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Records of Marine Algae from
South-Eastern Queensland I

BY

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- „ 4 Records of Queensland Fungi, IV. By R. F. Langdon, M.Agr.Sc., and D. A. Herbert, D.Sc.
- „ 9 Records of Queensland Fungi, V. By R. F. N. Langdon, M.Agr.Sc.
- „ 10 Notes on some Fungi from New Guinea. By R. F. N. Langdon, M.Agr.Sc.
- „ 12 Studies in Australian Ergots. 1—*Claviceps pusilla* Cesati. By R. F. N. Langdon, M.Agr.Sc.
- „ 13 Records of Queensland Fungi, VI. By R. F. N. Langdon, M.Agr.Sc.

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FROM SOUTH-EASTERN QUEENSLAND I

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Records of Marine Algae from South-Eastern Queensland I

A. B. CRIBB, M.Sc.

INTRODUCTION

In this and subsequent papers it is proposed to deal with the marine algae of south-eastern Queensland, an area which will be taken to comprise approximately that part of the coast extending from the Queensland-New South Wales border in the south to Noosa in the north, a distance of approximately 130 miles. This area has been chosen for several reasons: it is reasonably accessible from Brisbane and includes a wide variety of habitats rich in algae which have in the past been very much neglected, less than $\frac{1}{5}$ of the number of species recorded from the State being listed for this area; further, the area falls into that section of the coast extending from approximately the mouth of the Clarence River in the south to Noosa in the north which Bennett and Pope (1953) suggest as the area of overlap between the Solanderian Tropical province of the north and the Peronian Warm Temperate province of the south. If this suggestion is correct it would be expected that many algal species will find either their northern or southern geographical boundary within this area, and it is hoped that the investigations will reveal any such limits.

Unless otherwise indicated, all Queensland collections have been made by the author.

PREVIOUS WORK ON MARINE ALGAE IN QUEENSLAND

As far as can be ascertained, the first person to collect specimens of marine algae in Queensland waters was Robert Brown, who accompanied Flinders on the voyage of "The Investigator" and worked along the Queensland coast during the latter half of 1802. Since that time there have been published over 40 papers listing or describing species of Queensland algae. Some of these are by authors who did not visit the State but received the specimens from various collectors, while in the case of Bailey's publications the specimens were determined by other workers.

The following table indicates the numbers of species from the various groups already recorded for Queensland:—

	Queensland generally	South-eastern Queensland
Cyanophyta	15	6
Chlorophyta	102	9
Phaeophyta	96	18
Rhodophyta	103	45
Total	316	78

These figures are claimed to be approximate only as synonymy has not been carefully checked, and it is expected that further work will reveal a number of invalid records, and add to the list some of the many species still unrecorded.

Published work on algal ecology in Queensland has been more limited. Brief references to algae are made in a number of papers or reports on marine zoology, but the papers by Harvey Johnston (1917) and Stephenson *et al.* (1931), both predominantly zoological are the only ones to mention the algae in any detail. The paper by Bennett and Pope (1953) in which biogeographical considerations are discussed deals only briefly with Queensland.

The following papers are concerned, at least in part, with Queensland algae:—

- AGARDH, J. G. (1889). Species Sargassorum Australiae. *K. Svenska Vetensk. Akad. Handl.*, **23** (3): 1-133.
- ASKENASY, E. (1888). Algen. Forschungsreise S.M.S. "Gazelle." 4 Theil. Botanik. pp. 58, pls. 12. Berlin.
- (1894). Ueber einige australische Mccresalgen. *Flora*, **78**: 1-18.
- BAILEY, F. M. (1883). A synopsis of the flora of Queensland. pp. 890. Brisbane.
- (1886). A synopsis of the Queensland flora. First supplement. pp. 99, pls. 4. Brisbane.
- (1888). A synopsis of the Queensland flora. Second supplement. pp. 153. Brisbane.
- (1890). Catalogue of the indigenous and naturalised plants of Queensland. pp. 116. Brisbane.
- (1895). Contributions to the Queensland flora. Dept. of Agric., Brisbane, Bot. Bull. No. 11, pp. 69, pls. 17. Brisbane.
- (1910a). Contributions to the flora of Queensland. *Qd. Agric. J.*, **24** (5): 221-223.
- (1910b). Contributions to the flora of Queensland. *Ibid.*, **25** (4): 164-166.
- (1911). Contributions to the flora of Queensland. *Ibid.*, **26** (3): 126-129.
- (1912a). Contributions to the flora of Queensland. *Ibid.*, **28**: 74-77.
- (1912b). Contributions to the flora of Queensland. *Ibid.*, **29**: 178-182.
- (1913). Comprehensive Catalogue of Queensland Plants. pp. 879, pls. 16. Brisbane.
- BENNETT, I. AND POPE, E. C. (1953). Intertidal zonation of the exposed rocky shores of Victoria, together with a rearrangement of the biogeographical provinces of temperate Australian shores. *Aust. J. Mar. Freshw. Res.*, **4** (1): 105-159.
- BROWN, R., in TURNER, D. (1811). Historia fucorum. Vol. 3. pp. 148, pls. 62. London.
- COTTON, A. D. (1913). Notes on Queensland Florideae. *Kew Bull.* (1913) No. 7: 252-255.
- DICKIE, G. (1877). Notes on algae collected by H. N. Moseley, M.A., of H.M.S. "Challenger," chiefly obtained in Torres Straits, coasts of Japan and Juan Fernandez. *J. Linn. Soc. (Bot.)* **15**: 446-455.
- GRUNOW, A. (1874). Algen der Fidschi-, Tonga- und Samoa-Inseln. *J. Mus. Godeffroy* **6**: 23-50.
- HARVEY, W. H. (1863). Synoptic catalogue of Australian and Tasmania algae. In: *Phycologia Australica* 5. pls. 241-300. London.
- JOHNSTON, T. HARVEY (1917). Ecological notes on the littoral fauna and flora of Caloundra, Queensland. *Qd. Nat.*, **2** (2): 53-63.
- LEVRING, F. (1946). A list of marine algae from Australia and Tasmania. *Acta Hort. Gotthoburg*, **16**: 215-227.
- (1953). The marine algae of Australia. 1. Rhodophyta: Goniotrichales, Bangiales and Nematinales. *Ark. Bot. Ser.* **2**, **2** (6): 457-530.
- LUCAS, A. H. S. (1909). Revised list of the Fucoideae and Florideae of Australia. *Proc. Linn. Soc. N.S.W.*, **34**: 9-60.
- (1912). Supplementary list of the marine algae of Australia. *Ibid.*, **37** (1): 157-171.
- (1913). Notes on Australian marine algae, 1. *Ibid.*, **38** (1): 49-60.
- (1919). Notes on Australian marine algae, 2. *Ibid.*, **44** (1): 174-179.
- (1927). Notes on Australian marine algae, 5. *Ibid.*, **52** (4): 555-562.
- (1931). The marine algae hitherto recorded from north-east Australia. *Rep. Gl. Barrier Reef Comm.*, **3**: 47-57.
- (1934). Notes on Australian marine algae, 7. *Proc. Linn. Soc. N.S.W.*, **59** (5-6): 348-350.
- MAY, V. (1938). A key to the marine algae of New South Wales. Pt. 1. Chlorophyceae. *Proc. Linn. Soc. N.S.W.*, **63** (3-4): 207-218.
- (1939). A key to the marine algae of New South Wales. Pt. 2. Melanophyceae. *Ibid.*, **64** (1-2): 191-215.
- (1946). Studies on Australian marine algae. 2. *Ibid.*, **70** (3-4): 121-124.
- (1947). Studies on Australian marine algae. 3. *Ibid.*, **71** (5-6): 273-277.
- (1948a). Studies on Australian marine algae. 4. *Ibid.*, **73**: 293-297.
- (1948b). The algal genus *Gracilaria* in Australia. *C.S.I.R. Bull.* No. 235: 1-64.
- (1949). Studies on Australian marine algae. 5. *Proc. Linn. Soc. N.S.W.*, **74** (3-1): 196-202.
- (1951a). Studies on Australian Marine algae. 6. *Ibid.*, **76** (3-4): 83-87.
- (1951b). The marine algae of Brampton Island, Great Barrier Reef, off Mackay, Queensland. *Ibid.*, **76** (3-4): 83-104.
- MONTAGNE, J. F. C. (1845). Plantes cellulaires. In: *Botanique. In: D'Urville, Voyage au pôle sud et dans l'Océanie sur la Corvette l'Astrolabe et la Zélée. 1837-1840.* Paris.
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- SONDER, W. (1871). Die Algen des tropischen Australiens. pp. 142, pls. 6. Hamburg.
- (1880-81). In: F. Mneller, *Fragmenta Phytographiae Australiae.* pp. 132. Melbourne.
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DIVISION CHLOROPHYTA

CLADOPHORALES—Cladophoraceae

Chaetomorpha antennina (Bory) Kuetz. (Pl. 1, fig. 6)

Kuetzing 1849, p. 397; Boergesen 1913, p. 16, figs. 4-5; 1940, p. 37.

Chaetomorpha media (Ag.) Kuetzing 1849, p. 380; Boergesen 1925, p. 37, figs. 9-10.

Hab.: Lower littoral rocks in exposed positions.

Aust. distr.: Q'ld. (Coolangatta, 9.iv.1949; Stradbroke Is., 13.viii.1949—Mrs. G. Y. McKeon; Caloundra, May, 1948; Noosa, 23.v.1949, 14.iv.1954; Elliott Hds., 22.vi.1949—Mrs. G. Y. McKeon).

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

Chaetomorpha aerea (Dillw.) Kuetz. (Pl. 1, fig. 7)

Kuetzing 1849, p. 379; Taylor 1937, p. 81, pl. 1, figs. 10-12; Smith 1944, p. 56, pl. 6, figs. 4-5.

Superficially resembling *C. antennina* but differing in the shorter basal cell and by cells above the basal one growing through the ones below. Attachment is by rhizoids, generally less developed than in *C. antennina*, and though the plants are referred to the widespread and polymorphic *C. aerea* it is doubtful whether they are specifically identical with the plant originally described from England, this plant having a disc attachment.

Hab.: Lower littoral, sometimes in pools, on exposed rocky shore.

Aust. distr.: Q'ld. (Miami, March, 1948; Caloundra, 10.iv.1948; Noosa, 3.i.1951), N.S.W.

Extra-Aust. distr.: Widely distributed in temperate and warm seas.

Chaetomorpha natalensis (Hering) De Toni forma *exposita* Boergesen (Pl. 1, fig. 8)

Boergesen 1948, p. 6, fig. 1.

Hab.: Low green mat on exposed mid-littoral rock platforms, particularly round margins of shallow pools.

Aust. distr.: Q'ld. (Caloundra, March, 1948, 23.ii.1953).

Extra-Aust. distr.: Mauritius.

Chaetomorpha linum (Mueller) Kuetz. (Pl. 1, fig. 10)

Kuetzing 1845, p. 204; Taylor 1928, p. 60, pl. 4, fig. 11; 1937, p. 80, pl. 1, figs. 1-2.

Hab.: Upper sublittoral in sheltered localities.

Aust. distr.: Q'ld. (Nerang R., Southport, March, 1948, 1.i.1950, 7.i.1953; Redcliffe, 14.ii.1953, 25.vii.1953), N.S.W., Kangaroo Is.

Extra-Aust. distr.: Widely distributed in warm and temperate seas.

Rhizoclonium riparium (Roth) Harv. (Pl. 1, fig. 9)

Harvey 1849, pl. 238; Taylor 1937, p. 83, pl. 1, fig. 3; Smith 1944, p. 63, pl. 7, fig. 4.

Rhizoclonium implexum (Dillw.) Kuetzing 1845, p. 206; Smith 1944, p. 62, pl. 8, fig. 3.

Rhizoclonium riparium var. *implexum* Rosenvinge 1893, p. 915.

Queensland material shows a range of forms from those with very rarely occurring 1-celled rhizoidal branches to those with numerous multicellular rhizoidal branches, and they are here all referred to *R. riparium*, though forms with rarely occurring unicellular rhizoids are often referred to *R. riparium* var. *implexum* or *R. implexum*.

Hab.: Upper littoral in sheltered shaded positions, or in well illuminated positions only during cooler months.

Aust. distr.: Q'ld. (Coolangatta, 27.v.1953; Southport, 20.xi.1953; Brisbane R., Brisbane, 2.ix.1953; Pine R., 31.iii.1953; Dunk Is.—E. J. Banfield), N.S.W.

Extra-Aust. distr.: Widespread in warm and temperate seas.

Rhizoclonium hookeri Kuetz. (Pl. 1, fig. 4).

Kuetzing 1849, p. 383; Taylor 1928, p. 66, pl. 3, fig. 7, pl. 4, fig. 18; Levring 1938, p. 8, fig. 4 C-F; 1945, p. 5.

Hab.: Crisp curly filaments forming fleecy layer, often with *Bostrychia*, over damp cave walls, in this position in a fresh-water rather than a marine environment but subject to salt spray during heavy seas.

Aust. distr.: Q'ld. (Paradise Cave, Noosa, Jan. 1948, 26.xii.1950).

Extra-Aust. distr.: Fairly widely distributed in warm and temperate seas.

SIPHONALES--Bryopsidaceae

Bryopsis indica A. & E. S. Gepp (Pl. 1, fig. 2)

Gepp A. & E. S. 1908, p. 169, pl. 22, figs. 10-11; Boergesen 1953, p. 6, fig. 1.

Distinguished by arrangement of the ramuli typically in 2 rows on each side of the axis or occasionally in 1, 3, or 4 rows or in an irregular band on each side; ramuli sharply constricted at point of insertion, in older plants sometimes becoming excessively long and tangled.

Hab.: Sublittoral fringe and upper sublittoral in sheltered or semi-exposed localities, frequently on other algae.

Aust. distr.: Q'ld. (Redcliffe, all seasons; Miami, 22.vi.1949; Currumbin, 26.v.1953; Deadman's Beach, Stradbroke Is., 13.viii.1949—Mrs. G. Y. McKeon), N.S.W. (Fingal, 10.iv.1949).

Extra-Aust. distr.: Japan, Ceylon, Chagos Archipelago, Mauritius.

***Bryopsis indica* forma *unilateralis* f. nov.** (Pl. 1, fig. 3)

Ramuli typicale secundi, valde constricti in basis. Hab.: In saxi, Miami, Queensland.

Forming dense clumps 1-8 cm. high; ramuli frequently 1-2 mm. long but sometimes becoming much lengthened and tangled as in the species; differing from the species mainly in its more slender nature and in the typically secund arrangement of the ramuli, though this arrangement not always constant and sometimes interrupted, or in part pinnate, or sometimes wholly pinnate.

This form overlaps to a certain extent with the species but does seem to warrant some taxonomic distinction. A secund species, *B. pennata* var. *secunda* (Harvey) Collins and Hervey (syn. *B. plumosa* var. *secunda* Harvey, *B. harveyana* J. Ag.) is well known in various parts of the world and Boergesen (1946) has found that the ramuli in this species are, at least sometimes, produced in a band rather than in a single row as is indicated in the figure of Vickers (1908). The figure of Taylor (1928) also seems to indicate arrangement in a band. In the absence of *B. indica* on the Queensland coast the specimens might be referred to the already described secund species, but there is obviously a very close affinity between the plant in question and *B. indica* and it seems to differ from *B. pennata* in the base of the adult ramuli, those of *B. pennata* being tapered or at least not as sharply constricted as in the Queensland form. A specimen from Heron Island on the Great Barrier Reef agrees well with *B. pennata*, and the ramuli of the south Queensland plant differ clearly from this in the way indicated above.

The type specimen is located in the herbarium of the Department of Botany, University of Queensland.

Aust. distr.: Q'ld. (Coolangatta, 9.iv.1949; Burleigh, 5.i.1953; Miami, 22.vi.1949 Type in Herb. Univ. Q'ld., 11.v.1950; Currumbin, 26.v.1953; Pt. Lookout, Stradbroke Is., 31.xii.1948, 4.i.1949, Mrs. G. Y. McKeon), N.S.W. (Fingal, 10.iv.1949).

Codiaceae

Chlorodesmis major Zan. (Pl. 1, fig. 1).

Zanardini 1874, p. 13; Lucas 1935, p. 200.

Clump consisting of a densely felted base from which arises a mass of long dark green filaments, the whole clump 5-7 cm. high; felted base consisting of branched filaments up to 175 μ in diameter, often irregularly torulose and passing below into sinuous and often irregularly torulose rhizoids which are also given off laterally and which in the narrowest parts may be 30 μ ; contents of these basal filaments and rhizoids generally orange-red; above, the filaments dichotomously branched, the distances between successive dichotomies usually 1-3 cm., the two branches each constricted at the same height immediately above the dichotomy, and between successive dichotomies the filaments, 120-165 μ in diameter, unconstricted or sometimes constricted at usually rare intervals, the constrictions usually being more numerous towards the base; apices rounded.

When describing *C. hildebrandtii* from the Indian Ocean the Gepps (1911) had not seen a specimen of *C. major*. No figure of *C. major* from Lord Howe Island is available, but from the descriptions available the two species appear to be very similar and should be carefully compared. The main characters distinguishing *C. hildebrandtii* appear to be its smaller diameter, 80-130 μ , and the lack of orange-red contents in the basal portions.

Egerod (1952) has recently figured a Hawaiian specimen of a *Chlorodesmis* which she assigns to *C. hildebrandtii*, and this differs from the Queensland specimen mainly in the greater frequency of interdichotomal constrictions in the upper part of the thallus and in the frequently occurring bead-like swelling just above the ultimate constriction.

Hab.: Drift on ocean beach.

Aust. distr.: Q'ld. (Southport, 8.ii.1953).

Extra-Aust. distr.: Lord Howe Island.

Boodleopsis pusilla (Collins) Taylor, Joly and Bernatowicz (Pl. 1, fig. 5).

Taylor, Joly and Bernatowicz 1953, p. 105.

Dichotomosiphon pusillus Collins 1909, p. 431.

In material from Tallebudgera Creek branching is predominantly dichotomous with generally numerous interdichotomal constrictions (Pl. 1, fig. 5), but a specimen from Noosa shows both dichotomous and trichotomous branching with a greater distance between successive branchings and only rarely occurring interdichotomal constrictions. This material also shows the large oval basal sporangium-like bodies discussed by Taylor, Joly and Bernatowicz.

Hab.: On shaded upper littoral clay bank and on mid littoral mangrove roots.

Aust. distr.: Q'ld. (Tallebudgera Creek, 8.ii.1953, 25.v.1953, 5.ix.1953; Noosa, 12.iv.1954).

Extra-Aust. distr.: West Indies, Brazil, Bermuda.

DIVISION PHAEOPHYTA

‡ DICTYOTALES—Dictyotaceae

Dictyota dichotoma (Huds.) Lamx. (Pl. 3, fig. 8)

Lamouroux 1809a, p. 331; Harvey 1846-51, pl. 103; Taylor 1928, p. 119, pl. 16, fig. 14.

Hab.: Upper sublittoral in sheltered locality.

Aust. distr.: Q'ld. (Redcliffe, 14.ii.1953), N.S.W., Vic., Tas., S. Aust., W. Aust.

Extra-Aust. distr.: Widely distributed.

Dictyota dichotoma var. *intricata* (Ag.) Grev. (Pl. 3, fig. 4)

Greville 1830, p. 58; Harvey 1846-51, pl. 103, fig. 2; Papenfuss 1944a, p. 338.

It is quite possible that some of the plants here referred to *D. dichotoma* var. *intricata* are similar to those referred by Collins and Hervey (1917) and Taylor (1942) to *D. linearis* (Ag.) Grev. The Queensland plants show considerable variation, and it is not clear to what extent the two species can be regarded as distinct.

Hab.: Often forming large loosely attached masses in upper sublittoral in estuarine and sheltered localities.

Aust. distr.: Q'ld. (Nerang R., Southport, all seasons; Brampton Is.—V. May), N.S.W., Kangaroo Is.

Extra-Aust. distr.: England, Mediterranean, S. Africa.

Dictyota bartayresii Lamx. (Pl. 3, fig. 6)

Lamouroux 1809a, p. 331; Collins and Hervey 1917, p. 90; Taylor 1928, p. 117, pl. 16, fig. 16, pl. 19, fig. 10.

Dictyota bartayresiana Lamouroux 1809b, p. 43; Harvey 1853, p. 110, pl. 8c; Vickers 1908, p. 38, pl. 12-13; Weber-Van Bosse 1913, p. 182; Boergesen 1914, p. 53; 1935, p. 36.

Dictyota apiculata J. Ag. var. *jedanensis* Weber-van Bosse 1913, p. 183, pl. 3, fig. 6.

? *Dictyota friabilis* Setchell 1926, p. 91, pl. 13, figs. 4-7, pl. 20, fig. 1.

Plants up to 9 cm. long, dichotomously branched 0.7 to 2 cm. between dichotomies, the sinus usually rounded and the lobes more or less spreading, angle of branching usually 45°-90°; thallus usually showing greater or less attenuation towards the base, in the more extreme forms reaching 5-6 mm. in the upper part and narrowing to 1.5 mm. near the base; apices minutely apiculate or obtuse, often somewhat truncate; surface cells 1½-3 diameters long, 10-21 × 17-32 μ, medullary cells usually 1-2 diameters long, 75-135 × 120-300 μ; attachment by groups of rhizoids from the basal parts; tetrasporangia up to 135 μ scattered singly or in small groups over the whole thallus, sparsely towards the margins but not delimiting clear-cut sterile marginal bands.

Weber-van Bosse described *D. apiculata* var. *jedanensis* from the Malayan Archipelago, distinguishing it from the species by the greater width in the apical parts and the attenuated base, and by the rounded apices with only small apiculations. The Queensland material appears to provide a connecting link between *D. apiculata* var. *jedanensis* and *D. bartayresii*. One plant from Redcliffe shows very good agreement, both with respect to basal attenuation and rounded minutely apiculate apices, with Weber-van Bosse's fig. 6 of *D. apiculata* var. *jedanensis*, while another plant from the same collection shows good agreement in general form with specimens of *D. bartayresii* figured by Vickers in her Pl. 12, fig. 1 and Pl. 13, fig. 1. The more extremely apiculate of the apices agree well with Pl. 13, fig. 3 of Vickers, but the apex figured by Harvey in his Pl. 8, fig. C3 is more acuminate than any found in the Queensland material. *D. bartayresii* is well known as a very variable species, and both Boergesen (1914) and Collins and Hervey (1917) report forms with both rounded and acute apices. In outline, also, considerable variation seems possible; Vickers (Pl. 13, fig. 1, 2) shows forms with broader apical portions, Vickers (Pl. 12, fig. 1) and Harvey (Pl. 8, fig. C1) illustrate other plants with little variation in width, while Collins and Hervey report some forms showing a similarity to *D. divaricata*.

The disposition of the tetrasporangia, *i.e.*, scattered over the whole frond, is the same in both *D. bartayresii* and in *D. apiculata* var. *jedanensis*. Weber-van Bosse states that in var. *jedanensis* the arrangement of cells is at first in transverse lines and then in longitudinal lines, an arrangement clearly shown in the figure of *D. bartayresii* (Vickers, pl. 13, fig. 3), and also evident in some of the Redcliffe specimens.

Considering the great variation which has been reported in *D. bartayresii* and the variable nature of the Redcliffe specimens, it seems best to regard *D. apiculata* var. *jedanensis* as a form of *D. bartayresii*.

Weber-van Bosse suggests that *D. sandwicensis* Sonder, *D. pardalis* Kuetz. and *D. pinnatifida* Kuetz. may be merely forms of *D. bartayresii*.

Two collections of a small sterile *Dictyota* (pl. 3, fig. 6 e-i) from Redcliffe (16.iii.1954) and Scarborough (11.iii.1953), at first thought to represent a distinct species, are now regarded as juvenile forms of *D. bartayresii*.

The plants are decumbent or semi-decumbent, often crowded and overlapping, and attached to one another and to the substratum by groups of rhizoids. The basal part is cuneate and tapers to a distinct stipe-like portion best seen in the smaller plants. In texture the plants are rather brittle and often break during collection. The thallus is short and broad, up to 2.5 cm. long, 3.6 mm. broad, closely dichotomously branched, the sinus generally rounded or sometimes angular, 45°–90°. Apices are obtuse often somewhat truncate and the whole plant shows very good agreement with some juvenile portions of the collection of *D. bartayresii* from Redcliffe.

Two small species of *Dictyota* resembling the juvenile Queensland plants have been described—*D. friabilis* Setchell from Tahiti and *D. conrescens* Taylor (1945) from Mexico. From the descriptions, the former appears to agree very well with the small Queensland plants and it is here suggested that it represents only a juvenile form of *D. bartayresii*. Taylor's species differs mainly in the closer branching above to give a sub-palmate appearance in the upper parts; Taylor himself remarks that it "has somewhat the aspect of *D. Bartayresiana* of the Caribbean." *D. bartayresii* does not appear to have been recorded from the Pacific coast of N. America which is fairly well known algologically, so Taylor's plant may represent a juvenile form of some other species. The species from Ceylon referred by Boergesen (1936) to *D. ceylanica* Kuetz. and the one from the Malayan Archipelago referred by Weber-van Bosse (1913) to *D. ceylanica* var. *rotundata* Weber-van Bosse also should be compared with juvenile specimens of *D. bartayresii*.

Hab.: Lower littoral and upper sublittoral rocks in sheltered localities.

Aust. distr.: Q'ld. (Redcliffe, 14.ii.1953, 16.iii.1954; Scarborough, 11.iii.1953; C. York, Gulf of Carpentaria—Lucas; Low Is.—Stephenson).

Extra-Aust. distr.: W. Indies, Malayan Arch., Indian Ocean, Gold Coast.

Dictyota divaricata Lamx. (Pl. 3, fig. 9).

Taylor 1928, p. 120, pl. 16, figs. 6–9.

Dictyota ceylanica var. *anastomosans* Yamada 1950, p. 186, fig. 4.

The specimens show excellent agreement with a specimen of *D. ceylanica* var. *anastomosans* Yamada from Ryukyusho, Formosa, determined and sent to the author by Professor Yamada. Yamada's figure of this variety shows a branch in which the angle of branching is acute, but his specimen shows also many dichotomies in which the angle of branching is 90° or more. The gradual or sudden tapering of the branches is similar to that in the Queensland specimen and the variety is here regarded as synonymous with *D. divaricata*.

Hab.: Drift clumps on ocean beach, often intimately mixed with *Laurencia* sp. or *Hypnea* sp.

Aust. distr.: Q'ld. (Mooloolabah, 31.xii.1950; Southport, 8.ii.1953).

Extra-Aust. distr.: West Indies, Pacific Mexico, Japan, Formosa, Indian Ocean, Red Sea.

Dictyota volubilis Kuetz. (Pl. 3, fig. 7)

Kuetzing 1849, p. 554; Boergesen 1914, p. 54.

Hab.: Lower littoral rocks, sometimes sand embedded, in semi-exposed positions.

Aust. distr.: Q'ld. (Noosa, 24.v.1949, 15.iv.1954; Caloundra, 18.v.1950).

Extra-Aust. distr.: W. Indies, Barbados, Venezuela, Mediterranean?

Dictyota indica Sonder sensus Collins (Pl. 3, fig. 5)

Sonder in Kuetzing 1859, p. 8, pl. 17, fig. 1; Taylor 1928, p. 120, pl. 16, fig. 1.
 Hab.: Sublittoral fringe on exposed rocky shores.
 Aust. distr.: Q'ld. (Coolangatta, 27.v.1953; Miami, 11.viii.1948, 22.vi.1949; Noosa, 23.v.1949).
 Extra-Aust. Distr.: West Indies.

Dictyota pardalis Kuetz. (Pl. 3, fig. 3)

Kuetzing 1859, pl. 39, fig. 2; Taylor 1928, p. 120, pl. 16, fig. 12.
 In habit somewhat resembling *D. dichotoma* var. *intricata* but distinguished by its obtuse apices and more divaricate branching.
 Hab.: Upper sublittoral in estuarine locality.
 Aust. distr.: Q'ld. (Noosa, 20.xii.1950).
 Extra-Aust. distr.: West Indies, Malayan Archipelago.

Dictyota pardalis forma *pseudohamata* f. nov. (Pl. 3, fig. 10)

Anguli plerumque obtusati, ramulis saepe recurvatis. Hab.: In algae, Caloundra, Queensland.

Plants up to 14 cm., sometimes spirally twisted in the lower parts, regularly dichotomous, 1-3 cm. between dichotomies, the sinus angular or more often rounded, sometimes acute but typically obtuse and up to 135°; alternate branches of successive dichotomies often slightly arrested and each with its outer branch often distinctly recurved and sometimes appearing almost hooked; branches 1.5-2.5 mm. in lower parts, tapering slightly towards obtuse or somewhat truncate apices; tetrasporangia, groups of hairs and rhizoids as in specimen of *D. pardalis* from Noosa.

This form differs from the species mainly in its wider angle of branching and recurved branches. One species with hooked branches, *D. hamata* Setchell, has been described from Tahiti, but in this species the hooked branch is acute, distinctly narrower than the other branches, and more curved than in *D. pardalis* f. *pseudohamata*.

The type specimen is located in the herbarium of the Department of Botany, University of Queensland.

Hab.: On algae in sublittoral fringe in semi-exposed locality.
 Aust. distr.: Q'ld. (Caloundra, 18.v.1950 Type in Herb. Univ. Q'ld.).

Dilophus marginatus J. Ag. (Pl. 3, fig. 2)

J. Agardh 1894, p. 91.
Dictyota rugulosa Lucas 1935, p. 212.
Dictyota rugulosa Lucas, described from Lord Howe Island, does not appear to differ from this species and is relegated to synonymy.
 Hab.: Sublittoral fringe or upper sublittoral in semi-exposed localities.
 Aust. distr.: Q'ld. (Noosa, 24.v.1949, 3.i.1951; Caloundra, 10.iv.1948, 18.v.1950), N.S.W., Vic., S. Aust., Lord Howe Is.

Dilophus prolificans (A. & E. S. Gepp) comb. nov. (Pl. 3, fig. 1)

Dictyota prolificans A. & E. S. Gepp 1906, p. 250, pl. 481, fig. 2.
 Since the medulla is polystromatic at the margins the species is, according to modern practice, transferred to *Dilophus*.
 Hab.: Sub-littoral fringe in semi-exposed localities.
 Aust. distr.: Q'ld. (Noosa, 15.iv.1954; Caloundra, 18.v.1950), N.S.W., Lord Howe Is.

CHORDARIALES—Spermatochneaceae

Nemacystus decipiens (Sur.) Kuck. (Pl. 2, fig. 1)

Kuckuck 1929, p. 68, figs. 92-93; Boergesen 1941, p. 57, fig. 23.

Hab.: On *Sargassum* in upper sub-littoral sheltered positions.

Aust. distr.: Q'd. (Redcliffe, 9.vii.1949, 1.ix.1949, 25.vii.1953).

Extra-Aust. distr.: Japan, Arabian Sea, Iranian Gulf, Mauritius.

DICTYOSIPHONALES—Punctariaceae

Petalonia fascia (Mueller) Kuntze (Pl. 2, fig. 5)

Kuntze 1898, p. 419; Taylor 1937, p. 172, pl. 14, fig. 5, pl. 15, fig. 3; Rosenvinge and Lund 1947, p. 31, fig. 10.

Ilea fascia (Mueller) Fries 1835, p. 321; Smith 1944, p. 126, pl. 20, fig. 4.

Phyllitis fascia (Mueller) Kuetzing 1843, p. 342.

In many of the specimens there are amongst the plurilocular sporangia numerous paraphyses, coarsely granular, rounded, obovoid, clavate or cylindrical, 5-14 μ broad, up to 18 μ long, occurring singly or in groups. Most previously described collections of *Petalonia fascia* appear to have lacked paraphyses though Setchell and Gardner (1925) report "paraphyses(?) and hairs present in some species," and figure a form with paraphyses.

Hab.: Lower littoral in estuarine and sheltered localities during cooler months.

Aust. distr.: Q'd. (Redcliffe, 1.ix.1949, 10.x.1953; Nerang R., 22.vi.1949), N.S.W.

Extra-Aust. distr.: Mediterranean, Europe, Atlantic and Pacific North America.

Endarachne binghamiae J. Ag. (Pl. 2, fig. 6)

J. Agardh 1896, p. 27, pl. 1, fig. 5; Setchell and Gardner 1925, p. 538, pl. 38, figs. 37-38, pl. 83a.

Hab.: Lower littoral exposed rocky shore.

Aust. distr.: Q'd. (Miami, Aug. 1948, 11.v.1950; Currumbin, 6.ix.1953), N.S.W.

Extra-Aust. distr.: California, Japan.

Scytosiphon lomentaria (Lyngb.) J. Ag. (Pl. 2, fig. 2)

J. Agardh 1848, p. 126; Setchell and Gardner 1925, p. 531, pl. 44, figs. 72, 74; Taylor 1937, p. 174, pl. 15, fig. 2, pl. 16, fig. 3; Doty 1947, p. 37.

Distinctly flattened specimens seem to be absent but many other forms of this very variable species are present. At least some of the unconstricted plants could probably be referred to *S. attenuatus* (Foslie) Doty (*S. lomentaria* f. *cylindricus major* Setchell and Gardner) but it is difficult to see any sharp distinctions between the various forms and they are here all included under the one species.

Hab.: Lower littoral sheltered positions during cooler months.

Aust. distr.: Q'd. (Redcliffe, 25.vii.1953, 19.viii.1953), N.S.W., Vic., Tas., S. Aust., W. Aust.

Extra-Aust. distr.: Widely distributed in cold and temperate seas.

Rosenvingea intricata (J. Ag.) Boergesen (Pl. 2, fig. 4)

Boergesen 1914, p. 26; 1930, p. 169, fig. 9; Taylor 1928, p. 111, pl. 15, figs. 15-17; 1942, p. 53, pl. 10, fig. 2; 1945, p. 83; Dawson 1944, p. 233, pl. 52, fig. 1.

Tubes often somewhat contorted, seldom over 1 cm. in diameter, irregularly forked and sometimes with numerous short irregularly placed branches or protuberances; distance between successive forkings usually not exceeding 2 cm.; tubes tapering shortly to a shortly acute or occasionally obtuse apex often about 1 mm. diameter; no basal stipe or disc, and attachment by rhizoids produced from any part of the thallus in contact with the substratum; where the tubes touch one another also frequently adhering by rhizoids; in section consisting of an outer layer of small cells 10–20 μ in diameter and internally of 1–3 layers of much larger thin-walled cells; plurilocular sporangia typically cylindric-clavate up to 34 μ long and up to 10.5 μ broad; sori scattered, often fairly densely, typically elliptical, or sometimes rounded or somewhat irregular, up to 750 μ long and 375 μ broad, from the centre of each arising a tuft of usually 2–12 hairs.

The branching in the species is rather variable but in the Queensland plants is always more or less of the type figured by Dawson (1944) rather than of the more slender form shown by Taylor (1942). Some of the more compact plants resemble in form *Colpomenia ramosa* Taylor figured by Taylor (1945). The branch apices are never as excessively fine as indicated by Taylor (1942).

Closest to this species seems to be *R. fastigiata* (Zanardini) Boergesen which according to the figure of Zanardini (1872) differs mainly in its rather more regularly branched thallus and the lack of tapering of the tubes. According to Boergesen (1914) the sori in this latter species are roundish with a central group of hairs, and in this respect resemble the Queensland plants of *R. intricata*. Boergesen (1914) reports "hairs in groups several together both in the sterile part of the thallus and in the sori" in *R. intricata*, while Taylor (1945) reports the gametangia unaccompanied by hairs.

Hab.: Sublittoral fringe and upper sublittoral in estuarine and sheltered localities.

Aust. distr.: Q'ld. (Nerang River, Southport, March, 1948, 11.v.1950, 24.xii.1952; Redcliffe, 9.v.1950).

Extra-Aust. distr.: West Indies, Mexico (Gulf of Mexico and Pacific), Gulf of California, Ecuador, Samoa, Malayan Archipelago, India, Mediterranean.

Rosenvingea orientalis (J. Ag.) Boergesen (Pl. 2, fig. 3)

Boergesen 1914, p. 26; 1930, p. 168.

Thallus tubular, up to 23 cm. long and 1–3 mm. in diameter, repeatedly forked, the distance between successive forkings in the mature parts sometimes up to 9 cm.; below, the thallus narrowing suddenly into a very short stipe and attachment disc, and above tapering gradually to the apices which are quite subulate, the diameter 1 mm. behind the apex generally 225–300 μ ; numerous lateral branches sometimes given off near the base of the plant; in transverse section similar to *R. intricata*, consisting of an outer layer of small pigmented cells with rounded outer walls, in surface view appearing irregularly polygonal, usually 5–10 μ in diameter, and arranged either without apparent order or in somewhat indistinct longitudinal rows, internally of 2–3 layers of large colourless cells; plurilocular sporangia cylindric-clavate up to 34 μ long and up to 10.5 μ broad, similar in shape and size to those of *R. intricata* arranged in oval or more usually somewhat irregularly elongate sori up to 600 μ long and up to 180 μ broad, each with a group of up to 8 hairs arising usually towards the middle, or sometimes large sori with up to 3 such groups; similar hair groups or sometimes single hairs also found commonly on the sterile parts.

The Queensland plants appear to be intermediate between *R. orientalis* and *R. sanctae-crucis*, both slender plants which seem to be separated on somewhat slight grounds. According to Boergesen (1914), *R. orientalis* differs essentially by the absence of hairs which in *R. sanctae-crucis* are found in the sterile parts and isolated or 2–3 together in any part of the sorus. However, in plants from Bombay, he (1930) reports hairs occurring now and then but not common in *R. orientalis*. Boergesen (1930) also finds differences in the sori of the

two species, those of *R. orientalis* being small and oval, those of *R. sanctae-crucis* larger and irregular, with the sporangia up to 20 μ long in the former and 20–40 μ or longer in the latter. Specimens of *R. orientalis* from the Indian Ocean are found by Boergesen (1941) to differ from *R. sanctae-crucis* in their more slender thallus and the hair-like ends of the branches.

The branch apices of the Queensland plants are much finer than is indicated for *R. sanctae-crucis* in Boergesen's figure, and particularly in dried specimens do appear hair-like. Sori corresponding to the type reported by Boergesen in each of these two species occur and hairs are usually in distinct groups, not singly or 2–3 together as in *R. sanctae-crucis*. The hyphal filaments running along the walls of the large cells in *R. sanctae-crucis* cannot be detected in the Queensland plants. On geographical grounds it might be expected that *R. orientalis* is the more likely to be found in Queensland being known previously from the Indian Ocean, Malayan Archipelago, and Formosa, while *R. sanctae-crucis* is known only from the West Indies. De Toni (1895) lists *R. orientalis* also from Guadeloupe, but Boergesen ignores this record.

Hab.: Upper sublittoral in estuarine and sheltered localities.

Aust. distr.: Q'ld. (Nerang R., Southport, 29.xii.1948, 24.xii.1952; Dunwich, Stradbroke Is., 27.v.1951; Tallebudgera Creek, 25.v.1953).

Extra-Aust. distr.: India, Malayan Archipelago, Formosa.

DIVISION RHODOPHYTA

RHODYMENIALES—Champiaceae

Champia compressa Harv. (Pl. 4, fig. 3)

Harvey 1838, p. 402; 1847, p. 78, pl. 30.

Hab.: On drift *Sargassum* on ocean beach.

Aust. distr.: Q'ld. (Caloundra, 20.viii.1953), N.S.W., Vic., W.A.

Extra-Aust. distr.: S. Africa, Ceylon, New Caledonia, Malayan Archipelago, Friendly Is.

CERAMIALES—Ceramiaceae

Ceramium gracillimum Griff. et Harv. var. *byssoideum* (Harvey) Mazoyer (Pl. 4, fig. 4)

Mazoyer 1938, p. 323; Feldmann-Mazoyer 1940, p. 293, fig. 109; Boergesen 1952 p. 42, fig. 21.

C. byssoideum Harvey 1853, p. 218; Taylor 1928, p. 190, pl. 27, figs. 20–21.

C. transversale Collins and Harvey 1917, p. 145, pl. 5, figs. 29–31.

Hab.: Commonly epiphytic on algae in estuarine and sheltered localities.

Aust. distr.: Q'ld. (Southport, 20.xi.1953; Redcliffe, 25.vii.1953).

Extra-Aust. distr.: Mediterranean, Florida, West Indies, Venezuela, Ecuador, India, Bikini Atoll.

Delesseriaceae

Mesotrema elegans (Hering) Papenfuss (Pl. 4, fig. 5)

Papenfuss 1942, p. 449.

Martensia elegans Hering 1841, p. 92; Harvey 1847, p. 73, pl. 43, figs. 1–7.

Hab.: Sublittoral fringe and lower littoral pools in semi-exposed localities.

Aust. distr.: Q'ld. (Coolangatta, 9.iv.1949; Burleigh, 20.ii.1949; Pt. Lookout, 7.xii.1951—Mrs. G. Y. McKeon; Caloundra, 20.vii.1953), N.S.W., Vic., S. Aust., W. Aust.

Extra-Aust. distr.: Kermadec Is., Japan, South Africa, Mauritius.

Myriogramme bombayensis Boergs.

Boergesen 1931, p. 23, fig. 15, pl. 2, fig. 4; 1935, p. 57, figs. 24-25.

Hab.: Upper sublittoral in sheltered localities.

Aust. distr.: Q'ld. (Redcliffe, 18.ii.1949, 9.vii.1949, 25.vii.1953).

Extra-Aust. distr.: Bombay.

Taenioma perpusillum (J. Ag.) J. Ag. (Pl. 4, fig. 2)

J. Agardh 1863, p. 1257; Papenfuss 1944b, p. 193, pls. 23-24.

Hab.: Forming short olive-brown fur over rocks and pebbles in lower littoral shallow pools in sheltered localities, or occasionally amongst the mat of mixed algae in lower littoral exposed positions.

Aust. distr.: Q'ld. (Redcliffe, 14.ii.1953; Noosa, 14.iv.1954), W. Aust. (Dirk Hartog Is.).

Extra-Aust. distr.: West coast of Mexico, Gulf of California, Galapagos Is., Hawaiian Is., Japan, Tonga Is., Molucca Is., S. Africa, Puerto Rico.

Rhodomelaceae

Lophosiphonia saccorhiza Collins and Hervey (Pl. 4, fig. 6)

Collins and Hervey 1917, p. 127, pl. 2, figs. 13-14, pl. 3, figs. 15-17.

Hab.: Epiphytic on drift *Codium cuneatum* S. & G. on ocean beach.

Aust. distr.: Q'ld. (Southport, March, 1948).

Extra-Aust. distr.: Bermuda.

Fernandosiphonia unilateralis Levring (Pl. 4, fig. 1)

Levring 1941, p. 660, figs. 28-29, pl. 53, fig. 2.

Hab.: On *Dilophus*, *Sargassum* and *Zonaria*, and other algae in sublittoral fringe in semi-exposed localities.

Aust. distr.: Q'ld. (Noosa, 25.v.1949, 19.xi.1952; Mooloolabah, 1.i.1951; Caloundra, 18.v.1950).

Extra-Aust. distr.: Juan Fernandez Is.

SUMMARY

A bibliography of previous work on Queensland marine algae is provided; 34 species, varieties and forms are recorded including *Bryopsis indica* f. *unilateralis* f. nov., *Dictyota pardalis* f. *pseudohamata* f. nov. and *Dilophus prolificans* (A. & E. S. Gepp) comb. nov.; four previously described species or varieties are relegated to synonymy.

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EXPLANATION OF PLATES

PLATE 1

- Fig. 1—*Chlorodesmis major*. *a-c*, basal portion of plant, x 9; *d*, portion of erect branch, x 9; *e*, apex of erect branch, x 18.
- Fig. 2—*Bryopsis indica*. *a*, young axis with ramuli not clearly arranged in 2 double rows, x 36; *b*, mature axis with ramuli in 2 double rows, x 36; *c*, double row of scars on old branch, x 36; *d-e*, whole plant, x $\frac{3}{2}$; *f*, whole plant with one axis showing elongate and tangled ramuli, x $\frac{3}{2}$.
- Fig. 3—*Bryopsis indica* f. *unilateralis*. *a*, band of scars on old axis, x 40; *b-d*, whole plant, x $\frac{3}{2}$.
- Fig. 4—*Rhizoclonium hookeri*. *a-b*, x 21.
- Fig. 5—*Boodleopsis pusilla*. *a-c*, x 36.
- Fig. 6—*Chaetomorpha antennina*. *a-c*, x 10.
- Fig. 7—*Chaetomorpha aerea*. *a-h*, x 10.
- Fig. 8—*Chaetomorpha natalensis* f. *exposita*. *a-c*, x 21.
- Fig. 9—*Rhizoclonium riparium*. *a-d*, filaments showing various degrees of rhizoid development found in different collections, x 87.
- Fig. 10—*Chaetomorpha linum*. *a-b*, x 40.

PLATE 2

- Fig. 1—*Nemacystus decipiens*. *a*, portion of plant, x $\frac{3}{2}$; *b-d*, assimilating filaments, x 165; *e*, assimilating filament and hair, x 165; *f-g*, plurilocular sporangia, x 165.
- Fig. 2—*Scytosiphon lomentaria*. *a-d*, x $\frac{1}{2}$.
- Fig. 3—*Rosenvingea orientalis*. *a*, whole plant, x $\frac{1}{2}$; *b*, branch apex, x 46; *c*, sori, x 20.
- Fig. 4—*Rosenvingea intricata*. *a*, section through sorus, x 165; *b-f*, various forms of branches, x $\frac{1}{2}$ (*b* from formalin preserved specimen, *c-f* from mounted specimens).
- Fig. 5—*Petalonia fascia*. *a*, section through fertile thallus with paraphyses and hairs among sporangia, x 162; *b*, section through fertile thallus, x 162; *c*, whole plant, x $\frac{1}{2}$.
- Fig. 6—*Endarachne binghamiae*. *a-b*, whole plants, x $\frac{1}{2}$; *c*, section through fertile thallus, x 162.

PLATE 3

- Fig. 1—*Dilophus prolificans*, x $\frac{3}{2}$.
- Fig. 2—*Dilophus marginatus*, x $\frac{3}{2}$.
- Fig. 3—*Dictyota pardalis*, x $\frac{3}{2}$.
- Fig. 4—*Dictyota dichotoma* var. *intricata*, x $\frac{3}{2}$.
- Fig. 5—*Dictyota indica*, x $\frac{3}{2}$.
- Fig. 6—*Dictyota bartayresii*. *a-b*, mature plant, x $\frac{3}{2}$; *c-d*, apices from the same plant, x 6; *e-i*, juvenile plants, x $\frac{3}{2}$.
- Fig. 7—*Dictyota volubilis*, x $\frac{3}{2}$.
- Fig. 8—*Dictyota dichotoma*, x $\frac{3}{2}$.
- Fig. 9—*Dictyota divaricata*, *a-c*, x 3.
- Fig. 10—*Dictyota pardalis* f. *pseudohamata*, x $\frac{3}{2}$.

PLATE 4

- Fig. 1—*Fernandosiphonia unilateralis*. *a*, portion of plant, x 6; *b*, portion of plant, x 21.
- Fig. 2—*Taenioma perpusillum*. *a*, portion of plant, x 10; *b*, tetrasporic branch, x 46; *c-f*, branch apices in various stages of development, x 150; *g*, mature branch apex, x 82; *h*, portion of basal system with erect branches, x 30.
- Fig. 3—*Champia compressa*, x 5.
- Fig. 4—*Ceramium gracillimum* var. *byssoidesum*. *a, c, d*, portions of branch, x 100; *b*, node of prostrate filament with rhizoid, x 100; *e*, tetrasporic node, x 100.
- Fig. 5—*Mesotrema elegans*. *a*, whole plant, x $\frac{3}{2}$; *b*, plant with proliferating marginal teeth, x $\frac{3}{2}$.
- Fig. 6—*Lophosiphonia saccorhiza*. *a*, portion of prostrate filament with rhizoids, x 18; *b*, portion of plant, x 2; *c*, tetrasporic branch, x 87.
- Fig. 7—*Myriogramme bombayensis*. *a-b*, x $\frac{3}{2}$.

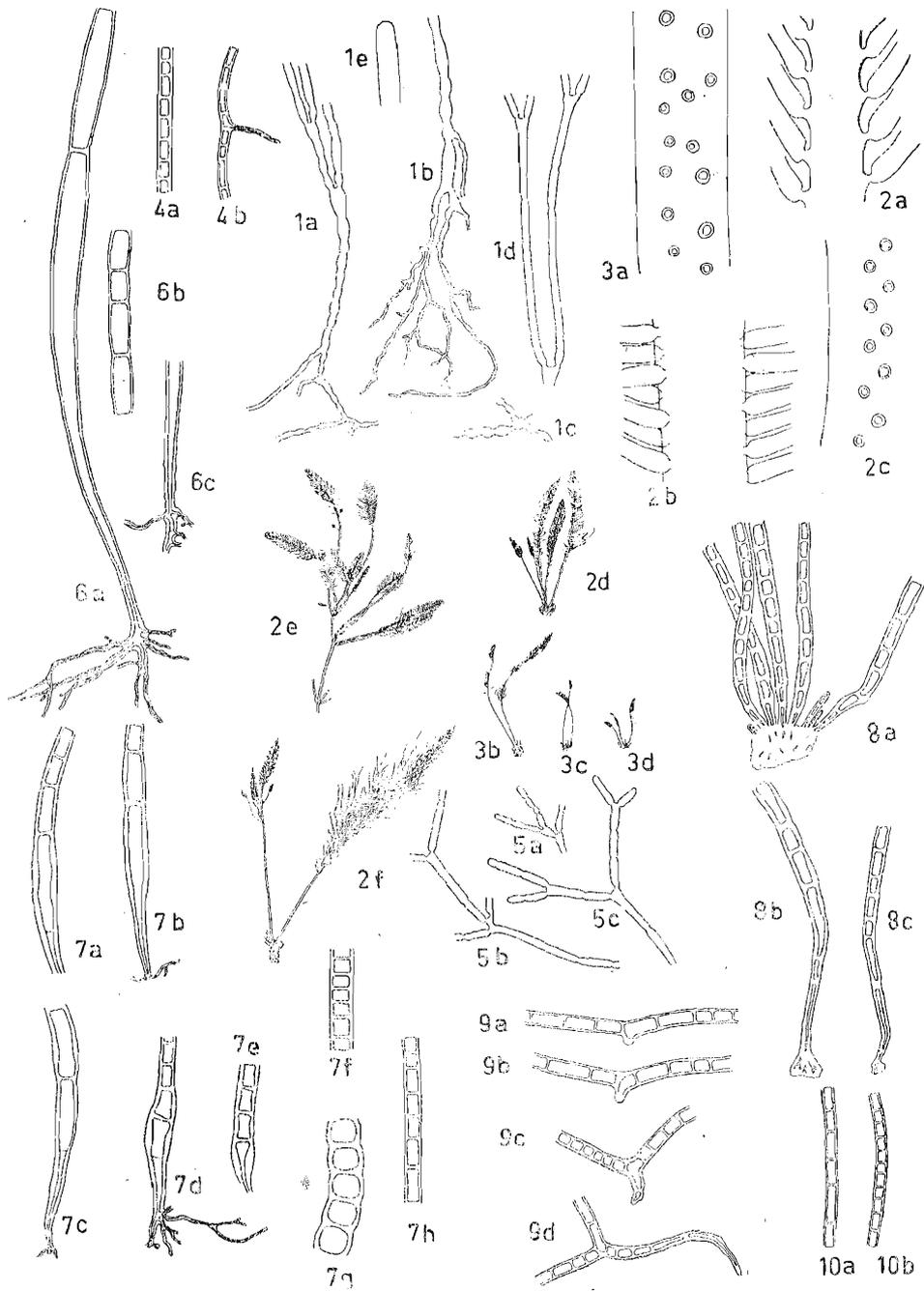


PLATE I

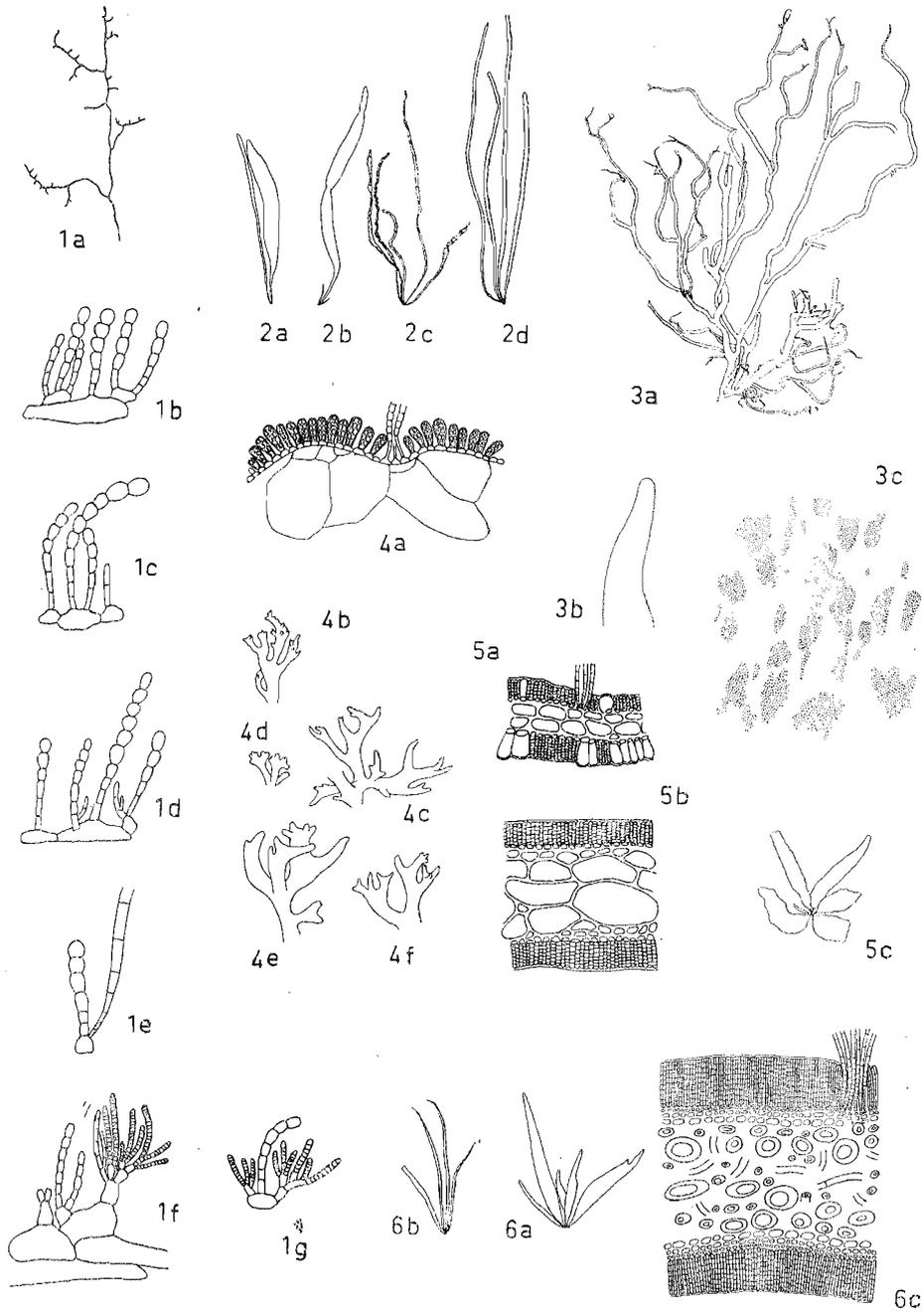


PLATE II

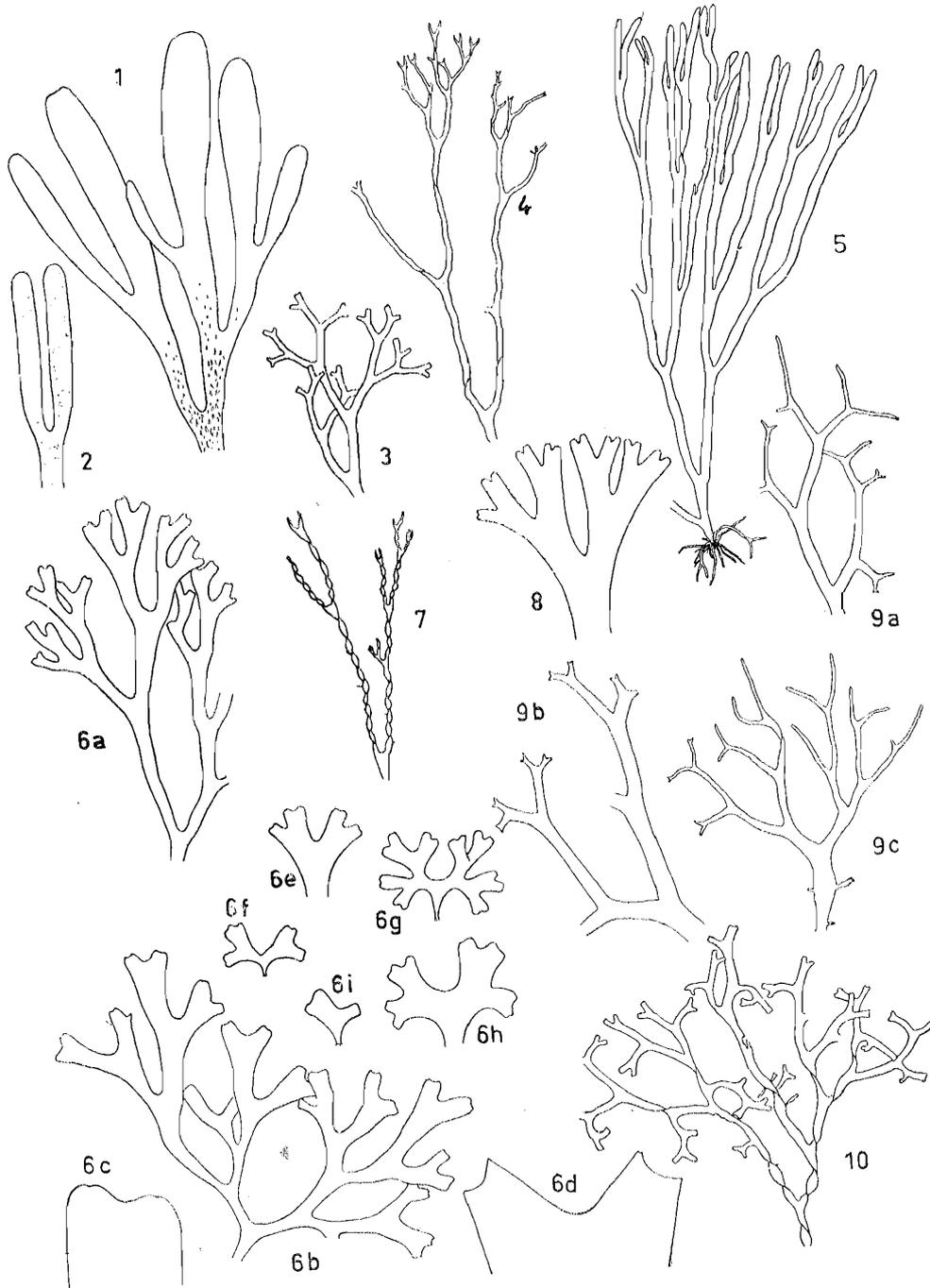


PLATE III

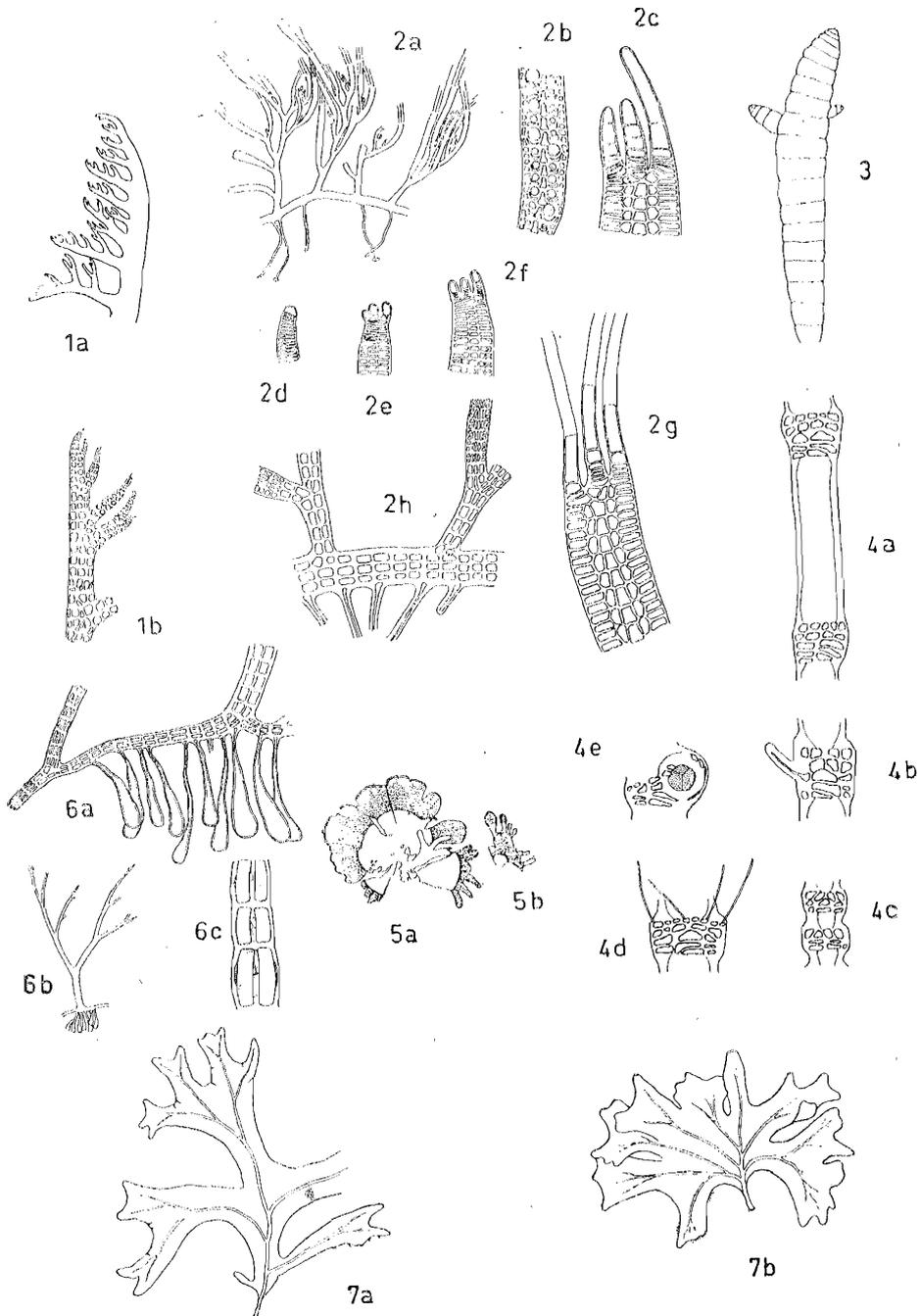


PLATE IV