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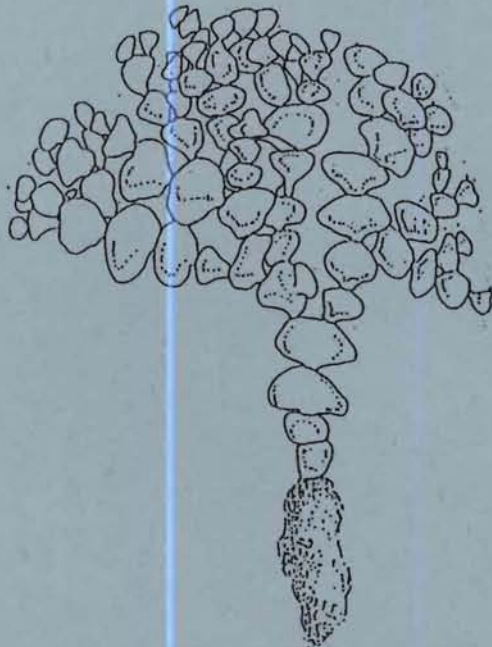
Contributions to a Catalogue of the Marine Algae of Fiji

1. Halimeda (Chlorophyceae)

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INTRODUCTION

The purpose of this catalogue is to provide a guide to selected and important benthic marine algae of the Fiji Islands. By publishing the catalogue as an in progress series through the USP Marine Studies Programme Technical Reports, it is hoped to make the information available as rapidly as possible, at the same time recognising that these contributions are preliminary steps towards the publication of more comprehensive accounts at a later date. The main purpose of the catalogue will be to provide a useable reference guide to common genera of Fijian benthic marine algae, including keys and illustrations.

South & Kasahara (1992) have published a preliminary checklist of the benthic marine algae of the Fiji Islands, in which they attempted to bring together all previously published records. Their preliminary list is intended as a starting point for more detailed studies of the flora, which is still poorly known.

THE GENUS HALIMEDA

General classification:

CLASS: Chlorophyceae

ORDER: BRYOPSIDALES

FAMILY: HALIMEDIACEAE

GENUS: *Halimeda* Lamouroux, 1812.

Lamouroux 1812:186.

For synonymy of the genus see Hillis (1959:339) and Hillis-Colinvaux (1980:85).

The genus Halimeda is comprised of 31 species, almost exclusively tropical in distribution, but with one species (H. cuneata), which is almost entirely subtropical (Hillis, 1959; Hillis-Colinvaux, 1980; Noble, 1986). Hillis (1959) and Hillis-Colinvaux (1980) has published comprehensive monographs of the genus, and these richly-illustrated accounts are essential resources for the identification of the species, as well as important compendia of the taxonomy, nomenclature, morphology, anatomy, physiology, ecology, and distribution of the species. Other important references on the genus are Barton (1901), Taylor (1950) and Taylor (1960). The most in-depth investigation of Fijian Halimeda species is included in the publications of Kasahara (1985; 1988).

Hillis (1959) and Hillis-Colinvaux (1980) has summarized the world distribution of Halimeda species. By far the greater number of species occurs in the Indo-Pacific region (24) compared with the Atlantic (13: Hillis-Colinvaux, 1980; Noble, 1986). Of the 23 Indo-Pacific species, Hillis-Colinvaux listed only six that also occurred in the Atlantic, with the remaining species being distinct for each of the two regions (Table 1). More recent studies from Fiji (Kasahara, 1985; 1988) and New Caledonia (Garrigue & Tsuda, 1988) have added one other species (H. simulans) to the group occurring in both regions. With 15 species of Halimeda, from the potential total of 24 Indo-Pacific species, the flora of Fiji is well represented by this genus (Table 1). This number compares well with the 15 species reported from New Caledonia (Garrigue & Tsuda, 1988), a somewhat more sub-tropical region than Fiji, but is significantly less than the 21 species recorded from Micronesia (Tsuda & Wray, 1977). It is likely that continuing floristic studies in Fiji will reveal the presence of more species.

Key to Fijian species of Halimeda

The following key principally emphasizes macroscopic features of Halimeda species occurring in Fiji. Firm identification of similar species depends, however, to a large extent on a microscopic examination of the internal anatomy of the plants, particularly three features: the shape and size of the surface layer of utricles; the branching pattern, shapes and sizes of the primary and secondary utricles in the cortical layers of the segments; and the arrangement of the medullary filaments at the nodes, especially as to whether they are free or fused, how many are fused together, the length of the fusion zone, and the presence or absence of pores in the fusion zones. These characteristics have been used to arrange Halimeda species into five Sections (Hillis-Colinvaux, 1980), and are the most important diagnostic features, since the gross morphology of species of Halimeda is sometimes quite variable, and a number of similar species may be easily confused. Examination of the anatomical features requires decalcification of the thallus, and microscopic examination; as far as possible this procedure has been avoided for the use of the following key, in recognition of the fact that final identification of species will require laboratory study.

The size ranges given in the key refer to the known ranges of the species as described in Hillis-Colinvaux (1988), within which Fijian species occur. This approach is used since, for the present, there are insufficient representative examples of Fijian specimens to allow calculation of reliable local size ranges.

1. Distinct holdfast present.....2
1. Distinct holdfast absent.....7
 2. Base of plant and holdfast region of matted filaments and branches; holdfast not bulbous(12) *H. renschii*
 2. Base of plant otherwise.....3
3. Holdfast large to massive, 4-12 cm long; plants usually occurring in sandy or muddy habitats.....4
3. Holdfast small, not massive; plants attached to coral rock, in crevices, caves or overhangs, infrequently associated with mud or sand9
 4. Segments predominantly cylindrical, holdfast massive, up to 12 cm long(4) *H. cylindracea*
 4. Segments reniform, cuneate or otherwise, not predominantly cylindrical; holdfast 4 - 9 cm long5
5. Basal portion of thallus caulescent, the lower part of the plant often simple; segments variously shaped, predominantly reniform; holdfast large, to 9 cm long.....(7)*H. incrassata*
5. Basal portion of plant not caulescent; holdfast to 4 cm long6
 6. Plants erect, to 12 cm tall, calcification moderately heavy; cortex of 2-4 (5) layers, the outermost utricles remaining attached after decalcification; segments reniform.....(13) *H. simulans*
 6. Plants erect, flat or somewhat bushy, to 23 cm tall, calcification moderate to rather light; cortex of (2) 3-4 layers, outermost utricles separating following decalcification; segments sometimes compressed-cylindrical, more commonly subcuneate, discoidal or subreniform.....(9) *H. macrophysa*
7. Plants attached by rhizoids when in contact with the substratum; sprawling, rarely compact.....(11)*H. opuntia*
7. Plants attached by an inconspicuous holdfast, spreading or compact in form.....8
 8. Plants large, up to 70cm long, loose or compact; branching from a single plane, segments commonly 1-3 ribbed, to 13mm long X 21 mm broad, often forming a short stalk at the nodal junction; a "skin" of peripheral utricles sometimes separating from the rest of the cortex when the plant dries.....(2) *H. copiosa*

8. Plants smaller, to 15cm tall, spreading or compact, often forming cushion-like clumps; segments generally plane or sometimes ribbed, mainly subcuneate, discoid or reniform, 13mm long X 19mm broad, reaching 25 mm long X 40mm broad in deep water specimens.....(15) *H. tuna*
9. Plants fragile, friable; surface of segments dull, rugose, noticeably pitted.....(9)*H. macrophysa*
9. Plants not fragile or friable; surface of segments not noticeably pitted.....10
10. Filaments at node remaining completely separated(6)*H. fragilis*
10. Filaments at node fusing in twos or threes.....11
11. Segments very large, to 29 X 33 mm; commonly discoid to reniform.....(5)*H. discoidea*
11. Segments smaller.....12
12. Segments small, > 5 mm in maximum dimension(10)*H. minima*
12. Segments considerably larger (11) 16 mm long X 18 (27) mm broad.....13
13. Many of segments supported by a cushion segment, or a stalk region of uncorticated medullary filaments.....(3) *H. cuneata*
13. Segments not supported by a cushion segment or a stalk region of uncorticated medullary filaments.....14
14. Calcification rather heavy, utricles remaining firmly attached following decalcification; nodal medullary filaments united in twos and threes, not especially entangled and adhering only slightly(1)*H. bikinensis*
14. Calcification moderate, utricles usually separating following decalcification; nodal medullary filaments united in twos and threes, units entangled and strongly adhering.....(14) *H. taenicola*

CATALOGUE OF SPECIES

Note: Representative material cited is housed in the Phycological Herbarium, South Pacific Regional Herbarium, University of the South Pacific, Fiji.

1. **Halimeda bikinensis** W.R. Taylor [Figs 1-2]

Taylor 1950:87, pl. 48, fig. 1 [Type locality: Bikini Atoll, Marshall Islands].

Hillis 1959:358, pl. 2, fig. 1; pl. 5, figs. 17-18; pl. 6, fig. 3; pl. 10; Hillis-Colinvaux 1980:141, fig. 43.

Distribution: Western Indian Ocean, North Pacific, south-western Pacific Ocean.

Fiji: Kasahara, 1988; South & Kasahara, 1992.

Representative material: Mamami, Viti Levu: Kasahara, 19-10-1985; Korovou, Viti Levu: Kasahara, 27-9-1985.

2. **Halimeda copiosa** Goreau & Graham [Figs 3-5]

Goreau & Graham 1967:433, figs. 1-10 [Type locality: Jamaica].

Synonymy:

Halimeda opuntia (Linnaeus) Lamouroux f. **hederacea** Barton 1901:21, pl. III, fig. 23.

Halimeda opuntia (Linnaeus) Lamouroux var. **hederacea** (Barton) Hillis 1959:360, pl.5, fig.4.

Halimeda hederacea (Barton) Colinvaux 1968:30, figs. 1,2 (1,4,5,6,8).

Hillis-Colinvaux 1980:118, figs. 33, 101.

Distribution: Western Indian Ocean, western Pacific; north and south Atlantic.

Fiji: The occurrence of this species in Fiji is uncertain. Material previously referred to **H. opuntia** var. **hederacea** (Chapman, 1977; Kasahara, 1988; South & Kasahara, 1992) does not closely resemble published descriptions and illustrations; further studies are required.

3. **Halimeda cuneata** Hering [Figs 9-11]

Hering in Krauss, 1846:214 [Type locality Durban, South Africa].

Synonymy:

Halimeda obovata Kützing 1858:11, pl.25, fig. 1

Halimeda versatilis J.Agardh 1887:86

Hillis 1959:345, pls. 1,5-7,9; Meñez 1961:58, pl.4, figs. 43-46; pl.5, figs. 54,55;
Hillis-Colinvaux 1980:124, figs. 36,61.

Distribution: Sub-tropical; western Indian Ocean (north & south); south-eastern Indian Ocean; south-western Pacific.

Fiji: Dravuni Is., Kadavu: Kasahara, 1985:18, pl.2, fig.2; pl.14, fig.c (as **H.cuneata** f. **undulata** Barton); South 1991:5. South & Kasahara, 1992; Kasahara (1985) cites Barton (1901, pl.1, fig.10) as representative of this species. This illustration was excluded from **Halimeda cuneata** by Hillis-Colinvaux, 1980. Fiji specimens (In herb. Kyoto University) require verification.

4. **Halimeda cylindracea** Decaisne [Figs 6-8]

Decaisne 1842:103 [Type locality Malagasy Republic].

Halimeda polydactylis J.Agardh 1887:89

Halimeda incrassata Harvey 1860:125, pp, including pl. 125.

Halimeda incrassata Harvey f. **monilis** Barton 1901:27 pp. incl. pl.4, fig.40.

[**Halimeda monile** (Ellis & Solander) Lamouroux is a mis-applied name: see Hillis 1959:374)]

Hillis 1959:373, pl.4, fig. 3; pl.5, figs. 22-23; pl.6, fig. 19; pl.7, fig. 13; pl.12;
Hillis-Colinvaux 1980:100, figs. 4,5,104.

Distribution: Western Indian Ocean; western Pacific, north and south.

Fiji: Kasahara 1985:19, pl.3, fig.3.; South, 1991:5; South & Kasahara, 1992.

Representative material: Toberua Pass, Viti Levu: Kasahara, 26-9-1985; Man Friday Resort, Coral Coast, Viti Levu: Carlson, 19-21 January, 1973; Dravuni Is., Kadavu: South, 10 April, 1991.

5. **Halimeda discoidea** Decaisne [Figs 15-17]

Decaisne 1842:102 [Type locality not known.

Synonymy:

Halimeda discoidea v. **platyloba** Boergesen 1911:134, fig. 3

Halimeda discoidea f. **intermedia** Gilbert 1947:126

Halimeda discoidea f. **subdigitata** Gilbert 1947:125

Halimeda tuna Barton 1901:11 (p.p.)

?*Halimeda cuneata* Hering f. *digitata* Barton 1901:16, pl.2, fig.9

Hillis 1959:352, pl.2, fig.5; pl.5, fig. 11; pl.6, fig. 11; pl.7, figs 9-10; pl.8, figs 5-8; pl.11; Hillis-Colinvaux 1980:136, fig. 41.

Distribution: Pantropical; western and eastern Indian Ocean including the Red Sea; western Pacific, north and south; north-eastern Pacific; western Atlantic, north and south; north-eastern Atlantic.

Fiji: Chapman, 1971; Kasahara, 1988; South & Kasahara, 1992.

Representative material: Tagage, Coral Coast, Viti Levu: Kasahara, 15-10-1985, No. 20064; Bau, Viti Levu: Kasahara, 29-9-1985, No. 20062; Nabuna, Viti Levu: Kasahara 14-10-1985.

6. *Halimeda fragilis* W.R. Taylor [Figs 18-20]

Taylor 1950:88, 207; pl.48, fig.2 [Type locality Eniwetok Atoll, Marshall Islands]

Hillis 1959:363, pl.3, fig.2; pl.5, fig.10; pl.6, fig.1; pl.7, fig.1; pl.8, fig.1; pl.9; Hillis-Colinvaux 1980:1512, fig.47.

Distribution: Central Indian Ocean; north-western Pacific; south-western Pacific.

Fiji: Kasahara, 1988; South & Kasahara, 1992.

7. *Halimeda incrassata* (Ellis) Lamouroux [Figs 23-25]

Lamouroux 1816:307 [Type locality: West India]

Basionym: *Corallina incrassata* Ellis 1768:408, pl. XVII, figs. 20-27.

Synonymy:

Corallina tridens Ellis & Solander 1786: 109, pl.20, fig.a

Halimeda tridens (Ellis & Solander) Lamouroux 1816:308

?*Halimeda brevicaulis* Kützing 1858:11, pl.25, fig.2

Hillis (1959) and Hillis-Colinvaux (1980) does not recognize distinct varieties of this species.

Hillis 1959:365, pl./4, figs.1-2; pl5, fig. 21; pl.6, figs 21-24; pl.12; Hillis-Colinvaux 1980:93, fig.22. Taylor 1960:181, figs 1,4.

Distribution: Pan tropical.

Fiji: Askenasy, 1888; Chapman, 1971; Kasahara, 1985:20, pl.3, fig.2; South & Kasahara, 1992.

8. **Halimeda macroloba** Decaisne [Figs 12-14]

Decaisne 1841:118 [Type locality: Red Sea]

Barton 1901:24, pl.3, figs.33-38; Hillis 1959:375, pl.3, fig.3; pl.5, figs.19-20; pl.6, fig.17; pl.12; Hillis-Colinvaux 1980:108, fig.28.

Distribution: Tropical Indian and Pacific Oceans.

Fiji: Hillis, 1959:376; Kasahara, 1985:20, pl.2, fig.4; 1988; South, 1991:5; South & Kasahara, 1992.

Representative material: Namarai, Viti Levu: Kasahara, 19-10-1985; Tavua, Viti Levu: Kasahara, 11-10-1985, No. 20047; Rakiraki, Viti Levu: Kasahara, 11-10-1985, No. 20046; Nasova Bay, Viti Levu: Kasahara, 19-10-1985, No. 20048; Dravuni Is., Kadavu: South, April 10, 1991; Suva Point, Viti Levu: Carlson, 25-2-1973, BC12-73.

9. **Halimeda macrophysa** Askenasy [Figs 21-22]

Askenasy 1888:14, pl.IV, figs.1-4 [Type locality: Makutu Is., Fiji]

Barton 1901:17, pl.2, figs. 15-18; Hillis 1959:361, pl.2, fig.3; pl.5, fig.16; pl.6, fig.8; pl.11; Hillis-Colinvaux 1980, p. 134, figs.40, 99.

Distribution: Tropical Indo-Pacific.

Fiji: Askenasy, 1881:14 (Makutu Is., Type Locality); Chapman, 1971; Kasahara, 1985:21; South & Kasahara, 1992.

Representative material: Suva, Viti Levu: Kasahara, 1988; Korovou, Viti Levu: Kasahara, 27-9-1985, No. 20034; Makuluva Is., Viti Levu: Kasahara, 19-10-1985.

10. **Halimeda minima** (W.R. Taylor) Colinvaux [Fig. 34]

Colinvaux 1968:32, figs. 5,6.

Basionym: **Halimeda opuntia** (Linnaeus) Lamouroux f. **minima** W.R. Taylor 1950:82, pl.39, fig.2 [Type locality Bikini Atoll, Marshall Islands].

Hillis-Colinvaux 1980:113, fig. 30.

Distribution: Northern and south-western Pacific Ocean.

Fiji: Garbary et al. 1992; South & Kasahara, 1992.

11. **Halimeda opuntia** (Linnaeus) Lamouroux [Figs 26-28]

Lamouroux 1812:186.

Basionym: **Corallina opuntia** Linnaeus 1758:805, p.p. [Type locality: Jamaica]

Synonymy:

Halimeda cordata J. Agardh 1887:83 (see Tsuda & Wray, 1977; Hillis-Colinvaux, 1980; Silva *et al.*, 1987).

Halimeda opuntia (Linnaeus) Lamouroux f. **cordata** (J. Agardh) Barton 1901:20, pl.2, fig.20.

Halimeda triloba Decaisne 1842:102

Halimeda opuntia (Linnaeus) Lamouroux f. **triloba** (Decaisne) J. Agardh 1887:84.

The status of **Halimeda opuntia** (Linnaeus) Lamouroux var. **macrocarpa** Askenasy needs clarification.

Barton 1901:18, pl.2, figs.19-27; Taylor 1950:80, pl.39, fig.1; Egerod 1952:397, pl.3, fig.19a,e & f; Hillis 1959:359, pl.2, figs.7-8; pl.5, figs.3-4; pl.6, fig.6; pl.7, fig.3; pl.10; Hillis-Colinvaux 1980:110, figs.19, 51, 92.

Distribution: Pan tropical.

Fiji: Askenasy, 1888; Chapman, 1971; Kasahara 1985:22, pl.2, fig.3; Kasahara, 1988; South, 1991:5; South & Kasahara, 1992.

Representative material: Nasova Bay, Viti Levu: Kasahara, 19-10-1985; Tagage, Viti Levu: Kasahara, 3-10-1985; Malevu, Coral Coast, Viti Levu: Kasahara, 3-10-1985; Off Bau, Viti Levu: Kasahara, 26-9-1985, No. 20020; Tagage, Viti Levu: Kasahara, 3-10-1985, No. 20025; Makuluva Is., Viti Levu: Kasahara, 22-9-1985, No. 20011; Deuba, Viti Levu: Carlson, 8-10-1972, No. BC43-72; Dravuni, Kadavu: South, 10-4-1991.

12. **Halimeda renschii** Hauck [Fig. 39]

Hauck 1886:167 [Type locality: Comoro Islands, Johannes Is.]

Synonymy:

Halimeda opuntia (Linnaeus) Lamouroux f. **renschii** (Hauck) Barton 1901:21, pl.II, figs. 22, 22a.

Halimeda batanensis W.R. Taylor 1973:34, figs. 1,2.

Hillis-Colinvaux 1980:115, fig. 31.

Distribution: Eastern Indian Ocean; western, south-western and south-eastern Pacific.

Fiji: Garbary et al., 1992; South & Kasahara, 1992.

13. **Halimeda simulans** Howe [Figs 29-31]

Howe 1907:503, pl. 29 [Type locality: Culebra Is., Puerto Rico].

Synonymy:

Halimeda incrassata (Ellis et Solander) Lamouroux var. **simulans** (Howe) Boergesen 1913:114, fig. 92.

Hillis 1959:368, pl.3, fig. 4; pl.5, fig.27; pl.6, fig.15; pl.11; Hillis-Colinvaux 1980:103, fig.26.

Distribution: Eastern Indian Ocean, tropical and sub-tropical Pacific Ocean; north and south-western Atlantic.

Fiji: Chapman, 1977; Kasahara 1985:22, pl.3, fig.1; pl.14, fig.D; Kasahara, 1988; South & Kasahara, 1992.

Representative material: Korotoga, Viti Levu: Kasahara, 3-10-1985; Korovoi, Viti Levu: Kasahara, 27-9-1985, No. 20031; Laucala Bay, Suva, Viti Levu: Carlson, 19-10-1972 (as **Halimeda tuna**); Suva Point, Suva, Viti Levu: Carlson, 12-02-1973, BC12-73 (as **Halimeda tuna**).

14. **Halimeda taenicola** W.R. Taylor [Figs 32-33]

Taylor 1950:86, pl.46, fig.1 [Type locality: Rongerick, Enyvetik Is., Marshall Islands].

Hillis 1959:354, pl.2, fig.6; pl.5, fig.12; pl.6, fig.14; pl.14; pl.11; Hillis-Colinvaux 1980:139, fig. 42.

Distribution: Tropical western Pacific Ocean.

Fiji: Garbary et al. 1992; South & Kasahara, 1992.

15. **Halimeda tuna** (Ellis & Solander) Lamouroux [Figs 35-38]

Lamouroux 1812:186; 1816:309, pl. XI, fig.8 [Type locality: Mediterranean Sea].

Basionym: **Corallina tuna** Ellis & Solander 1786:111, pl.20, fig.e.

Hillis 1959:342, pl.1,5,6,9; Hillis-Colinvaux 1980:122, fig.35.

Synonymy:

?**Halimeda tuna** f. **albertisii** Piccone 1879:23, fig. 2.

Halimeda tuna f. **platydisca** (Decaisne) Barton 1901:14, pl.1, fig.2.

Halimeda tuna var. **platydisca** Boergesen 1911:134.

The status of **Halimeda tuna** f. **triloba** Barton in South & Kasahara, 1992 needs investigation (= **Halimeda triloba** Decaisne 1842:102, synonymous with **Halimeda opuntia**?; see synonymy in Silva et al., 1987).

Distribution: Tropical and sub-tropical oceans in general; Mediterranean.

Fiji: Chapman 1971, 1977; Kasahara 1985:23, pl.2, fig.1; Kasahara, 1988; South & Kasahara, 1992.

Representative material: Tagage, Coral Coast, Viti Levu: Kasahara, 15-10-1985; Suva, Viti Levu: Kasahara, 11-9-1985; Nasova Bay, Viti Levu: Kasahara, 19-10-1985, No. 20060; Korovou, Viti Levu: Kasahara, 27-9-1985, No. 20056.

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13. **Halimeda simulans** Howe [Figs 29-31]

Howe 1907:503, pl. 29 [Type locality: Culebra Is., Puerto Rico].

Synonymy:

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Distribution: Eastern Indian Ocean, tropical and sub-tropical Pacific Ocean; north and south-western Atlantic.

Fiji: Chapman, 1977; Kasahara 1985:22, pl.3, fig.1; pl.14, fig.D; Kasahara, 1988; South & Kasahara, 1992.

Representative material: Korotoga, Viti Levu: Kasahara, 3-10-1985; Korovoi, Viti Levu: Kasahara, 27-9-1985, No. 20031; Laucala Bay, Suva, Viti Levu: Carlson, 19-10-1972 (as **Halimeda tuna**); Suva Point, Suva, Viti Levu: Carlson, 12-02-1973, BC12-73 (as **Halimeda tuna**).

14. **Halimeda taenicola** W.R. Taylor [Figs 32-33]

Taylor 1950:86, pl.46, fig.1 [Type locality: Rongerick, Enyvetik Is., Marshall Islands].

Hillis 1959:354, pl.2, fig.6; pl.5, fig.12; pl.6, fig.14; pl.14; pl.11; Hillis-Colinvaux 1980:139, fig. 42.

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TABLE I.

Geographical distribution of *Halimeda* species in the Indo-Pacific and Atlantic Oceans, and in Fiji. From Hillis (1959), Hillis-Colinvaux (1980), Tsuda & Wray (1977), Noble (1986), Silva *et al.* (1987), Garrigue and Tsuda (1988) and South & Kasahara (1992).

Species	Indo-Pacific	Atlantic	Fiji
bikinensis	+		+
borneensis	+		
copiosa	+	+	+
cryptica		+	
cuneata	+		+
cylindracea	+		+
discoidea	+	+	+
distorta	+		
favulosa		+	
fragilis	+		+
gigas	+		
gracilis	+	+	
goreauii		+	
incrassata	+	+	+
lacrimosa		+	
lacunalis	+		
macroloba	+		+
macrophysa	+		+
magnidisca	+		
melanesica	+		
micronesica	+		
minima	+		+
monile		+	
opuntia	+	+	+
renschii	+		+
scabra		+	
simulans	+	+	+
stuposa	+		
taenicola	+		+
tuna	+	+	+
velasquezii	+		
TOTAL SPECIES	25	13	15

LEGENDS TO FIGURES 1 - 36.

Figures 1 - 11

Fig. 1 *Halimeda bikinensis*. Habit drawing. Scale = 2.0 cm. Fig. 2 *Halimeda bikinensis*, surface view of decalcified segment. From Hillis (1959, pl. 5, fig. 17). Scale = 100 μm . Fig. 3 *Halimeda copiosa*. Habit drawing. Scale = 2.0 cm. Fig. 4 *Halimeda copiosa*, surface view of decalcified segment. Scale = 30 μm . Fig. 5 *Halimeda copiosa*, Longitudinal view of nodal medullary filaments. Fig. 6 *Halimeda cylindracea*. Habit drawing. Scale = 2.0 cm. Fig. 7 *Halimeda cylindracea*. Surface view of decalcified segment. From Kasahara (1985, pl. 3, fig. 3). Scale = 100 μm . Fig. 8 *Halimeda cylindracea*. Longitudinal view of nodal medullary filaments. From Hillis (1959, pl. 7, fig. 13). Scale = 200 μm . Fig. 9 *Halimeda cuneata*. Habit drawing; based on Hillis (1959, pl. 1, fig. 6) and Hillis-Colinvaux (1980, fig. 36). Scale = 2.0 cm. Fig. 10 *Halimeda cuneata*. Surface view of decalcified segment. After Kasahara (1985, pl.2, fig. 2a). Scale = 50 μm . Fig. 11 *Halimeda cuneata*. Longitudinal view of medullary filaments. From Kasahara (1985, pl. 2, fig. 2a). Scale = 50 μm .

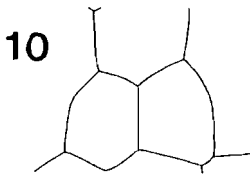
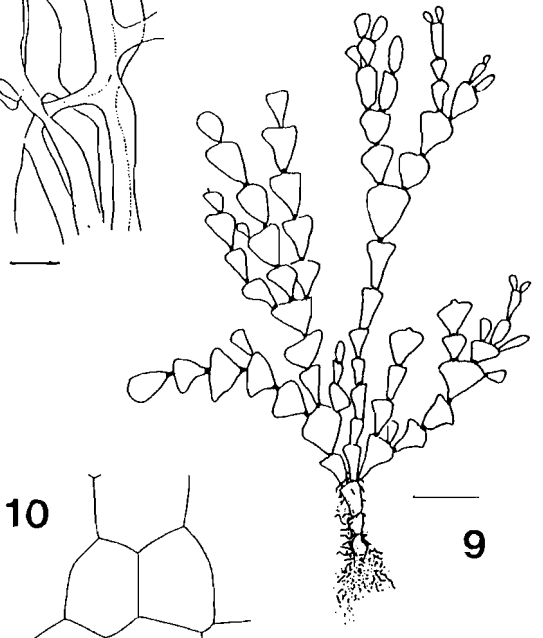
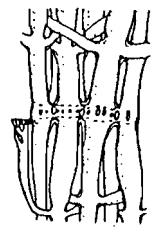
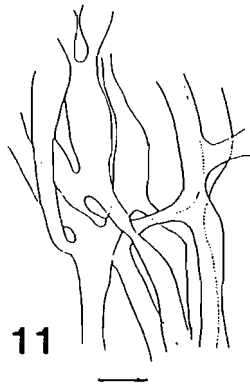
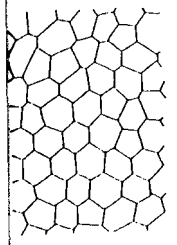
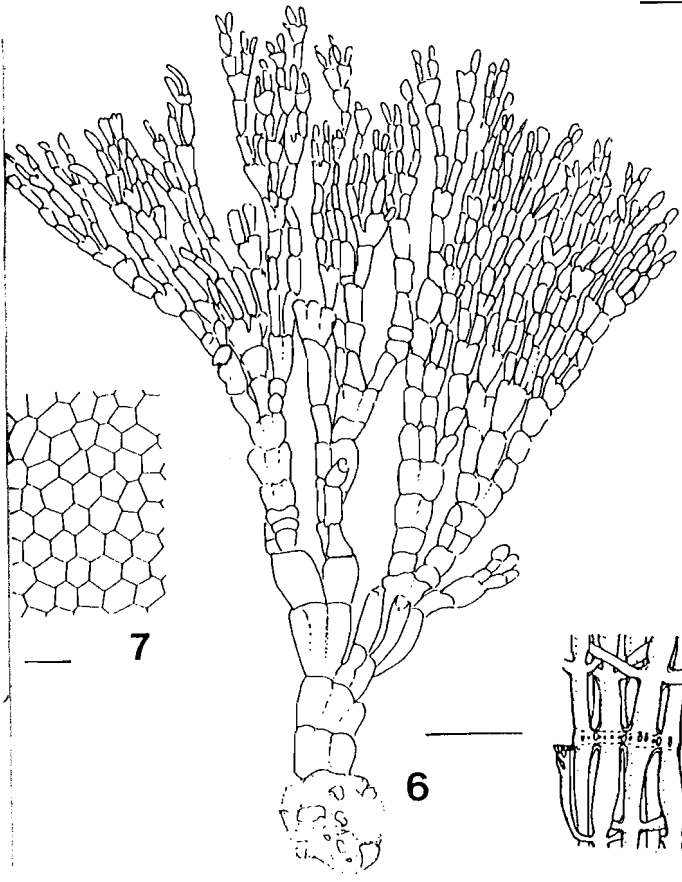
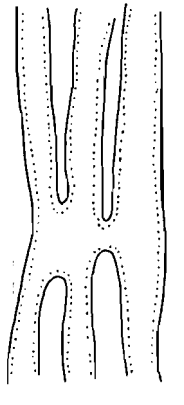
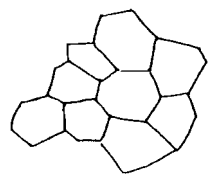
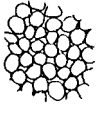
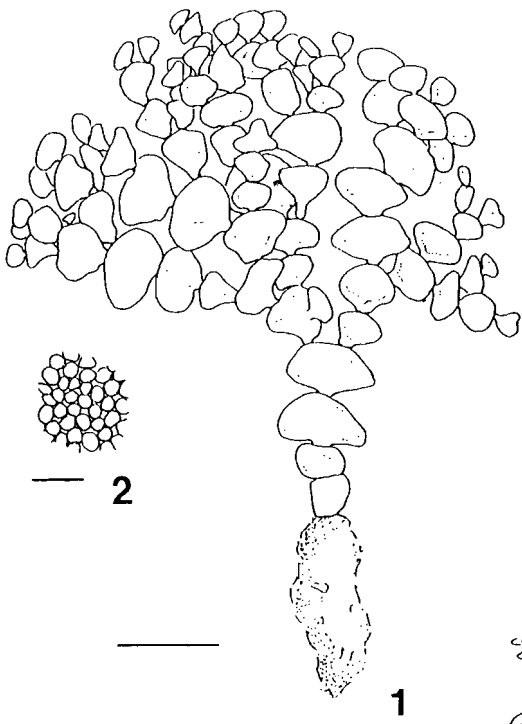
Figures 12 - 25

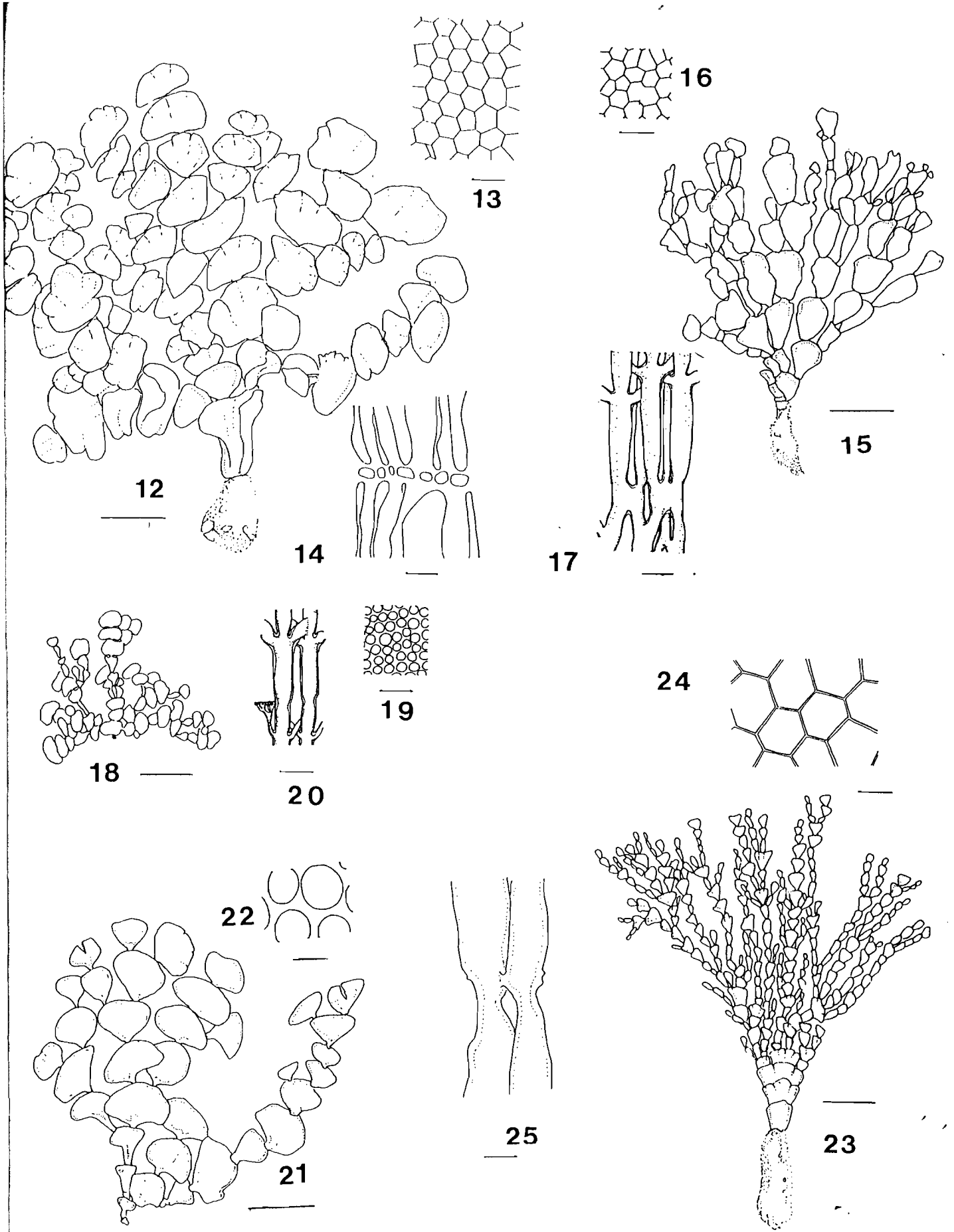
Fig. 12 *Halimeda macroloba*. Habit drawing. Scale = 2.0 cm. Fig. 13 *Halimeda macroloba*. Surface view of decalcified segment. From Kasahara (1985, pl. 2, fig. 4a). Scale = 50 μm . Fig. 14 *Halimeda macroloba*. Longitudinal view of nodal medullary filaments. From Kasahara (1985, pl. 2, fig. 4b). Scale = 100 μm . Fig. 15 *Halimeda discoidea*. Habit drawing. Scale = 2.0 cm. Fig. 16 *Halimeda discoidea*. Surface view of decalcified segment. From Hillis (1959, pl. 5, fig. 11). Scale = 100 μm . Fig. 17 *Halimeda discoidea*. Longitudinal view of nodal medullary filaments. From Hillis (1959, pl. 7, fig. 10). Scale = 200 μm . Fig. 18 *Halimeda fragilis*. Habit drawing. Redrawn from Hillis (1959, pl. 3, fig. 2). Scale = 2.0 cm. Fig. 19 *Halimeda fragilis*. Surface view of decalcified segment. From Hillis (1959, pl. 5, fig. 10). Scale = 200 μm . Fig. 20 *Halimeda fragilis*. Longitudinal view of nodal medullary filaments. From Hillis (1959, pl.7, fig. 1). Scale = 100 μm . Fig. 21 *Halimeda macrophysa*. Habit drawing. Scale = 2.0 cm. Fig. 22 *Halimeda macrophysa*. Surface view of decalcified segment. From Hillis (1959, pl. 5, fig. 16). Scale = 100 μm . Fig. 23 *Halimeda incrassata*. Habit drawing. Scale = 2.0 cm. Fig. 24 *Halimeda incrassata*. Surface view of decalcified segment. From Kasahara (1985, pl.3, fig. 2a). Scale = 100 μm . Fig. 25 *Halimeda incrassata*. Longitudinal view of nodal filaments. Redrawn from Kasahara (1985, pl. 3, fig. 2b). Scale = 100 μm .

Figures 26 - 39

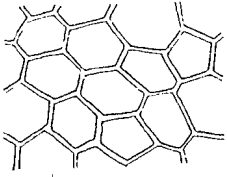
Fig. 26 *Halimeda opuntia*. Habit drawing. Scale = 2.0 cm. Fig. 27 *Halimeda opuntia*. Surface view of decalcified segment. From Kasahara (1985, pl. 2, fig. 3a). Scale = 10 μm . Fig. 28 *Halimeda opuntia*. Longitudinal view of nodal medullary filaments. From Kasahara (1985, pl. 2, fig. 3b). Scale = 100 μm . Fig. 29 *Halimeda simulans*. Habit drawing. Scale

= 2.0 cm. Fig. 30 *Halimeda simulans*. Surface view of decalcified segment. From Hillis (1959, pl. 5, fig. 27). Scale = 100 μm . Fig. 31 *Halimeda simulans*. Longitudinal view of nodal medullary filaments. From Kasahara (1985, pl. 2, fig. 3b). Scale = 100 μm . Fig. 32 *Halimeda taenicola*. Habit drawing. Adapted from Hillis (1959, pl. 2, fig. 6). Scale = 2.0 cm. Fig. 33 *Halimeda taenicola*. Surface view of decalcified segment. From Hillis (1959, pl. 5, fig. 12). Scale = 100 μm . Fig. 34 *Halimeda minima*. Habit drawing, based on Hillis-Colinvaux (1980, fig. 30). Scale = 2.0 cm. Fig. 35 *Halimeda tuna*. Habit drawing. Scale = 2.0 cm. Fig. 36 *Halimeda tuna*. Surface view of decalcified segment. From Kasahara (1985, pl. 2, fig. 1a). Scale = 50 μm . Fig. 37 *Halimeda tuna*. Longitudinal view of nodal medullary filaments. Redrawn from Kasahara (1988, No. 2053). Scale = 500 μm . Fig. 38 *Halimeda tuna*. Longitudinal view of nodal medullary filaments. From Kasahara (1985, pl. 2, fig. 1b). Scale = 200 μm . Fig. 39 *Halimeda renschii*. Habit drawing. Based on Hillis-Colinvaux (1980, fig. 31). Scale = 2.0 cm.





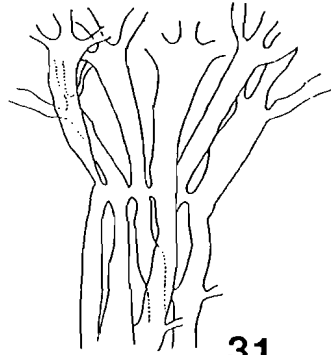
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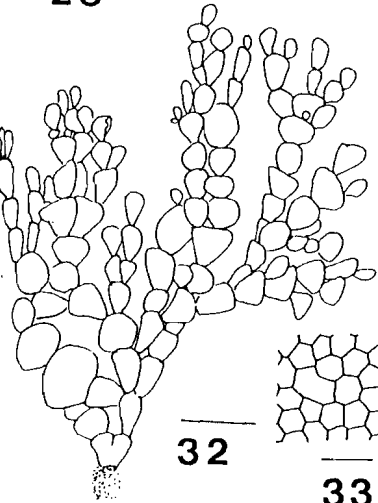


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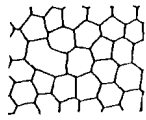
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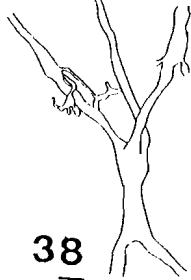
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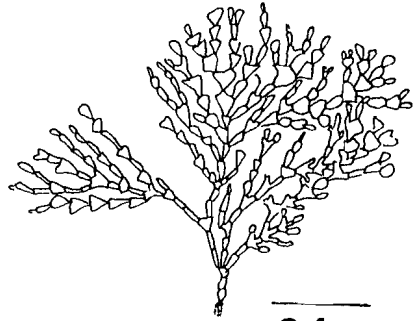
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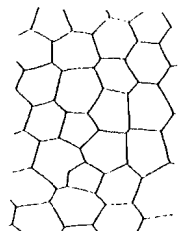
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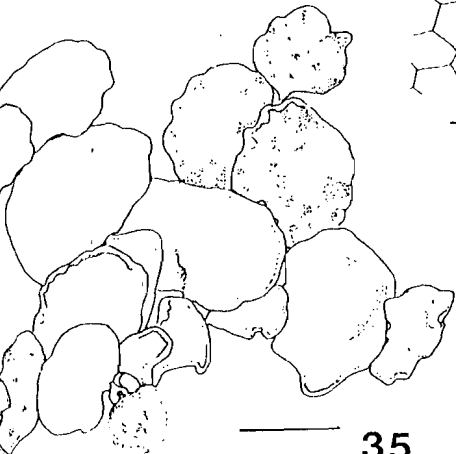
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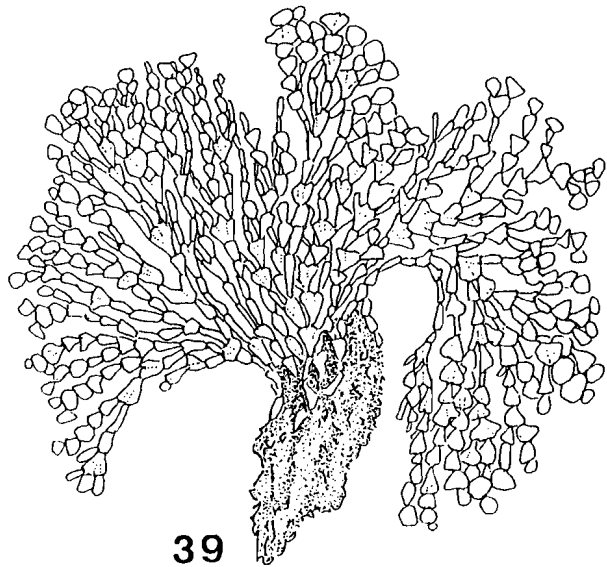
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