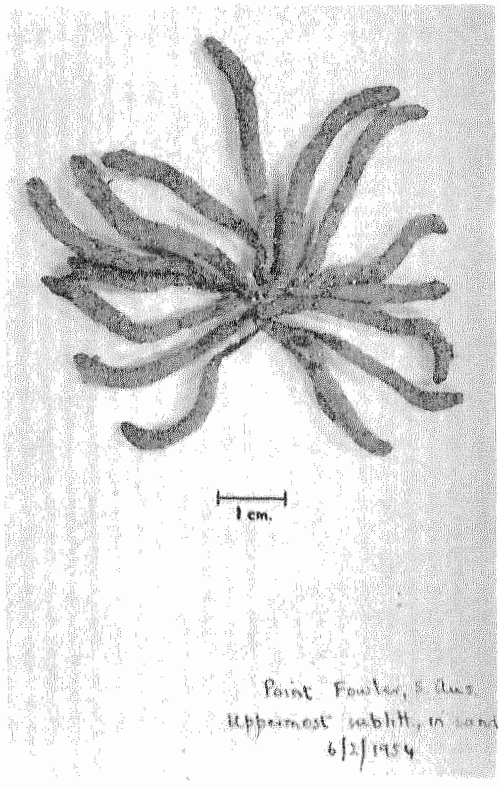

FIG. 11. *Dasycladus densus*, n. sp. Type.

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*.

Chloroclados 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.

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