

SEAWEEDS OF THE SPERMONDE ARCHIPELAGO, SW SULAWESI, INDONESIA

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SUMMARY

Seaweeds are important components of tropical reef systems. The present paper deals with the Chlorophyta, Phaeophyta and noncoralline Rhodophyta collected by the first author in the Spermonde Archipelago, SW Sulawesi, Indonesia, during the Buginesia-III project (November 1988–November 1990). Additional collections from this area by Keblusek (July 1991–October 1991) were also studied and the results are incorporated in the present paper. The results of the present study are compared with those of the Siboga Expedition (1899–1900), of the Danish Expedition to the Kei Islands (1914–1916), and of the Snellius-II Expedition (1985). In total, 199 taxa (80 Chlorophyta belonging to 21 genera, 36 taxa of Phaeophyta belonging to 11 genera, 83 noncoralline Rhodophyta belonging to 40 genera, and about 35 taxa of coralline algae) were collected. Of these, 72 taxa are new records for Indonesia (17 Chlorophyta, 20 Phaeophyta, and 35 noncoralline Rhodophyta). *Caulerpa buginense* and *Udotea flabellum* f. *longifolia* are newly described.

Keys to the genera, species, and forms are provided, and remarks on the economic potential of some of the seaweeds are included.

Key words: Indonesia, seaweeds, keys, biotic reefs.

INTRODUCTION

The fieldwork of the Buginesia-III project, part of a multi-disciplinary series of research projects (marine biology/physical geography) in the Spermonde Archipelago, SW Sulawesi, Indonesia (Fig. 1), was carried out from November 1988 till November 1990 (Best & Zonneveld, 1989). The primary objective of the project was to collect data, both biological and geo-physical, for studies on taxonomy and on distribution patterns of marine plants in the Spermonde Archipelago. A large collection of marine plants, macro-algae as well as seagrasses, was made and the materials are deposited in the Rijksherbarium at Leiden (L). Additional data on taxa occurring in the Indonesian Archipelago were obtained from results of the Siboga Expedition (1899–1900; Weber-van Bosse, 1913, 1921, 1923, 1928), of the Danish Expedition to the Kei Islands (as part of Dr Th. Mortensen's Pacific Expedition, 1914–1916; Weber-van Bosse, 1926), and of the Snellius-II Expedition (1985; Coppejans & Prud'homme van Reine, 1989a, b, 1992a, b) as well as from an unpublished report on Keblusek's fieldwork (June 1991–October 1991) on use of economically important seaweeds in the Spermonde Archipelago. In many cases comparisons with the original material were made.

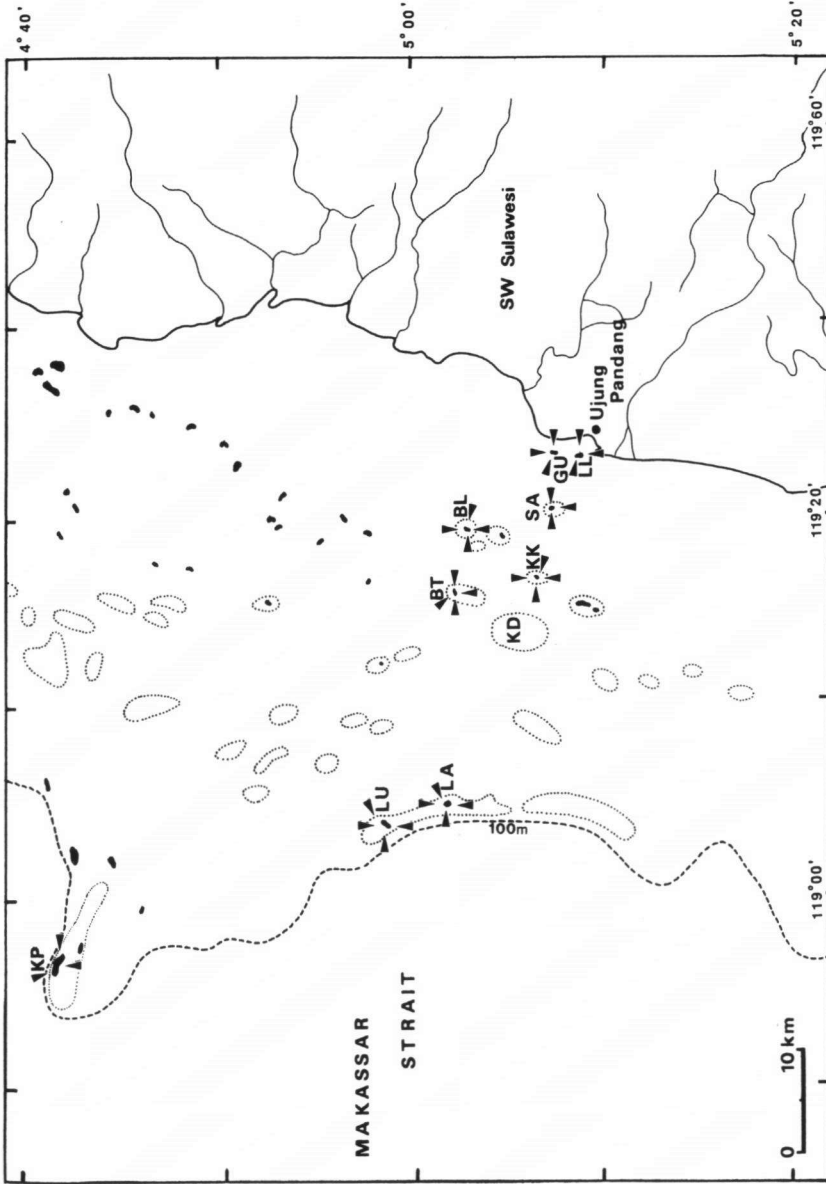


Fig. 1. Map of the Spermonde Archipelago, SW Sulawesi, Indonesia, showing the collecting localities. Used abbreviations: BL = Barang Lompo island; BT = Bone Tambung island; GU = Gusung island; KD = Kudingareng Keke island; KP = Kapoasang island; LA = Langkai island; LL = Lae Lae island; LU = Lanyukang island; SA = Samalona island. Arrowheads indicate the sampling locations.

The purposes of this paper are to provide a basis for future study and research in this area of Indonesia and to provide a complete list of collected and identified specimens to serve as a source for ecological research in the Buginesia-III project (Verheij, 1993c in prep.). Where necessary remarks are made on distribution, taxonomy, and general appearance. Keys to genera and species are provided where possible.

The nongeniculate Corallinales are incorporated in a separate series of papers (Verheij, 1992, 1993a, b) and they are only referred here by their taxonomic name and their synonymy. Verheij & Erftemeyer (1993 in prep.) will describe the seagrasses and the seaweeds associated with seagrass beds.

MATERIAL AND METHODS

During the present study, marine plants were collected on the reefs of several islands in the Spermonde Archipelago (Fig. 1). All collections were numbered and preserved in a 5% formol/95% seawater solution. After at least 48 hours the coralline algae were transferred to glass jars containing a 70% ethanol/2% glycerin solution. Large macro-algae (e.g. *Turbinaria* spp. and *Sargassum* spp.) and large seagrasses (e.g. *Enhalus acoroides*) were kept in the formol/seawater solution. From the remaining specimens small, representative fragments were selected and stored in small glass tubes. The remaining parts of these specimens were preserved as voucher specimens according the method described by Tsuda & Abbott (1985).

The following data for each collection were stored in a database: a) field identification, b) location, c) depth, d) date of collection, e) substratum, f) collectors name and g) annotations. After returning to Leiden, the Netherlands, the field identifications were checked and where necessary updated.

In the present paper, taxa are listed in alphabetical order within divisions. Data for each taxon include: the most recent name with author citation, year of publication of the name and page in the original publication, the same for basionyms and synonyms; the local distribution and depth (in metres); world distribution; citation of herbarium numbers for the collections from the Spermonde Archipelago or of collectors' numbers, and additional remarks. Additional relevant collections were examined in PC, C, and L, but are not listed in the present paper. Dichotomous keys are provided using mainly field characters. In some cases, however, the use of anatomical characters could not be avoided.

Dried samples from collections made by Verheij are referred to by herbarium accession numbers, while wet-preserved collections of Verheij and all Keblusek's samples are referred to by collectors' numbers. The numbered samples often contain more than one specimen. The collections are kept in the Rijksherbarium, Leiden (L). Additional collections were studied in C (Danish Expedition to the Kei Islands collections) and L (Siboga Expedition and Snellius-II collections). Duplicates were sent to the Herbarium Bogoriense (BO). Herbarium abbreviations follow Holmgren et al. (1990).

Data on distribution are obtained from: Gepp & Gepp (1911), Weber-van Bosse (1913, 1921, 1923, 1926, 1928), Hillis-Colinvaux (1980), Cordero (1981), Cribb (1983), Tseng (1983), Womersley (1984, 1987), Abbott & Norris (1985), Silva et al. (1987), Abbott (1988) and Trono & Ganzon-Fortes (1988).

RESULTS

CHLOROPHYTA

Key to the genera of Chlorophyta from the Spermonde Archipelago:

- 1a. Cells uninucleate; cell diameter in general less than 20 μm ; thallus foliose or filamentous; one non-reticulate chloroplast 2
- b. Cells multinucleate; cell diameter in general larger than 20 μm ; thallus massive, cylindrical, branched, not foliose or filamentous; more than one chloroplast or one reticulate chloroplast 3
- 2a. Thallus at least partly hollow **XXII. Enteromorpha**
- b. Thallus membranous; distromatic **XXIII. Ulva**
- 3a. Thallus consisting of filaments or vesicle-like cells partitioned by complete cross walls, arising in irregular or regular fashion. 4
- b. Thallus consisting of intricate or whorled filaments, vesicles, or blades, in sterile plants not partitioned by complete cross walls 10
- 4a. Filaments forming solidly or loosely organized groups or clumps of various shapes. 5
- b. Filaments not in distinct groups or clumps. 9
- 5a. Plants with vesicle-like cells 6
- b. Plants forming blades or intricate filamentous networks 8
- 6a. Vesicles soft and flexible rather large (larger than 1 cm long), elongate, usually in small groups **XV. Boergesenia**
- b. Vesicles firm, small (less than 1 cm long), often in tightly packed clusters. 7
- 7a. Thalli solid or hollow, formed of rounded, small, pseudoparenchymatous vesicular cells **XVI. Dictyosphaeria**
- b. Thalli formed of branched vesicular cells **XVII. Valonia**
- 8a. Plants consist of clumps of stipitate blades **XII. Anadyomene**
- b. Plants consist of intricate, branched, filamentous networks . . **XIII. Boodlea**
- 9a. Plants always filamentous **XIV. Chaetomorpha**
- b. Thallus one giant coenocytic cell **XVIII. Ventricaria**
- 10a. Thallus not strictly radially organized; gametes not produced in cysts or gametangial rays 11
- b. Thallus strictly radially organized; gametes produced in cysts or in gametangial rays 21
- 11a. Internal structure of plant composed of a filamentous medulla and a cortex of inflated utricles 12
- b. Internal structure of plant composed of filaments only or internal structure not partitioned 14
- 12a. Thallus calcified, composed of flat or cylindrical segments, joined by narrow, not calcified internodes **VI. Halimeda**
- b. Thallus not calcified and not segmentated 13
- 13a. Thallus subdichotomous; branches slender (less than 2 mm broad); utricles subglobose or somewhat compressed and lateral to the sparse medullary filaments **VII. Pseudocodium**

- b. Thallus of different form, e. g. dichotomously massive, branched, or bulbous; utricles elongate, single or compound and sprouting from the numerous medullary filaments **III. Codium**
- 14a. Thallus composed of interwoven, conglutinated or laterally connected filaments 15
 - b. Thallus composed of free, simple or branched filaments or internal structure not partitioned 18
- 15a. Thallus not calcified 16
 - b. Thallus calcified 17
- 16a. Filaments with special appendages (tenacula with prongs) . . . **IX. Rhipilia**
 - b. Filaments without special appendages (tenacula without prongs) **IV. Avrainvillea**
- 17a. Stipes corticated **XI. Udotea**
 - b. Stipes not corticated **VIII. Rhipidosiphon**
- 18a. Thallus of another form, internal structure not partitioned, but provided with internal ridges (trabeculae) **II. Caulerpa**
 - b. Thallus composed of free, simple or branched filaments 19
- 19a. Erect parts without main axis, filaments constricted above each dichotomous branching **V. Chlorodesmis**
 - b. Erect parts with main axis, filaments not constricted above branching 20
- 20a. Thallus composed of monosiphonous main axes, provided with glomeruli of verticils of dichotomously branching filaments **X. Tydemania**
 - b. Thallus composed of creeping stolons and erect main axes, provided with penate lateral branchlets **I. Bryopsis**
- 21a. Thalli not calcified **XX. Bornetella**
 - b. Thalli calcified 22
- 22a. Thalli cylindrical-clavate, without cap at tip of stipe **XXI. Neomeris**
 - b. Thalli with cap at tip of long, slender stipe **XIX. Acetabularia**

Order CAULERPALES

Family BRYOPSIDACEAE

I. Bryopsis Lamouroux

Bryopsis plumosa (Hudson) C. Agardh

Ulva plumosa Hudson, 1762: 571.

Bryopsis plumosa (Hudson) C. Agardh, 1822: 448; Weber-van Bosse, 1913: 92–93; Lawson & John, 1987: 93.

Local distribution – Gusung: 1 m.

Distribution – Tropical and warm temperate seas of the world (e.g. Indonesia, Philippines, England, West Africa).

Specimens examined – L 992.261-226.

Family CAULERPACEAE

II. *Caulerpa* Lamouroux

Remarks — The genus *Caulerpa* is represented in the Spermonde Archipelago by 15 species, the same number as the genus *Halimeda*. However, within one species, *C. racemosa*, 7 growth forms, ecads, are distinguished. For a discussion on these ecads see Coppejans & Prud'homme van Reine (1992b). The major part of the Chlorophyta biomass on the reefs is formed by *Caulerpa* spp. and *Halimeda* spp.

Although many species of *Caulerpa* could be used as vegetables, only one, *C. racemosa* ecad *corynephora*, is sold on the central market of Ujung Pandang as human food. However, some of the remaining taxa of the genus occur so scattered that they cannot be collected in suitable amounts and thus are not (yet?) used for consumption.

Key to species and ecads of the *Caulerpa* from the Spermonde Archipelago:

- 1a. Erect parts flat, blade- or strap-like, without ramuli 2
- b. Erect parts cylindrical, bearing ramuli of various shapes 5
- 2a. Erect parts blade-like 3
- b. Erect parts strap-like with serrate margin, in general spirally twisted with serrate margins 11. *C. serrulata*
- 3a. Blades without marginal teeth 9c. *C. racemosa* ecad *lamourouxii*
- b. Blades with marginal teeth 4
- 4a. Margins of blades with some small teeth 1. *C. brachypus*
- b. Margins of blades strongly dentated 13. *C. subserrata*
- 5a. Ramuli spherical, clavate, turbinate or peltate 6
- b. Ramuli seriate and terete, cylindrical, compressed or flat 15
- 6a. Ramuli peltate; stalk abruptly expanding into disc-like apex 7
- b. Ramuli spherical, clavate or turbinate 8
- 7a. Disc-like apex of ramuli small (in general less than 5 mm in diameter)
 - 9f. *C. racemosa* ecad *peltata*
- b. Disc-like apex of ramuli large (in general larger than 10 mm in diameter)
 - 9d. *C. racemosa* ecad *macrodisca*
- 8a. Ramuli globose, abruptly enlarging from the base to the apex 9
- b. Ramuli turbinate or clavate, gradually enlarging from the base to the apex 10
- 9a. Distinct constriction between stalk and globose apex; ramuli densely packed over the entire erect part 5. *C. lentillifera*
- b. No distinct constriction between stalk and apex; erect part not completely covered with ramuli 9e. *C. racemosa* ecad *occidentalis*
- 10a. Ramuli turbinate, flattened at the apex 9h. *C. racemosa* ecad *turbinata*
- b. Ramuli clavate, with rounded apex. 11
- 11a. Ramuli opposite, occasionally alternate, in one plane, somewhat compressed, closely packed 12
- b. Ramuli not opposite 13
- 12a. Chloroplast without pyrenoids 9a. *C. racemosa* ecad *corynephora*
- b. Chloroplast with pyrenoids 8. *C. opposita*

- 13a. Stolon bearing compressed, naked, strap-like erect parts; ramuli irregularly placed on erect parts or occasionally absent
 - 9c. *C. racemosa* ecad *lamourouxii*
 - b. Strap-like erect parts absent; ramuli more or less regularly placed on erect parts 14
- 14a. Ramuli narrowly clavate, radially arranged 9b. *C. racemosa* ecad *laetevirens*
 - b. Ramuli pear-shaped, irregularly placed on the erect parts
 - 9g. *C. racemosa* ecad *racemosa*
- 15a. Ramuli complanate 16
 - b. Ramuli terete, cylindrical or spiniform 19
- 16a. Ramuli constricted at the base 17
 - b. Ramuli not constricted at the base 18
- 17a. Apex of ramuli rounded; ramuli distinctly overlapping; no distinct midrib
 - 2. *C. buginense*
 - b. Ramuli sickle-shaped, with mucronate apex; ramuli not overlapping; midrib narrow, less than length of ramuli 14. *C. taxifolia*
- 18a. Ramuli not overlapping; no distinct midrib 7. *C. manorensis*
 - b. Ramuli slightly overlapping; midrib broader than length of ramuli; ramuli sickle-shaped 10. *C. scalpelliformis*
- 19a. Ramuli in whorls 20
 - b. Ramuli in longitudinal rows 21
- 20a. Ramuli both on erect and stoloniferous parts 4. *C. elongata*
 - b. Ramuli restricted to erect parts; stoloniferous parts naked 15. *C. verticillata*
- 21a. Ramuli terete, in two or three rows 22
 - b. Ramuli spiniform 3. *C. cupressoides*
- 22a. Ramuli mucronate 23
 - b. Ramuli with rounded tips; ± clavate . . 9a. *C. racemosa* ecad *corynephora*
- 23a. Ramuli not constricted, slightly acuminate, axis terete 12. *C. sertularioides*
 - b. Ramuli constricted at their bases, gradually tapering in a mucronate apex, axes compressed 6. *C. lessonii*

1. *Caulerpa brachypus* Harvey (Plate 1: 1)

Caulerpa brachypus Harvey, 1858: 333; Weber-van Bosse, 1898: 280–281; Weber-van Bosse, 1913: 97–98; Weber-van Bosse, 1926: 89; Coppejans & Meinesz, 1988: 184; Coppejans & Beeckman, 1990: 113; Coppejans & Prud'homme van Reine, 1992b: 673.

Local distribution – Kapoposang, Langkai: 15–20 m.
 Distribution – Tropical and warm temperate Indian Ocean (Kenya), tropical western Pacific (Indonesia, Japan, eastern Australia).

Specimens examined – L 992.071-755 / -758 / -772 / -774 / -778 / -788, Keblusek 148.

Remarks – In the Spermonde Archipelago *C. brachypus* occurs only in the deeper parts, 15–25 m deep, on the sandy reef bottoms at the west side of the islands on the edge of the shelf. This is in disagreement with the findings of Coppejans & Meinesz (1988) who reported that in Papua New Guinea *C. brachypus* also occurs in shallow water, 1–3 m deep. Subsequently Coppejans (1992) corrected the determination of these specimens to *C. biserrulata* Sonder.

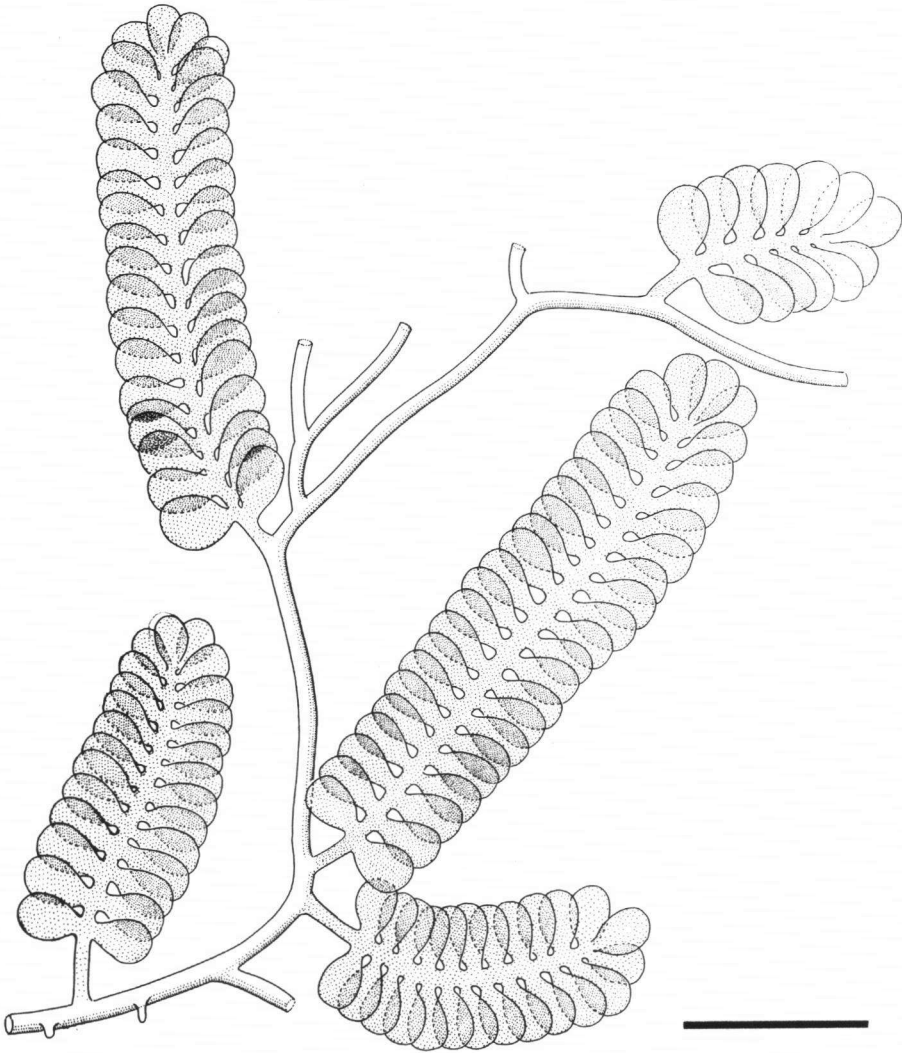


Fig. 2. Habitus of the holotype specimen of *Caulerpa buginense* (L 992.261-045). Scale bar = 1 cm.

2. *Caulerpa buginense* Verheij & Prud'homme van Reine, *spec. nov.* (Fig. 2)

Latin diagnosis: Stolones breves cylindrici ad 25 cm longi minus quam 1 mm diametro substratum superjecti interdum partim substrato tecti. Rhizoidea brevia 2–5 mm longa minus quam 0.5 mm diametro. Frondes erectae planae 3–4 cm longae, rhachidi 1–2 mm lata, ramulis complanatis oppositis rotundatis ad 4 mm diametro, basi profunde constrictis, ramulis contiguis imbricatis.

Diagnosis – Stolons short, up to 25 cm, cylindrical, diameter less than 1 mm, lying down on the substratum sometimes partly covered by the substratum. Rhizoids

short, 2–5 mm, less than 0.5 mm in diameter. Fronds upright, 3–4 cm long, flat. Central part of frond, rachis, 1–2 mm width. Ramuli compressed, opposite, rounded, deeply constricted at the base, diameter up to 4 mm, adherent ramuli overlapping.

Holotype – L 992.261-045, Langkai Island, west side, depth 15 m.

Etymology – The species is named after the local population of SW Sulawesi: the Buginese, and after the research project: Buginesia project.

Local distribution – Langkai: 10–20 m.

Distribution – Indonesia (Sulawesi).

Specimens examined – L 992.261-045.

Remarks – *C. buginense* is rare. The species occurs at depths of 10–20 m in the outermost zone of the Spermonde Archipelago. The species is related to the *taxifolia* group. It differs from other species in the *taxifolia* group in the shape of the ramuli. The constriction between the stalk and the ramuli of *C. buginense* is similar to the constriction between the stalk and the ramuli of *C. lentillifera*. However, the ramuli of *C. buginense* are flat whereas the ramuli of *C. lentillifera* are (sub)spherical.

3. *Caulerpa cupressoides* (Vahl) C. Agardh (Plate 1: 2)

Fucus cupressoides Vahl, 1802: 333.

Caulerpa cupressoides (Vahl) C. Agardh, 1817: XXIII; Weber-van Bosse, 1898: 323; Weber-van Bosse, 1913: 103–104; Weber-van Bosse, 1926: 91; Børgesen, 1907: 368–378; Lawson & John, 1987: 88; Coppejans & Beeckman, 1990: 113–114; Coppejans & Prud'homme van Reine, 1992b: 673–686; Coppejans, 1992: 389–392.

Caulerpa urvilliana Montagne, 1845: 21; Weber-van Bosse, 1898: 319; Silva et al., 1987: 111.

Local distribution – Kapoposang, Langkai, Lanyukang: 15 m.

Distribution – Pantropical.

Specimens examined – L 992.071-752 / -753 / -769 / -785 / -851–857 / -868–871 / -873 / -885–889, Keblusek 79, 147, 267.

4. *Caulerpa elongata* Weber van Bosse (Plate 1: 3)

Caulerpa elongata Weber van Bosse, 1898: 273; Weber-van Bosse, 1913: 96; Coppejans & Beeckman, 1990: 114–116; Coppejans & Prud'homme van Reine, 1992b: 686; Coppejans, 1992, 393.

Local distribution – Not observed in the Spermonde Archipelago.

Distribution – Tropical Indian Ocean (Kenya), tropical western Pacific (Indonesia, Philippines).

Specimens examined – L 992.071-756 / -762.

Remarks – This species has not been found in the research area in the Spermonde Archipelago, but has been collected north of the Spermonde Archipelago and in the southern part of SW Sulawesi (Bira).

5. *Caulerpa lentillifera* J. Agardh (Plate 1: 4)

Caulerpa lentillifera J. Agardh, 1837: 173; Weber-van Bosse, 1898: 380; Weber-van Bosse, 1913: 112–113; Coppejans & Meinesz, 1988: 184–186; Coppejans & Beeckman, 1989: 383–384; Coppejans & Beeckman, 1990: 118; Coppejans & Prud'homme van Reine, 1992b: 690–692; Coppejans, 1992: 395.

Local distribution – Kapoposang, Langkai, Lanyukang: 1–15 m.

Distribution – Tropical Indian Ocean (Kenya), tropical western Pacific (Indonesia, eastern Australia).

Specimens examined – L 992.071-768 / -770 / -771 / -784, Keblusek 149.

6. *Caulerpa lessonii* Bory de Saint-Vincent (Plate 1: 5)

Caulerpa lessonii Bory de Saint-Vincent, 1828: 193; Weber-van Bosse, 1913: 104; Coppejans & Prud'homme van Reine, 1992b: 692.

Local distribution – Bone Tambung, Langkai: 15–20 m.

Distribution – Indo-Pacific (Indonesia, Philippines), tropical western Pacific (Carolina Islands).

Specimens examined – L 992.071-766 / -776 / -782 / -798.

7. *Caulerpa manorensis* Nizamuddin (Plate 1: 6)

Caulerpa manorensis Nizamuddin, 1964: 204–223; Coppejans & Meinesz, 1988: 186–189; Coppejans, 1992: 395.

Local distribution – Samalona, Barang lombo, Kudingareng Keke, Bone Tambung: 20–35 m.

Distribution – Tropical Indian Ocean (Pakistan), tropical Pacific (Indonesia, Papua New Guinea).

Specimens examined – L 992.071-757 / -759 / -760 / -773 / -775 / -781 / -789 / 790 / -797.

Remarks – Coppejans & Meinesz (1988: 186) already discussed the relationships of *C. manorensis* with closely related taxa. In the Spermonde Archipelago, *C. manorensis* occurs on quiet, sandy substrata, in general more than 20 m deep, and it usually is associated with the seagrass *Halophila decipiens* Ostenfeld and the green alga *Codium geppii* Schmidt.

8. *Caulerpa opposita* Coppejans & Meinesz (Plate 1: 7)

Caulerpa opposita Coppejans & Meinesz, 1990: 190–191; Coppejans, 1992: 397.

Local distribution – Langkai: 10 m.

Distribution – Indonesia, Papua New Guinea.

Collected specimen – L 992.071-792.

9. *Caulerpa racemosa* (Forsskål) J. Agardh (Plate 1: 8, 9; Plate 2: 1–6)

Fucus racemosus Forsskål, 1775: 191.

Caulerpa racemosa (Forsskål) J. Agardh, 1873: 35; Weber-van Bosse, 1898: 357–373; Weber-van Bosse, 1913: 104–110; Weber-van Bosse, 1926: 91–92; Børgesen, 1907: 378–389; Lawson & John, 1987: 89; Coppejans & Meinesz, 1988: 191; Coppejans & Beeckman, 1989: 384–392; Coppejans & Beeckman, 1990: 119; Coppejans & Prud'homme van Reine, 1992b: 693–701; Coppejans, 1992: 397–403.

Fucus clavifer Turner, 1808: 126.

Caulerpa clavifera (Turner) C. Agardh, 1817: XXIII.

Fucus uvifer Turner, 1816: 81.

Caulerpa uvifera (Turner) C. Agardh, 1817: XXIII.

Local distribution – All Islands from the surface to 30 m depth.

Distribution – Tropical Indian Ocean and western Pacific (Indonesia, Philippines, Eastern Australia).

Remarks – The morphological variability of *C. racemosa* is striking. Weber-van Bosse (1898: 359–360), who described many varieties and formas, already stated about the species: “Toutes ces forment livrent continuellement passage de l’une à l’autre. Quelquefois on peut parler d’une série comme ...” Børgesen (1907: 43) added to the observations of Weber-van Bosse (1898): “If one has a large material it will be soon evident that the different forms are often united to such a degree by transitions that the boundaries can only be made quite arbitrarily.” Taylor (1960: 151) confirmed the observations made by Weber-van Bosse and Børgesen (1907) by stating: “This famous, ubiquitous tropical species is among the most variable in its variable genus.” Coppejans & Beeckman (1989, 1990) studied large collections of *C. racemosa* and noted the variability of specimens belonging to the species but they did not discuss the taxonomical position of the different entities of *C. racemosa* (variety, forma or ecad). Subsequently, Coppejans & Prud'homme van Reine (1992b) and Coppejans (1992) discussed the status of these entities, and referred to them as ecads.

Controlled laboratory experiments (e.g. Peterson, 1972; Calvert, 1976; Ohba & Enomoto, 1987) demonstrated the relationship between the morphology of the thallus and ecological factors, like light. More tests are needed to demonstrate the relationships between all forms of *C. racemosa*.

During the course of the present study large collections of specimens belonging to *C. racemosa* were made. The variability between the specimens, but also within one specimen, is enormous. The different entities of *C. racemosa* are treated in the present paper as ecological phenotypes (ecads). Due to the morphological variability of the species 60% of the collections can be listed under more than one ecad; however, they are only listed under the dominant form.

9a. *Caulerpa racemosa* ecad *corynephora* [var. *corynephora* (Montagne) Weber-van Bosse, 1898: 364] (Plate 1: 8)

Local distribution – Gusung: 2 m.

Distribution – Indonesia.

Specimens examined – L 992.071-761 / -765 / -777 / -791 / -794, Keblusek 200, 202, 220.

9b. *Caulerpa racemosa* ecad *laetevirens* [var. *laetevirens* (Montagne) Weber-van Bosse, 1898: 366] (Plate 1: 9)

Local distribution – Kudingareng Keke: 10–12 m.

Distribution – Tropical Indian Ocean (Kenya), tropical western Pacific (Indonesia, Philippines).

Collected specimen – Keblusek 201.

9c. *Caulerpa racemosa* ecad *lamourouxii* [var. *lamourouxii* (Turner) Weber-van Bosse, 1898: 368] (Plate 2: 1)

Local distribution – Kudingareng Keke, Bone Tambung, Lanyukang: 1–25 m.

Distribution – Indonesia, Kenya.

Specimens examined – L 992.261-026–034, Keblusek 95.

Remarks – For discussion see also Coppejans & Prud'homme van Reine (1992b: 696).

9d. *Caulerpa racemosa* ecad *macrodisca* [var. *macrodisca* (Decaisne) Weber-van Bosse, 1898: 376] (Plate 2: 2)

Local distribution – Samalona, Barang Lompo, Langkai: 15–25 m.

Distribution – Indonesia.

Specimens examined – L 992.071-763 / -767 / -779 / -780 / -783 / -793 / -795 / -796, L 992.261-001 / -002 / -003.

Remarks – Coppejans & Prud'homme van Reine (1992b: 696) included this ecad in *C. racemosa* ecad *peltata macrodisca*. For discussion see also Coppejans & Prud'homme van Reine (1992b: 696).

9e. *Caulerpa racemosa* ecad *occidentalis* [var. *occidentalis* (J. Agardh) Børge-sen, 1907: 379] (Plate 2: 3)

Local distribution – Langkai: 1 m.

Distribution – Indonesia, Kenya.

Specimens examined – L 992.261-024 / -025.

9f. *Caulerpa racemosa* ecad *peltata* [var. *peltata* (Lamouroux) Eubank, 1946: 421] (Plate 2: 4)

Local distribution – Kudingareng Keke, Bone Tambung, Langkai, Lanyukang, Kapoposang: 1–20 m.

Distribution – Indonesia, Kenya.

Specimens examined – L 992.261-036–044, Keblusek 210, 259, 260.

Remarks – Coppejans & Prud'homme van Reine (1992b: 696) included this ecad in *C. racemosa* ecad *peltata peltata*. For discussion see also Coppejans & Prud'homme van Reine (1992b: 696).

9g. *Caulerpa racemosa* ecad *racemosa* [var. *racemosa*] (Plate 2: 5)

Local distribution – Lae Lae, Samalona, Kudingareng Keke, Langkai: 1–10 m.

Distribution – Tropical and subtropical Indian Ocean, tropical and subtropical Pacific.

Specimens examined – L 992.261-004–022, Keblusek 34, 203.

9h. *Caulerpa racemosa* ecad *turbinata* [var. *turbinata* (J. Agardh) Eubank, 1946: 420] (Plate 2: 6)

Local distribution – Kudingareng Keke: 1 m.

Distribution – Indonesia, Kenya.
Specimens examined – L 992.261-035.

10. *Caulerpa scalpelliformis* (R. Braun) C. Agardh (Plate 2: 7)

Fucus scalpelliformis R. Braun, 1811: 174.
Caulerpa scalpelliformis (R. Braun) C. Agardh, 1822: 437; Weber-van Bosse, 1898: 286–289; Lawson & John, 1987: 89; Coppejans & Beeckman, 1990: 119.

Local distribution – Samalona, Barang Lompo, Kudingareng Keke, Bone Tambung: 20–35 m.

Distribution – Indonesia, tropical Indian Ocean, Australia, tropical west Africa.

Specimens examined – L 992.057-007 / -037 / -067–073 / -084–086 / -089 / -098 / -101 / -102, L 992.071-834 / -849 / -850 / -866 / -867 / -880 / -882 / -883.

Remarks – The collected specimens fully agree with the description of *C. scalpelliformis* and with the description given by Weber-van Bosse (1898: 286–289). However, the collected thalli are rather small.

11. *Caulerpa serrulata* (Forsskål) J. Agardh (Plate 2: 8)

Caulerpa serrulata (Forsskål) J. Agardh, 1837: 174; Coppejans & Meinesz, 1988: 191–192; Coppejans & Beeckman, 1990: 120–121; Coppejans & Prud'homme van Reine, 1992b: 701–704; Coppejans, 1992: 403–404.
Fucus serrulatus Forsskål, 1775: 189.

Caulerpa freycinetii C. Agardh, 1822: 129; Weber-van Bosse, 1913: 102; Weber-van Bosse, 1926: 90.

Caulerpa hummii Diaz-Piferrer, 1969: 13.

Local distribution – Samalona, Barang Lompo, Kudingareng Keke, Bone Tambung, Langkai, Lanyukang: 1–25 m.

Distribution – Tropical Indian Ocean (Kenya), tropical western Pacific (Indonesia, Philippines).

Specimens examined – L 992.057-024 / -032 / -037 / -055 / -056 / -115 / -117 / -124 / -127 / -131–133 / -140 / -141 / -148 / -149 / -156 / -159, L 992.071-764 / -799 / -800 / -812 / -814 / -816 / -828 / -830 / -832 / -844, Keblusek 18, 38, 59, 93, 219.

Remarks – This is one of the most abundant species of *Caulerpa* on the reef flats of the Spermonde Archipelago, but is also found at depths up to 25 m.

12. *Caulerpa sertularioides* (S.G. Gmelin) Howe (Plate 3: 1)

Fucus sertularioides S.G. Gmelin, 1768: 151.
Caulerpa sertularioides (S.G. Gmelin) Howe, 1905: 576; Weber-van Bosse, 1898: 294; Weber-van Bosse, 1913: 100–101; Weber-van Bosse, 1926: 90; Lawson & John, 1987: 90; Coppejans & Meinesz, 1988: 192–194; Coppejans & Beeckman, 1990: 120–122; Coppejans, 1992: 404; Coppejans & Prud'homme van Reine, 1992b: 704.

Fucus plumaris Forsskål, 1775: 190.

Caulerpa plumaris (Forsskål) C. Agardh, 1822: 436.

Local distribution – Gusung, Barang Lompo, Kudingareng Keke, Bone Tambung, Langkai: 1–25 m.

Distribution – Pantropical.

Specimens examined – L 992.057-032 / -033 / -040 / -048 / -064–066 / -079 / -081 / -095 / -097 / -099 / -105 / -111.

Remarks – *Caulerpa sertularioides* occurs at different depths, 1–25 m, but is restricted to silty or silty sand bottoms.

13. *Caulerpa subserrata* Okamura (Plate 3: 2)

Caulerpa subserrata Okamura, 1897: 3; Weber-van Bosse, 1898: 283–284; Weber-van Bosse, 1913: 99; Coppejans, 1992: 389.

Local distribution – Kapoposang: 2 m.

Distribution – Indo-Pacific (Indonesia, Philippines), tropical and warm temperate western Pacific (Japan).

Specimens examined – L 992.071-786.

Remarks – See Coppejans (1992: 389) (as *C. subserrulata*).

14. *Caulerpa taxifolia* (Vahl) C. Agardh (Plate 3: 3)

Fucus taxifolius Vahl, 1802: 36.

Caulerpa taxifolia (Vahl) C. Agardh, 1817: XXII; Weber-van Bosse, 1898: 292; Weber-van Bosse, 1913: 100; Børgesen, 1907: 363–364; Lawson & John, 1987: 90; Coppejans & Beeckman, 1990: 122–124; Coppejans, 1992: 406; Coppejans & Prud'homme van Reine, 1992b: 706.

Local distribution – Bone Tambung, Langkai, Lanyukang: 5–15 m.

Distribution – Pantropical.

Specimens examined – L 992.057-113 / -119, Keblusek 146.

Remarks – *Caulerpa taxifolia* is not well represented in the Spermonde Archipelago. The thalli are in general poorly developed and the maximum height is less than 10 cm. Observations around Monaco (Mediterranean) showed that specimens, probably escaped from a local sea-aquarium and invading the whole French Mediterranean coast, reached heights up to 65 cm.

15. *Caulerpa verticillata* J. Agardh (Plate 3: 4)

Caulerpa verticillata J. Agardh, 1847: 6; Weber-van Bosse 1898: 267; Weber-van Bosse, 1913: 96; Coppejans & Meinesz, 1988: 194; Coppejans & Beeckman, 1990: 124; Coppejans, 1992: 406; Coppejans & Prud'homme van Reine, 1992b: 708.

Local distribution – Kudingareng Keke: 20 m.

Distribution – Tropical Indian Ocean, Indo-Pacific.

Specimens examined – L 992.071-754 / -787.

Remarks – During the present study *C. verticillata* has been found only twice around Kudingareng Keke Island, growing on dead *Acropora* branches at a depth of 20 m.

Family CODIACEAE

III. *Codium* Stackhouse

Key to species of *Codium* from the Spermonde Archipelago:

- 1a. Thallus amorphous, not branched 1. *C. arabicum*
- b. Thallus branched 2
- 2a. Thallus only attached at its base 3
- b. Thallus repeatedly attached throughout the whole thallus 4
- 3a. Utricles pyriform, irregularly swollen, diameter 150–600 µm, 340–850 µm long
5. *C. harveyi*
- b. Utricles truncate, not swollen, diameter 150–300 µm, 450–750 µm long
2. *C. bartlettii*
- 4a. Utricles large, diameter 200–500 µm, 900–1100 µm long, swollen just below apex; thallus cushion-like, densely dichotomously branched 3. *C. edule*
- b. Utricles small, diameter 100–200 µm, 300–400 µm long, apex rounded; thalli slender, in general sparsely dichotomously branched 4. *C. geppii*

1. *Codium arabicum* Kützting (Plate 3: 5)

Codium arabicum Kützting, 1856: 35; Trono, 1968: 190–191; Silva, 1952: 382; Silva et al., 1987: 111; Coppejans & Prud'homme van Reine, 1992a: 174.
Codium conoratum Setchell, 1926: 82.

Local distribution – Barang Lompo, Kudingareng Keke, Langkai: 1–20 m.
Distribution – Indo-Pacific (Indonesia, Philippines), central western Pacific, Red Sea.

Specimens examined – L 992.261-130 / -179 / -195.
Remarks – The specimens agree with the description given by Kützting (1856).

2. *Codium bartlettii* Tseng & Gilbert (Plate 3: 6)

Codium bartlettii Tseng & Gilbert, 1942: 291.
Local distribution – Langkai: 10–20 m.
Distribution – Indo-Pacific.
Specimens examined – L 992.261-096 / -112 / -1127 / -131 / -134 / -214 / -230.
Remarks – Most specimens were growing unattached or almost unattached on the reef slopes and sandy bottoms.

3. *Codium edule* Silva (Plate 3: 7)

Codium edule Silva, 1952: 392; Trono, 1968: 190; Trono & Ganzon-Fortes, 1980: 64; Silva et al., 1987: 112.
Local distribution – Barang Lompo; Bone Tambung, Langkai: 1 m.
Distribution – Indo-Pacific, central Pacific.
Specimens examined – L 992.261-080 / -147 / -163 / -246.

4. *Codium geppii* Schmidt (Plate 3: 8; Plate 4: 1)

Codium geppii Schmidt, 1923: 50.

Codium divaricatum A. Gepp & E. S. Gepp, 1911: 136. (replaced name).

Local distribution – Samalona, Barang Lompo, Kudingareng Keke, Bone Tambung, Langkai: 1–35 m.

Distribution – Indo-Pacific (Indonesia, Philippines).

Specimens examined – L 992.261-136 / -146 / -150 / -152 / -162 / -166 / -168 / -178 / -182 / -194 / -198 / -216 / -232 / -247 / -255, L 992.274-129 / -197 / -214, Keblusek 94.

Remarks – Two different growth forms were collected in the Spermonde Archipelago, which both fully agree with the description of the anatomy of *C. geppii*. The form found in shallow reef parts is more densely branched than the very sparsely branched form found in the deeper reef parts. The deeper form is often partly decumbent. When the thallus touches the substratum, it forms secondary attachments.

5. *Codium harveyi* Silva (Plate 4: 2)

Codium harveyi Silva in Silva & Womersley, 1956: 277–278.

Local distribution – Lae Lae: 2 m.

Distribution – Indonesia, Australia.

Specimens examined – L 992.261-215 / -248, Keblusek 99, 222, 223.

Remarks – This is the first report of the species outside Australia. The specimens fully agree with the description given by Silva (1956: 277–278). The shape and dimensions of the utricles are within the range of *C. harveyi*. The plugs in the medullary filaments are also located close to the utricle in contrast to the position of the plug in a closely related species, *C. muelleri* Kützting (1856: 34).

Family UDOTACEAE

IV. *Avrainvillea* Decaisne

Key to species of *Avrainvillea* from the Spermonde Archipelago:

- 1a. Little differentiation between stipe and blade; no distinct holdfast
 - 7. *Avrainvillea* spec.
 - b. Thallus differentiated into stipe, blade and holdfast 2
- 2a. Stipe one to several times branched, each branch bearing one blade 3
 - b. Stipes unbranched, bearing one blade 5
- 3a. Siphon dichotomies shallowly constricted 5. *A. longicaulis*
 - b. Siphon dichotomies deeply constricted 4
- 4a. Blades spongy; siphons tapering towards blade surface; blade margins smooth; siphon diameter more than 35 µm 1. *A. amadelpia*
 - b. Blades papery; siphons torulose; blade margins lacerate; siphon diameter less than 30 µm 4. *A. lacerata*

- 5a. Thallus black; siphons moniliform; apices rounded 6. **A. nigricans**
- b. Thallus in general green, not black; siphons cylindrical to torulose 6
- 6a. Siphon dichotomies shallowly constricted 3. **A. gardineri**
- b. Siphon dichotomies deeply constricted 7
- 7a. Blades papery; blade margins lacerate; siphons torulose; siphon diameter less than 30 μm 4. **A. lacerata**
- b. Blades in general spongy; siphons cylindrical; siphon diameter larger than 30 μm 2. **A. obscura**

Remark: Figure 3 shows the different shapes of siphons found in *Avrainvillea*.

1. Avrainvillea amadelpha (Montagne) A. Gepp & E.S. Gepp (Plate 4: 3)

Avrainvillea amadelpha (Montagne) A. Gepp & E.S. Gepp, 1908: 178; Olsen-Stojkovich, 1985: 36–38; Coppejans & Prud'homme van Reine, 1989: 120–123.
Udotea amadelpha Montagne, 1857: 136.

Local distribution – Kudingareng Keke: 5–15 m.

Distribution – Indo-Pacific (Indonesia), Red Sea.

Specimens examined – L 992.274-061–063.

Remarks – All filament dimensions and shapes agree with the description as given by Olsen-Stojkovich (1985) and Coppejans & Prud'homme van Reine (1989).

2. Avrainvillea obscura (C. Agardh) J. Agardh (Plate 4: 4)

Dichonema erectum Berkeley, 1842: 157.
Anadyoneme obscura C. Agardh, 1822: 401.
Avrainvillea erecta (Berkeley) A. Gepp & E.S. Gepp, 1911: 29; Weber-van Bosse, 1913: 114; Olsen-Stojkovich, 1985: 22–24.
Avrainvillea obscura (C. Agardh) J. Agardh, 1887: 53; Olsen-Stojkovich, 1985: 19–22.

Local distribution – Samalona, Barang Lompo, Kudingareng Keke, Bone Tambung, Langkai, Lanyukang, Kapoposang: 1–35 m.

Distribution – Tropical Indian Ocean, tropical Pacific.

Specimens examined – L 992.274-064–081 / -159.

Remarks – The authors agree with the conclusion of Coppejans & Prud'homme van Reine (1989) that the characters used by Olsen-Stojkovich (1985) to distinguish *A. erecta* and *A. obscura* are not suitable for collections from Indonesia. They refer their specimens to the *A. erecta* / *A. obscura* complex. The material from the Spermonde Archipelago contains specimens with the extreme forms of *A. erecta* and *A. obscura* as described by Olsen-Stojkovich, but on the other hand also specimens with intermediate forms. All these specimens are treated as belonging to *A. obscura*.

3. Avrainvillea gardineri A. Gepp & E.S. Gepp

Avrainvillea gardineri A. Gepp & E.S. Gepp, 1908: 36; Weber-van Bosse, 1926: 84; Olsen-Stojkovich, 1985: 26.

Local distribution – Samalona, Barang Lompo, Kudingareng Keke, Bone Tambung: 25–30 m.

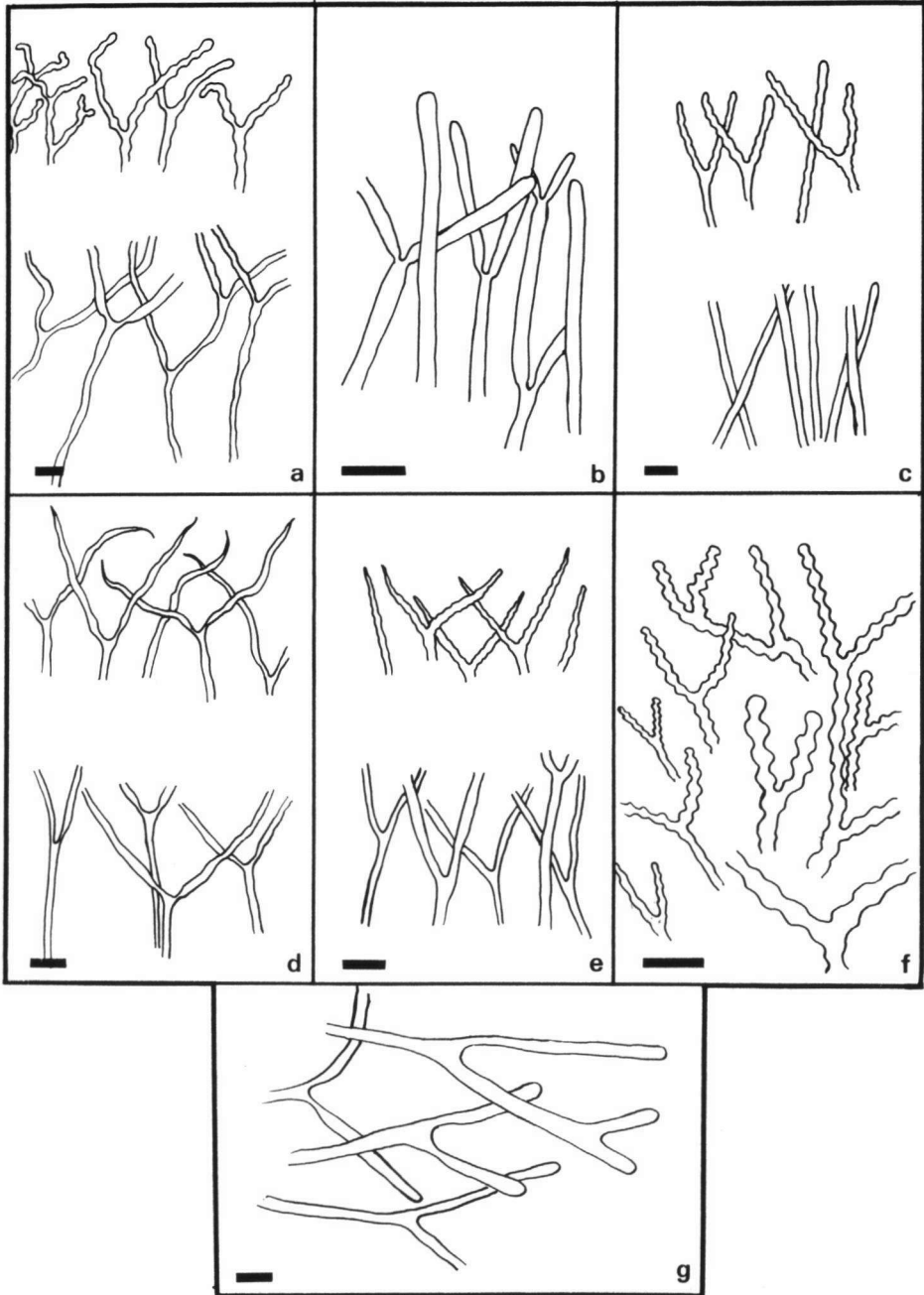


Fig. 3. Summary of the types of siphons as found in the species belonging to the genus *Avrainvillea* in the Spermonde Archipelago. — a: *A. amadelpa*; b: *A. erecta/obscura* complex; c: *A. gardineri*; d: *A. lacerata*; e: *A. longicaulis*; f: *A. nigricans*; g: *Avrainvillea* spec. — Scale bars = 250 μm.

Distribution – Indonesia, tropical Indian Ocean.

Specimens examined – L 992.274-048–054.

Remarks – The anatomy agrees fully with the description of A. Gepp & E.S. Gepp (1908) and Olsen-Stojkovich (1985). However, the collections from the Spermonde Archipelago never reach the maximum dimensions given by Olsen-Stojkovich.

4. *Avrainvillea lacerata* J. Agardh (Plate 4: 5)

Avrainvillea lacerata J. Agardh, 1887: 54; A. Gepp & E.S. Gepp, 1911: 38; Weber-van Bosse, 1913: 115; Olsen-Stojkovich, 1985: 33–36; Coppejans & Prud'homme van Reine, 1989: 127.

Local distribution – Langkai, Kapoposang: 15–25 m.

Distribution – Tropical Indian Ocean, tropical Pacific (Indonesia).

Specimens examined – L 992.274-057 / -058.

Remarks – All the filament dimensions and shapes agree with the description as given by Olsen-Stojkovich (1985) and Coppejans & Prud'homme van Reine (1989). Littler & Littler (1992: 394) discussed the relationship of *A. lacerata* and *A. levis* Howe (1905: 565) in detail. All specimens from the Spermonde Archipelago are irregularly branched, characteristic for *A. lacerata*, according to Littler & Littler.

5. *Avrainvillea longicaulis* (Kützting) Murray & Boodle (Plate 4: 6)

Avrainvillea longicaulis (Kützting) Murray & Boodle, 1889: 70; Schneider & Searles, 1991: 88; Olsen-Stojkovich, 1985: 29–31; Coppejans & Prud'homme van Reine, 1989: 125–126.
Rhipilia longicaulis Kützting, 1858: 13.

Local distribution – Barang Lompo, Bone Tambung: 20 m.

Distribution – Indo-Pacific (Indonesia), Caribbean.

Specimens examined – L 992.274-055 / -056.

Remarks – All anatomical features, filament dimensions and filament shape, agree with the description as given by Olsen-Stojkovich (1985). The shape of the thalli, on the contrary, differs. Specimens from the Spermonde Archipelago do not have a long stipe and the blades are in general reniform. This agrees with the shape described by Coppejans & Prud'homme van Reine (1989). Olsen-Stojkovich also incorporated *A. levis* Howe (1905: 565) in *A. longicaulis*. However, in the present paper we follow Littler & Littler (1992: 392) and regard *A. levis* as a separate, Caribbean species.

6. *Avrainvillea nigricans* Decaisne

Avrainvillea nigricans Decaisne, 1842: 108; Olsen-Stojkovich, 1985: 38–40.

Local distribution – Barang Lompo, Bone Tambung: 25–30 m.

Distribution – Tropical Indian Ocean, tropical Pacific (Indonesia), Caribbean.

Specimens examined – L 992.274-059 / -060.

Remarks – All anatomical features, filament dimensions and the filament shape, agree with the description as given by Olsen-Stojkovich (1985). The shape of the thallus, on the contrary, differs. The specimens from the Spermonde Archipelago do not have such a long stipe and the blades are in general smaller.

7. *Avrainvillea* spec. (Plate 4: 7)

Local distribution – Samalona, Barang Lompo: 20 m.

Specimens examined – L 992.274-164.

Remarks – All collected specimens are very small with little differentiation between stipe and blade. No bulbous holdfast is present.

V. *Chlorodesmis* Harvey & Bailey

Key to species of *Chlorodesmis* from the Spermonde Archipelago:

1a. Supradichotomic constriction unequally placed above dichotomy

1. *C. fastigiata*

b. Supradichotomic constriction at the level of dichotomy . 2. *C. hildebrandtii*

Remarks – Figure 4 shows the two different types of supradichotomic constrictions as found in the genus *Chlorodesmis* of the Spermonde Archipelago.

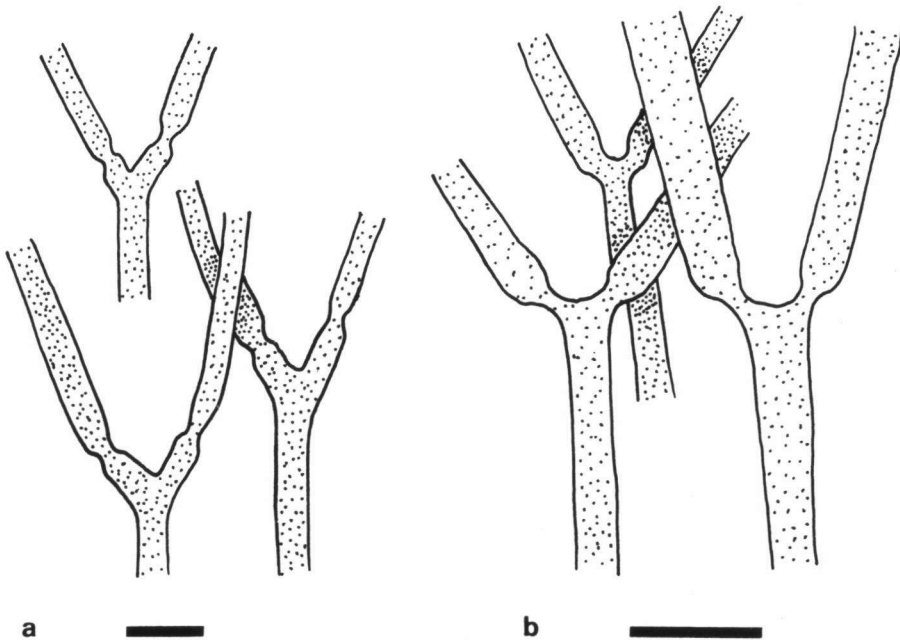


Fig. 4. Two types of dichotomic constrictions as found in the species of the genus *Chlorodesmis* in the Spermonde Archipelago. — a: *C. fastigiata*; b: *C. hildebrandtii*. — Scale bars = 250 μ m.

1. *Chlorodesmis fastigiata* (C. Agardh) Ducker

Chlorodesmis fastigiata (C. Agardh) Ducker, 1969: 17; Coppejans & Prud'homme van Reine, 1989: 127.

Vaucheria fastigiata C. Agardh, 1824: 176.

Chlorodesmis comosa Harvey & Bailey, 1851: 373; Trono & Ganzon-Fortes, 1988: 42; Weber-van Bosse, 1913: 144.

Local distribution – Samalona, Barang Lompo, Kudingareng Keke: 1–10 m.

Distribution – Indo-Pacific, tropical western Pacific (Indonesia).

Specimens examined – L 992.261-223 / -224 / -239 / -240 / -256.

Remarks – Collected material fully agrees with the description given by Coppejans & Prud'homme van Reine (1989).

2. *Chlorodesmis hildebrandtii* A. Gepp & E. S. Gepp

Chlorodesmis hildebrandtii A. Gepp & E. S. Gepp, 1911: 16; Weber-van Bosse, 1913: 114; Trono & Ganzon-Fortes, 1988: 43; Coppejans & Prud'homme van Reine, 1989: 129.

Local distribution – Lae Lae, Gusung, Samalona, Langkai, Lanyukang: 1–2 m.

Distribution – Indo-Pacific, tropical western Pacific (Indonesia).

Specimens examined – L 992.261-097 / -113 / -129 / -145 / -161 / -177 / -184 / -193 / -196 / -200 / -209 / -225 / -241.

Remarks – Collected material fully agrees with the description given by Coppejans & Prud'homme van Reine (1989).

VI. *Halimeda* Lamouroux

Remarks – An intensive taxonomical and ecological study on the genus *Halimeda* has been carried out by Hillis-Colinvaux (1980). Her morphological definition and descriptions of macrostructure and microstructure, of the genus and species, are used during the present study unless otherwise indicated. Her key has been used as the base for the key that follows below. In the Spermonde Archipelago the genus *Halimeda* comprises, together with the genus *Caulerpa*, the largest number of species (15) of all seaweed genera.

Key to species of *Halimeda* from the Spermonde Archipelago:

- 1a. Thallus growing in loose substratum; bulbous holdfast well developed (in general larger than 1 cm) 2
- b. Thallus attached to hard substratum or growing in loose substratum with small holdfast (in general less than 1 cm) 5
- 2a. Segments flat throughout thallus; segments slightly lobed, reniform or subcuneate (except basal segment) 3
- b. Segments cylindrical throughout thallus or only supra-basal segments cylindrical 4

- 3a. Segments small (to 12 mm long and 18 mm broad); peripheral utricles hexagonal **13. H. simulans**
- b. Segments large (to 25 mm long and 35 mm broad); peripheral utricles round and loosely organized **7. H. macroloba**
- 4a. Segments in general cylindrical throughout the thallus ... **2. H. cylindracea**
- b. Supra-basal segments (1–3) cylindrical, upper segments flat; peripheral utricles hexagonal **13. H. simulans**
- 5a. Rhizoid filaments connected to several (supra) basal segments, covering a large holdfast area **9. H. melanesica**
- b. Holdfast region restricted to basal segment and/or secondary holdfasts formed throughout thallus 6
- 6a. Secondary holdfasts formed throughout thallus 7
- b. Holdfast region restricted to basal segment 9
- 7a. Branching in one plane; thalli in general flat on the substratum; up to 2 layers of utricles **6. H. gracilis**
- b. Branching in all directions; thalli forming densely packed clumps; three or more layers of utricles. 8
- 8a. Segments relatively large, up to 15 mm long and 20 mm broad **4. H. distorta**
- b. Segments relatively small, up to 7 mm long and 10 mm broad **12. H. opuntia**
- 9a. Basal segment flabellate and larger than all other segments (up to 12 mm long, 18 mm broad); basal segment supporting many branches
10. H. micronesica
- b. Basal segment not flabellate; basal segment supporting one or a few branches 10
- 10a. Surface utricles large (diameter larger than 120 μm) 11
- b. Surface utricles small (diameter less than 120 μm) 12
- 11a. Segments large (up to 30 mm long, 40 mm broad); dried thalli brownish coloured; thalli slightly calcified; outer utricles in surface view round and loosely organized **5. H. gigas**
- b. Segments small (up to 15 mm long and 25 mm broad); dried thalli white; moderately calcified; outer utricles in surface view hexagonal and densely packed
8. H. macrophysa
- 12a. Secondary utricles large (diameter larger than 90 μm) **3. H. discoidea**
- b. Secondary utricles small (diameter less than 90 μm) 13
- 13a. Tertiary utricles large (diameter larger than 110 μm) **14. H. taenicola**
- b. Tertiary utricles small (diameter less than 110 μm) 14
- 14a. Utricles clearly constricted at the base; diameter of secondary and tertiary utricles larger than diameter of medullary filaments **15. H. tuna**
- b. Utricles not clearly constricted at the base; diameter of secondary and tertiary utricles equal to diameter of medullary filaments 15
- 15a. Thalli large, up to 70 cm; segments up to 16 mm long and 25 mm broad; thalli sparsely branched; branches long **1. H. copiosa**
- b. Thalli small, in general less than 15 cm; segments to 6 mm long and 11 mm broad; thalli regularly branched **11. H. minima**

1. *Halimeda copiosa* Goreau & Graham (Plate 5: 1)

Halimeda copiosa Goreau & Graham, 1967: 433; Hillis-Colinvaux, 1980: 118–120.

Halimeda opuntia f. *hederacea* Barton, 1901: 21.

Halimeda opuntia var. *hederacea* (Barton) Hillis, 1959: 360.

Halimeda hederacea (Barton) Colinvaux, 1968: 30.

Local distribution – Langkai, Lanyukang, Kapoposang: 5–10 m.

Distribution – Tropical Indian Ocean, tropical western Pacific (Indonesia, Philippines), Caribbean.

Specimens examined – L 992.274-039–043, Keblusek 100.

Remarks – The specimens from the Spermonde Archipelago agree fully with the descriptions given by Goreau & Graham (1967) and Hillis-Colinvaux (1980). For additional Indonesian records see Coppejans & Prud'homme van Reine (1992a: 175).

2. *Halimeda cylindracea* Decaisne (Plate 5: 2)

Halimeda cylindracea Decaisne, 1842: 103; Hillis-Colinvaux, 1980: 100–101.

Local distribution – Bone Tambung, Langkai, Lanyukang, Kapoposang: 1–20 m.

Distribution – Tropical Indian Ocean, tropical western Pacific (Indonesia, Philippines).

Specimens examined – L 992.274-278 / -294 / -310 / -343 / -506 / -524–526 / -540–542 / -556–558 / -573 / -574, Keblusek 251.

Remarks – The anatomy and morphology agree with the description given by Hillis-Colinvaux (1980). However, the plants were never observed deeper than 20 m, while Hillis-Colinvaux gives a maximum depth of at least 58 m. For additional Indonesian records see Coppejans & Prud'homme van Reine (1992a: 175).

3. *Halimeda discoidea* Decaisne (Plate 5: 3)

Halimeda discoidea Decaisne, 1842: 102; Taylor, 1950: 85; Hillis-Colinvaux, 1980: 136–139.

Local distribution – Samalona, Barang Lompo, Kudingareng Keke, Langkai, Kapoposang: 1–30 m.

Distribution – Pantropical.

Specimens examined – L 992.261-049 / -059 / -063–066 / -079 / -081 / -082 / -095 / -098 / -110 / -111 / -114 / -126 / -128 / -144 / -151 / -171 / -175 / -187 / -191 / -203 / -207, L 992.274-128, Keblusek 49, 73, 85, 261.

Remarks – Hillis-Colinvaux (1980: 138–139) discussed the nomenclatural problems surrounding this species. For additional Indonesian records see Coppejans & Prud'homme van Reine (1992a: 175).

4. *Halimeda distorta* (Yamada) L.H. Colinvaux (Plate 5: 4)

Halimeda incrassata forma *distorta* Yamada, 1941: 119; Yamada, 1944: 28.

Halimeda distorta (Yamada) L.H. Colinvaux, 1968: 33.

Local distribution – Kudingareng Keke, Kapoposang: 1–10 m.

Distribution – Tropical western Pacific (Indonesia).

Specimens examined – Keblusek 211, 276.

Remarks – The specimens fully agree with the description given by Hillis-Colinvaux. For additional Indonesian records see Coppejans & Prud'homme van Reine (1992a: 175).

5. *Halimeda gigas* W.R. Taylor (Plate 5: 5)

Halimeda gigas W.R. Taylor, 1950: 84; Hillis-Colinvaux, 1980: 132–134.

Local distribution – Lae Lae, Gusung, Barang Lompo, Kudingareng Keke, Langkai, Lanyukang, Kapoposang: 1–25 m.

Distribution – Tropical north-western Pacific (Indonesia, Philippines).

Specimens examined – L 992.261-051 / -052 / -061 / -067 / -068 / -070 / -083 / -084 / -086 / -093 / -099 / -100 / -109 / -116 / -120 / -121 / -135 / -139 / -204, Keblusek 71, 75, 78, 90, 263.

Remarks – The specimens from the Spermonde Archipelago agree fully with the descriptions given by Taylor (1950) and Hillis-Colinvaux (1980).

6. *Halimeda gracilis* Harvey ex J. Agardh (Plate 5: 6)

Halimeda gracilis Harvey ex J. Agardh, 1887: 82; Barton, 1901: 22; Weber-van Bosse, 1913: 122; Taylor, 1950: 83–84; Hillis-Colinvaux, 1980: 144–147.

Local distribution – Gusung: 2 m.

Distribution – Pantropical.

Specimens examined – L 992.274-044, Keblusek 101.

Remarks – The specimens from the Spermonde Archipelago have an average of 6–8 segments between two branches, and thus are less branched than the specimens figured by Hillis-Colinvaux (1980). For additional Indonesian records see Coppejans & Prud'homme van Reine (1992a: 175).

7. *Halimeda macroloba* Decaisne (Plate 5: 7)

Halimeda macroloba Decaisne, 1841: 118; Barton, 1901: 24; Weber-van Bosse, 1913: 122–123; Weber-van Bosse, 1926: 86–88; Hillis-Colinvaux, 1980: 108–110.

Local distribution – Samalona, Barang Lompo, Kudingareng Keke, Bone Tambung, Langkai, Lanyukang, Kapoposang: 1–30 m.

Distribution – Indo-Pacific (Indonesia, Philippines), eastern Australia, Red Sea.

Specimens examined – L 992.274-001 / -002 / -004–038, Keblusek 24–27, 35, 36, 74, 131, 134, 224, 233, 234, 252, 253.

Remarks – The collected specimens agree fully with the analysis given by Hillis-Colinvaux (1980). *Halimeda macroloba* is, together with *H. opuntia* forma *opuntia*, the most abundant representative of the genus *Halimeda* on the reefs of the Spermonde Archipelago. For additional Indonesian records see Coppejans & Prud'homme van Reine (1992a: 175–176).

8. *Halimeda macrophysa* Askenasy (Plate 6: 1)

Halimeda macrophysa Askenasy, 1888: 14; Barton, 1901: 17; Weber-van Bosse, 1913: 121; Hillis-Colinvaux, 1980: 134–136.

Local distribution – Kudingareng Keke, Langkai, Kapoposang: 2–10 m.

Distribution – Tropical Indian Ocean, tropical western Pacific (Indonesia, Philippines).

Specimens examined – L 992.183-499 / -500 / -514 / -515 / -529 / -530 / -544 / -545, Keblusek 45, 70, 80.

Remarks – This is one of the species that can easily be identified in the field by the large utricles which can be observed without optical instruments.

9. *Halimeda melanesica* Valet (Plate 6: 2)

Halimeda melanesica Valet, 1966: 680; Hillis-Colinvaux, 1980: 153–154.

Local distribution – Lanyukang: 2 m.

Distribution – Tropical south-western Pacific (Indonesia).

Specimens examined – L 992.274-314.

Remarks – This very characteristic species can easily be recognized in the field by the segments of the lower parts which are kept together with the substratum by many rhizoideal filaments. The anatomy agrees fully with that described by Hillis-Colinvaux (1980).

10. *Halimeda micronesica* Yamada (Plate 6: 3)

Halimeda micronesica Yamada, 1941: 121; Taylor, 1950: 89–90; Hillis-Colinvaux, 1980: 149–151.

Local distribution – Langkai: 10 m.

Distribution – Tropical Indian Ocean, tropical western Pacific (Indonesia, Philippines, Caroline Islands, Basilan Islands).

Specimens examined – L 992.274-282 / -298 / -326, Keblusek 81.

Remarks – The specimens from the Spermonde Archipelago agree with the descriptions given by Yamada (1941), Taylor (1950) and Hillis-Colinvaux (1980). For additional Indonesian records see Coppejans & Prud'homme van Reine (1992a: 176).

11. *Halimeda minima* (W.R. Taylor) L.H. Colinvaux (Plate 6: 4)

Halimeda opuntia forma *minima* W.R. Taylor, 1950: 82.

Halimeda minima (W.R. Taylor) L.H. Colinvaux, 1968: 32; Hillis-Colinvaux, 1980: 113–115.

Local distribution – Langkai: 2–5 m.

Distribution – Tropical northern Pacific (Indonesia).

Specimens examined – L 992.274-045–047.

Remarks – Colinvaux (1968) discussed the relation of this species with *H. opuntia*. For additional Indonesian records see Coppejans & Prud'homme van Reine (1992a: 176).

12. *Halimeda opuntia* (Linnaeus) Lamouroux (Plate 6: 5 & 6)

Halimeda opuntia (Linnaeus) Lamouroux, 1816: 308; Weber-van Bosse, 1926: 86; Taylor, 1950: 80–83; Hillis-Colinvaux, 1980: 110–112.

Corallina opuntia Linnaeus, 1758: 805.

Fucus prolifer M. Blanco, 1837: 838.

Halimeda cordata J. Agardh, 1887: 83.

Halimeda opuntia forma *cordata* (J. Agardh) Barton, 1901: 20.

Local distribution – Samalona, Barang Lompo, Kudingareng Keke, Bone Tambung, Langkai, Lanyukang, Kapoposang: 1–30 m.

Distribution – Pantropical. For additional Indonesian records see Coppejans & Prud'homme van Reine (1992a: 176).

Remarks – This species is the major contributor to the large *Halimeda* deposits between the islands Langkai, Lanyukang and Kapoposang. Hillis-Colinvaux (1980) does not recognize forms within the species *H. opuntia*. Taylor (1950) on the other hand, describes for the reefs of Bikini six forms of the species. On the reefs of the Spermonde Archipelago two very distinct forms can be recognized: *H. opuntia* forma *opuntia* and forma *triloba*. The present authors keep these two forms separate.

Key to the forms of the species *Halimeda opuntia* from the Spermonde Archipelago:

- 1a. Segments small (4 mm long, 5 mm broad); lobes on segments slightly developed; thalli up to 15 cm tall **12a. *H. opuntia* forma *opuntia***
 b. Segments large (to 10 mm long, to 11 mm broad); lobes on segments well developed; thalli up to 25 cm tall **12b. *H. opuntia* forma *triloba***

12a. *Halimeda opuntia* (Linnaeus) Lamouroux forma *opuntia* (Plate 6: 5)

Halimeda opuntia (Linnaeus) Lamouroux forma *opuntia*; Barton, 1901: 20 (as *H. opuntia* forma *typica*); Weber-van Bosse, 1913: 121; Weber-van Bosse, 1926: 86; Taylor, 1950: 83.

Local distribution – Samalona, Barang Lompo, Kudingareng Keke, Bone Tambung, Langkai, Lanyukang, Kapoposang: 1–30 m.

Distribution – Pantropical.

Specimens examined – L 992.274-224 / -240 / -256 / -272 / -280 / -296 / -301 / -312 / -317 / -328 / -344 / -359 / -366 / -382 / -387 / -398 / -399 / -403 / -408 / -414 / -415 / -419 / -424 / -431 / -527, Keblusek 6, 43, 46, 52, 53, 69, 122, 275.

12b. *Halimeda opuntia* (Linnaeus) Lamouroux forma *triloba* (Decaisne) J. Agardh (Plate 6: 6)

Halimeda triloba Decaisne, 1842: 102.

Halimeda opuntia (Linnaeus) Lamouroux forma *triloba* (Decaisne) J. Agardh, 1887: 83; Barton, 1901: 20; Weber-van Bosse, 1913: 122; Weber-van Bosse, 1926: 86; Taylor, 1950: 81–82.

Local distribution – Langkai, Lanyukang: 10–15 m.

Distribution – Pantropical.

Specimens examined – L 992.274-360 / -376 / -392, Keblusek 82.

13. *Halimeda simulans* Howe (Plate 6: 7)

Halimeda simulans Howe, 1907: 503; Hillis-Colinvaux, 1980: 103–105.

Local distribution – Samalona, Barang Lompo, Kudingareng Keke, Bone Tambung: 1–35 m.

Distribution – Tropical and warm temperate eastern Indian Ocean, tropical and warm temperate north-western Pacific (Indonesia, Philippines), western Atlantic, Caribbean.

Specimens examined – L 992.261-058 / -140 / -141 / -156 / -157 / -160 / -172 / -173 / -176 / -188 / -189 / -192 / -205 / -208, L 992.183-546 / -559, Keblusek 11, 23, 121.

Remarks – For additional Indonesian records see Coppejans & Prud'homme van Reine (1992a: 176).

14. *Halimeda taenicola* W.R. Taylor (Plate 6: 8)

Halimeda taenicola W.R. Taylor, 1950: 86–87; Hillis-Colinvaux, 1980: 139–141.

Local distribution – Langkai: 10 m.

Distribution – Tropical western Pacific (Indonesia, Philippines).

Specimens examined – L 992.274-330 / -425, Keblusek 3, 10, 68.

Remarks – Hillis-Colinvaux (1980) discussed the relationship of the species with *H. discoidea* and *H. macroloba*. For additional Indonesian records see Coppejans & Prud'homme van Reine (1992a: 176).

15. *Halimeda tuna* (Ellis & Solander) Lamouroux (Plate 6: 9)

Corallina tuna Ellis & Solander, 1786: 111.

Halimeda tuna (Ellis & Solander) Lamouroux, 1816: 309; Barton, 1901: 14; Weber-van Bosse, 1913: 120; Weber-van Bosse, 1926: 85; Taylor, 1950: 84; Hillis-Colinvaux, 1980: 122–124.

Halimeda platydisca Decaisne, 1842: 102.

Halimeda tuna f. *platydisca* (Decaisne) Barton, 1901: 14.

Local distribution – Lae Lae: 1–5 m.

Distribution – All tropical and warm temperate seas of the world.

Specimens examined – L 992.261-062 / -078 / -094 / -115, Keblusek 150.

Remarks – *Halimeda tuna* is not as abundant in the Spermonde Archipelago as the available literature suggests. The anatomy of specimens examined agrees with descriptions given by Taylor (1950) and Hillis-Colinvaux (1980). The morphology, on the other hand, differs slightly. All specimens are connected by a inconspicuous holdfast to the substratum; a small stipe with holdfast (Hillis-Colinvaux 1980: 123) has not been observed. For additional Indonesian records see Coppejans & Prud'homme van Reine (1992a: 176).

VII. *Pseudocodium* Weber-van Bosse

Pseudocodium floridanum Dawes & Mathieson (Plate 7: 1)

Pseudocodium floridanum Dawes & Mathieson, 1972: 273–277.

Local distribution – Samalona: 25 m.

Distribution – Indonesia, Papua New Guinea, Florida.

Specimens examined – L 992.261-133 / -149.

Remarks – Specimens examined fully agree with the descriptions given by Dawes

& Mathieson (1972). This Atlantic species was first found in the Pacific Ocean in Papua New Guinea by Coppejans (pers. comm.). The present record is the first one for Indonesia.

VIII. *Rhipidosiphon* Montagne

Rhipidosiphon javensis (Montagne) A. Gepp & E.S. Gepp (Plate 7: 6)

Rhipidosiphon javensis Montagne, 1842: 15; Littler & Littler, 1990.

Udotea javensis (Montagne) A. Gepp & E.S. Gepp, 1904: 364; A. Gepp & E.S. Gepp, 1911: 110; Weber-van Bosse, 1913: 116; Weber-van Bosse, 1926: 85; Coppejans & Prud'homme van Reine, 1989a: 139.

Local distribution – Samalona, Kudingareng Keke, Langkai: 5–20 m.

Distribution – Tropical Indian Ocean, tropical western Pacific (Indonesia, Philippines).

Specimens examined – L 992.261-170 / -186 / -236 / -252.

Remarks – The genus *Rhipidosiphon* was recently re-established by Littler & Littler (1990). They included also a newly described 'pair' species, *R. floridensis*, in the genus, which only differs from *R. javensis* in the position of the constriction above the dichotomies, equal vs. unequal constrictions. The material collected during the present study shows thalli with unequal constrictions, *R. javensis* type, and constrictions with equal constrictions, *R. floridensis* type. Further studies of the types of both taxa and of large collections are needed to elucidate the relationship of both original taxa. The Indonesian specimens agree fully with the description given by A. Gepp & E.S. Gepp (1911: as *Udotea javensis*) and by Littler & Littler (1990).

During the present study none of the collected specimens reached the large dimensions as given by Coppejans & Prud'homme van Reine (1989a: as *U. javensis*).

IX. *Rhipilia* Kützing

Rhipilia orientalis A. Gepp & E.S. Gepp (Plate 7: 2)

Rhipilia orientalis A. Gepp & E.S. Gepp, 1911: 57 & 140; Weber-van Bosse, 1913: 115; Coppejans & Prud'homme van Reine, 1989: 131.

Local distribution – Kudingareng Keke, Bone Tambung, Kapoposang: 5–25 m.

Distribution – Tropical central Indo-Pacific, tropical western Pacific (Indonesia, Australia).

Specimens examined – L 992.261-132 / -148 / -164 / -180.

Remarks – Specimens fully agree with the descriptions given by A. Gepp & E.S. Gepp (1911) and Coppejans & Prud'homme van Reine (1989).

X. *Tydemania* Weber-van Bosse

Tydemania expeditionis Weber-van Bosse (Plate 7: 3)

Tydemania expeditionis Weber-van Bosse, 1901: 139; Weber-van Bosse, 1913, 116; A. Gepp & E.S. Gepp, 1911: 66; Trono & Ganzon-Fortes, 1988: 63–64; Coppejans & Prud'homme van Reine, 1989: 133–135.

Local distribution – Barang Lompo, Langkai, Kapoposang: 1–15 m.

Distribution – Tropical Indian Ocean, tropical Pacific (Indonesia, Philippines), Red Sea.

Specimens examined – L 992.261-055 / -057 / -059 / -071 / -073 / -075 / -087 / -089 / -106 / -122 / -142 / -158 / -174 / -190 / -206.

Remarks – Collected material fully agrees with the description given by Weber-van Bosse (1913) and Coppejans & Prud'homme van Reine (1989). No flabellate specimens have been observed.

XI. *Udotea* Lamouroux

Key to species of *Udotea* from the Spermonde Archipelago:

- 1a. Blades composed of filaments without appendages. 2
- b. Blades composed of filaments with appendages. 3
- 2a. Blades composed of several layers of filaments (polystromatic)
 - 4. *U. orientalis*
- b. Blades composed of a single layer of filaments (monostromatic)
 - 3. *U. glaucescens*
- 3a. Appendages ramified 2. *U. flabellum*
- b. Appendages turbinate, pear-shaped, rounded 1. *U. argentea*

1. *Udotea argentea* Zanardini (Plate 7: 4)

Udotea argentea Zanardini, 1858: 290; A. Gepp & E. S. Gepp, 1911: 125; Weber-van Bosse, 1913 117; Weber-van Bosse, 1926: 85; Coppejans & Prud'homme van Reine, 1989a: 136–137.

Local distribution – Bone Tambung, Langkai, Lanyukang, Kapoposang: 1–20 m.

Distribution – Tropical Indian Ocean, tropical western Pacific (Indonesia, Philippines), Red Sea (Egypt, Suez).

Specimens examined – L 992.261-046 / -047 / -048 / -060 / -074 / -076 / -090 / -092 / -108 / -124 / -138 / -143 / -154 / -167 / -188 / -199 / -217 / -218 / -220 / -221 / -231 / -234 / -237 / -250 / -253 / -254, L 992.183-550 / -565.

Remarks – Specimens agree fully with the descriptions given by A. Gepp & E. S. Gepp (1911). *Udotea argentea* is the most common species of the genus *Udotea* and it is common on the reef flats of the islands in the outer zones of the Spermonde Archipelago. It also occurs to depths of 20 m.

2. *Udotea flabellum* (Ellis & Solander) Howe (Plate 8: 1 & 4)

Key to forms of *U. flabellum* from the Spermonde Archipelago:

- 1a. Length of blades less than two times the diameter
 - 2a. *U. flabellum* forma *flabellum*
- b. Length of blades more than four times the diameter
 - 2b. *U. flabellum* forma *longifolia*

2a. *Udotea flabellum* (Ellis & Solander) Howe forma *flabellum* (Plate 8: 4)

Corallina flabellum Ellis & Solander, 1786: 124.

Udotea flabellum (Ellis & Solander) Howe, 1904: 94; A. Gepp & E.S. Gepp, 1911: 131; Weber-van Bosse, 1913: 118; Coppejans & Prud'homme van Reine, 1989a: 137–139; Schneider & Searles, 1991: 90–91.

Local distribution – Langkai, Lanyukang, Kapoposang: 1–20 m.

Distribution – Pantropical.

Specimens examined – L 992.261-053 / -069 / -072 / -077 / -085 / -088 / -101 / -104 / -117 / -249.

Remarks – The collected specimens agree fully with the descriptions given by A. Gepp & E.S. Gepp (1911) and Coppejans & Prud'homme van Reine (1989a).

2b. *Udotea flabellum* (Ellis & Solander) Howe forma *longifolia* Verheij & Prud'homme van Reine, *forma nov.* (Plate 8: 1)

Latin diagnosis: In structuris anatomis ad *Udotea flabellum* f. *flabellum* sed in dispositionis siphonis. Laxiore in stipidis longiore (maximum 7 cm), laminis 25 cm longis, in diametro 3–4 cm.

Diagnosis: Anatomical structure and position of siphons similar to *Udotea flabellum* forma *flabellum*. Length of stipe up to 7 cm. Blades up to 25 cm long, 3–4 cm broad.

Type material – Holotype collection: L 992.261-201, east side, Samalona Island, SW Sulawesi, Indonesia, depth 25 m, 24-ix-1989; isotype collection: L 992.261-185; paratype collections: L 992.261-065 / -105 / -121 / -155.

Local distribution – Samalona, Barang Lompo: 20–25 m.

Specimens examined – L 992.261-065 / -105 / -121 / -155 / -185 / -201.

Remarks – The collected specimens anatomically clearly belong to *Udotea flabellum*. However, morphologically these specimens differ from *U. flabellum* as described by Ellis & Solander. The collected specimens are up to 25 cm long, 3–4 cm wide, with a long stipe, up to 7 cm. This new forma is typical for sandy, soft bottoms, at depths of 20–25 m, at the reef bases of islands close to the mainland of SW Sulawesi.

3. *Udotea glaucescens* Harvey ex J. Agardh (Plate 7: 5)

Udotea glaucescens Harvey ex J. Agardh, 1887: 70; A. Gepp & E.S. Gepp, 1911: 113; Weber-van Bosse, 1913: 117; Coppejans & Prud'homme van Reine, 1989a: 139.

Local distribution – Langkai: 10–20 m.

Distribution – Tropical Indian Ocean, tropical Pacific (Indonesia, Philippines).

Specimens examined – L 992.261-012 / -118, L 992.183-520 / -535.

Remarks – The maximum observed diameter of the filaments in the blades is 90 μm . This agrees with the dimensions given by Coppejans & Prud'homme van Reine (1989a) and by Gilbert & Doty (1969). It is, however, less than the maximum diameter of 105 μm as given by A. Gepp & E.S. Gepp (1911).

4. *Udotea orientalis* A. Gepp & E.S. Gepp (Plate 7: 7)

Udotea orientalis A. Gepp & E.S. Gepp, 1911: 119; Weber-van Bosse, 1913: 117; Coppejans & Prud'homme van Reine, 1989a: 140.

Rhipidosiphon orientalis (A. Gepp & E.S. Gepp) Farghaly, 1980: 254.

Local distribution – Samalona, Barang Lompo, Langkai: 20–25 m.

Distribution – Tropical Indian Ocean, tropical Pacific (Indonesia, Philippines).

Specimens examined – L 992.261-137 / -153 / -169 / -201 / -219 / -233 / -235 / -251.

Remarks – The collected specimens agree fully with the descriptions given by A. Gepp & E.S. Gepp (1911) and Coppejans & Prud'homme van Reine (1989a).

Order CLADOPHORALES

Family ANADYOMENACEAE

XII. *Anadyomene* Lamouroux

***Anadyomene stellata* (Wulfen) C. Agardh (Plate 8: 2)**

Anadyomene stellata (Wulfen) C. Agardh, 1822: 400; Weber-van Bosse, 1913: 74–75.

Ulva stellata Wulfen, 1786: 351.

Anadyomene flabellata Lamouroux, 1816: 366.

Local distribution – Langkai: 20 m.

Distribution – Pan-(sub)tropical.

Specimens examined – L 992.261-165.

Remarks – The collected specimen fully agrees with the description given by Weber-van Bosse (1913).

Family BOODLEACEAE

XIII. *Boodlea* Murray & De Tony

***Boodlea composita* (Harvey) Brand**

Boodlea composita (Harvey) Brand, 1904: 187; Weber-van Bosse, 1913: 71–72; Trono, 1968: 161; Lawson & John, 1987: 95; Trono & Ganzon-Fortes, 1988: 17.

Conferta composita Harvey, 1834: 157.

Local distribution – Kudingareng Keke, Bone Tambung: 1 m.

Distribution – Tropical Indian Ocean, tropical Pacific (Indonesia, Philippines).

Specimens examined – L 992.261-223 / -224 / -239 / -240 / -256.

Remarks – The status and delimitation of this species are somewhat uncertain (W.H.C.F. Kooistra, pers. comm.).

Family CLADOPHORACEAE

XIV. *Chaetomorpha* Kützing***Chaetomorpha crassa* (C. Agardh) Kützing**

Chaetomorpha crassa (C. Agardh) Kützing, 1845: 204; Trono & Ganzon-Fortes, 1988: 15; Weber-van Bosse, 1913: 85; Lawson & John, 1987: 66; Schneider & Searles, 1991: 58–59.

Conferva crassa C. Agardh, 1824: 99.

Local distribution – Langkai: 15 m.

Distribution – Tropical to temperate Indian Ocean, tropical to temperate Pacific (Indonesia, Philippines), Mediterranean, North Sea, Atlantic.

Specimens examined – L 992.261-227 / -243.

Remarks – At the end of the dry monsoon, August–October, *C. crassa* forms thick mats at 10–20 m depth. It covers and entangles everything, e.g. gorgonia and sea-grasses.

Family SIPHONOCLADACEAE

XV. *Boergesenia* Feldmann***Boergesenia forbesii* (Harvey) J. Feldmann**

Valonia forbesii Harvey, 1860: 333; Weber-van Bosse, 1913: 59; Weber-van Bosse, 1926: 81.

Boergesenia forbesii (Harvey) J. Feldmann, 1938: 1503; Børgesen, 1948: 21; Trono, 1968: 157; Trono & Ganzon-Fortes, 1988: 16.

Local distribution – Barang Lompo, Kudingareng Keke, Langkai: 1 m.

Distribution – Tropical and warm temperate Indian Ocean, tropical and warm temperate Pacific (Indonesia, Philippines).

Specimens examined – L 992.261-211 / -212 / -228.

Family VALONIACEAE

XVI. *Dictyosphaeria* Decaisne ex Endlicher

Key to species of *Dictyosphaeria* from the Spermonde Archipelago:

- 1a. Thallus hollow when young; mature thalli composed of a single layer of large vesicular cells 1. *D. cavernosa*
- b. Thallus forms a solid, pseudoparenchymatous structure . . . 2. *D. versluisii*

1. *Dictyosphaeria cavernosa* (Forsskål) Børgesen

Dictyosphaeria cavernosa (Forsskål) Børgesen, 1932: 2; Trono, 1968: 157–158; Trono & Ganzon-Fortes, 1988: 18–19; Schneider & Searles, 1991: 78.

Ulva cavernosa Forsskål, 1775: 187.

Valonia favulosa C. Agardh, 1822: 432; Weber-van Bosse, 1926: 82.

Dictyosphaeria favulosa (C. Agardh) Decaisne ex Endlicher, 1843: 18; Weber-van Bosse, 1913: 63.

Local distribution – Lae Lae, Gusung: 1 m.
 Distribution – Tropical Indian Ocean, tropical Pacific (Indonesia, Philippines),
 Mediterranean, Red Sea.
 Specimens examined – L 992.274-100.

2. *Dictyosphaeria versluysii* Weber-van Bosse

Dictyosphaeria versluysii Weber-van Bosse, 1905: 144; Weber-van Bosse, 1913: 64; Trono, 1968: 158.

Dictyosphaeria vanbosseae Børgesen, 1912: 256.

Dictyosphaeria setchellii Børgesen, 1940: 12.

Local distribution – Lae Lae: 2 m.

Distribution – Pantropical.

Specimens examined – L 992.261-244.

Remarks – Only one collection of this taxon from the Spermonde Archipelago has been found. The material fits well in the description of *D. versluysii* by Weber-van Bosse (1905: 144).

XVII. *Valonia* C. Agardh

Key to species of *Valonia* from the Spermonde Archipelago:

- 1a. Vegetative cells small, diameter less than 2.5 mm 1. *V. aegagropila*
- b. Vegetative cells large, diameter larger than 3 mm 2
- 2a. Vegetative cells longer than 2 × their diameter 2. *V. fastigiata*
- b. Vegetative cells shorter than 2 × their diameter 3. *V. macrophysa*

Remarks – The genus *Valonia* is restricted to the reef flats of the islands of the outer zones of the Spermonde Archipelago. Locally they are an important component of the underwater vegetation.

1. *Valonia aegagropila* C. Agardh (Plate 8: 3)

Valonia aegagropila C. Agardh, 1822: 429; Weber-van Bosse, 1913: 60–61; Weber-van Bosse, 1926: 81; Børgesen, 1948: 21; Trono, 1968: 156; Trono & Ganzon-Fortes, 1988: 20.

Local distribution – Langkai: 1 m.

Distribution – Tropical Indian Ocean, tropical Pacific (Indonesia, Philippines).

Specimens examined – L 992.261-238.

2. *Valonia fastigiata* Harvey ex J. Agardh (Plate 8: 5)

Valonia fastigiata Harvey ex J. Agardh, 1887: 101; Weber-van Bosse, 1913: 61; Trono, 1968: 156–157.

Local distribution – Kudingareng Keke, Langkai: 1–5 m.

Distribution – Tropical Indian Ocean, tropical Pacific (Indonesia, Philippines).

Specimens examined – L 992.261-054 / -103 / -119 / -181 / -197.

3. *Valonia macrophysa* Kützing (Plate 8: 6)

Valonia macrophysa Kützing, 1843: 307.

Local distribution – Bone Tambung, Langkai: 5 m.

Distribution – Tropical Indian Ocean, tropical Pacific (Indonesia, Philippines).

Specimens examined – L 992.261-107 / -123.

XVIII. *Ventricaria* Olsen & J. West***Ventricaria ventricosa* (J. Agardh) Olsen & J. West**

Valonia ventricosa J. Agardh, 1887: 101; Weber-van Bosse, 1913: 60; Børgesen, 1948: 20; Egerod, 1952: 347; Trono, 1968: 155–156; Trono & Ganzon-Fortes, 1988: 21.

Ventricaria ventricosa (J. Agardh) Olsen & J. West, 1988: 104.

Local distribution – Lae Lae, Gusung: 1–2 m.

Distribution – Tropical Indian Ocean, tropical Pacific (Indonesia, Philippines), Caribbean (Virgin Islands).

Specimens examined – Verheij 1275.

Remarks – The taxonomic position of the genus *Ventricaria* is not yet fixed. Olsen & West (1988) tentatively placed the genus in the Siphonocladaceae. In the present paper the genus is kept within the Valoniaceae, closely related to the genus *Valonia*. Further research is needed to determine the taxonomic position of *Ventricaria*. The size of the thalli varies greatly, the maximum observed diameter was 5 cm.

Order DASYCLADALES**Family DASYCLADACEAE****XIX. *Acetabularia* Lamouroux*****Acetabularia dentata* Solms-Laubach**

Acetabularia dentata Solms-Laubach, 1895: 28.

Local distribution – Gusung: 1–2 m.

Distribution – Tropical Indian Ocean, tropical Pacific (Indonesia, Philippines).

Specimens examined – Keblusek 113.

XX. *Bornetella* Munier-Chalmas***Bornetella nitida* Munier-Chalmas ex Sonder**

Bornetella nitida Munier-Chalmas ex Sonder, 1880: 39; Weber-van Bosse, 1913: 89; Coppejans & Prud'homme van Reine, 1989b: 125–126.

Local distribution – Gusung: 2 m.

Distribution – Tropical Indian Ocean, tropical Pacific (Indonesia).

Specimens examined – L 992.261-091.

Remarks – The specimens of the Spermonde Archipelago are smaller than the dimensions given by Coppejans & Prud'homme van Reine (1989b). However, anatomically they are identical.

XXI. Neomeris Lamouroux

Key to species of *Neomeris* from the Spermonde Archipelago:

- 1a. Base of thallus with annular rings at the basis of the thallus; decalcified gametangia oblongate 1. *N. annulata*
- b. Base of the thallus lacking annular rings; decalcified gametangia spherical
2. *N. vanbosseae*

1. Neomeris annulata Dickie

Neomeris annulata Dickie, 1874: 198; Weber-van Bosse, 1913: 88–89; Coppejans & Prud'homme van Reine, 1989b: 127–128.

Local distribution – Samalona, Kudingareng Keke, Langkai: 1–15 m.

Distribution – Pantropical.

Specimens examined – Formol collections Verheij 0112, 0163, 0242, 0352, 0879, 1030, 1088, 1113 (sometimes mixed with *N. vanbosseae*).

Remarks – All specimens agree with the description given by Coppejans & Prud'homme van Reine (1989b).

2. Neomeris vanbosseae Howe

Neomeris vanbosseae Howe, 1909: 80; Weber-van Bosse, 1913: 88; Coppejans & Prud'homme van Reine, 1989b: 127–128.

Local distribution – Gusung, Kudingareng Keke, Lanyukang: 1–10 m.

Distribution – Tropical Indian Ocean, tropical Pacific (Indonesia, Philippines).

Specimens examined – Formol collection Verheij 0112, 0163, 0242, 1030, 1088, 1113 (sometimes mixed with *N. annulata*).

Remarks – All specimens agree with the description given by Coppejans & Prud'homme van Reine (1989b).

Order ULVALES

Family ULVACEAE

XXII. Enteromorpha Link

Key to species of *Enteromorpha* from the Spermonde Archipelago:

- 1a. Thallus branched throughout; cells often arranged in rows throughout the thallus; more than one pyrenoid present per cell 1. *E. clathrata*
- b. Thallus unbranched or only branched at the base; cells not arranged in rows throughout the thallus; one pyrenoid present per cell 2

- 2a. Thallus branched at the base; cells in upper parts of thallus arranged in rows
 2. **E. compressa**
 b. Thallus unbranched; cells un-ordered throughout 3. **E. intestinalis**

Remarks – Hollow thalli of *Enteromorpha* are in general filled up with coral sand.

1. *Enteromorpha clathrata* (Roth) Greville

Enteromorpha clathrata (Roth) Greville, 1830: LXVI; Lawson & John, 1987: 54; Trono & Ganzon-Fortes, 1988: 11; Schneider & Searles, 1991: 43.

Conferva clathrata Roth, 1806: 175.

Local distribution – Langkai, Lanyukang: 2 m.

Distribution – Tropical and warm temperate Indian Ocean, tropical and warm temperate Pacific (Indonesia, Philippines), Baltic Sea, tropical west Africa.

Specimens examined – L 992.261-242.

2. *Enteromorpha compressa* (Linnaeus) Nees

Enteromorpha compressa (Linnaeus) Nees, 1820: 2; Schneider & Searles, 1991: 43.

Ulva compressa Linnaeus, 1753: 1163.

Local distribution – Kapoposang: 1 m.

Distribution – Indo-Pacific (Indonesia, Philippines), Europe.

Specimens examined – Keblusek 262.

3. *Enteromorpha intestinalis* (Linnaeus) Nees

Enteromorpha intestinalis (Linnaeus) Nees, 1820: 2; Trono & Ganzon-Fortes, 1988: 12; Schneider & Searles, 1991: 45–46.

Ulva intestinalis Linnaeus, 1753: 1163.

Local distribution – Langkai: 1 m.

Distribution – Indo-Pacific (Indonesia, Philippines), Europe.

Specimens examined – L 992.261-210.

XXIII. *Ulva* Linnaeus

Ulva reticulata Forsskål

Ulva reticulata Forsskål, 1775: 187; Weber-van Bosse, 1913: 52; Weber-van Bosse, 1926: 77.

Phycoseris reticulata (Forsskål) Kützting, 1849: 478.

Local distribution – Harbour area of Ujung Pandang.

Distribution – Tropical Indian Ocean (Saudi Arabia), tropical Pacific (Indonesia, Philippines).

Specimens examined – Keblusek 48.

Remarks – *Ulva reticulata* forms the major part of the thick layers of rotting seaweeds which are deposited on the sandy/muddy beaches in and around the harbour of Ujung Pandang especially during the months of July and August.

PHAEOPHYTA

Key to genera of Phaeophyta from the Spermonde Archipelago:

- 1a. Thallus relatively large (in general more than 20 cm); thallus differentiated into rhizoidal holdfast, (main) axis and lateral ramuli 2
- b. Thallus relatively small (in general less than 15 cm); thallus not differentiated into rhizoidal holdfast, (main) axis and ramuli 4
- 2a. Receptacles arising from vegetative branches, not from axillary branches
 - VII. Hormophysa**
 - b. Receptacles arising from axillary branches, not from vegetative branches . . . 3
 - 3a. Vesicles on stalks replacing ramuli **VIII. Sargassum**
 - b. Vesicles in the centre of the ramuli **IX. Turbinaria**
 - 4a. Thallus crustose, prostrate, leathery; major part of thallus attached to substratum **IV. Lobophora**
 - b. Thallus not crustose; only a small part of the thallus attached to the substratum . . . 5
 - 5a. Thallus without conspicuous apical cell(s); thallus net-like, solid or tubular. 6
 - b. Thallus with a single apical cell or with a row of conspicuous apical cells; thallus flat, flabellate or densely branched 8
 - 6a. Cells containing a single pyrenoid 7
 - b. Cells containing several pyrenoids **I. Chnoospora**
 - 7a. Thallus net-like **X. Hydroclathrus**
 - b. Thallus not net-like **XI. Rosenvingea**
 - 8a. Apical margin of thallus inrolled, revolute; thalli calcified **V. Padina**
 - b. Apical margin not inrolled; thalli not calcified. 9
 - 9a. Thallus with fan-shaped margins. 10
 - b. Thallus (sub)dichotomously branched. 11
 - 10a. Medullary cells rectangular in cross section; sporangia in sori; zonation in thallus poorly developed **V. Lobophora**
 - b. Medullary cells not rectangular in cross section sporangia not in sori; zonation in thallus well developed **VI. Stypopodium**
 - 11a. Thallus growth initiated from a single apical cell **III. Dictyota**
 - b. Thallus growth initiated from a cluster of apical cells 12
 - 12a. Thallus lobes with prominent midrib; thallus never bearing blades
 - II. Dictyopteris**
 - b. Thallus lobes without midrib; thallus sometimes bearing small blades
 - V. Padina**

Order DICTYOSIPHONALES

Family CHNOOSPORACEAE

I. Chnoospora J. Agardh

Chnoospora implexa J. Agardh

Chnoospora implexa J. Agardh, 1848: 172; Weber-van Bosse, 1913: 137; Silva et al., 1987: 79.

Local distribution – Barang Lompo, Kapoposang: 1–4 m.

Distribution – Tropical Indian Ocean, tropical Pacific (Indonesia), Red Sea.

Specimens examined – Keblusek 2, 214, 235, 265.

Remarks – See Weber-van Bosse (1913: 137) for discussion of synonymy of *C. implexa*.

Order DICTYOTALES

Family DICTYOTACEAE

II. *Dictyopteris* Lamouroux

Key to species *Dictyopteris* from the Spermonde Archipelago:

- 1a. Thalli usually small (up to 5 cm), and narrow (less than 3 mm) . 2. *D. repens*
 - b. Thalli usually large (more than 5 cm), and broad (more than 3 mm)
1. *D. jamaicensis*

Remarks – Both species of *Dictyopteris* are uncommon in the Spermonde Archipelago. *Dictyopteris repens* is found on the more shallow parts of the reefs, while *D. jamaicensis* is found on the deeper parts of the reef.

1. *Dictyopteris jamaicensis* W.R. Taylor (Plate 9: 2)

Dictyopteris jamaicensis W.R. Taylor, 1960: 631; Silva et al., 1987: 74.

Local distribution – Barang Lompo, Kudingareng Keke: 5–10 m.

Distribution – Tropical Indian Ocean, tropical western Pacific (Indonesia, Philippines), Caribbean.

Specimens examined – L 992.035-530 / -606 / -629 / -645, Keblusek 213, one collection was sent to BO.

2. *Dictyopteris repens* (Okamura) Børgesen (Plate 9: 1)

Dictyopteris repens (Okamura) Børgesen, 1924: 265; Silva et al., 1987: 75.

Haliseris repens Okamura, 1916: 8.

Local distribution – Samalona: 1 m.

Distribution – Tropical Indian Ocean, tropical Pacific (Indonesia, Philippines), Atlantic Ocean.

Specimens examined – L 992.035-607.

III. *Dictyota* Lamouroux

Remarks – Hörnig et al. (1992) discussed the relationship between *Dictyota* and *Dilophus* J. Agardh. During the present study a multilayered medulla was observed, at least rarely, in *D. bartayresiana*, *D. ciliolata*, *D. crenulata*, *D. dichotoma*, *D. marginata* and *D. intermedia*.

The key to the genus *Dictyota* from the Spermonde Archipelago as presented here is partly based on a field key made by Coppejans and Prud'homme van Reine for use in Papua New Guinea. This key has been tested on the collections from the Spermonde Archipelago and on collections in L.

Key to species of *Dictyota* from the Spermonde Archipelago:

- 1a. Thalli mainly decumbent, with spiny outgrowths, fronds with narrow base
 - 1. ***D. bartayresiana***
- b. Thalli erect, without spiny outgrowths, fronds mainly without narrow base . . . 2
- 2a. Margins of the fronds dentate/crenulate 3
 - b. Margins of the fronds smooth and/or with proliferations 4
- 3a. Margins dentate (teeth broadly based and terete towards the top); thalli loosely branched; narrow sinuses (less than 30°); fronds with subacute tips
 - 3. ***D. ciliolata***
- b. Margins of the fronds dentate/crenulate; thalli bushy, densely branched; wide sinuses (more than 45°); fronds with rounded tips 4. ***D. crenulata***
- 4a. Thalli with stolons or stoloniferous outgrowths 5
 - b. Thalli without stolons or stoloniferous outgrowths 6
- 5a. Segments cuneate; fronds often wider than 6 mm 6. ***D. intermedia***
- b. Segments linear, fronds corrugated and up to 4 mm wide . . . 7. ***D. marginata***
- 6a. Surface of frond with spiny outgrowths; fronds with in general acute tips, sometimes rounded tips and narrow base (less than 2 mm) . . . 1. ***D. bartayresiana***
- b. Surface of frond smooth; fronds with rounded tips, without narrow base . . . 7
- 7a. Segments more than 2 mm broad, often somewhat cuneate
 - 5a. ***D. dichotoma* var. *dichotoma***
 - b. Segments less than 1.5 mm broad, hardly tapering, sometimes even slightly cuneate. 8
- 8a. Segments slightly cuneate; sinuses wide and rounded 2. ***D. cervicornis***
- b. Segments hardly tapering; sinuses generally narrow
 - 5b. ***D. dichotoma* var. *intricata***

1. *Dictyota bartayresiana* Lamouroux (Plate 9: 3)

Dictyota bartayresiana Lamouroux, 1809: 43; Weber-van Bosse, 1913: 182–183; Oosterbaan, 1984: 14; Lawson & John, 1987: 120; Silva et al., 1987: 75.

Local distribution – Lae Lae, Kudingareng Keke, Bone Tambung, Langkai, Lan-yukang: 1 m.

Distribution – Tropical Indian Ocean, tropical Pacific (Indonesia, Philippines), Caribbean.

Specimens examined – L 992.057-488 / -741 / -757 / -768 / -960 / -976, Keblusek 16, 114, 115, three collections were sent to BO.

Remarks – Hörnig et al. (1992) discussed the two species concepts of *D. bartayresiana*: *D. bartayresiana* Lamouroux sensu Vickers, characterized by acute tips of the fronds and toothlets on the fronds, and *D. bartayresiana* Lamouroux sensu Kützing,

characterized by rounded tips of the fronds and the absence of toothlets. The first description agrees with the protologue of Lamouroux. Specimens fitting in the latter description are included in *D. neglecta* Hörnig et al. (1992). The collections from the Spermonde Archipelago fit in the first description although parts of the thalli approach the description of *D. neglecta*. We consider all collected specimens to belong to *D. bartayresiana* Lamouroux sensu Vickers.

2. *Dictyota cervicornis* Sonder ex Kützing (Plate 9: 6)

Dictyota cervicornis Sonder ex Kützing, 1859: 11; Silva et al., 1987: 75; Lawson & John, 1987: 119–120.

Local distribution – Bone Tambung: 1 m.

Distribution – Tropical Indian Ocean, tropical Pacific (Indonesia, Philippines), North Atlantic, Cuba.

Specimens examined – Keblusek 64.

Remarks – This species was originally described from the North Atlantic. Hörnig et al. (1992) discussed the relationship of *D. cervicornis* to *D. indica* Sonder ex Kützing and to *D. caribaea* Hörnig & Schnetter.

3. *Dictyota ciliolata* Kützing (Plate 9: 4)

Dictyota ciliolata Kützing, 1859: 12; Silva et al., 1987: 75; Lawson & John, 1987: 122.

Local distribution – Langkai: 1–2 m.

Distribution – Tropical Indian Ocean, tropical Pacific (Indonesia, Philippines), Atlantic (Venezuela).

Specimens examined – L 992.057-481 / -773, two collections were sent to Herbarium Bogoriense (BO).

Remarks – This species was originally described from the Atlantic (Venezuela). Silva et al. (1987) reported *D. ciliolata* also from the Philippines.

4. *Dictyota crenulata* J. Agardh (Plate 9: 5)

Dictyota crenulata J. Agardh, 1848; Lawson & John, 1987: 123.

Dilophus crenulatus (J. Agardh) Nizamuddin & Gerloff, 1979: 865; Oosterbaan, 1984: 17.

Local distribution – Barang Lompo, Langkai: 1–15 m.

Distribution – Indonesia, Macaronesian Islands, Caribbean.

Specimens examined – L 992.057-494 / -992 / -996 / -997 / -999, two collections were sent to BO.

Remarks – Hörnig et al. discussed the taxonomical problems surrounding this species in relation to *Dictyota jamaicensis*.

5. *Dictyota dichotoma* (Hudson) Lamouroux

Remarks – Hörnig & Schnetter (1988) provide a complete list of synonyms of both varieties of *D. dichotoma*.

5a. *Dictyota dichotoma* (Hudson) Lamouroux var. *dichotoma*

Ulva dichotoma Hudson, 1762: 476.

Dictyota dichotoma (Hudson) Lamouroux, 1809: 42; Oosterbaan, 1984: 15; Womersley, 1987: 194–195; Lawson & John, 1987: 123.

Dictyota dichotoma (Hudson) Lamouroux var. *dichotoma*: Lamouroux, 1809: 42.

Dictyota volubilis Kützting, 1849: 554.

Local distribution – Lae Lae, Gusung, Samalona: 1–20 m.

Distribution – Cosmopolitan.

Specimens examined – L 992.057-482 / -484 / -985 / -993 / -994, Keblusek 63, 231, three collections were sent to BO.

Remarks – Womersley (1987) noted that this taxon is restricted to subtropical, temperate or colder water. However, the variety has also been reported from the Philippines (Silva et al. 1987) and seems to be also common on the reefs of the Spermonde Archipelago.

5b. *Dictyota dichotoma* (Hudson) Lamouroux var. *intricata* (C. Agardh) Greville

Dictyota dichotoma (Hudson) Lamouroux var. *intricata* (C. Agardh) Greville, 1830: 58.

Zonaria dichotoma var. *intricata* C. Agardh, 1823: 134; Papenfuss, 1944, 339.

Zonaria linearis C. Agardh, 1820: 134.

Dictyota linearis (C. Agardh) Greville, 1830: XLIII; Oosterbaan, 1984: 16.

Local distribution – Bone Tambung, Langkai: 1–2 m.

Distribution – Tropical Indian Ocean, tropical Pacific (Indonesia, Philippines), Spain.

Specimens examined – L 992.057-752 / -799, Keblusek 57, one collection was sent to BO.

Remarks – This species originally was described as *Zonaria linearis* by C. Agardh (1820) from the North Atlantic (Spain). Silva et al. (1987) reported *D. linearis* also from the Philippines.

6. *Dictyota intermedia* Zanardini (Plate 9: 7)

Dictyota intermedia Zanardini, 1874: 488.

Dictyota zonata J. Agardh, 1880–1881: 96.

Local distribution – Kudingareng Keke: 1 m.

Distribution – Indonesia.

Specimens examined – L 992.057-487.

Remarks – In the present paper, *Dictyota intermedia* Zanardini and *D. zonata* J. Agardh are regarded as synonyms. J. Agardh, in his description of *D. zonata*, also mentioned the resemblance of his species to *D. intermedia*, but kept them separate. Studies of relevant (type) collections have to be carried out. In case these studies show that the type specimens belong to different taxa, a new name has to be given to *D. zonata* because this name is not available. *Dictyota zonata* has been described by Lamouroux (1809: 41) and is probably a synonym of *Styopodium zonale* (Lamouroux) Papenfuss (1940: 205) as suggested by Howe (1918: 507), who referred that species to *Zonaria zonalis* (Lamouroux) Howe.

7. *Dictyota marginata* (J. Agardh ex J. Agardh) Hörnig, Schnetter & Prud'homme van Reine (Plate 9: 8)

Dictyota marginata (J. Agardh) Hörnig, Schnetter & Prud'homme van Reine, 1992: 53. This is, however, a later homonym of *Dictyota marginata* (C. Agardh) Greville, 1830. Further studies are in progress (Hörnig, pers. comm.).

Dilophus marginatus J. Agardh, 1894: 91; Womersley, 1987: 202.

Local distribution – Barang Lompo, Langkai: 1–10 m.

Distribution – Indo-Pacific (Indonesia, Philippines).

Specimens examined – L 992.057-433 / -480 / -486 / -490, two collections were sent to BO.

Remarks – A multilayered medulla is present throughout the thallus of *D. marginata*. Specimens conform to the description given by J. Agardh.

IV. *Lobophora* J. Agardh

***Lobophora variegata* (Lamouroux) Womersley (Plate 10: 1)**

Lobophora variegata (Lamouroux) Womersley, 1967: 221; Womersley, 1987: 253; Allender & Kraft, 1983: 81–83; Oosterbaan, 1984: 27–28; Silva et al., 1987: 77; Lawson & John, 1987: 127; Farrant & King, 1989: 393–394.

Dictyota variegata Lamouroux, 1809: 40.

Zonaria variegata (Lamouroux) C. Agardh, 1817: XX; Weber-van Bosse, 1913: 175, 178; Weber-van Bosse, 1926: 99.

Gymnosorus variegatus (Lamouroux) J. Agardh, 1894: 11.

Pocockiella variegata (Lamouroux) Papenfuss, 1943: 467.

Lobophora nigrescens Sonder, 1845: 50.

Pocockiella nigrescens (Sonder) Papenfuss, 1943: 467.

Local distribution – Lae Lae, Gusung, Samalona, Kudingareng Keke, Barang Lompo, Bone Tambung, Langkai, Lanyukang: 1–10 m.

Distribution – Widely spread in tropical to temperate regions.

Specimens examined – L 992.035-623 / -639 / -640 / -655 / -656 / -657, one collection was sent to BO.

Remarks – Ruyter van Steveninck (1987) discussed the ecology of *L. variegata* in the Caribbean in detail. This cosmopolitan species seems to be more abundant on Caribbean coral reefs than on the reefs of the Spermonde Archipelago.

V. *Padina* Adanson

Remarks – According to the literature (Gaillard, 1975; Allender & Kraft, 1983; Farrant & King, 1989) the margin of the fronds is inrolled towards the side of the sporangia, only in *Padina sanctae-crucis* the margin should be inrolled towards the opposite side. During the present study it was found that the margins of the fronds of all the collections of all species were never inrolled towards the sporangial side but always towards the opposite side. Herbarium collections present in L show the same margin inrollment. Therefore this character cannot be used for delimiting species.

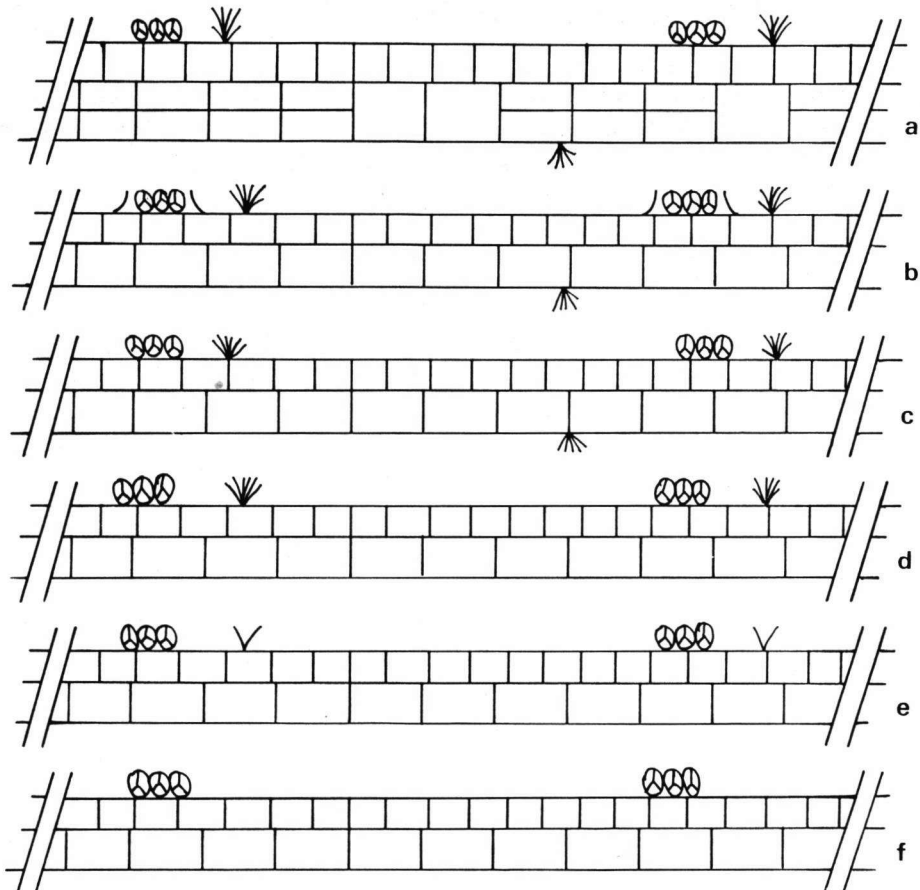


Fig. 5. Schematic summary of the different combinations of hairband and sporangia/gametangia as found in the species of the genus *Padina* in the Spermonde Archipelago. — a: *P. boergesenii*; b: *P. sanctae-crucis*; c: *P. australis*; d: *P. minor*; e: *P. tenuis*; f: *Padina* spec.

Figure 5 shows the place and organisation of the hairbands on upper and lower surface, of the indusium and of the sporangia cq. gametangia for the different species.

The developmental '*Vaughaniella*' stage is commonly present at the base of the thalli from the Spermonde Archipelago. The '*Vaughaniella*' stage was first described by Børgesen (1950) as a separate genus but subsequently not recognized by Cribb (1951) who concluded that *V. rupicola* Børgesen was the rhizomatous portion of *P. commersonii* Bory. Since it has been described for several species [e.g. *P. pavonica* (Coppejans, 1983), *P. tenuis* and *P. boergesenii* (Allender & Kraft, 1983)]. The '*Vaughaniella*' stage was observed in five of the six species from the Spermonde Archipelago but not in *P. boergesenii*.

Key to species of *Padina* from the Spermonde Archipelago:

- 1a. Thallus flabelliform 2
- b. Thallus dichotomously branched 6. 'Vaughaniella' stage
- 2a. Fronds two cell layers thick throughout the thallus 3
- b. Fronds at least partly more than two cell layers thick 2. *P. boergesenii*
- 3a. Hairs alternating on both sides of the thallus: sterile zone in between the hair bands 4
- b. Hairs absent or only on one side of the thallus 5
- 4a. Sporangia with indusium 4. *P. sanctae-crucis*
- b. Sporangia without indusium 1. *P. australis*
- 5a. Hairs apparent only on the thallus margin 5. *P. tenuis*
- b. Hairs apparent on the sporangia side of thallus and on thallus margin 6
- 6a. Many hairs apparent; sterile zone absent; calcification only on the sporangia side 3. *P. minor*
- b. Hairs apparent, but scarce; strong calcification on both sides of thallus 6. *Padina* spec.

1. *Padina australis* Hauck (Plate 10: 3–6)

Padina australis Hauck, 1887: 44; Okamura, 1932: 88; Weber-van Bosse, 1913: 179–180; Weber-van Bosse, 1926: 100; Allender & Kraft, 1983: 85–86; Silva et al., 1987: 77; Lawson & John, 1987: 128; Farrant & King, 1989: 388.

Local distribution – Lae Lae, Gusung, Samalona, Barang Lompo, Kudingareng Keke, Langkai, Lanyukang: 1–15 m.

Distribution – Tropical and warm temperate Indian Ocean, tropical and warm temperate Pacific (Indonesia, Philippines), tropical West Africa.

Specimens examined – L 992.035-537 / -555 / -571 / -618 / -626 / -630 / -634 / -642 / -646 / -647 / -654 / -658 / -660, L 992.057-832 / -838 / -839 / -848 / -854 / -855 / -870 / -876, Keblusek 5, 33, 44, 58, 91, 132, 137, 228, one collection was sent to BO.

Remarks – *Padina australis* grows throughout the Spermonde Archipelago between 1 and 15 metres depth. Monoecious gametangial plants (Plate 10: 3 & 4) and sporangial plants (Plate 10: 5 & 6) were collected throughout the year.

2. *Padina boergesenii* Allender & Kraft (Plate 10: 2)

Padina boergesenii Allender & Kraft, 1983: 87–89.

Local distribution – Barang Lompo: 10 m.

Distribution – Indonesia, Lord Howe Island, Danish West Indies.

Specimens examined – L 992.057-860.

Remarks – Specimens do not differ from the description given by Allender & Kraft (1983), except for the margin inrollment (see general discussion on *Padina*). The fronds are mostly 3 cells thick throughout, near the margin and sometimes locally in the fronds 2 cells thick.

3. *Padina minor* Yamada (Plate 10: 7)

Padina minor Yamada, 1925: 251; Silva et al., 1987: 78.

Local distribution – Barang Lompo, Kudingareng Keke, Langkai: 1 m.

Distribution – Tropical Indian Ocean, tropical Pacific (Indonesia, Philippines, Taiwan).

Specimens examined – L 992.035-596 / -638 / -661, Keblusek 62, 123, 133.

Remarks – Specimens agree with descriptions given by Yamada (1925) and by Tseng (1983). Only tetrasporangial plants were collected during the present study.

4. *Padina sanctae-crucis* Børgesen (Plate 11: 1 & 2)

Padina sanctae-crucis Børgesen, 1914: 45; Gaillard, 1975: 85–103; Silva et al., 1987: 78; Womersley, 1987: 219.

Padina japonica Yamada, 1931: 67–69.

Local distribution – Gusung, Barang Lompo, Kudingareng Keke: 1–2 m.

Distribution – Tropical Indian Ocean, tropical Pacific (Indonesia, Philippines), Caribbean.

Specimens examined – Keblusek 32, 98, 138.

Remarks – Gaillard (1975) noted that the differential features of *Padina sanctae-crucis* and *P. japonica* are not constant and he suggested including them in *P. sanctae-crucis*. The collections from the Spermonde Archipelago agree well with this opinion.

5. *Padina tenuis* Bory de Saint-Vincent (Plate 10: 8)

Padina tenuis Bory de Saint-Vincent, 1827: 590; Womersley & Bailey, 1970: 292; Allender & Kraft, 1983: 83; Farrant & King, 1989: 390.

Local distribution – Lae Lae, Samalona, Barang Lompo, Kudingareng Keke, Langkai: 1–15 m.

Distribution – Tropical and warm temperate Indian Ocean, tropical and warm temperate Pacific (Indonesia, Solomon Islands).

Specimens examined – L 992.057-840 / -844 / -847 / -856 / -863 / -864 / -872 / -879, Keblusek 13.

Remarks – During the present study no gametangial thalli were collected. The hairband and sterile zone configuration conform to descriptions given by Allender & Kraft (1983) and Farrant & King (1989).

6. *Padina* ‘*Vaughaniella*’ stage (Plate 11: 3)

Local distribution – Gusung, Samalona and Bone Tambung: 1–5 m.

Specimens examined – L 992.274-082, Keblusek 60, 103.

Remarks – When the ‘*Vaughaniella*’ stage is the only stage present, it is impossible to identify the species of *Padina* to which it belongs. Collections containing only ‘*Vaughaniella*’ stage material are listed under this entry.

7. *Padina* spec. (Plate 11: 4)

Local distribution – Samalona, Barang Lompo, Kudingareng Keke: 1–20 m.

Specimens examined – Several unnumbered collections in L, Keblusek 124.

Remarks – This material differs from all the other species in calcification. This calcification is on both sides of the fronds. The diameter of the cells is larger than the diameter of the cells of any of the other species.

The collections mentioned probably represent a new species. However, only a few damaged sporangia were found, without the possibility of measuring their dimensions.

VI. *Styopodium* (Kützing) J. Agardh

Key to species of *Styopodium* from the Spermonde Archipelago:

- 1a. Thallus composed of several reniform blades; prominent concentric growth-lines present **2. *S. zonale***
 b. Thallus sheet-like; growth-lines not prominent **1. *S. flabelliforme***

1. *Styopodium flabelliforme* Weber-van Bosse (Plate 11: 6)

Styopodium flabelliforme Weber-van Bosse, 1913: 176; Silva et al., 1987: 79.

Local distribution – Langkai, Kapoposang: 10–20 m.

Distribution – Indo-Pacific.

Specimens examined – L 992.057-439 / -492, Keblusek 83, 266, one collection was sent to BO.

Remarks – The newly collected material is much larger than the type material collected by Weber-van Bosse during the Siboga Expedition (1899–1900).

2. *Styopodium zonale* (Lamouroux) Papenfuss (Plate 11: 5)

Styopodium zonale (Lamouroux) Papenfuss, 1940: 205; Oosterbaan, 1984: 34; Lawson & John, 1987: 134.

Fucus zonalis Lamouroux, 1805: 38.

Zonaria zonalis (Lamouroux) Howe, 1918: 507.

Styopodium lacunatum Kützing, 1859: 26.

Zonaria lobata C. Agardh, 1824: 265.

Padina lobata (C. Agardh) Greville, 1830: XLIV.

Styopodium lobatum (C. Agardh) Kützing, 1859: 25.

Local distribution – Kudingareng Keke: 25 m.

Distribution – Indonesia, South Africa, tropical West Africa, Caribbean, tropical and warm temperate Atlantic.

Specimens examined – L 992.057-491, one collection was sent to BO.

Remarks – This is the first report of *S. zonale* from the Indo-Pacific. The newly collected material has been compared with collections from South Africa (annotated by Papenfuss) and with collections from the Caribbean. No differences were observed between the plants of these collections and the Indonesian material.

Order FUCALES

Family CYSTOSEIRACEAE

VII. *Hormophysa* Kützing

***Hormophysa cuneiformis* (J.F. Gmelin) Silva (Plate 12: 1)**

Hormophysa cuneiformis (J.F. Gmelin) Silva, 1987: 81, 130.

Fucus cuneiformis J.F. Gmelin, 1792: 1389.

Cystoseira triquetra C. Agardh, 1820: 61.

Hormophysa triquetra (C. Agardh) Kützing, 1843: 359; Womersley, 1987: 356.

Local distribution – Samalona: 10 m.

Distribution – Tropical and warm temperate Indo-Pacific (Indonesia, Philippines, Japan).

Specimens examined – L 992.035–622.

Remarks – Silva (in Silva et al., 1987) discussed the synonymy of *H. cuneiformis*. The only specimen collected during the present study was not attached to the substratum, but was found in healthy condition entangled between dead coral branches.

Family SARGASSACEAE

VIII. *Sargassum* C. Agardh

Remarks – The genus *Sargassum* offers many systematic problems. The astonishing variability of many characters and the large amount of work carried out in the past have led to an enormous number of specific names, of which many probably will prove to be synonyms. The purpose of this paper is not to give a taxonomic treatment of the taxa, but an annotated catalog which can be used for further research in the area and which is the basis for further analyses (Verheij & Povel, submitted; Verheij, 1993d).

The identification key is based on field observations and on data obtained from papers on Indo-Pacific species of *Sargassum* (e.g. Yoshida, 1983; Abbott & Norris, 1985; Abbott, 1988).

During the course of this study several small or incomplete specimens were collected. These specimens could not be identified up to species level and they are thus not listed in the key to the species. However, their localities are given at the end of the list of species.

Key to species of *Sargassum* from the Spermonde Archipelago:

- 1a. Ramuli turbinate, flattened; secondary branches compressed 1. *S. cristaefolium*
- b. Ramuli not turbinate; secondary branches not compressed 2
- 2a. Main axes smooth, no spines 3
- b. Main axes bearing spines; primary branches bearing highly branched spines 2. *S. hawaiiensis*

4. *Sargassum ilicifolium* (Turner) C. Agardh

Fucus ilicifolius Turner, 1808: 113.

Sargassum ilicifolium (Turner) C. Agardh, 1820: 11; Weber-van Bosse, 1913: 160; Silva et al., 1987: 85; Yoshida in Abbott, 1988: 15.

Local distribution – Kudingareng Keke, Langkai: 1 m.

Distribution – Tropical and warm temperate Indian Ocean (India), tropical and warm temperate Pacific (Indonesia, Taiwan, Japan).

Specimens examined – L 992.057-715 / -731, Verheij 0403, 1236.

Remarks – Both collections contain only young, sterile plants.

5. *Sargassum pallidum* (Turner) C. Agardh (Plate 12: 4)

Sargassum pallidum (Turner) C. Agardh, 1820: 39; Yoshida, 1983: 134.

Fucus pallidus Turner, 1811: 85.

Local distribution – Gusung, Samalona: 1 m.

Distribution – Tropical and warm temperate Pacific (Indonesia, Philippines, Japan, Taiwan).

Specimens examined – Keblusek 8, 237.

6. *Sargassum siliquosum* J. Agardh

Sargassum siliquosum J. Agardh, 1848: 316; Weber-van Bosse, 1913: 154; Yamada, 1942: 503; Silva et al., 1987: 82, 87; Yoshida in Abbott, 1988: 18.

Local distribution – Barang Lompo: 1 m.

Distribution – Tropical and warm temperate Indian Ocean, tropical and warm temperate Pacific (Singapore, Indonesia, Papua New Guinea, Taiwan, Japan).

Specimens examined – L 992.057-736, Verheij 0140.

Remarks – This collection contains only sterile branches of lower order.

7. *Sargassum* spec.

Local distribution – Lae Lae, Gusung, Kudingareng Keke, Langkai: 1 m.

Remarks – This entry contains several, incomplete alcohol collections.

IX. *Turbinaria* Lamouroux

Key to species of *Turbinaria* from the Spermonde Archipelago:

- 1a. Ramuli in top view triangular **2. *T. decurrens***
- b. Ramuli irregular, not triangular in top view 2
- 2a. Ramuli large (more than 15 mm in diameter); margins of ramuli fully or partly surrounded by a crown of large teeth **3. *T. ornata***
- b. Ramuli small (less than 13 mm in diameter); no distinct crown of large teeth on the 'leaf' margin 3

- 3a. Thallus attached to substratum by a discoid holdfast and dichotomously branched, subcylindrical or compressed stolons 4. *T. parvifolia*
 b. Thallus attached to substratum only by a branched holdfast, discoid holdfast absent, mainly unbranched 1. *T. conoides*

1. *Turbinaria conoides* (J. Agardh) Kützing (Plate 12: 9)

Turbinaria conoides (J. Agardh) Kützing, 1860: 24; Weber-van Bosse, 1913: 148; Weber-van Bosse, 1926: 98; Silva et al., 1987: 88; Trono & Ganzon-Fortes, 1988: 103–104.

Turbinaria vulgaris J. Agardh var. *conoides* J. Agardh, 1848: 267.

Local distribution – Lae Lae: 1 m.

Distribution – Tropical and warm temperate Indian Ocean and tropical and warm temperate western Pacific (Indonesia, China, western and eastern Australia).

Specimens examined – L 992.052-737 / -772, Verheij 0585, 0757, Keblusek 76, 240.

2. *Turbinaria decurrens* Bory de Saint-Vincent

Turbinaria decurrens Bory de Saint-Vincent, 1828: 119; Weber-van Bosse, 1913: 149; Silva et al., 1987: 89; Trono & Ganzon-Fortes, 1988: 104–106.

Local distribution – Lae Lae, Gusung, Samalona, Barang Lompo, Kudingareng Keke, Bone Tambung, Langkai, Lanyukang: 1 m.

Distribution – Tropical Pacific.

Specimens examined – L 992.057-740, Verheij 0318, 0592, 0915, Keblusek 61, 84.

3. *Turbinaria ornata* (Turner) J. Agardh (Plate 12: 7)

Turbinaria ornata (Turner) J. Agardh, 1848: 266; Weber-van Bosse, 1913: 149; Silva et al., 1987: 89; Trono & Ganzon-Fortes, 1988: 107–109.

Fucus turbinatus Linnaeus var. *ornatus* Turner, 1808: 50.

Local distribution – Samalona, Barang Lompo, Kudingareng Keke, Bone Tambung, Langkai, Lanyukang: 1 m.

Distribution – Tropical eastern Indian Ocean, tropical western Pacific Ocean (Indonesia, Philippines).

Specimens examined – L 992.057-755 / -771, Verheij 0104, 0158, 0238, 0329, 0481, 0573, 1005, 1026, 1048, Keblusek 4.

4. *Turbinaria parvifolia* Tseng & Lu (Plate 12: 8)

Turbinaria parvifolia Tseng & Lu, 1982.

Local distribution – Lae Lae, Langkai: 1 m.

Distribution – Indonesia, China (Xisha Island).

Specimens examined – L 992.057-739 / -756, Verheij 1229, one collection was sent to BO.

Remarks – This is the first report of *T. parvifolia* outside China.

Order SCYTOSIPHONALES

Family SCYTOSIPHONACEAE

X. *Hydroclathrus* Bory

Remarks – During the present study two species of *Hydroclathrus* were collected. Sometimes, both species grew together at the same locality. In the field and in dried herbarium collections, both species can be separated easily; no intermediate forms were observed.

Key to species of *Hydroclathrus* from the Spermonde Archipelago:

- 1a. Diameter of filaments forming the network less than 2 mm; diameter of rounded meshes in general less than 1 cm 2. *H. tenuis*
- b. Diameter of filaments forming the network more than 3 mm; diameter of rounded meshes in general 1–5 cm 1. *H. clathratus*

1. *Hydroclathrus clathratus* (C.Agardh) Howe (Plate 13: 2)

Encoelium clathratum C.Agardh, 1822: 412.

Hydroclathrus clathratus (C.Agardh) Howe, 1920: 590; Silva et al., 1987: 80; Lawson & John, 1987: 138.

Hydroclathrus cancellatus Bory de Saint-Vincent, 1825: 419; Weber-van Bosse, 1913: 136; Weber-van Bosse, 1926: 97.

Local distribution – Kudingareng Keke, Bone Tambung, Langkai, Kapoposang: 1–15 m.

Distribution – Tropical Indian Ocean (Maldives), tropical Pacific (Indonesia, Philippines, Papua New Guinea), tropical West Africa.

Specimens examined – L 992.035-560 / -576 / -592 / -608 / -624 / -625 / -631 / -641, Keblusek 19, 30, 56; two collections were sent to BO.

2. *Hydroclathrus tenuis* Tseng & Lu (Plate 13: 1)

Hydroclathrus tenuis Tseng & Lu, 1983:

Local distribution – Kapoposang: 2 m.

Distribution – Indonesia, Japan.

Specimens examined – Keblusek 255.

XI. *Roseningea* Børgesen

Roseningea intricata (J. Agardh) Børgesen (Plate 13: 3)

Asperococcus intricatus J. Agardh, 1847: 7; Weber-van Bosse, 1913: 137–138.

Roseningea intricata (J. Agardh) Børgesen, 1914: 26; Weber-van Bosse, 1926: 97; Silva et al., 1987: 80.

Local distribution – Samalona: 25 m.

Distribution – Tropical Indian Ocean, tropical Pacific (Indonesia, Philippines), Mexico.

Specimens examined – L 992.035-559, Keblusek 22, one collection was sent to BO.

RHODOPHYTA

RHODOPHYCEAE

Key to genera of Rhodophyceae from the Spermonde Archipelago:

- 1a. Thallus sponge-like, purple **XXXI. Ceratodictyon**
- b. Thallus not sponge-like 2
- 2a. Thallus calcified, vegetative cell walls impregnated with calcite 3
- b. Thallus not calcified, vegetative cell walls not impregnated with calcite 20
- 3a. Plants throughout dimerous **XXI. Mastophora**
- b. Plants at least partly monomerous. 4
- 4a. Gametangial structures not in conceptacles; no simultaneous cleavage of tetrasporangia. 5
- b. Gametangial structures in conceptacles; simultaneous cleavage of tetrasporangia 11
- 5a. Plants flattened 6
- b. Plants cylindrical. 7
- 6a. Plants forming prostrate rather rigid crusts **XL. Peyssonnelia**
- b. Plants erect, irregular, slippery, often liver-coloured . **XXXIII. Titanophora**
- 7a. Plant rigid throughout 8
- b. Uppermost parts of plant soft 10
- 8a. Branches with distinct rings of hairs **I. Actinotrichia**
- b. Branches naked or with hairs scattered over thallus surface 9
- 9a. Cortical cells not laterally attached; tetrasporophyte filamentous, gametophyte cylindrical and branched **III. Tricleocarpa**
- b. Cortical cells firmly laterally attached; tetrasporophyte and gametophyte cylindrical and branched **II. Galaxaura**
- 10a. Plants irregularly alternately branched; thallus gelatinous **XLVII. Trichogloea**
- b. Plants regular dichotomously branched; thallus not gelatinous **XLVI. Liagora**
- 11a. Plants articulated (with genicula) 12
- b. Plants not articulated (without genicula) 13
- 12a. Cells of adjacent filaments joined by secondary pit-connections, not by fusions **XVII. Amphiroa**
- b. Cells of adjacent filaments joined by cell fusions, not by secondary pit-connections **XVIII. Jania**
- 13a. Tetrasporangia cruciately cleaved, not organized in roofed conceptacles **XXVII. Sporolithon**
- b. Tetrasporangia zonately cleaved, organized in roofed conceptacles. 14

14a.	Tetrasporangial conceptacles uniporate	15
b.	Tetrasporangial conceptacles multiporate	18
15a.	Cells of adjacent filaments joined by secondary pit-connections, not by cell fusions	XIX. Lithophyllum
b.	Cells of adjacent filaments joined by cell fusions not by secondary pit-connections	16
16a.	Tetrasporangial conceptacle roof formed by filaments surrounding and interspersing the tetrasporangia	XX. Hydrolithon
b.	Tetrasporangial conceptacle roof formed only by filaments surrounding the tetrasporangia	17
17a.	Simple spermatangia both on floor and roof of male conceptacle chamber; gonimoblast filaments arising from dorsal side of the fusion cell; plants with predominantly coaxial core of filaments	XXII. Neogoniolithon
b.	Simple spermatangia restricted to the floor of male conceptacle chamber; gonimoblast filaments arising from the periphery of the fusion cell; plants with predominantly noncoaxial core of filaments	XXIII. Spongites
18a.	Epithallial cells flattened with flared rims	XXV. Lithothamnion
b.	Epithallial cells not flattened and without flared rims	19
19a.	Roof of spermatangial conceptacles formed centrepitally from groups of peripheral filaments; each filament usually terminated by one epithallial cell	XXVI. Mesophyllum
b.	Roof of spermatangial conceptacles formed by continued meristematic activity in filaments that form the spermatangial initials; each filament usually terminated by several epithallial cells	XXIV. Clathromorphum
20a.	Plants net-like	VIII. Zellera
b.	Plants not net-like	21
21a.	Plants uniseriate, filaments not corticated	V. Griffithsia
b.	Plants of other forms, e.g. membranous, vesicle-like, polysiphonous	22
22a.	Plants filamentous and corticated or polysiphonous.	23
b.	Plants not filamentous neither polysiphonous.	32
23a.	Plants filamentous with small, irregularly organized cortical cells	24
b.	Plants polysiphonous, with distinct, well organized pericentral cells	25
24a.	Cortication pattern similar throughout the thallus	IV. Ceramium
b.	Cortication at the apices restricted to the nodes and forming a complete cover towards the base of the thallus	VI. Spyridia
25a.	Main axes prostrate; two rows of leaf-like branches with polysiphonous axis and two monostromatic 'wings' on each side	XIV. Leveillea
b.	Plants not as above	26
26a.	Axes with bright coloured, monosiphonous, radially formed branchlets	VII. Dasya
b.	Monosiphonous branchlets lacking or if present, always colourless	27
27a.	Thallus with spiniform, not monosiphonous, branchlets	IX. Acanthophora
b.	Thallus without spiniform, not monosiphonous, branchlets	28
28a.	Polysiphonous axes without cortication	29
b.	Polysiphonous axes covered by small cortical cells	31

- 29a. Branches clearly spirally arranged **XVI. Tolypocladia**
 b. Branches not spirally arranged. 30
- 30a. Branches produced in a definite repeated sequence . . . **XII. Herposiphonia**
 b. Branches not produced in a definite repeated sequence . **XV. Polysiphonia**
- 31a. Terminal branches constricted or tapering at their base **XI. Chondria**
 b. Terminal branches not constricted or tapering at their base . **XIII. Laurencia**
- 32a. Thallus predominantly cylindrical or slightly compressed. 33
 b. Thallus at least partly clearly flattened. 42
- 33a. Thallus at least partly hollow. 34
 b. Thallus not hollow. 35
- 34a. Thallus hollow, cylindrical, septated, and branched **XLVIII. Champia**
 b. Hollow vesicles filled up with a mucilaginous substance; with or without solid stipes **XLIX. Botryocladia**
- 35a. Plants (pseudo)dichotomously branched **XLI. Gymnogongrus**
 b. Plants not (pseudo)dichotomously branched 36
- 36a. Plants with an uniaxial structure 37
 b. Plants with a multiaxial structure 40
- 37a. Plants prostrate **XXXVII. Hypnea**
 b. Plants erect or with basal prostrate part and many erect branches 38
- 38a. Plants bushy with many, radially formed, branches . . . **XXXVII. Hypnea**
 b. Plants not bushy, not richly branched. 39
- 39a. Plants with rhizines **XXIX. Gelidium**
 b. Plants without rhizines **XXVIII. Gelidiella**
- 40a. Medulla pseudoparenchymatous **XXXII. Gracilaria**
 b. Medulla filamentous 41
- 41a. Spines in pairs, lines or whorls, with densely rhizoidal axes **XLIII. Eucheuma**
 b. Spines absent or not in pairs, lines or whorls, and without densely rhizoidal axes **XLIV. Kappaphycus**
- 42a. Thallus crustose **XXXIX. Coriophyllum**
 b. Thallus not crustose 43
43. Blades with perforations of variable sizes **XXXVIII. Kallymenia**
 b. Blades without perforations 44
- 44a. Blades with prominent midribs, at least in part 45
 b. Blades without midribs 46
- 45a. Blades in a rosette, sometimes on short stipes **X. Amansia**
 b. Blades not in a rosette **XXXIV. Cryptonemia**
- 46a. Axes small (in general less than 3 mm wide). 47
 b. Axes large (in general more than 3 mm wide) 52
- 47a. More than 3 orders of branching usually present; apices of branches recurved
XLII. Portieria
 b. Less than 3 orders of branching usually present; apices of branches not recurved 48
- 48a. Main axes simple to pinnately branched **XXIX. Gelidium**
 b. Main axes dichotomously or trichotomously branched. 49
- 49a. Plants without internal rhizines 50
 b. Plants with internal rhizines 51

- 50a. Plants with prominent apical cell **XXVIII. Gelidiella**
- b. Plants without prominent apical cell **XXXI. Ceratodictyon**
- 51a. Branching opposite **XXX. Pterocladia**
- b. Branching not opposite **XXIX. Gelidium**
- 52a. Plants dichotomously branched 53
- b. Plants not dichotomously branched 54
- 53a. Plants membranous **L. Rhodymenia**
- b. Plants leatherly, not membranous **XXXII. Gracilaria**
- 54a. Medulla pseudoparenchymatous **XXXII. Gracilaria**
- b. Medulla hollow or filamentous 55
- 55a. Blades stipitate **XXXVI. Halymenia**
- b. Blades not stipitate 56
- 56a. Blades usually less than 4 cm wide. 57
- b. Blades usually more than 6 cm wide. 58
- 57a. Blades papillate **XLV. Meristotheca**
- b. Blades not papillate **XXXV. Grateloupia**
- 58a. Blades papillate; tetrasporangia zonately divided **XLV. Meristotheca**
- b. Blades not papillate; tetrasporangia cruciately divided **XXXVI. Halymenia**

Order BONNEMAISONIALES

Family GALAXAURACEAE

I. *Actinotrichia* Decaisne

***Actinotrichia fragilis* (Forsskål) Børgesen (Plate 14: 1)**

Fucus fragilis Forsskål, 1775: 190.

Actinotrichia fragilis (Forsskål) Børgesen, 1932: 6; Cordero, 1981: 50; Cribb, 1983: 25; Silva et al., 1987: 22.

Galaxaura rigida Lamouroux, 1816: 265.

Actinotrichia rigida (Lamouroux) Decaisne, 1842: 118; Weber-van Bosse, 1921: 207.

Local distribution – Samalona: 1 m.

Distribution – Tropical western Pacific (Indonesia, Philippines), tropical Indian Ocean (Yemen).

Specimens examined – L 992.274-209 / -306.

Remarks – During the present study no reproductive structures were found. In the Spermonde Archipelago *A. fragilis* is commonly epilithic or epiphytic on seagrasses.

II. *Galaxaura* Lamouroux

Key to species of *Galaxaura* from the Spermonde Archipelago:

- 1a. Branches deeply constricted, almost articulated **2. *G. obtusata***
- b. Branches not deeply constricted **2**

- 2a. Assimilatory layer composed of four layers of cells, the third layer of cells distinctly smaller **4. *G. striata***
 b. Assimilatory filaments not as above **3**
 3a. Assimilatory filaments arising from an inflated basal cell, terminal cell of short assimilatory filaments not inflated **3. *G. rugosa***
 b. Assimilatory filaments without inflated basal cell, terminal cell of short assimilatory filaments inflated **1. *G. cohaerens***

1. *Galaxaura cohaerens* Kjellman

Galaxaura cohaerens Kjellman, 1900: 54; Huisman & Borowitzka, 1990: 164–165.

Galaxaura fasciculata Kjellman, 1900: 53; Weber-van Bosse, 1921: 213; Cordero, 1981: 57; Silva et al., 1987: 23.

Local distribution – Kudingareng Keke, Bone Tambung: 1 m.

Distribution – Indo-Pacific (Indonesia, Philippines), Japan, Caroline Islands, Caribbean.

Specimens examined – Keblusek 42, 66.

Remarks – See Huisman & Borowitzka (1990: 164) for selection of type species and synonymy.

2. *Galaxaura obtusata* (Ellis & Solander) Lamouroux (Plate 14: 2)

Corallina obtusata Ellis & Solander, 1786: 113.

Galaxaura obtusata (Ellis & Solander) Lamouroux, 1816: 262; Weber-van Bosse, 1921: 220; Cordero, 1981: 62; Silva et al., 1987: 24; Lawson & John, 1987: 164; Huisman & Borowitzka, 1990: 162.

Tubularia umbellata Esper, (1805–1812): 125.

Galaxaura umbellata (Esper) Lamouroux, 1816: 262.

Galaxaura robusta Kjellman, 1900: 85.

Local distribution – Samalona, Barang Lompo, Langkai: 15–25 m.

Distribution – Indo-Pacific (Indonesia, Philippines), Caribbean.

Specimens examined – L 992.274-364 / -449 / -456 / -464, Keblusek 212.

Remarks – This distinctly species can be easily recognized in the field by the deep constrictions at the base of the branches. Among the *Galaxaura* species this species lives at the greatest depths, up to 25 m.

3. *Galaxaura rugosa* (Ellis & Solander) Lamouroux (Plate 14: 3)

Corallina rugosa Ellis & Solander, 1786: 115.

Galaxaura cuculligera Kjellman, 1900: 58; Weber-van Bosse, 1921: 212.

Galaxaura elongata J. Agardh, 1876: 529; Cordero, 1981: 54; Weber-van Bosse, 1921: 212.

Galaxaura glabriuscula Kjellman, 1900: 56.

Galaxaura rugosa (Ellis & Solander) Lamouroux, 1816: 263; Papenfuss et al., 1982: 421–422; Cribb, 1983: 26; Silva et al., 1987: 24; Lawson & John, 1987: 160 & 166.

Galaxaura subverticillata Kjellman, 1900: 48; Cordero, 1981: 65; Silva et al., 1987: 24.

Local distribution – Samalona, Kudingareng Keke, Langkai: 1–15 m.
 Distribution – Indo-Pacific (Indonesia, Philippines), Japan, Vietnam, Caribbean (Virgin Islands, St Croix, Jamaica).
 Specimens examined – L 992.274-275.

4. *Galaxaura striata* Kjellman (Plate 14: 4)

Galaxaura striata Kjellman, 1900: 66; Cordero, 1981: 64; Silva et al., 1987: 24.

Local distribution – Langkai: 5 m.
 Distribution – Indo-Pacific (Indonesia, Philippines), Marquesas Islands.
 Specimens examined – L 992.274-291.
 Remarks – The specimens collected are slightly larger than the specimens described by Kjellman (1900: 66) and Cordero (1981: 64).

III. *Tricleocarpa* Huisman & Borowitzka

Tricleocarpa oblongata (Ellis & Solander) Huisman & Borowitzka (Plate 14: 5, 6)

Tricleocarpa oblongata (Ellis & Solander) Huisman & Borowitzka, 1990: 168.

Corallina oblongata Ellis & Solander, 1786: 114.

Galaxaura oblongata (Ellis & Solander) Lamouroux, 1816: 262; Cordero, 1981: 60; Silva et al., 1987: 23; Lawson & John, 1987: 164.

Galaxaura eburnea Kjellman, 1900: 62.

Local distribution – Lae Lae, Gusung, Kudingareng Keke, Langkai, Kapoposang: 1–20 m.

Distribution – Tropical and subtropical Pacific (Indonesia, Philippines, China, Japan, Mexico), Caribbean.

Specimens examined – L 992.274-433 / -440 / -441 / -457 / -473 / -489 / -491 / -505 / -506, Keblusek 89.

Remarks – The specimens collected agree fully with the descriptions given by Huisman & Borowitzka (1990: 168–169) and Lamouroux (1816: 262, as *G. oblongata*).

Order CERAMIALES

Family CERAMIACEAE

IV. *Ceramium* Roth

Ceramium spec.

Local distribution – all over the Spermonde Archipelago: 1–5 m.

Specimens examined – L 992.274-091.

Remarks – The genus *Ceramium* is well represented in the Spermonde Archipelago, but, the quantity is low and reproductive structures were seldom found. In general it forms mixed turfs with many other filamentous algae like *Herposiphonia* spp. and *Polysiphonia* spp.

V. *Griffithsia* C. Agardh

Griffithsia spec.

Local distribution – Kudingareng Keke, Bone Tambung, Langkai, Lanyukang, Kapoposang: deeper than 35 m.

Specimens examined – L 992.274-371.

Remarks – *Griffithsia* specimens are quite common on hard substratum, dead shells or corals, on the sandy bottom in between the islands of the outer strips. Identification on species level was impossible because the collections are sterile.

VI. *Spyridia* Harvey

Spyridia filamentosa (Wulfen) Harvey

Fucus filamentosus Wulfen, 1803: 63.

Spyridia filamentosa (Wulfen) Harvey, 1833: 337; Weber-van Bosse, 1923: 320; Weber-van Bosse, 1926: 124; Cordero, 1981: 184; Cribb, 1983: 94; Silva et al., 1987: 57; Lawson & John, 1987: 282.

Local distribution – Barang Lompo, Bone Tambung, Langkai: 2–10 m.

Distribution – Tropical Indo-Pacific (Indonesia, Philippines), eastern Australia, Mediterranean.

Specimens examined – L 992.274-117 / -133 / -142 / -148 / -150 / -158 / -176 / -204, Keblusek 236.

Remarks – In general the thalli collected are taller, up to 10 cm, than the thalli collected in the Philippines (Cordero, 1981: 184) and the Great Barrier Reef (Cribb, 1983: 94). However, the internal structure fully agrees with both descriptions.

Family DASYACEAE

VII. *Dasya* C. Agardh

Key to species of *Dasya* from the Spermonde Archipelago:

- 1a. Tetrasporangial stichidia not topped by branched axes; pseudodichotomies usually separated by 2 cells **1. *D. baillouviana***
- b. Tetrasporangial stichidia topped by branched axes; pseudodichotomies in general separated by one cell **2. *D. caraibica***

1. *Dasya baillouviana* (S.G. Gmelin) Montagne

Fucus baillouviana S.G. Gmelin, 1768: 165.

Dasya baillouviana (S.G. Gmelin) Montagne, 1841: 165; Cribb, 1983: 101; Silva et al., 1987: 59; Lawson & John, 1987: 285.

Local distribution – Lanyukang: 1 m.

Distribution – Indo-Pacific (Indonesia, Philippines), Mediterranean.

Specimens examined – L 992.274-352.

Remarks – The successive dichotomies of the lateral branchlets were always separated by 2 cells.

2. *Dasya caraibica* Børgesen (Plate 14: 7)

Dasya caraibica Børgesen, 1919: 319; Cribb, 1983: 102.

Local distribution – Lae Lae: 1 m.

Distribution – Indo-Pacific (Indonesia), eastern Australia, Caribbean.

Specimens examined – L 992.274-206 / -237.

Remarks – The successive dichotomies of the lateral branchlets were usually separated by 1 cell. However, sometimes 2 cells were observed.

Family DELESSERIACEAE

VIII. *Zellera* Martens

***Zellera tawallina* Martens (Plate 14: 8)**

Zellera tawallina Martens, 1868: 33; Weber-van Bosse, 1923: 391; Silva et al., 1987: 59.

Local distribution – Barang Lompo, Kudingareng Keke, Bone Tambung, Langkai: 5–15 m.

Distribution – Tropical Indo-Pacific (Indonesia, Philippines).

Specimens examined – L 992.274-145 / -213 / -429.

Remarks – Some reproductive tetrasporangial thalli were collected during the months of June and July.

Family RHODOMELACEAE

IX. *Acanthophora* Lamouroux

Key to species of *Acanthophora* from the Spermonde Archipelago:

- 1a. Spines present throughout the fronds **1. *A. muscoides***
- b. Spines present only on the main axes **2. *A. spicifera***

Remarks – *Acanthophora muscoides* and *A. spicifera* are separated from each other on the basis of presence or absence of spines on the branches. In some plants it looks as if a few, small, irregularly formed spines are present on the almost nude braches. Field experiments may elucidate whether or not the development of spines on the branches is caused by environmental conditions and, consequently, if this character can be used for species delimitation.

1. *Acanthophora muscoides* (Linnaeus) Bory de Saint-Vincent (Plate 15: 1)

Fucus muscoides Linnaeus, 1753: 1161.

Acanthophora muscoides (Linnaeus) Bory de Saint-Vincent, 1828: 156; Cordero, 1981: 189; Silva et al., 1987: 60; Lawson & John, 1987: 297.

Local distribution – Lae Lae, Barang Lompo, Kudingareng Keke, Bone Tambung, Langkai, Lanyukang: 1–2 m.

Distribution – Indo-Pacific (Indonesia, Philippines), Ascension Island, Japan, Caribbean.

Specimens examined – L 992.274-333 / -357 / -363 / -383 / -396 / -412 / -426 / -428, Keblusek 37, 55, 239.

2. *Acanthophora spicifera* (Vahl) Børgesen (Plate 15: 2)

Fucus spiciferus Vahl, 1802: 44.

Acanthophora spicifera (Vahl) Børgesen, 1910: 201; Weber-van Bosse, 1923: 347; Weber-van Bosse, 1926: 127; Cordero, 1981: 189; Cribb, 1983: 105; Silva et al., 1987: 60; Lawson & John, 1987: 297.

Fucus acanthophorus Lamouroux, 1805: 51.

Acanthophora thierryi Lamouroux, 1813: 132.

Acanthophora orientalis J. Agardh, 1863: 820.

Local distribution – Samalona, Barang Lompo, Kudingareng Keke, Bone Tambung, Langkai, Kapoposang: 1 m.

Distribution – Indo-Pacific (Indonesia, Philippines), Mariane Islands, Japan, Caribbean.

Specimens examined – L 992.274-279 / -295 / -311 / -327 / -361 / -362 / -378 / -379 / -394 / -395 / -410 / -411 / -427, Keblusek 14.

X. *Amansia* Lamouroux

Amansia glomerata C. Agardh (Plate 15: 3)

Amansia glomerata C. Agardh, 1822: 194; Weber-van Bosse, 1923: 369; Cordero, 1981: 192; Cribb, 1983: 106; Silva et al., 1987: 61.

Local distribution – Bone Tambung: 2–5 m.

Distribution – Indo-Pacific (Indonesia, Philippines), Japan, Galapagos Archipelago, Mediterranean.

Specimens examined – L 992.274-220 / -365, Keblusek 274.

XI. *Chondria* C. Agardh

Chondria dasyphylla (Woodward) C. Agardh

Fucus dasyphyllus Woodward, 1794: 239.

Chondria dasyphylla (Woodward) C. Agardh, 1817: XVIII; Weber-van Bosse, 1923: 352; Cordero, 1981: 196; Silva et al., 1987: 63.

Local distribution – Samalona: 10 m.

Distribution – Tropical Indo-Pacific (Indonesia, Philippines), West Europe.

Specimens examined – L 992.274-416.

XII. *Herposiphonia* Nägeli

Key to species of *Herposiphonia* from the Spermonde Archipelago:

- 1a. Indeterminate branches more than 5–6 cells long; 2–5 trichocytes; 8–12 pericentral cells **1. *H. secunda* forma *tenella***
- b. Indeterminate branches less than 5 or 6 cells long; none or 1 trichocyte; 1–7 or > 12 pericentral cells **2. *Herposiphonia* spec.**

1. *Herposiphonia secunda* (C. Agardh) Ambronn forma *tenella* (C. Agardh) Wynne

Hutchinsia tenella C. Agardh, 1828: 105.

Herposiphonia tenella (C. Agardh) Ambronn, 1880: 197; Weber-van Bosse, 1923: 365; Weber-van Bosse, 1926: 128; Cribb, 1983: 111.

Herposiphonia secunda (C. Agardh) Ambronn forma *tenella* (C. Agardh) Wynne, 1985: 173; Silva et al., 1987: 64; Lawson & John, 1987: 314.

Local distribution – Barang Lompo: 5 m.

Distribution – Indo-Pacific (Indonesia, Philippines), eastern Australia, Mediterranean.

Specimens examined – Verheij 0015.

Remarks – Silva et al. (1987) discussed the confusion between *H. secunda* and *H. tenella*.

2. *Herposiphonia* spec.

Local distribution – Barang Lompo: 10 m.

Specimens examined – Verheij 0683.

Remarks – The genus *Herposiphonia* is probably, like *Ceramium*, also well represented in the Spermonde Archipelago but always in low quantities and generally sterile. Usually plants form mixed turfs with many other filamentous algae like *Ceramium* spp. and *Polysiphonia* spp.

XIII. *Laurencia* Lamouroux

Key to species of *Laurencia* from the Spermonde Archipelago:

- 1a. Fronds, even young ones, densely covered with wart-like outgrowths **7. *L. papillosa***
- b. Fronds only slightly covered with wart-like outgrowths 2
- 2a. Fronds at least partly compressed 3
- b. Fronds not compressed 6
- 3a. Only main axes compressed **3. *L. dotyi***
- b. Thallus throughout strongly compressed. 4
- 4a. Plants erect, without accessory holdfasts; medulla composed of large irregularly shaped cells **9. *L. pinnata***
- b. Plants semi-prostrate, sometimes with accessory holdfasts from branches . . . 5

- 5a. Medullary cells with lenticular thickenings 1. *L. brongniartii*
 b. Medullary cells without lenticular thickenings 8. *L. parvipapillata*
 6a. Thalli creeping; main axes thin (diameter less than 0.3 mm)
 5. *L. mariannensis*
 b. Thalli erect; main axes thick (diameter more than 0.5 mm) 7
 7a. Cortical cells palisade-like 6. *L. obtusa*
 b. Cortical cells not palisade-like 8
 8a. Plants irregularly branched; up to 7.5 cm tall 2. *L. cartilaginea*
 b. Plants alternately branched; up to 15 cm tall 4. *L. glandulifera*

Remarks — The collections belonging to *Laurencia* were identified using keys of Yamada (1931: 187), McDermid (in Abbott, 1988: 231) for Hawaiian species and Zhang Junfu & Xia Bangmei (in Abbott, 1988: 249) for Chinese species. *Laurencia* is one of the most dominant Rhodophyta of the reef flats in the Spermonde Archipelago.

1. *Laurencia brongniartii* J. Agardh (Plate 15: 4)

Laurencia brongniartii J. Agardh, 1841: 20; Yamada, 1931: 240; Cordero, 1981: 204; Cribb, 1983: 114; Silva et al., 1987: 64; Lawson & John, 1987: 316.

Laurencia concinna Montagne, 1842: 6; Weber-van Bosse, 1923: 346; Weber-van Bosse, 1926: 127.
Laurencia grevilleana Harvey, 1855: 545.

Distribution — Indo-Pacific (Indonesia, Philippines), Rottnest Island, western Australia, Caribbean, West Africa.

Specimens examined — L 992.274-155.

2. *Laurencia cartilaginea* Yamada (Plate 15: 5)

Laurencia cartilaginea Yamada, 1931: 230; Cordero, 1981: 206; Silva et al., 1987: 65.

Local distribution — Lae Lae, Samalona, Barang Lompo, Kudingareng Keke, Langkai: 1–2 m.

Distribution — Indo-Pacific (Indonesia, Philippines), tropical and warm temperate Pacific (Japan, Singapore, Carolina Islands, Hawaiian Archipelago).

Specimens examined — L 992.274-124 / -157 / -179 / -189 / -207 / -208 / -223 / -239 / -255 / -265 / -271 / -276 / -292 / -308 / -324 / -329 / -345, Keblusek 7, 40, 229.

Remarks — *Laurencia cartilaginea* is the most common species of the genus *Laurencia* throughout the Spermonde Archipelago.

3. *Laurencia dotyi* Saito (Plate 15: 6)

Laurencia dotyi Saito, 1969: 154.

Local distribution — Barang Lompo Kudingareng Keke, Bone Tambung: 1–20 m.

Distribution — Tropical Pacific (Indonesia, Hawaiian Archipelago).

Specimens examined — L 992.274-140 / -156 / -172 / -188.

4. *Laurencia glandulifera* (Kützinger) Kützinger (Plate 15: 7)

Chondria glandulifera Kützinger, 1845: 15.

Laurencia glandulifera (Kützinger) Kützinger, 1849: 855; Yamada, 1931: 212; Cordero, 1981: 209; Silva et al., 1987: 66.

Local distribution – Langkai: 5–15 m.

Distribution – Tropical Indo-Pacific (Indonesia, Philippines), Mediterranean.

Specimens examined – L 992.274-123 / -139.

5. *Laurencia mariannensis* Yamada (Plate 15: 8)

Laurencia mariannensis Yamada, 1931: 200; Cribb, 1983: 121; Silva et al., 1987: 66.

Local distribution – Langkai: 1 m.

Distribution – Indo-Pacific (Indonesia, Philippines), tropical Pacific (Saipan, Marianas Islands).

Specimens examined – L 992.274-116 / -136.

Remarks – Specimens fully agree with the description and the illustrations by Yamada (1931).

6. *Laurencia obtusa* (Hudson) Lamouroux (Plate 16: 1)

Fucus obtusus Hudson, 1778: 586.

Laurencia obtusa (Hudson) Lamouroux, 1813: 130; Weber-van Bosse, 1923: 341; Yamada, 1931: 222; Cordero, 1981: 211; Silva et al., 1987: 66; Lawson & John, 1987: 320.

Local distribution – Kudingareng Keke: 1 m.

Distribution – Indo-Pacific (Indonesia, Philippines), Atlantic Ocean, Mediterranean.

Specimens examined – L 992.274-132.

Remarks – Cordero (1981) reported *L. obtusa* as one of the most common species of the genus *Laurencia* from the Philippines. During the present study *L. obtusa* was found to be rather uncommon in the Spermonde Archipelago.

7. *Laurencia papillosa* (C. Agardh) Greville (Plate 16: 2)

Chondria papillosus C. Agardh, 1822: 344.

Laurencia papillosa (C. Agardh) Greville, 1830: LII; Weber-van Bosse, 1923: 344; Weber-van Bosse, 1926: 126; Yamada, 1931: 190; Cordero, 1981: 215; Silva et al., 1987: 67; Lawson & John, 1987: 320.

Local distribution – Kudingareng Keke, Bone Tambung, Langkai, Kapoposang: 1 m.

Distribution – Tropical and warm temperate Indian Ocean, tropical and warm temperate Pacific (Indonesia, Philippines), Atlantic Ocean, Mediterranean, Caribbean.

Specimens examined – L 992.274-168 / -171 / -184 / -187 / -201 / -221 / -267, Keblusek 264, 270.

Remarks – *Laurencia papillosa* is, in the field, probably the easiest recognizable species of *Laurencia*, due to the dense cover of wrat-like outgrowths of the thallus surface.

8. *Laurencia parvipapillata* Tseng

Laurencia parvipapillata Tseng, 1943: 204; Cribb, 1983: 123; Silva et al., 1987: 67.

Local distribution – Langkai: 1 m.

Distribution – Indo-Pacific (Indonesia, Philippines), tropical and warm temperate Pacific (Hawaiian Archipelago, Vietnam, eastern Australia).

Specimens examined – L 992.274-115 / -152.

Remarks – Specimens fully agree with the descriptions and illustrations of Tseng (1943) and Cribb (1983).

9. *Laurencia pinnata* Yamada

Laurencia pinnata Yamada, 1931: 242; Cordero, 1981: 217; Silva et al., 1987: 68.

Laurencia pinnatifida Weber-van Bosse, 1923: 345, not (Gmelin) Lamouroux (misapplied name).

Fucus pinnatifidus Gmelin, 1768: 156.

Local distribution – Kudingareng Keke: 15 m.

Distribution – Indo-Pacific (Indonesia, Philippines), Japan.

Specimens examined – L 992.274-250.

Remarks – Yamada (1931) described this species and incorporated most specimens from the Indo-Pacific, previously identified as *Laurencia pinnatifida* (Gmelin) Lamouroux. Examination of the Siboga Expedition collections of *L. pinnatifida* confirm their placement in *L. pinnata* Yamada and not in *L. pinnatifida* (Gmelin) Lamouroux.

10. *Laurencia spec.*

Local distribution – Samalona, Barang Lompo: 1 m.

Specimens examined – L 992.274-285 / -381.

Remarks – The two collections under this entry are incomplete thalli and were unidentifiable. The specimen under L 992.274-285 partly agrees with the description of *L. okamurai* Yamada, 1931: 206. However, no study could be carried out of the type collection or of other relevant collections.

XIV. *Leveillea* Decaisne

Leveillea jungermannioides (Hering & Martens) Harvey

Amansia jungermannioides Hering & Martens in Martens & Hering, 1836: 485; Weber-van Bosse, 1926: 130; Cordero, 1981: 224; Cribb, 1983: 127.

Polyzonia jungermannioides (Hering & Martens) J. Agardh, 1841: 25.

Leveillea jungermannioides (Hering & Martens) Harvey, 1855: 539; Weber-van Bosse, 1923: 365; Cordero, 1981: 221; Cribb, 1983: 127; Silva et al., 1987: 68.

Leveillea gracilis Decaisne, 1839: 376.

Local distribution – Kudingareng Keke, Bone Tambung, Langkai, Lanyukang, Kapoposang: 2–10 m.

Distribution – Tropical Indian Ocean, tropical Pacific (Indonesia, Philippines, eastern Australia), Red Sea.

Specimens examined – only present as epiphyte on different *Halimeda* collections.

Remarks – *Leveillea jungermannioides* often grows as an epiphyte on *Halimeda* spp., on coralline algae or on other, usually calcified, large reef organisms.

XV. *Polysiphonia* Greville

Polysiphonia infestans Harvey

Polysiphonia infestans Harvey, 1855: 539; Cribb, 1983: 131.

Polysiphonia zostericola Lucas, 1919: 177.

Local distribution – Barang Lompo, Kudingareng Keke: 5–10 m.

Distribution – Indonesia.

Specimens examined – L 992.274-173 / -402.

Remarks – *Polysiphonia infestans* forms in the Spermonde Archipelago regularly monospecific turfs.

Polysiphonia spec.

Local distribution – Kudingareng Keke: 1–20 m.

Specimens examined – L 992.274-167 / -202.

Remarks – *Polysiphonia* spp. in general form mixed turfs with many other filamentous algae like *Ceramium* spp. and *Herposiphonia* spp.

XVI. *Tolypocladia* Schmitz

Tolypocladia glomerulata (C. Agardh) Schmitz (Plate 16: 3)

Hutchinsia glomerulata C. Agardh, 1824: 158.

Tolypocladia glomerulata (C. Agardh) Schmitz in Schmitz & Hauptfleisch, 1897: 442; Cordero, 1981: 229; Cribb, 1983: 135; Silva et al., 1987: 71.

Roschera glomerulata (C. Agardh) Schmitz, 1895: 441; Weber-van Bosse, 1923: 359.

Local distribution – Bone Tambung: 10 m.

Distribution – Indo-Pacific (Indonesia, Philippines), tropical Indian Ocean (Shark Bay, western Australia).

Specimens examined – L 992.274-258.

Remarks – *Tolypocladia glomerulata* has only been found once during the present study. The collected specimen agrees fully with the description given by Cribb (1983: 135).

Order CORALLINALES

Family CORALLINACEAE

Remarks – The subfamily classification within the family Corallinaceae follows, with one exception, Woelkerling (1988). The genus *Sporolithon*, however, has been placed in the Sporolithaceae (Verheij, 1993a). Taxa belonging to the Corallinales are listed

below without any diagnostic details. Taxonomic accounts on the non-geniculate Corallinales will be presented in separate papers (Verheij, 1992, 1993a, b). The identification of the geniculate Corallinales was made by Prof. Dr. H.W. Johansen on the basis of external characteristics only, and therefore must be considered tentative. The geniculate Corallinales of the Spermonde Archipelago will be published in a joint paper.

Subfamily *AMPHIROIDEAE*

XVII. Amphiroa Lamouroux

Amphiroa beauvoisii Lamouroux

Amphiroa beauvoisii Lamouroux, 1816: 299; Silva et al., 1987: 33; Lawson & John, 1987: 196.

Amphiroa canaliculata Martens

Amphiroa canaliculata Martens, 1866: 28; Weber-van Bosse, 1904: 97.

Amphiroa fragilissima (Linnaeus) Lamouroux

Corallina fragilissima Linnaeus, 1758: 806.

Amphiroa fragilissima (Linnaeus) Lamouroux, 1816: 298; Weber-van Bosse, 1904: 89; Cordero, 1977: 85; Silva et al., 1987: 33.

Amphiroa foliacea Lamouroux

Amphiroa foliacea Lamouroux in Quoy & Gaimard, 1824: 628; Weber-van Bosse, 1904: 92; Cordero, 1977: 84; Silva et al., 1987: 33.

Subfamily *CORALLINOIDEAE*

XVIII. Jania

Jania spec.

Subfamily *LITHOPHYLLOIDEAE*

XIX. Lithophyllum Philippi

Lithophyllum bamleri Heydrich

Lithothamnion bamleri Heydrich, 1897: 4–6.

Lithophyllum kotschyannum Unger

Lithophyllum kotschyannum Unger, 1858: 22; Foslie, 1909: 34; Gordon, Masaki & Akioka, 1976: 267–269; Adey, Townsend & Boykins, 1984: 37–40.

Lithophyllum okamurai Foslie

Lithophyllum okamurai Foslie, 1900: 4; Foslie, 1904: 50–52.
Lithophyllum okamurai Foslie forma *valida* Foslie, 1906: 23.

Lithophyllum tamiense Heydrich

Lithophyllum tamiense Heydrich, 1897: 1, figs. 4–7; Heydrich, 1901: 419; Foslie, 1900: 11; Foslie, 1901: 17.
Lithothamnion moluccense Foslie, 1897: 12.
Lithophyllum moluccense (Foslie) Foslie, 1901a: 12; Foslie, 1901b: 17; Foslie in Weber-van Bosse & Foslie, 1904: 65–69; Gordon, Masaki & Akioka, 1976: 270–272.
Goniolithon moluccense (Foslie) Foslie, 1898: 8; Foslie, 1900: 10, 11; Foslie, 1901b: 17.
Lithothamnion pygmaeum Heydrich, 1897: 3.
Goniolithon pygmaeum (Heydrich) Foslie, 1898: 8.
Lithophyllum torquescens Foslie, 1901a: 11; Foslie, 1901b: 23–24.
Lithophyllum moluccense forma *torquescens* Foslie in Weber-van Bosse & Foslie, 1904: 69–70.

Subfamily *MASTOPHOROIDEAE*

XX. Hydrolithon Foslie

Hydrolithon gardineri (Foslie) Verheij & Prud'homme van Reine, *comb. nov.*

Basionym: *Lithophyllum gardineri* Foslie, 1907: 30. K. Norske Vidensk. Selsk. Skr. 1906 (8): 1–34.
Porolithon gardineri (Foslie) Foslie, 1909: 57.
Lithophyllum coarctatum Foslie, 1907: 31.
Porolithon coarctatum (Foslie) Foslie, 1909: 57.

Hydrolithon onkodes (Heydrich) Penrose & Woelkerling

Lithothamnion onkodes Heydrich, 1897: 6; Heydrich, 1901: 533.
Goniolithon onkodes (Heydrich) Foslie, 1898: 8.
Porolithon onkodes (Heydrich) Foslie, 1909: 57; Gordon, Masaki, Akioka, 1976: 266–267; Adey, Townsend & Boykins, 1984: 7–8; Lawson & John, 1987: 216.
Hydrolithon onkodes (Heydrich) Penrose & Woelkerling, 1992: 81–88.

Hydrolithon reinboldii (Weber-van Bosse & Foslie) Foslie

Lithophyllum reinboldii Weber-van Bosse & Foslie in Foslie, 1901: 5.
Goniolithon reinboldii (Weber-van Bosse & Foslie) Foslie in Weber-van Bosse & Foslie, 1904: 49; Johnson, 1964: 26.
Hydrolithon reinboldii (Weber-van Bosse & Foslie) Foslie, 1909: 55; Gordon, Masaki & Akioka, 1976: 255–257; Adey, Townsend & Boykins, 1984: 25–26; Penrose & Woelkerling, 1990.
Paragoniolithon reinboldii (Weber-van Bosse & Foslie) Lemoine, 1911: 166.
Spongites reinboldii (Weber-van Bosse & Foslie) Penrose & Woelkerling in Woelkerling, 1988 173.

XXI. Mastophora Decaisne**Mastophora pacifica** (Heydrich) Foslie

Melobesia pacifica Heydrich, 1901: 529; Foslie, 1901: 19.

Mastophora pacifica (Heydrich) Foslie, 1903: 25; Foslie in Weber-van Bosse & Foslie, 1904: 73
75; Foslie, 1905: 4; Foslie, 1909: 53.

Lithoporella pacifica (Heydrich) Foslie, 1909: 59; Dawson, 1954: 428; Gordon, Masaki & Akioka
1976: 259.

Mastophora rosea (C. Agardh) Setchell

Zonaria rosea C. Agardh, 1824: 264.

Mastophora rosea (C. Agardh) Setchell, 1943.

Mastophora licheniformis Decaisne, 1842: 359, 365.

Mastophora macrocarpa forma *condensata* Foslie, 1907: 30.

Mastophora rosea forma *condensata* (Foslie) Setchell, 1943.

Mastophora affinis Foslie, 1904 in Weber-van Bosse & Foslie: 71; Verheij & Woelkerling, 1992: 276.

XXII. Neogoniolithon Sethell & Mason**Neogoniolithon fosliei** (Heydrich) Setchell & Mason

Lithothamnion fosliei Heydrich, 1897: 58.

Archaeolithothamnion fosliei (Heydrich) Foslie, 1898: 4; Foslie, 1900; Foslie, 1901: 8; Heydrich
1901: 185.

Goniolithon fosliei (Heydrich) Foslie, 1903: 470; Foslie in Weber-van Bosse & Foslie, 1904: 46.

Lithophyllum fosliei (Heydrich) Heydrich, 1897: 410; Lemoine, 1911: 142.

Neogoniolithon fosliei (Heydrich) Setchell & Mason, 1943: 90; Womerley & Bailey, 1970: 310;
Gordon, Masaki & Akioka, 1976: 261; Adey, Townsend & Boykins, 1984: 23–24; Woelker-
ling, 1985: 148; Penrose, 1990; Penrose, 1992: 338–350.

Paragoniolithon solubile (Foslie & Howe) Adey, Townsend & Boykins, 1982: 12.

Neogoniolithon spec.**XXIII. Spongites Kützing****Spongites spec.**Subfamily *MELOBESIOIDEAE***XXIV. Clathromorphum Foslie****Clathromorphum spec.****XXV. Lithothamnion Heydrich****Lithothamnion prolifer** Foslie in Weber-van Bosse & Foslie

Lithothamnion prolifer Foslie in Weber-van Bosse & Foslie, 1904: 18, pl. I figs. 17–20; Verheij &
Woelkerling, 1992: 282.

Mesophyllum prolifer (Foslie in Weber-van Bosse & Foslie) Adey, 1970: 25.

XXVI. *Mesophyllum* Lemoine

***Mesophyllum erubescens* (Foslie) Lemoine**

Lithothamnium erubescens Foslie, 1901: 3; Foslie in Weber-van Bosse & Foslie, 1904: 31; Printz, 1926: 40.

Mesophyllum erubescens (Foslie) Lemoine, 1928: 252.

Lithothamnium erubescens Foslie forma *madagascariensis* Foslie, 1902: 3.

Lithothamnium madagascariensis Foslie, 1906: 19.

Mesophyllum madagascariensis (Foslie) Adey, 1970: 25; Adey et al., 1982: 58.

***Mesophyllum syrphetodes* Adey, Townsend & Boykins**

Mesophyllum syrphetodes Adey, Townsend & Boykins, 1982: 63.

***Mesophyllum* spec.**

Family SPOROLITHACEAE

Subfamily SPOROLITHOIDEAE

XXVII. *Sporolithon* Heydrich

***Sporolithon episoredion* (Adey, Townsend & Boykins) Verheij**

Archaeolithothamnium episoredion Adey, Townsend & Boykins, 1982: 50–52.

Sporolithon episoredion (Adey, Townsend & Boykins) Verheij, 1992: 501; Verheij, 1993a (in press).

***Sporolithon episporum* (Howe) Dawson**

Sporolithon episporum (Howe) Dawson 1960: 40; Verheij, 1993a (in press).

Archaeolithothamnium episporum Howe, 1918: 2, pl. 1–6.

***Sporolithon molle* (Heydrich) Heydrich**

Sporolithon molle (Heydrich) Heydrich 1897b: 416–417; Verheij, 1993a (in press).

Sporolithon ptychoides forma *mollis* Heydrich, 1897a: 67–69.

***Sporolithon ptychoides* Heydrich**

Sporolithon ptychoides Heydrich 1897a: 67–69; Verheij, 1993a (in press).

Sporolithon ptychoides forma *ptychoides* (as *Sporolithon ptychoides* forma *dura* Heydrich, 1897a: 67–69.

Order GELIDIALES

Family GELIDIACEAE

Remarks – Hatta & Prud'homme van Reine (1991) recently published a paper on the Gelidiales of the Snellius-II Expedition. Several of the species of the Gelidiales, found during that Expedition were also found during the present study. For detailed descriptions of the species see Hatta & Prud'homme van Reine (1991).

XXVIII. *Gelidiella* J. Feldmann & Hamel***Gelidiella acerosa* (Forsskål) J. Feldman & Hamel**

Fucus acerosus Forsskål, 1775: 190.

Gelidiella acerosa (Forsskål) J. Feldman & Hamel, 1934: 533; Cordero, 1981: 70; Cribb, 1983: 29; Santelices & Stewart in Abbott & Norris, 1985: 21; Silva et al., 1987: 25; Lawson & John, 1987: 179; Santelices in Abbott, 1988: 93.

Fucus rigidus Vahl, 1802: 46 (nom. illeg.).

Sphaerococcus rigidus C. Agardh, 1822: 285.

Gelidium rigidus (C. Agardh) Greville, 1830: LVII.

Fucus spinaeformis Lamouroux, 1805: 77.

Gelidium spiniforme (Lamouroux) Lamouroux, 1813: 129.

Local distribution – Lae Lae, Samalona, Barang Lompo, Langkai: 1–2 m.

Distribution – Tropical and warm temperate seas all over the world.

Specimens examined – L 992.274-307 / -323 / -358 / -374 / -375 / -390 / -391 / -406 / -407 / -422 / -423, Keblusek 130.

Remarks – *Gelidiella acerosa* is one of the common Rhodophyta species on the reef flats of the Spermonde Archipelago. Although common, the species has not been collected regularly in the past, probably due to the large amount of epiphytes growing on the thallus and making the plant almost invisible. Large numbers of other small algae and especially sponges are growing in between the branches. This species is among those producing the best quality agar, unfortunately until now farming of the species is almost impossible.

XXIX. *Gelidium* Lamouroux***Gelidium pusillum* (Stackhouse) Le Jolis**

Fucus pusillus Stackhouse, 1795: 16.

Acrocarpus pusillus (Stackhouse) Kützinger, 1849: 762.

Gelidium pusillum (Stackhouse) Le Jolis, 1863: 139; Weber-van Bosse, 1921: 225; Cordero, 1981: 74; Silva et al., 1987: 25; Lawson & John, 1987: 175; Santelices in Abbott, 1988: 102.

Fucus crinalis Turner, 1819: 4.

Gelidium crinale (Turner) Lamouroux in Bory de Saint-Vincent, 1825: 191; Weber-van Bosse, 1921: 225.

Local distribution – Barang Lompo, Kudingareng Keke: 1–25 m.

Distribution – Cosmopolitan distribution.

Specimens examined – Verheij 0514, 0985.

Remarks – This economically important species does not occur in large quantities in the Spermonde Archipelago.

***Gelidium* spec.**

Local distribution – Barang Lompo, Kudingareng Keke: 1 m.

Specimens examined – Present in many of the unnumbered alcohol collections.

Remarks – Most specimens are part of multi-specific algal turfs found throughout the Spermonde Archipelago. The specimens probably belong to several taxa.

XXX. Pterocladia J. Agardh

Key to species of *Pterocladia* from the Spermonde Archipelago:

- 1a. Plants large; erect parts more than 10 mm tall and more than 500 µm thick
1. *P. caerulescens*
- b. Plants small; erect parts less than 10 mm tall and less than 500 µm thick
2. *P. caloglossoides*

Remarks – Both species are part of the turf-forming algal community of the Spermonde Archipelago. These species often also occur in almost mono-specific turfs.

1. Pterocladia caerulescens (Kützting) Santelices

Gelidium caerulescens Kützting, 1868: 19.

Pterocladia caerulescens (Kützting) Santelices, 1976: 173; Cribb, 1983: 34; Santelices & Stewart in Abbott & R.E. Norris, 1985: 24; Hatta & Prud'homme van Reine, 1991: 372.

Gelidium tropica Dawson, 1959: 40.

Gelidium irregulare Loomis, 1960: 6.

Local distribution – Barang Lompo: 1 m.

Distribution – Tropical Indian, tropical Pacific (Indonesia, eastern Australia, New Caledonia, Hawaiian Archipelago).

Specimens examined – L 992.274-163.

2. Pterocladia caloglossoides (Howe) Dawson

Gelidium caloglossoides Howe, 1914: 96; Weber-van Bosse, 1921: 226.

Pterocladia caloglossoides (Howe) Dawson, 1953: 76; Cribb, 1983: 34; Silva et al., 1987: 26.

Pterocladia parva Dawson, 1953: 77.

Local distribution – Samalona: 1 m.

Distribution – Tropical and warm temperate Indian Ocean (South Africa), tropical and warm temperate Pacific (Indonesia, Philippines, Vietnam, Peru, Baja California).

Specimens examined – L 992.274-096 / -232.

Order GIGARTINALES

Family GRACILARIACEAE

XXXI. Ceratodictyon Zanardini

Key to species of *Ceratodictyon* from the Spermonde Archipelago:

- 1a. Plants sponge-like 3. *C. spongiosum*
- b. Plants not sponge-like 2
- 2a. Plants large, max. 7 cm tall, subflabelliform, with short stipe 4. *C. variabile*
- b. Plants small, max. 4 cm tall, cylindrical or subflabelliform, without short stipe 3

- 3a. Lower branches attached to each other by small discs **1. *C. intricatum***
 b. Lower branches free **2. *C. repens***

Remarks — The genus *Ceratodictyon* is found throughout the Spermonde Archipelago from the intertidal to depths of 35 m. The genus has recently been the subject of a critical study (Norris, 1987b).

1. *Ceratodictyon intricatum* (C. Agardh) R.E. Norris

Ceratodictyon intricatum (C. Agardh) R.E. Norris, 1987b: 245.

Sphaerococcus intricatus C. Agardh, 1822: 333.

Gelidiopsis intricata (C. Agardh) Vickers, 1905: 61; Weber-van Bosse, 1926: 140; Weber-van Bosse, 1928: 425; Cordero, 1981: 119; Cribb, 1983: 56; Silva et al., 1987: 40.

Local distribution — Barang Lompo, Kudingareng Keke, Langkai, Kapoposang: 1–10 m.

Distribution — Indo-Pacific (Indonesia, Philippines), tropical Pacific (Mauritius, eastern Australia, Hawaiian Archipelago), Atlantic Ocean.

Specimens examined — L 992.274-097 / -101-106 / -247 / -249 / -377 / -393 / -409.

2. *Ceratodictyon repens* (Kützing) R.E. Norris

Ceratodictyon repens (Kützing) R.E. Norris, 1987b: 245.

Gelidium repens Kützing, 1968: 21.

Gelidiopsis repens (Kützing) Weber-van Bosse, 1928: 425; Cordero, 1981: 121; Silva et al., 1987: 40.

Gelidium acrocarpum Harvey (nom. nud.); Kützing, 1869: 8.

Gelidiopsis acrocarpa (Harvey) Schmitz, 1896: 148.

Local distribution — Samalona, Kudingareng Keke: 1 m.

Distribution — Indo-Pacific (Indonesia, Philippines), tropical Pacific (New Caledonia, Japan, Taiwan, Samoa).

Specimens examined — L 992.274-339, Keblusek 269.

3. *Ceratodictyon spongiosum* Zanardini

Ceratodictyon spongiosum Zanardini, 1878: 37; Weber-van Bosse, 1926: 140; Weber-van Bosse, 1928: 425; Cribb, 1983: 55; Silva et al., 1987: 40.

Local distribution — Samalona, Barang Lompo, Kudingareng Keke, Bone Tambung, Langkai, Lanyukang, Kapoposang: 1–2 m.

Distribution — Indo-Pacific (Indonesia, Philippines).

Remarks — This is probably one of the easiest identifiable species of the Rhodophyta, due its symbiotic life with a sponge.

4. *Ceratodictyon variabilis* (Greville ex J. Agardh) R.E. Norris

Gelidium variabile Greville ex J. Agardh, 1852: 468.

Gelidiopsis variabilis (Greville ex J. Agardh) Schmitz, 1895: 148; Cordero, 1981: 122 (erroneously as *G. repens*); Lawson & John, 1987: 223.

Ceratodictyon variabilis (Greville ex J. Agardh) R.E. Norris, 1987b: 243.

Local distribution – Langkai: 1 m.

Distribution – Indo-Pacific (Indonesia, Philippines), tropical and warm temperate Pacific (Japan, Taiwan, Tonga Islands), Red Sea (Akaba).

Specimens examined – L 992.274-095, Keblusek 15.

2. *Gracilaria blodgettii* Harvey

Gracilaria blodgettii Harvey, 1853: 111; Weber-van Bosse, 1926: 142; Weber-van Bosse, 1928: 430; Cordero, 1981: 124; Silva et al., 1987: 41; Abbott in Abbott, 1988: 155.

Local distribution – Gusung, Gusung Tallang: 1 m.

Distribution – Indo-Pacific (Indonesia, Philippines), tropical and warm temperate Pacific (Japan, Taiwan), Caribbean.

Specimens examined – Keblusek 225, 226.

3. *Gracilaria coronopifolia* J. Agardh (Plate 16: 4)

Gracilaria lichenoides (Lamouroux) Greville forma *coronopifolia* J. Agardh, 1848: 37; Zaneveld, 1956: 39.

Gracilaria coronopifolia J. Agardh, 1852: 592; Cordero, 1981: 127; Silva et al., 1987: 41.

Local distribution – Langkai: 1 m.

Distribution – Tropical Pacific (Indonesia, Philippines, Hawaiian Archipelago).

Specimens examined – L 992.274-304, Keblusek 135, 205.

Remarks – This species was not collected during the Siboga Expedition, but Weber-van Bosse collected *G. lichenoides* which could, according to Abbott (1988), also include *G. coronopifolia*.

4. *Gracilaria euclideanoides* Harvey (Plate 16: 5)

Gracilaria euclideanoides Harvey, 1860: 331; Weber-van Bosse, 1928: 433; Cordero, 1981: 129; Silva et al., 1987: 42.

Local distribution – Samalona, Barang Lompo, Langkai: 1–20 m.

Distribution – Indo-Pacific (Indonesia, Philippines), Japan.

Specimens examined – L 992.057-945, L 992.274-435 / -438 / -451 / -454 / -465 / -470 / -476 / -481 / -486 / -497 / -502.

5. *Gracilaria salicornia* (C. Agardh) Dawson

Sphaerococcus salicornia C. Agardh, 1820: pl. VIII.

Corallopsis salicornia (C. Agardh) Greville, 1830: LIII; Weber-van Bosse, 1928: 432.

Gracilaria salicornia (C. Agardh) Dawson, 1954: 4; Cordero, 1981: 132; Silva et al., 1987: 43; Abbott in Abbott, 1988: 142.

Gracilaria crassa Harvey ex J. Agardh, 1876: 417.

Local distribution – Barang Lompo: 1–25 m.

Distribution – Indo-Pacific (Indonesia, Philippines).

Specimens examined – L 992.274-200 / -320 / -355 / -367 / -373, Keblusek 216, 225.

6. Gracilaria verrucosa (Hudson) Papenfuss

Fucus verrucosus Hudson, 1762: 470.

Gracilaria verrucosa (Hudson) Papenfuss, 1950: 195; Cordero, 1981: 135; Silva et al., 1987: 44, 123; Lawson & John, 1987: 227.

Fucus confervoides Linnaeus, 1763: 1629; Weber-van Bosse, 1928: 436.

Local distribution – Barang Lompo, Langkai, Kapoposang: 1–2 m.

Distribution – Cosmopolitan.

Specimens examined – L 992.274-370 / -413 / -460 / -461 / -477 / -493, Keblusek 140, 206, 241.

Family GYMNOPHOEACEAE

XXXIII. Titanophora (J. Agardh) J. Feldmann

Titanophora weberae Børgesen (Plate 16: 6)

Titanophora weberae Børgesen, 1943: 39; Cordero, 1981: 118; Silva et al., 1987: 40.

Local distribution – Gusung, Langkai: 2–5 m.

Distribution – Indo-Pacific (Indonesia, Philippines), tropical and warm temperate Pacific (Japan, Mauritius, Solomon Islands).

Specimens examined – L 992.274-147 / -151 / -181, Keblusek 230.

Remarks – Specimens fully agree with the description given by Børgesen. They differ slightly in size, are up to 18 cm tall, while the thalli described by Cordero (1981: 118) are not more than 12 cm tall.

Family HALYMENIACEAE

XXXIV. Cryptonemia J. Agardh

Cryptonemia decumbens Weber-van Bosse (Plate 16: 7)

Cryptonemia decumbens Weber-van Bosse, 1921: 248.

Local distribution – Samalona: 25 m.

Distribution – Indonesia.

Specimens examined – L 992.274-400.

Remarks – A critical study of the type collection of *C. decumbens* confirmed the identification of the only collected specimen from the Spermonde Archipelago.

XXXV. Grateloupia C. Agardh

Grateloupia spec. (Plate 16: 8)

Local distribution – Lae Lae: 1 m.

Specimens examined – L 992.274-354.

Remarks – The only collection of this genus was in bad condition when collected and only generic characters could be recognized.

XXXVI. *Halymenia* C. Agardh

Key to species of *Halymenia* from the Spermonde Archipelago:

- 1a. Blades pinnate 2
 b. Blades not pinnate 3
 2a. Cortical layer 2–4 cells thick 5. *H. floresia*
 b. Cortical layer up to 8 cells thick 4. *H. durvillaei*
 3a. Blades lanceolate 1. *H. acuminata*
 b. Blades not lanceolate 4
 4a. Fronds densely covered with small spots 3. *H. dilatata*
 b. Fronds without small spots 2. *H. amoena*

1. *Halymenia acuminata* (Holmes) Okamura (Plate 17: 1)

Grateloupia acuminata Holmes, 1896: 254.

Halymenia acuminata (Holmes) Okamura, 1908: 174; Cordero, 1981: 108; Silva et al., 1987: 30.

Local distribution – Lanyukang: 1 m.

Distribution – Indo-Pacific (Indonesia, Philippines), tropical and warm temperate Pacific (Japan, Korea).

Specimens examined – L 992.274-131 / -135 / -183 / -216.

2. *Halymenia amoena* Bory de Saint-Vincent

Halymenia amoena Bory de Saint-Vincent, 1828: 169; Weber-van Bosse, 1921: 229.

Local distribution – Kudingareng Keke: 10 m.

Distribution – Indonesia.

Specimens examined – L 992.274-389 / -405.

3. *Halymenia dilatata* Zanardini (Plate 17: 2)

Halymenia dilatata Zanardini, 1851: 35; Weber-van Bosse, 1921: 236; Cordero, 1981: 109; Silva et al., 1987: 30.

Local distribution – Lae Lae: 1–2 m.

Distribution – Indo-Pacific (Indonesia, Philippines), Red Sea.

Specimens examined – L 992.274-121 / -122 / -137 / -138 / -154 / -170 / -180 / -186, Keblusek 112.

4. *Halymenia durvillaei* Bory de Saint-Vincent (Plate 17: 3)

Halymenia durvillaei Bory de Saint-Vincent, 1828: 180; Weber-van Bosse, 1921: 232; Cordero, 1981: 111; Cribb, 1983: 54; Silva et al., 1987: 30.

Local distribution – Lae Lae, Gusung, Samalona, Kudingareng Keke, Lanyukang: 1–2 m.

Distribution – Indo-Pacific (Indonesia, Philippines), Papua New Guinea.

Specimens examined – L 992.274-126 / -190 / -192 / -195 / -196 / -199 / -211 /

-212 / -215 / -227–229 / -231 / -243–245 / -252 / -257 / -258 / -260–262 / -268, Keblusek 51, 54, 88.

Remarks – This species is very common during the dry monsoon season on the reefs close to the harbour of Ujung Pandang.

5. Halymenia floresia (Clemente y Rubio) C. Agardh (Plate 17: 4)

Fucus floresia Clemente y Rubio, 1807: 312.

Halymenia floresia (Clemente y Rubio) C. Agardh, 1817: XIX; Weber-van Bosse, 1921: 231; Silva et al., 1987: 31; Lawson & John, 1987: 190.

Local distribution – Samalona: 10 m.
Distribution – Indonesia, Philippines, Spain.
Specimens examined – L 992.274-421.

Family HYPNEACEAE

XXXVII. Hypnea Lamouroux

Key to species of *Hypnea* from the Spermonde Archipelago (in part after Cordero 1981: 142):

- 1a. Main axes usually 1.5–3.0 mm thick; terminal branchlets forming stout spines **4. H. pannosa**
- b. Main axes usually less than 1.5 mm in diameter; terminal branchlets forming thin spines. 2
- 2a. Main axes very slender, 0.2–0.5 mm in diameter; plants small, less than 5 cm tall. 3
- b. Main axes 0.5–1.5 mm in diameter; plants large, more than 10 cm tall 4
- 3a. Plants brown/purple; thalli relatively large, 20–50 mm tall **3. H. musciformis**
- b. Plants yellow/orange; thalli relatively small, less than 15 mm tall, often secondarily attached to each other **5. H. spinella**
- 4a. Plants densely branched, apex of branchlets cervicorn, distinct main axes **5. H. spinella**
- b. Plants not densely branched, apex of branchlets not cervicorn, main axes not very distinct 5
- 5a. Lateral branchlets thin, 1.5–3 mm long, not densely packed **2. H. charoides**
- b. Lateral branchlets, less than 1.0 mm long, branchlets densely packed **1. H. boergesenii**

Remarks – Most species belonging to *Hypnea* are epiphytes on seagrasses. Apparently some species may be more or less specific for one or some species of seagrasses (see Verheij & Erftemeijer, in prep.).

1. Hypnea boergesenii Tanaka

Hypnea boergesenii Tanaka, 1941: 233; Silva et al., 1987: 48.

Local distribution – Samalona: 1 m.

Distribution – Indo-Pacific (Indonesia, Philippines), Taiwan.

Specimens examined – L 992.274-442 / -475.

2. *Hypnea charoides* Sonder

Hypnea charoides Sonder, 1848: 189; Weber-van Bosse, 1928: 449; Cordero, 1981: 144; Silva et al., 1987: 49.

Local distribution – Lae Lae, Barang Lompo, Bone Tambung: 1–5 m.

Distribution – (Sub)tropical Indian Ocean, and (sub)tropical western Pacific.

Specimens examined – Keblusek 136, 218, 271.

Remarks – Silva et al. (1987: 49) discussed the authorship of this species, Lamouroux (1813) versus Sonder (1848), in detail.

3. *Hypnea musciformis* (Wulfen in Jacquin) Lamouroux

Fucus musciformis Wulfen in Jacquin, 1789: 154.

Hypnea musciformis (Wulfen in Jacquin) Lamouroux, 1813: 131; Cordero, 1981: 148; Silva et al., 1987: 49; Lawson & John, 1987: 240.

Local distribution – Kapoposang: 1 m.

Distribution – Indo-Pacific (Indonesia, Philippines) (sub) tropical Pacific, Mediterranean, tropical West Africa.

Specimens examined – Keblusek 204.

4. *Hypnea pannosa* J. Agardh

Hypnea pannosa J. Agardh, 1847: 14; Weber-van Bosse, 1928: 455; Cribb, 1983: 59; Silva et al., 1987: 50.

Local distribution – Gusung, Samalona, Barang Lompo, Kudingareng Keke, Lanyukang: 1–5 m.

Distribution – Indo-Pacific (Indonesia, Philippines), tropical Pacific (Mexico).

Specimens examined – L 992.057-947 / -963 / -979, L 992.274-434 / -443 / -450 / -458 / -459 / -466 / -467 / -474 / -482 / -483 / -490 / -492 / -498 / -499 / -507 / -508, Keblusek 28, 77, 97, 108.

5. *Hypnea spinella* (C. Agardh) Kützing

Sphaerococcus spinellus C. Agardh, 1822: 323.

Hypnea spinella (C. Agardh) Kützing, 1847: 23; Weber-van Bosse, 1928: 454; Cribb, 1983: 60; Silva et al., 1987: 50; Lawson & John, 1987: 242; Haroun & Prud'homme van Reine (in press).

Hypnea cervicornis J. Agardh, 1852: 451; Weber-van Bosse, 1926: 147; Weber-van Bosse, 1928: 454; Cordero, 1981: 143.

Local distribution – Barang Lompo, Bone Tambung, Langkai, Lanyukang: 1–2 m.

Distribution – Pantropical, Japan.

Specimens examined – L 992.274 - 083 - 090, Keblusek 20, 39, 139, 227, 272.

Remarks – Haroun & Prud'homme van Reine (in press) recently discussed the morphological variability of the species, on which they based the reduction of *H. cervicornis* to *H. spinella*.

Family KALLYMENIACEAE

XXXVIII. *Kallymenia* J. Agardh

***Kallymenia feldmannii* Codomier**

Kallymenia feldmannii Codomier, 1971: 36.

Local distribution – Barang Lompo: 10 m.

Distribution – Indonesia, Mediterranean.

Specimens examined – L 992.274-356.

Remarks – The specimen fully agrees with the description of *K. feldmannii*, although the type locality is Banyuls-sur-Mer in the Mediterranean.

Family PEYSSONNELIACEAE

XXXIX. *Coriophyllum* Setchell & Gardner

***Coriophyllum setchellii* Weber-van Bosse (Plate 17: 5)**

Coriophyllum setchellii Weber-van Bosse, 1921: 300.

Local distribution – Langkai: 2 m.

Distribution – Indonesia.

Specimens examined – L 992.274-336.

Remarks – The specimen fully agrees with the description and material of Weber-van Bosse (1921: 300).

XL. *Peyssonnelia* Decaisne

***Peyssonnelia squamaria* (S.G. Gmelin) Decaisne (Plate 17: 6)**

Fucus squamarius S.G. Gmelin, 1768: 171.

Peyssonnelia squamaria (S.G. Gmelin) Decaisne, 1842: 30; Boudouresque & Denizot, 1975: 14-20; Cordero, 1981: 80; Silva et al., 1987: 28.

Local distribution – Langkai, Lanyukang, Kapoposang, Kudingareng Keke: 25 m.

Distribution – Tropical and warm temperate seas all over the world (e.g. Indonesia, Philippines, Mediterranean).

Specimens examined – L 992.274-094 / -269.

Remarks – Boudouresque & Denizot (1975) published a complete and comprehensive revision of *Peyssonnelia* from the Mediterranean. The specimens from the Spermonde Archipelago fully agree with their description of this species.

Family PHYLLOPHORACEAE

XLI. *Gymnogongrus* Martius***Gymnogongrus* spec. (Plate 17: 7)**

Local distribution – Langkai: 10 m.

Specimens examined – L 992.274-509.

Remarks – The only specimen collected is in bad condition and thus impossible to identify to species.

Family RHIZOPHYLLIDACEAE

XLII. *Portieria* Zanardini***Portieria hornemannii* (Lyngbye) Silva in Silva et al. (Plate 17: 8)***Desmia hornemannii* Lyngbye, 1819: 35; Silva in Silva et al., 1987: 128, 129.*Portieria hornemannii* (Lyngbye) P.C. Silva in Silva et al., 1987: 39 & 128, 129.*Chondrococcus hornemannii* (Lyngbye) Schmitz, 1895: 170; Weber-van Bosse, 1921: 255; Cordero, 1981: 96; Cribb, 1983: 35.

Local distribution – Lae Lae, Gusung, Samalona, Barang Lompo: 1 m.

Distribution – Indo-Pacific (Indonesia, Philippines), Red Sea.

Specimens examined – L 992.274-113 / -127 / -143 / -144 / -149 / -160 / -166 / -174 / -175 / -182 / -191 / -263, Keblusek 87, 96.

Remarks – Silva (in Silva et al., 1987: 128–129) discussed the synonymy of *Portieria* in detail.

Family SOLIERIACEAE

XLIII. *Eucheuma* J. Agardh**Key to species of *Eucheuma* from the Spermonde Archipelago:**

- 1a. Fronds with small papillae and covered with a sponge . . . **3. *Eucheuma* spec.**
 b. Not of that form **2**
 2a. Spines in whorls **1. *E. denticulatum***
 b. Spines in pairs or scattered throughout thallus, not in whorls **2. *E. serra***

1. *Eucheuma denticulatum* (N.L. Burman) Collins & Hervey (Plate 18: 1)*Fucus denticulatus* N.L. Burman, 1768: 28.*Eucheuma denticulatum* (N.L. Burman) Collins & Hervey, 1917: 106; Cribb, 1983: 64; Silva et al., 1987: 46.*Fucus muricatus* S.G. Gmelin, 1768: 111.*Eucheuma muricatum* (S.G. Gmelin) Weber-van Bosse, 1928: 413.

Local distribution – Barang Lompo, Bone Tambung, Langkai: 1–15 m.

Distribution – Tropical and warm temperate Indian Ocean (South Africa (?), Mo-

zambique), tropical and warm temperate Pacific (Indonesia, Philippines, Australia, New Caledonia, Hawaiian Archipelago).

Specimens examined – L 992.274-107 / -205 / -218 / -234 / -274, Keblusek 281, 286.

Remarks – The type locality is indicated as Cape of Good Hope, South Africa. This is probably a mistake. This species is cultivated on ropes on the reef flats of the islands mentioned above. The ‘seedlings’ are collected near the island of Kudingareng Lompo and near the town of Pare Pare, 100 km north of Ujung Pandang.

2. *Eucheuma serra* (J. Agardh) J. Agardh

Sphaerococcus serra J. Agardh, 1841: 17.

Eucheuma serra (J. Agardh) J. Agardh, 1847: 16; Weber-van Bosse, 1928: 411; Cordero, 1981: 159; Silva et al., 1987: 47; Doty in Abbott, 1988: 180.

Local distribution – Lae Lae: 1 m.

Distribution – Indo-Pacific (Indonesia, Philippines), Mauritius.

Specimens examined – Verheij 0377.

Remarks – The only specimen collected was found loose on the reef flat near a large area with raft cultures of *Eucheuma* spp. The collected specimen is probably a ‘seedling’ from the farm or was present in between the ‘seedlings’ and thrown out.

3. *Eucheuma* spec. (Plate 18: 2)

Local distribution – Barang Lompo, Kudingareng Keke, Langkai: 10–35 m.

Specimens examined – L 992.274-119 / -193 / -209 / -225 / -230 / -241 / -246 / -247, Keblusek 288, 289.

Remarks – This species is characterized by small papillae over the entire thallus. Between these papillae a symbiotic sponge, belonging to *Prosuberites* (Van Soest, pers. comm.), is living (Fig. 6) with the alga. The associated species are very abundant at the bases of the reefs of the islands mentioned above.

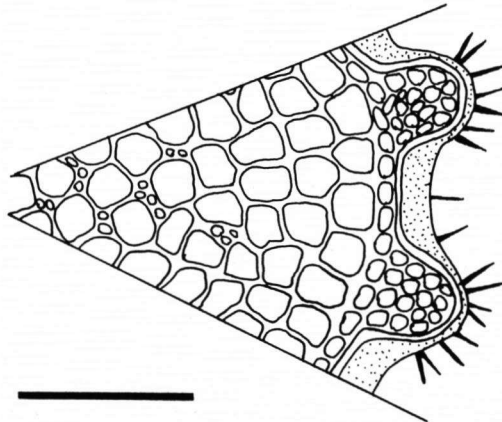


Fig. 6. Section through the thallus of *Eucheuma* spec. Note the papillae on thallus surface and the layer of sponge tissue enclosing the thallus completely. Scale bar = 0.5 mm.

XLIV. *Kappaphycus* Doty

Key to the *Kappaphycus* species from the Spermone Archipelago:

- 1a. Secondary branches usually absent 1. *K. alvarezii*
 b. Secondary branches usually present 2. *K. striatum*

1. *Kappaphycus alvarezii* (Doty) Doty

Eucheuma alvarezii Doty in Abbott & J.N. Norris, 1985: 37; Silva et al., 1987: 45.
Kappaphycus alvarezii (Doty) Doty in Abbott, 1988: 172.

Local distribution – Bone Tambung: 1 m.

Distribution – Tropical central Indo-Pacific (Indonesia, Philippines, Sabah, Malaysia).

Specimens examined – L 992.274-372, Keblusek 280, 285, 287.

Remarks – This species is widely cultivated in the Indo-Malay Archipelago, and often named *Eucheuma cottonii*.

2. *Kappaphycus striatum* (Schmitz) Doty (Plate 18: 3)

Eucheuma striatum Schmitz, 1895: 151; Weber-van Bosse, 1928: 423; Cordero, 1981: 160; Silva et al., 1987: 47.

Kappaphycus striatum (Schmitz) Doty in Abbott, 1988: 173.

Local distribution – Barang Lompo, Langkai: 1 m.

Distribution – Tropical Indian Ocean (East Africa), tropical Pacific (Indonesia, Philippines, Sabah, Malaysia, Micronesia).

Specimens examined – L 992.274-125 / -141 / -388 / -404 / -420, Keblusek 1, 50.

XLV. *Meristotheca* J. Agardh

Meristotheca papulosa (Montagne) J. Agardh (Plate 18: 4)

Kallymenia papulosa Montagne, 1850: 246.

Meristotheca papulosa (Montagne) J. Agardh, 1872: 37; Weber-van Bosse, 1928: 402; Silva et al., 1987: 48.

Local distribution – Kudingareng Keke: 2 m.

Distribution – Tropical western Pacific (Indonesia, Philippines), tropical Indian Ocean (Yemen).

Specimens examined – L 992.274-266, Keblusek 221.

Remarks – Specimens fully agree with the type specimens collected by Weber-van Bosse near Timor Island, and with the description of the species by Montagne (1850: as *Kallymenia papulosa*).

Order NEMALIALES

Family HELMINTHOCLADIACEAE

XLVI. *Liagora* Lamouroux

***Liagora ceranoides* Lamouroux (Plate 18: 5)**

Liagora ceranoides Lamouroux, 1816: 239; Cordero, 1981: 44; Cribb, 1983: 18; Silva et al., 1987: 20.

Local distribution – Langkai, Kapoposang: 1–2 m.

Distribution – Pantropical (Indonesia, Philippines, Virgin Islands, St. Thomas).

Specimens examined – L 992.274-099 / -322.

Remarks – *Liagora ceranoides* is usually found as an epiphyte on larger seagrasses (e.g. *Enhalus acoroides*) or growing between the seagrasses, attached to the bottom.

***Liagora* spec.**

Local distribution – Kapoposang: 2 m.

Specimens examined – L 992.274-217 / -338.

Family NEMALIACEAE

XLVII. *Trichogloea* Kützing

***Trichogloea requienii* (Montagne) Kützing**

Batrachospermum requienii Montagne, 1843: 355.

Trichogloea requienii (Montagne) Kützing, 1847: 54; Weber-van Bosse, 1921: 196; Cordero, 1981: 48; Cribb, 1983: 23; Silva et al., 1987: 19.

Local distribution – Langkai: 1 m.

Distribution – Tropical western Pacific (Indonesia, Philippines, eastern Australia), tropical Indian Ocean, Red Sea.

Specimens examined – Verheij 1243, Keblusek 256.

Remarks – Like *Liagora ceranoides*, *Trichogloea requienii* usually is found as an epiphyte on larger seagrasses.

Order RHODYMENIALES

Family CHAMPIACEAE

XLVIII. *Champia* Desvaux

***Champia parvula* (C. Agardh) Harvey**

Chondria parvula C. Agardh, 1824: 207.

Champia parvula (C. Agardh) Harvey, 1853: 76; Weber-van Bosse, 1928: 476; Cordero, 1981: 175; Cribb, 1983: 70; Silva et al., 1987: 53; Lawson & John, 1987: 251.

Local distribution – Samalona, Barang Lompo, Bone Tambung, Langkai: 1–20 m.

Distribution – Tropical and warm temperate seas all over the world (e.g. Indonesia, Philippines, Spain, West Africa).

Specimens examined – L 992.274-100 / -368 / -384, Keblusek 21, 217.

Remarks – *Champia parvula* is not common on reefs of the Spermonde Archipelago. However, the species is easily recognizable in the field by its paired, opposite branches and the prominent constrictions throughout the thallus.

Family RHODYMENIACEAE

XLIX. *Botryocladia* (J. Agardh) Kylin

Botryocladia microphysa (Hauck) Kylin (Plate 18: 6)

Botryocladia microphysa (Hauck) Kylin, 1931: 18.

Chrysmenia microphysa Hauck, 1885: 160; Weber-van Bosse, 1928: 465.

Local distribution – Bone Tambung: 30–35 m.

Distribution – Indonesia, Mediterranean.

Specimens examined – L 992.274-313 / -340 / -380.

Remarks – The specimens fully agree with those described by Hauck (1885) and Weber-van Bosse (1928).

L. *Rhodymenia* Greville

Key to species of *Rhodymenia* from the Spermonde Archipelago:

- 1a. Fronds more than 10 mm wide 5. **R. pacifica**
- b. Fronds less than 6 mm wide. 2
- 2a. Fronds densely, dichotomously branched, 4–6 mm in diameter
3. **R. intricata**
- b. Fronds not densely and/or not dichotomously branched, less than 4 mm in diameter 3
- 3a. Thalli less than 30 mm tall 4. **R. leptophyllia forma minima**
- b. Thalli more than 45 mm tall 4
- 4a. Fronds prostrate, sparsely, not dichotomously branched; fronds less than 3 mm broad 1. **R. coacta**
- b. Fronds at least partly erect, erect parts pseudodichotomously branched; fronds 3–6 mm broad 2. **R. corallina**

Remarks – Most species belonging to *Rhodymenia* are found on deeper, sandy substrates throughout the Spermonde Archipelago. Species are not present in the area close to the shore where input of mud and silt are too great.

1. Rhodymenia coacta Okamura & Segawa (Plate 19: 1)

Rhodymenia coacta Okamura & Segawa in Segawa, 1935: 84; Cordero, 1981: 172; Silva et al., 1987: 52.

Local distribution – Barang Lompo: 25 m.

Distribution – Indo-Pacific (Indonesia, Philippines), Japan.

Specimens examined – L 992.274-198.

2. Rhodymenia corallina (Bory de Saint-Vincent) Greville (Plate 19: 2)

Rhodymenia corallina (Bory de Saint-Vincent) Greville, 1830: XLVIII; Weber-van Bosse, 1928: 462; Kylin, 1930: 21..

Sphaerococcus corallinus Bory de Saint-Vincent, 1828: 175.

Local distribution – Barang Lompo, Kudingareng Keke: 5–25 m.

Distribution – Indonesia.

Specimens examined – L 992.274-108 / -233.

3. Rhodymenia intricata (Okamura) Okamura (Plate 19: 3)

Phyllophora intricata Okamura, 1921: 129.

Rhodymenia intricata (Okamura) Okamura, 1930: 23; Silva et al., 1987: 52.

Local distribution – Barang Lompo: 1–5 m.

Distribution – Indo-Pacific (Indonesia, Philippines), Japan.

Specimens examined – L 992.274-110–112 / -120 / -153 / -169 / -185, Keblusek 47.

4. Rhodymenia leptophyllia J. Agardh forma minima Weber-van Bosse (Plate 19: 4)

Rhodymenia leptophyllia J. Agardh forma *minima* Weber-van Bosse, 1928: 461.

Local distribution – Barang Lompo, Bone Tambung: 25–35 m.

Distribution – Indonesia.

Specimens examined – L 992.274-118 / -134.

5. Rhodymenia pacifica Kylin (Plate 19: 5)

Rhodymenia pacifica Kylin, 1931: 21.

Local distribution – Bone Tambung: 2 m.

Distribution – Indonesia.

Specimens examined – L 992.274-109 / -165.

Table 1. Comparison of taxa collected during the present study with those of the Siboga Expedition (1899–1900), the Danish Expedition to the Kei Islands (1914–1916) and the Snellius-II Expedition (1984). (* = taxon collected in that area, O = other species of the genus were collected in that area, or the genus is not yet studied in detail). Taxa are arranged alphabetically. — Table 1a: Chlorophyta; 1b: Phaeophyta; 1c: noncoralline Rhodophyta.

Table 1a Chlorophyta	Siboga Expedition			Danish Exp. Kei Islands	Snellius Expedition
	Ujung Pandang	Sulawesi	Indonesia	Kei Islands Indonesia	Indonesia
<i>Acetabularia</i>	O	O	O	O	
<i>dentata</i>	*	*	*		*
<i>Anadyomene</i>			O	O	O
<i>stellata</i>	*	*	*		
<i>Avrainvillea</i>					
<i>longicaulis</i>					*
<i>amadelpha</i>					*
<i>lacerata</i>			*		*
<i>nigricans</i>					
<i>gardineri</i>				*	
<i>obscura</i>	*	*	*		*
<i>spec.</i>					
<i>Boergesenia</i>					
<i>forbesii</i>	*	*	*	*	*
<i>Boodlea</i>	O	O	O	O	O
<i>composita</i>			*		
<i>Bornetella</i>			O	O	
<i>nitida</i>			*		*
<i>Bryopsis</i>			O		
<i>plumosa</i>			*		
<i>Caulerpa</i>	O	O	O		
<i>brachypus</i>	*	*	*	*	*
<i>buginense</i>					
<i>cupressoides</i>	*	*	*	*	*
<i>elongata</i>			*		*
<i>lentillifera</i>			*		*
<i>lessonii</i>					
<i>manorensis</i>					
<i>opposita</i>					
<i>racemosa</i>	*	*	*	*	*
<i>corynephora</i>			*	*	*
<i>laetivirens</i>			*	*	*
<i>lamourouxii</i>	*	*	*		*
<i>macrodisca</i>	*	*	*		*
<i>occidentalis</i>					*
<i>peltata</i>			*	*	*
<i>racemosa</i>	*	*	*		*
<i>turbinata</i>	*	*	*		*
<i>scalpelliformis</i>					
<i>serrulata</i>	*	*	*		*

(Table 1a continued)	Ujung Pandang	Sulawesi	Indonesia	Kei Islands Indonesia	Indonesia
<i>(Caulerpa)</i>					
<i>sertularioides</i>			*	*	*
<i>subserrata</i>			*		*
<i>taxifolia</i>			*	*	*
<i>verticillata</i>			*		*
<i>Chaetomorpha</i>	O	O	O	O	
<i>crassa</i>	*	*	*	*	*
<i>Chlorodesmis</i>					
<i>fastigiata</i>	*	*	*		*
<i>hildebrandtii</i>			*		*
<i>Codium</i>	O	O	O		
<i>arabicum</i>	*	*	*		*
<i>bartletti</i>					
<i>edule</i>					
<i>geppii</i>		*	*	*	
<i>harveyi</i>					
<i>Dictyosphaeria</i>				O	
<i>cavernosa</i>	*	*	*		*
<i>versluysii</i>	*	*	*		*
<i>Enteromorpha</i>		O	O	O	O
<i>clathrata</i>					
<i>compressa</i>					
<i>intestinalis</i>					
<i>Halimeda</i>		O	O		
<i>copiosa</i>					*
<i>cylindracea</i>					*
<i>discoidea</i>					*
<i>distorta</i>					
<i>gigas</i>					
<i>gracilis</i>			*		*
<i>macroloba</i>			*	*	*
<i>macrophysa</i>			*		
<i>malanesica</i>					
<i>micronesica</i>					*
<i>minima</i>					*
<i>opuntia</i>			*		*
<i>opuntia</i>			*	*	*
<i>triloba</i>			*	*	
<i>simulans</i>					*
<i>taenicola</i>					*
<i>tuna</i>	*	*	*	*	*
<i>Neomeris</i>			O	O	
<i>annulata</i>			*		*
<i>vanbosseae</i>			*		*
<i>Pseudocodium</i>					
<i>floridanum</i>					
<i>Rhipidosiphon</i>					
<i>javensis</i>	*	*	*	*	*
<i>Rhipilia</i>					
<i>orientalis</i>			*		*
<i>Tydemania</i>					
<i>expeditionis</i>	*	*	*		*

(Table 1a continued)	Ujung Pandang	Sulawesi	Indonesia	Kei Islands Indonesia	Indonesia
<i>Udotea</i>		0	0		
<i>argentea</i>			*	*	*
<i>flabellum</i>					
<i>flabellum</i>	*	*	*		*
<i>longifolia</i>					
<i>glaucescens</i>			*		*
<i>orientalis</i>			*		*
<i>Ulva</i>	0	0	0		
<i>reticulata</i>		*	*	*	*
<i>Valonia</i>	0	0	0		
<i>aegagropila</i>			*	*	*
<i>fastigiata</i>			*		
<i>macrophysa</i>					*
<i>Ventricaria</i>					
<i>ventricosa</i>			*		*

Table 1b
Phaeophyta

	Siboga Expedition			Danish Exp.	Snellius Expedition
	Ujung Pandang	Sulawesi	Indonesia	Kei Islands Indonesia	Indonesia
<i>Chnoospora</i>					
<i>implexa</i>			*		
<i>Dictyopteris</i>			0	0	0
<i>repens</i>					
<i>jamaicensis</i>					
<i>Dictyota</i>	0	0	0	0	0
<i>bartayresiana</i>	*	*	*		
<i>cervicans</i>					
<i>ciliolata</i>					
<i>crenulata</i>					
<i>dichotoma</i>					
<i>dichotoma</i>			*		
<i>intricata</i>					
<i>intermedia</i>					
<i>marginata</i>					
<i>Hormophysa</i>					
<i>cuneiformis</i>		*	*		*
<i>Hydroclathrus</i>					
<i>clathratus</i>	*	*	*	*	*
<i>tenuis</i>					
<i>Lobophora</i>					
<i>variegata</i>		*	*	*	*
<i>Padina</i>			0	0	0
<i>australis</i>	*	*	*	*	
<i>boergesenii</i>					
<i>minor</i>					
<i>sanctae-crucis</i>					
<i>tenuis</i>			*		
' <i>vaughaniella</i> '					
spec.					

(Table 1b continued)	Ujung Pandang	Sulawesi	Indonesia	Kei Islands Indonesia	Indonesia
<i>Rosenvingea</i>	0	0	0		
<i>intricata</i>	*	*	*	*	*
<i>Sargassum</i>	0	0	0	0	
<i>cristaeifolium</i>			*	*	*
<i>hawaiiensis</i>					
<i>hemiphyllum</i>					
<i>pallidum</i>					
<i>ilicifolium</i>			*		
<i>siliquosum</i>	*	*	*		
spec.					
<i>Styopodium</i>					
<i>zonale</i>					
<i>flabelliforme</i>			*		
<i>Turbinaria</i>	0	0	0		
<i>decurrens</i>		*	*		
<i>ornata</i>	*	*	*	*	
<i>parvifolia</i>					
<i>conoidea</i>	*	*	*	*	*

Table 1c Rhodophyta	Siboga Expedition			Danish Exp. Kei Islands	Snellius Expedition
	Ujung Pandang	Sulawesi	Indonesia	Kei Islands Indonesia	Indonesia
<i>Acanthophora</i>			0		
<i>muscoidea</i>					*
<i>spicifera</i>	*	*	*	*	*
<i>Actinotrichia</i>				0	
<i>fragilis</i>			*		*
<i>Amansia</i>			0	0	
<i>glomerata</i>			*		*
<i>Botryocladia</i>			0		0
<i>microphysa</i>			*		
<i>Ceramium</i>	0	0	0	0	0
spec.					
<i>Ceratodictyon</i>	0	0	0		
<i>intricatum</i>	*	*	*	*	*
<i>repens</i>			*		*
<i>spongiosum</i>			*	*	
<i>variabilis</i>					
spec.					
<i>Champia</i>		0	0		0
<i>parvula</i>	*	*	*		
<i>Chondria</i>			0	0	0
<i>dasyphylla</i>			*		
<i>Coriophyllum</i>					
<i>setchellii</i>			*		
<i>Cryptonemia</i>			0		0
<i>decumbens</i>			*		

(Table 1c continued)	Ujung Pandang	Sulawesi	Indonesia	Kei Islands Indonesia	Indonesia
<i>Dasya</i>			0		0
<i>baillouviana</i>					
<i>carabica</i>					
<i>Eucheuma</i>	0	0	0	0	0
<i>denticulatum</i>	*	*	*		*
<i>serra</i>			*		
spec.					
<i>Galaxaura</i>	0	0	0	0	0
<i>cohaerens</i>	*	*	*		*
<i>rugosa</i>			*		
<i>obtusa</i>			*		
<i>striata</i>					
<i>Gelidiella</i>					0
<i>acerosa</i>	*	*	*	*	*
<i>Gelidium</i>				0	0
<i>pusillum</i>			*		*
spec.					
<i>Gracilaria</i>	0	0	0	0	0
<i>arcuata</i>		*	*		
<i>blodgettii</i>			*	*	
<i>coronopifolia</i>			* (?)		
<i>eucheumoides</i>	*	*	*		*
<i>salicornia</i>	*	*	*	*	*
<i>verrucosa</i>					
<i>Grateloupia</i>			0		0
spec.					
<i>Griffithsia</i>			0		0
spec.					
<i>Gymnogongrus</i>			0		
spec.					
<i>Halymenia</i>	0	0	0	0	0
<i>acuminata</i>					
<i>amoena</i>			*		
<i>dilatata</i>			*		
<i>durvillaei</i>	*	*	*		*
<i>floresia</i>			*		
<i>Herposiphonia</i>			0		
<i>secunda</i>			*	*	
<i>tenella</i>			*	*	
spec.					
<i>Hypnea</i>	0	0	0		0
<i>boergesenii</i>					
<i>charoides</i>			*		
<i>muscifformis</i>					
<i>pannosa</i>		*	*		
<i>spinella</i>	*	*	*	*	
<i>Kallymenia</i>			0		0
<i>feldmannii</i>					
<i>Kappaphycus</i>					
<i>alvarezii</i>					
<i>striatum</i>			*		

(Table 1c continued)	Ujung Pandang	Sulawesi	Indonesia	Kei Islands Indonesia	Indonesia
<i>Laurencia</i>		0	0	0	0
<i>brongniartii</i>			*		
<i>cartilaginea</i>					
<i>dotyi</i>					
<i>glandulifera</i>					
<i>mariannensis</i>					
<i>obtusa</i>		*	*		
<i>papillosa</i>	*	*	*	*	*
<i>parvipapillata</i>					
<i>pinnata</i>			*		
spec.					
<i>Leveillea</i>					
<i>jungermannioides</i>			*	*	*
<i>Liagora</i>					0
<i>ceranoides</i>					
spec.					
<i>Meristotheca</i>					
<i>papulosa</i>			*		
<i>Peyssonnelia</i>	0	0	0	0	0
<i>squamaria</i>					
<i>Polysiphonia</i>		0	0	0	0
<i>infestans</i>					
spec.					
<i>Portieria</i>					
<i>hornemannii</i>	*	*	*		*
<i>Pterocladia</i>					
<i>caerulescens</i>					
<i>caloglossoides</i>			*		
<i>Rhodymenia</i>			0	0	0
<i>coacta</i>					
<i>corallina</i>			*		
<i>intricata</i>					
<i>leptophylla</i>			*		
<i>forma minima</i>			*		
<i>pacifica</i>					
<i>Spyridia</i>					
<i>filamentosa</i>	*	*	*	*	*
<i>Titanophora</i>					
<i>weberae</i>					
<i>Tolypiocladia</i>		0	0		
<i>glomerulata</i>			*		*
<i>Trichogloea</i>					0
<i>requienii</i>			*		
<i>Tricleocarpa</i>					
<i>oblongata</i>			*		
<i>Zellera</i>					
<i>tawallina</i>			*		*

DISCUSSION

Chlorophyta

During the Siboga Expedition, the Danish Expedition to the Kei Islands, and the Snellius-II Expedition, 131 taxa of Chlorophyta, according to modern taxonomic concepts, were collected. Weber-van Bosse reported for the Siboga Expedition and the Danish Expedition to the Kei Islands already 197 taxa of Chlorophyta, including many forms. Many of these forms are no longer considered as different from related taxa. Of the accepted 131 taxa, 68 were not collected during the Buginesia-III project 1988–1990. On the other hand, 17 taxa are newly reported for Indonesia; one forma, *Udotea flabellum* forma *longifolia*, and one species, *Caulerpa buginese*, are new for science.

Table 1a summarizes the taxa found during the present study, also indicating which taxa were also found during one or more of the earlier expeditions.

Phaeophyta

During the Siboga Expedition, the Danish Expedition to the Kei Islands, and the Snellius-II Expedition 88 taxa of Phaeophyta, according to modern taxonomic concepts, were collected (see also discussion on Chlorophyta). Of these 88 taxa, 72 were not collected during the Buginesia-III project 1988–1990.

Forty-three of the 72 taxa belong to the genus *Sargassum*. The taxonomy of this morphological highly variable genus is at present under reconsideration (e.g. Abbott in Abbott & Norris, 1985) and it is possible that some of the 43 supposed taxa reported from the Siboga Expedition prove to be synonyms. Most of the remaining 29 not collected taxa are small, microscopic species, which were outside the scope of the present study (Verheij & Povel, submitted).

On the other hand, 20 species are newly reported for Indonesia. Three of them, *Sargassum hawaiiensis*, *Turbinaria parvifolia* and *Hydroclathrus tenuis*, are reported for the first time from outside the type locality regions, respectively the Hawaiian Archipelago, and for the two last mentioned species China. One species, *Stypopodium zonale*, is reported for the first time for the Indo-Pacific.

Table 1b summarizes the taxa found during the present study, also indicating which taxa were also found during one or more of the earlier expeditions.

Rhodophyta

During the Siboga Expedition, the Danish Expedition to the Kei Islands, and the Snellius-II Expedition approximately 210 taxa of noncoralline Rhodophyta, according to modern taxonomic concepts, were collected. Weber-van Bosse reported for the Siboga Expedition and the Danish Expedition to the Kei Islands already 411 taxa of noncoralline Rhodophyta, including many forms (see also discussions on Chlorophyta and Phaeophyta). Of the approximately 210 taxa, 48 were collected during the Buginesia-III project 1988–1990, and 35 are newly reported for Indonesia.

Table 1c summarizes the noncoralline Rhodophyta taxa found during the present study, also indicating which taxa were also found during one or more of the earlier expeditions.

The nongeniculate Corallinales of the Siboga Expedition were studied by Foslie (in Weber-van Bosse & Foslie, 1904) and the geniculate Corallinales by Weber-van Bosse (in Weber-van Bosse & Foslie, 1904). The Corallinales of the Danish Expedition to the Kei Islands were studied by Weber-van Bosse (Weber-van Bosse, 1926). Foslie (1904) and Weber-van Bosse (1926) together reported 36 taxa of nongeniculate Corallinales and Weber-van Bosse (1904, 1926) reported 15 taxa of geniculate Corallinales from the Indonesian Archipelago. It is not yet possible, however, to estimate how many of these 51 taxa can be accepted according to modern taxonomic concepts.

One of the reasons for this taxonomic chaos is that many of the nongeniculate Corallinales are not based on the results of taxonomic study but are the result of the Foslie–Heydrich rivalry (Woelkerling, 1988: ix–xi). Another reason is that the taxonomy of Corallinales and the delimitation of the taxa within the Corallinales have changed recently (e.g. Penrose & Woelkerling, 1988; Penrose, 1990, 1992; Verheij, 1993a). Critical studies of the type collections of Corallinales, which are being carried out at present, are needed to resolve many of the taxonomic problems. This is, however, outside the scope of the present publication.

Due to a lack of reliable data, it is not yet possible to make statements about possible changes in the area studied in the past 90 years. The results of the expeditions cannot be used for comparison, because the Siboga Expedition collected throughout the Indonesian Archipelago, the Danish Expedition to the Kei Islands collected only around the Kei Islands, East Indonesia, and the Snellius-II Expedition collected in a restricted eastern part of the Indonesian Archipelago. The present study was restricted to a small area of Indonesia. Of the expeditions, only the Siboga Expedition visited the Spermonde Archipelago, from which Weber-van Bosse (1913, 1921, 1923 & 1928) reported 35 taxa of Chlorophyta, 14 taxa of Phaeophyta and 24 taxa of Rhodophyta. During the present study the number of recorded taxa of Chlorophyta raised to 93 (including 13 Siboga Expedition taxa, which we did not find again), of Phaeophyta to 43 (including 7 Siboga Expedition taxa), and of noncoralline Rhodophyta to 95 (including 12 Siboga Expedition taxa). Possibly the number of recorded corallinales will be 34. Because the material for the present study was sampled in the Spermonde Archipelago for almost two years while the Siboga Expedition only spent four weeks, from May 10th 1899 till June 8th 1899, nothing can be concluded from comparison of these results. However, the increasing impact of human activity on the reef systems must have its influences. The gradients of environmental components, such as eutrophication, sedimentation load of the rivers and grazing pressure, have become much more extreme in recent years and probably created a more extreme horizontal zonation of the reefs (Verheij & Povel, submitted).

Economic potential of seaweeds

In Southeast Asia various seaweeds have economical value. However, in Indonesia, the country in Southeast Asia with the longest shoreline, their importance is relatively low. Hatta et al. (submitted) summarized the distribution of economic important seaweeds in the Spermonde Archipelago. Remarks on the economic importance of the Chlorophyta, Phaeophyta, and Rhodophyta are separately made below.

Chlorophyta

The Chlorophyta do not have a high economic value. As human food (e.g. as salad or as vegetables), however, they can be of great value and are widely used in Asia (Trono, 1986). In the Spermonde Archipelago the number of Chlorophyta which can be used for these purposes is high (Hatta et al., submitted), but most are not used. The only taxon, sold on the local fish market of Paotere, is *Caulerpa racemosa* ead *corynephora*. It is collected in the area of the Gusung Tallang, shallow sandy mudbanks just south of Ujung Pandang, where the substratum locally completely is covered with the species, up to c. 500–1000 g/m² wet weight.

On the islands of the Spermonde Archipelago several taxa are used by the local people. *Caulerpa racemosa* and *C. lentillifera*, locally called 'Lawi-Lawi', and most of the taxa belonging to the genus *Codium*, locally called 'Donge-Donge', are eaten fresh or slightly cooked.

The other species occur on the reefs of the Spermonde Archipelago only in relatively small amounts, usually less than 100 kg per island (Keblusek, pers. comm.). A well planned information campaign on the islands of the archipelago (by the local government or even by the agriculture or fishery department of the Hasanuddin University) would perhaps stimulate the use of these seaweeds as human food. The impact on the reefs will be small, as long as the harvesting of seaweeds is coordinated and over-exploitation is avoided. In that case the local people will have an additional, cheap source of fresh vegetables.

Phaeophyta

The 'kelp' industry is less important nowadays than it was in the 19th century, because it is cheaper to produce Iodine and Potash chemically out of Potassium salts than out of kelp (Keblusek, pers. comm.). Thus Phaeophyta, such as *Sargassum* spp. and *Turbinaria* spp., are at present in general only used as a source for alginate production and as fertilizer.

The reefs of the Spermonde Archipelago close to the coast, such as Lae Lae island and Gusung island, have dense growths of Phaeophyta which are not yet used for economic purposes. Recently, however, the Biology and Chemistry Departments of the local university, Universitas Hasanuddin, have started a research project on the Iodine uptake by some Phaeophyta. They hope that the results can be used to help the people, living inland, to overcome their Iodine deficiency. The high coverages of the reefs by *Padina* spp. and *Sargassum* spp., which occur locally, could be used for small scale fertilization projects on the islands.

Rhodophyta

Some Rhodophyta are important mariculture products in Southeast Asia. Rhodophyta containing agar and carrageenan are farmed. In the Spermonde Archipelago, wild populations of species containing these colloids occur in relatively small amounts. Local fishermen use wild populations of *Euचेuma* spp. and *Kappaphycus* spp. as cuttings for their 'farms'. *Euचेuma denticulatum*, *E. spinosum*, *Kappaphycus alvarezii* and *K. striatum* are widely used. These species are farmed throughout the archipelago using the monoline-method (Trono, 1986; Juanich, 1988). *Gracilaria* spp. are in general farmed in mix cultures in brackish fish ponds, locally called 'tambaks'.

The dried seaweeds are sold to large international traders and are exported to Japan, America and Europe. It is not yet possible to produce the final products or half-products in Indonesia, but attempts to start an industry of seaweed products have been commenced by local businessmen.

In the summer of 1992 the amount of carrageenan-producing seaweed farms decreased due to a oversaturated world market. The small-scale setup of offshore farms reduces the financial risks and makes it easier, in time of lower world market prices, for the local farmers to change their job into another occupation, such as fisherman.

The 'tambak' farms, cultivating agar-producing seaweeds, are still operating on a normal scale. In order to minimize the financial risks, it would be advisable to develop culture methods for other agar-producing seaweeds (e.g. *Gelidium* and *Gelidiella*). These seaweeds produce a better quality of agar; however, the farming of these taxa is still difficult. This could be one of the tasks of the Marine Biology Department of the Hasanuddin University in Ujung Pandang (Verheij, 1993d).

On the islands of the Spermonde Archipelago some Rhodophyta are used as food. *Gracilaria blodgettii*, locally called 'Sango-Sango' and *G. salicornia* are eaten as vegetables. *Eucheuma* spp. and *Kappaphycus* spp., both locally called 'Agar besar', are used for making cake.

There is only a small-scale local use of Rhodophyta, and a well prepared information campaign could stimulate the use of Rhodophyta without a large impact on the reefs.

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LEGENDS OF THE PLATES

- Plate 1.** Habit of species belonging to the genus *Caulerpa* (scale bar = 1 cm). — 1: *C. brachypus*, L 992.071-755. — 2: *C. cupressoides*, L 992.071-852. — 3: *C. elongata*, L 992.071-762. — 4: *C. lentillifera*, L 992.071-770. — 5: *C. lessonii*, L 992.071-782. — 6: *C. manorensis*, L 992.071-775. — 7: *C. opposita*, L 992.071-792. — 8: *C. racemosa* ecad *corynephora*, L 992.071-777. — 9: *C. racemosa* ecad *laetevirens*, Keblusek 201.
- Plate 2:** Habit of species belonging to the genus *Caulerpa* (scale bar = 1 cm). — 1: *C. racemosa* ecad *lamourouxii*, L 992.261-033. — 2: *C. racemosa* ecad *macrodisca*, L 992.071-783. — 3: *C. racemosa* ecad *occidentalis*, L 992.261-025. — 4: *C. racemosa* ecad *peltata*, L 992.261-039. — 5: *C. racemosa* ecad *racemosa*, L 992.261-007. — 6: *C. racemosa* ecad *turbinata*, L 992.261-035. — 7: *C. scalpelliformis*, L 992.057-072. — 8: *C. serulata*, L 992.071-799.
- Plate 3:** Habit of species belonging to the genera *Caulerpa* and *Codium* (scale bar = 1 cm). — 1: *C. sertularioides*, L 992.057-066. — 2: *C. subserrata*, L 992.071-786. — 3: *C. taxifolia*, L 992.057-113. — 4: *C. verticillata*, L 992.071-787. — 5: *Codium arabicum*, L 992.261-130. — 6: *C. bartlettii*, L 992.261-134. — 7: *C. edule*, L 992.261-080. — 8: *C. geppii*, L 992.261-178.
- Plate 4:** Habit of species belonging to the genera *Codium* and *Avrainvillea* (scale bar = 1 cm). — 1: *C. geppii*, L 992.274-214. — 2: *C. harveyi*, Keblusek 99. — 3: *Avrainvillea amadelpha*, L 992.274-061. — 4: *A. obscura*, L 992.274-078. — 5: *A. lacerata*, L 992.274-057. — 6: *A. longicaulis*, L 992.274-056. — 7: *Avrainvillea* spec., L 992.274-164.
- Plate 5:** Habit of species belonging to the genus *Halimeda* (scale bar = 1 cm). — 1: *H. copiosa*, L 992.274-042. — 2: *H. cylindracea*, L 992.274-557. — 3: *H. distorta*, Keblusek 276. — 4: *H. discoidea*, L 992.261-191. — 5: *H. gigas*, L 992.261-051. — 6: *H. gracilis*, L 992.274-044. — 7: *H. macroloba*, L 992.274-010.
- Plate 6:** Habit of species belonging to the genus *Halimeda* (scale bar = 1 cm). — 1: *H. macrophysa*, L 992.183-529. — 2: *H. melanesica*, L 992.274-314. — 3: *H. micronesica*, L 992.274-326. — 4: *H. minima*, L 992.274-046. — 5: *H. opuntia* forma *opuntia*, L 992.274-317. — 6: *H. opuntia* forma *triloba*, L 992.274-392. — 7: *H. simulans*, L 992.183-546. — 8: *H. taenicola*, L 992.274-425. — 9: *H. tuna*, L 992.261-062.

- Plate 7:** Habit of species belonging to the Caulerpales (scale bar = 1 cm). — 1: *Pseudocodium floridanum*, L 992.261-133. — 2: *Rhipilia orientalis*, L 992.261-132. — 3: *Tydemania expeditionis*, L 992.261-075. — 4: *Udotea argentea*, L 992.183-565. — 5: *U. glaucescens*, L 992.183-535. — 6: *Rhipidosiphon javensis*, L 992.261-252. — 7: *Udotea orientalis*, L 992.261-169.
- Plate 8:** Habit of species belonging to the Chlorophyta (scale bar = 1 cm). — 1: of holotype collection of *Udotea flabellum* forma *longifolia*, L 992.261-201. — 2: *Anadyomene stellata*, L 992.261-165. — 3: *Valonia aegagrophila*, L 992.261-238. — 4: *Udotea flabellum* forma *flabellum*, L 992.261-104. — 5: *Valonia fastigiata*, L 992.261-054. — 6: *Valonia macrophysa*, L 992.261-123.
- Plate 9:** Habit of the species belonging to the Dictyotales (scale bar = 2.5 cm). — 1: *Dictyopteris repens*, L 992.035-607. — 2: *D. jamaicensis*, L 992.035-645. — 3: *Dictyota bartayresiana*, L 992.057-741. — 4: *D. ciliolata*, L 992.057-773. — 5: *D. crenulata*, L 992.057-996 — 6: *D. cervicornis*, Keblusek 64. — 7: *D. intermedia*, L 992.057-487. — 8: *D. marginata*, L 992.057-486.
- Plate 10:** Habit of and sections through some of the species belonging to the Dictyotales. (scale bars = 2.5 cm, scale bar Fig. 4 = 50 μ m). — 1: *Lobophora variegata*, L 992.035-657. — 2: *P. boergesenii*, tetrasporangial plant, L 992.057-860. — 3: *P. australis*, gametangial plant, L 992.035-654. — 4: *P. australis*, surface view of a band of gametangia. Note male and female gametangia occur on the same thallus, L 992.035-654. — 5: *P. australis*, tetrasporangial plant, L 992.035-658. — 6: *P. australis*, tetrasporangial plant, L 992.035-634. — 7: *Padina minor*, tetrasporangial plant, Keblusek 123. — 8: *P. tenuis*, tetrasporangial plant, L 992.057-840.
- Plate 11:** Habit of and sections through species belonging to the Dictyotales (scale bars = 2.5 cm, scale bar Fig. 2 = 50 μ m). — 1: *P. sanctae-crucis*, tetrasporangial plant, Keblusek 138. — 2: Longitudinal section through field of sporangia of *P. sanctae-crucis*. Arrow heads indicate the remains of the indusium, Keblusek 138. — 3: *Padina* 'Vaughaniella' stage, Verheij 0868. — 4: *Padina* spec., tetrasporangial plant, Verheij 0529. — 5: *Stytopodium zonale*, L 992.057-491. — 6: *S. flabelliforme*, L 992.057-439.
- Plate 12:** Habit of the species belonging to the Fucales (scale bars = 2.5 cm). — 1: *Hormophysa cuneiformis*, L 992.035-622. — 2: *Sargassum cristaefolium*, L 992.057-769. — 3: *S. hawaiiensis*, Keblusek 215. — 4: *S. pallidum*, Keblusek 237. — 5: *S. hemiphyllum*, L 992.057-738. — 6: *S. hemiphyllum*, L 992.057-753. — 7: *Turbinaria ornata*, L 992.057-771. — 8: *T. parvifolia*, L 992.057-756. — 9: *T. conoides*, L 992.057-737.
- Plate 13:** Habit of the species belonging to the Scytosiphonales (scale bars = 2.5 cm). — 1: *Hydroclathrus tenuis*, Keblusek 255. — 2: *H. clathratus*, L 992.035-624. — 3: *Rosenvingea intricata*, L 992.035-559.

- Plate 14:** Habit of the species belonging to the Bonnemaisoniales and Ceramiales (scale bars = 2.5 cm). — 1: *Actinotrichia fragilis*, L 992.274-290. — 2: *Galaxaura obtusata*, L 992.274-449. — 3: *G. rugosa*, L 992.274-275. — 4: *G. striata*, L 992.274-291. — 5: *Tricleocarpa oblongata*, L 992.274-506. — 6: *Tricleocarpa oblongata*, L 992.274-506. — 7: *Dasya caraibica*, L 992.274-237. — 8: *Zellera tawallina*, L 992.274-429.
- Plate 15:** Habit of the species belonging to the Ceramiales (scale bars = 2.5 cm; scale bars figs. 1 & 6 = 1.0 cm). — 1: *Acanthophora muscoides*, L 992.274-426. — 2: *A. spicifera*, L 992.274-427. — 3: *Amansia glomerata*, L 992.274-220. — 4: *Laurencia brongniartii*, L 992.274-155. — 5: *L. cartilaginea*, L 992.274-207. — 6: *L. dotyi*, L 992.274-140. — 7: *L. glandulifera*, L 992.274-139. — 8: *L. mariannensis*, L 992.274-136.
- Plate 16:** Habit of the species belonging to the Ceramiales, Gelidiales and Gigartinales (scale bars = 2.5 cm; scale bars figs. 3 & 7 = 1.0 cm). — 1: *L. obtusa*, L 992.274-132. — 2: *L. papillosa*, L 992.274-168. — 3: *Pterocladia caloglossoides*, L 992.274-232. — 4: *Gracilaria coronopifolia*, L 992.274-304. — 5: *G. eucheumoides*, L 992.274-945. — 6: *Titanophora weberae*, L 992.274-151. — 7: *Cryptonemia decumbens*, L 992.274-400. — 8: *Grateloupia spec.*, L 992.274-354.
- Plate 17:** Habit of the species belonging to the Gigartinales (scale bars = 2.5 cm; scale bar fig. 8 = 1.0 cm). — 1: *Halymenia acuminata*, L 992.274-216. — 2: *H. dilatata*, L 992.274-186. — 3: *H. durvillaei*, L 992.274-257. — 4: *H. floresia*, L 992.274-421. — 5: *Coriophyllum setchellii*, L 992.274-336. — 6: *Peyssonnelia squamaria*, L 992.274-094. — 7: *Gymnogongrus spec.*, L 992.274-509. — 8: *Portieria hornemannii*, L 992.274-143.
- Plate 18:** Habit of the species belonging to the Gigartinales (scale bars = 2.5 cm; scale bars figs. 4 & 6 = 1.0 cm). — 1: *Eucheuma denticulatum*, L 992.274-107. — 2: *Eucheuma spec.*, L 992.274-230. — 3: *Kappaphycus striatum*, L 992.274-125. — 4: *Meristotheca papulosa*, L 992.274-266. — 5: *Liagora ceranoides*, L 992.274-099. — 6: *Botryocladia microphyllum*, L 992.274-340.
- Plate 19:** Habit of the species belonging to the Rhodymeniales (scale bars = 2.5 cm; scale bars figs. 2 & 4 = 1.0 cm). — 1: *Rhodymenia coacta*, L 992.274-198. — 2: *R. corallina*, L 992.274-108. — 3: *R. intricata*, L 992.274-112. — 4: *R. leptophyllia* forma *minima*, L 992.274-118. — 5: *R. pacifica*, L 992.274-109.

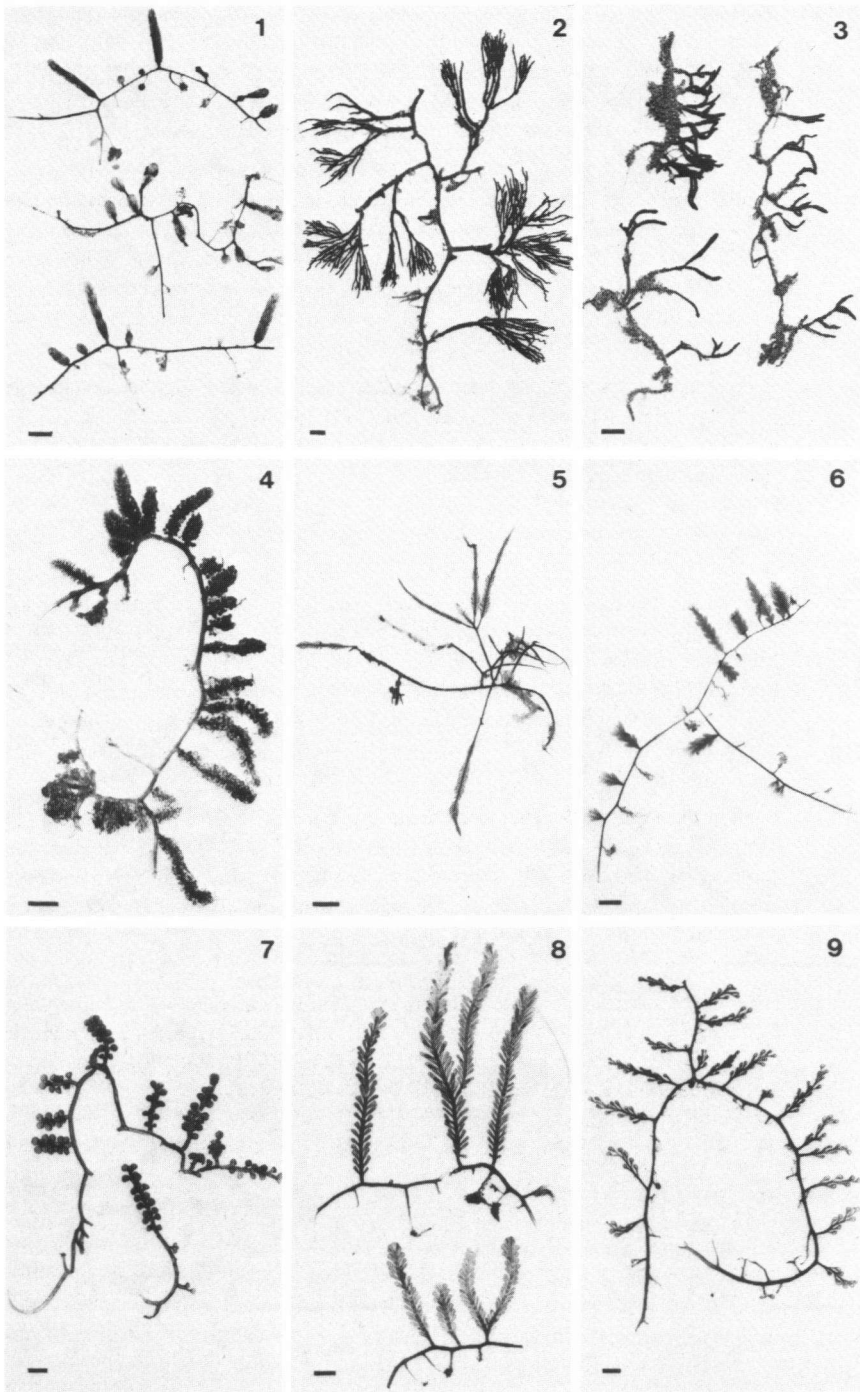


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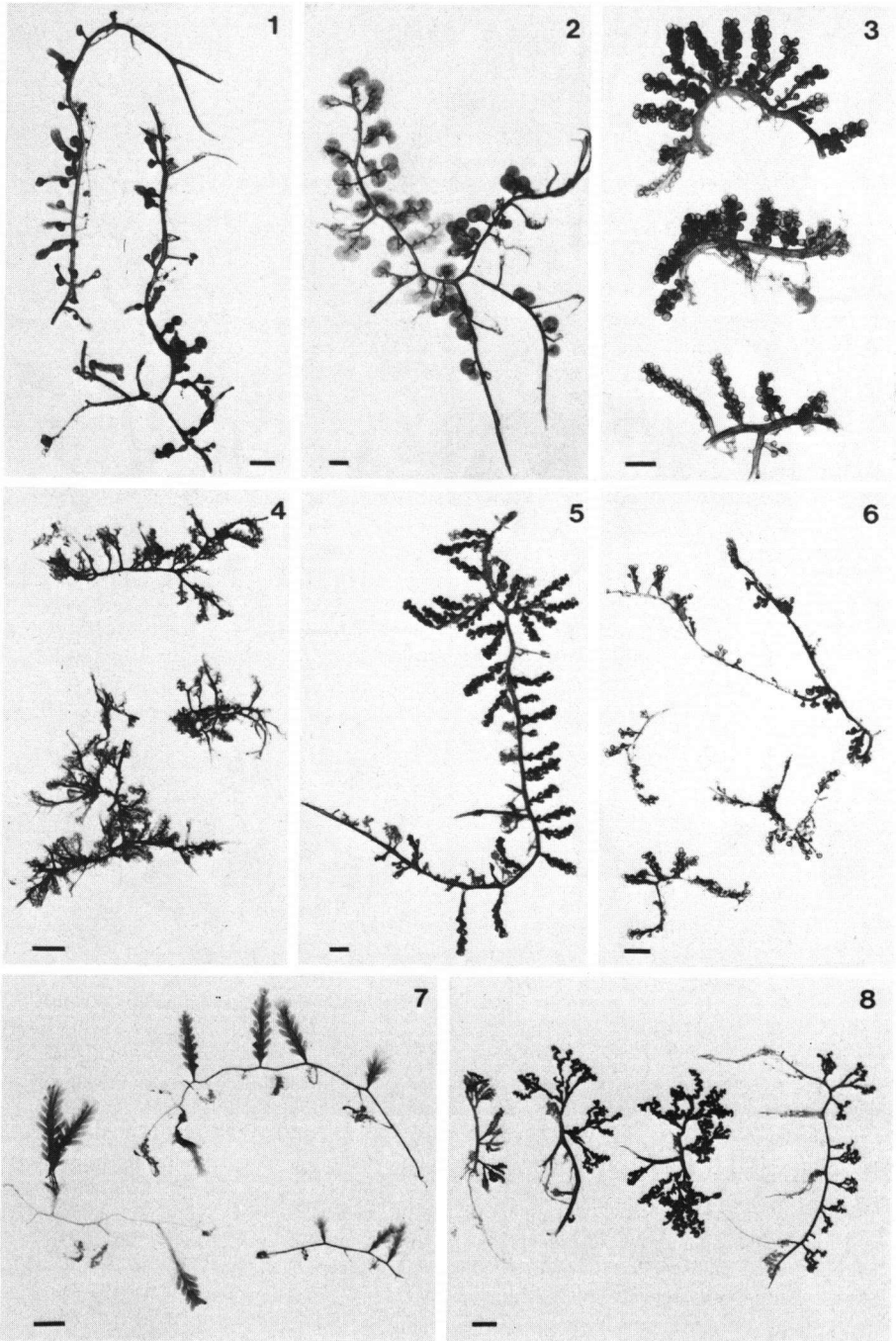


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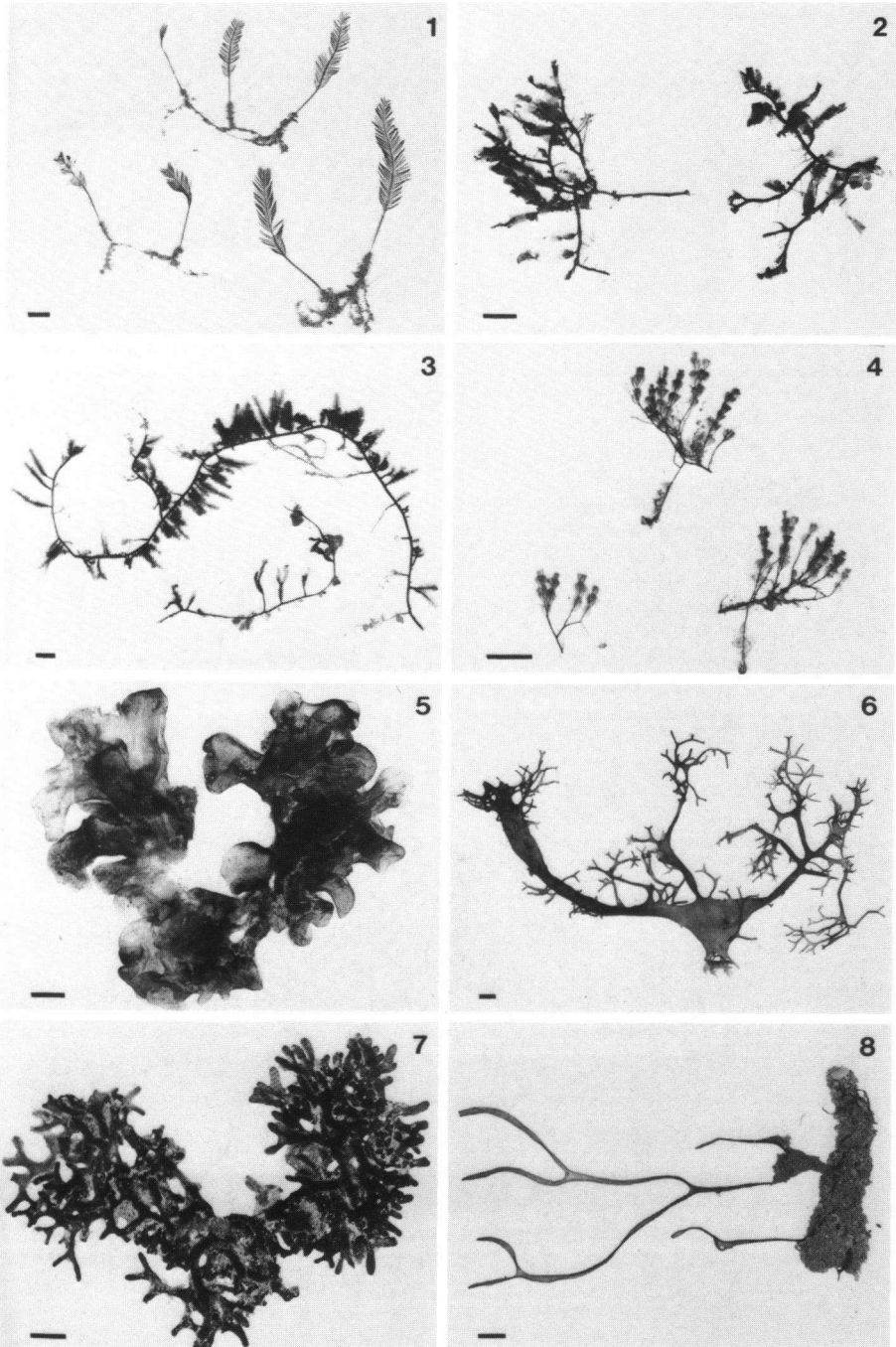


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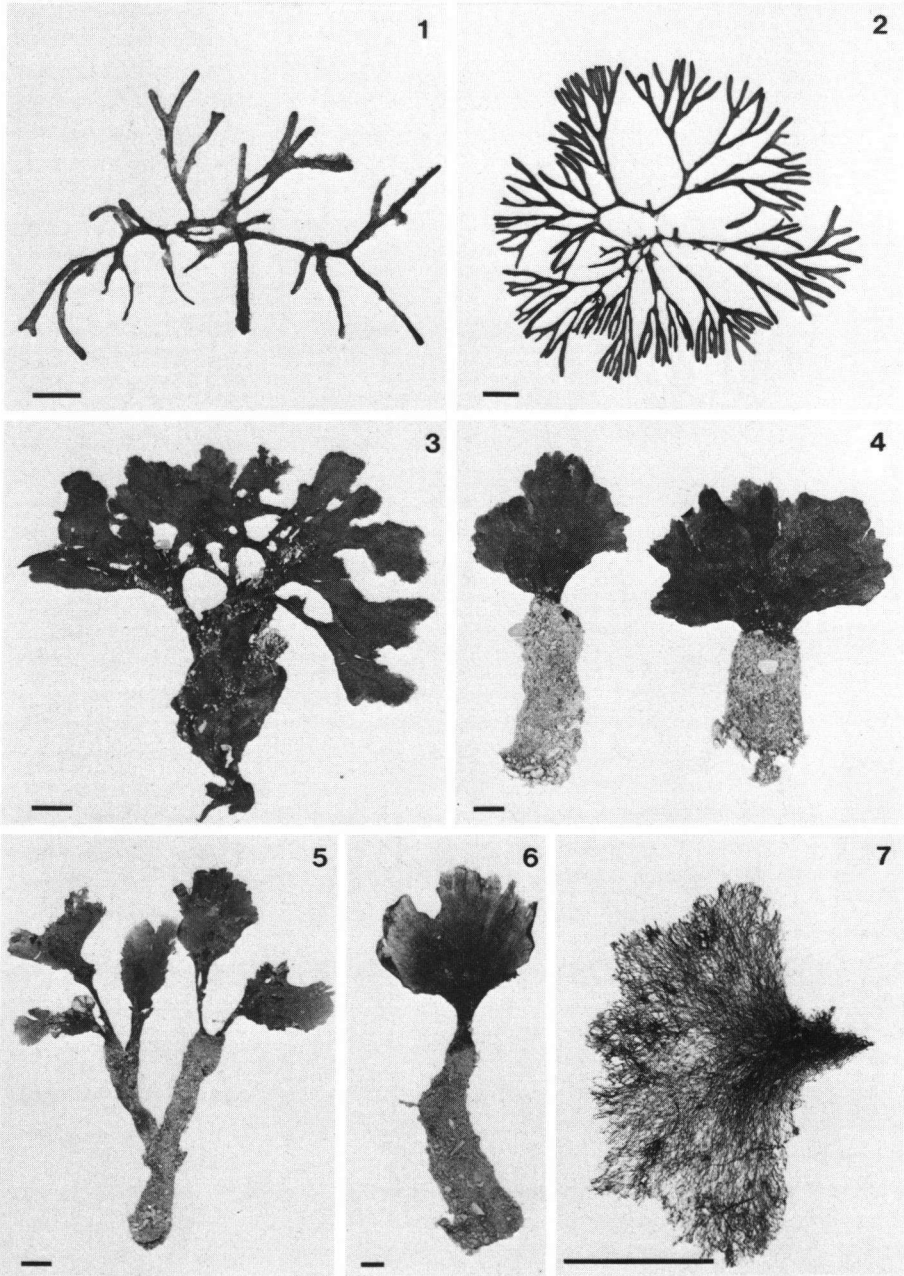


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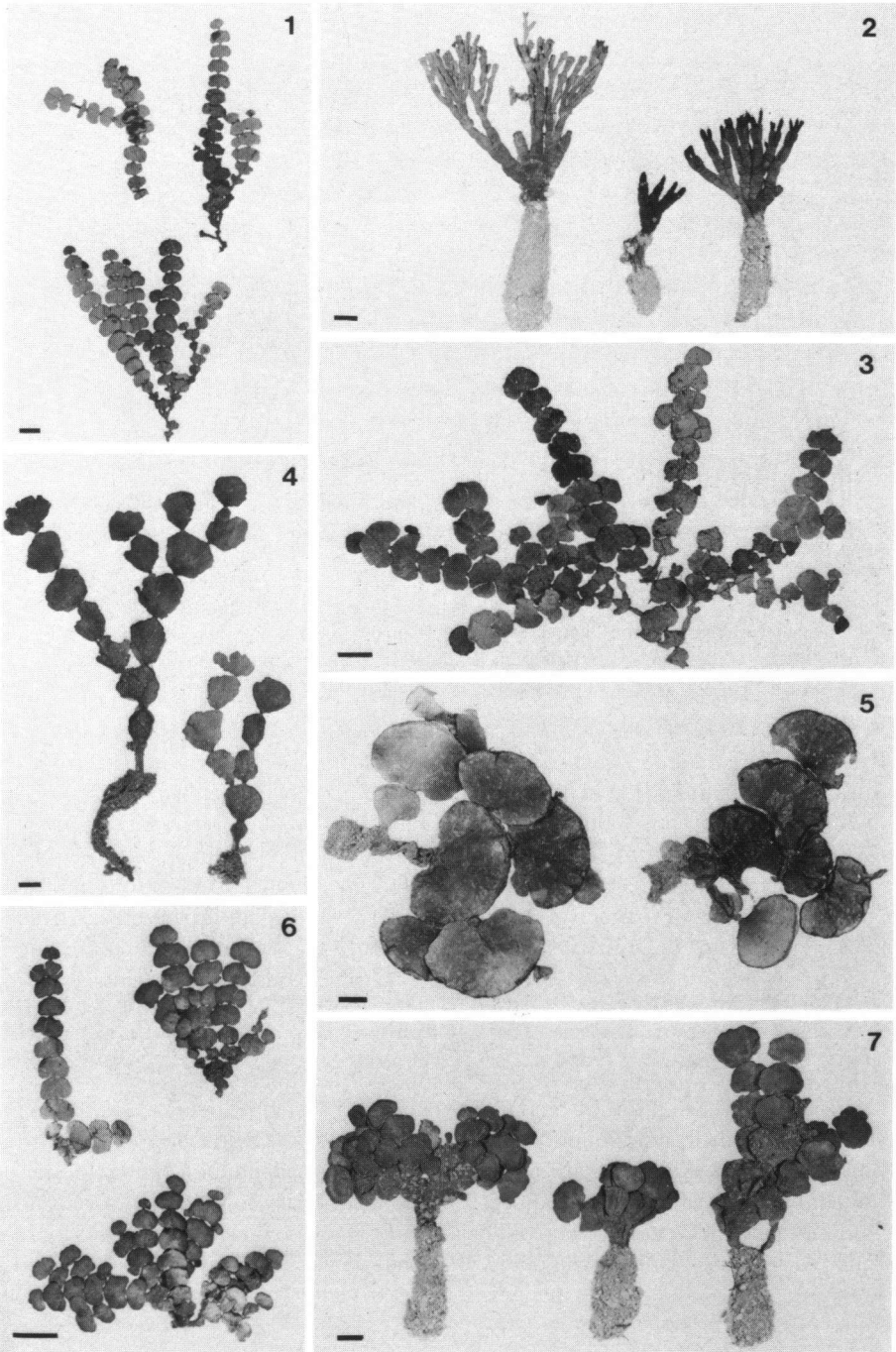


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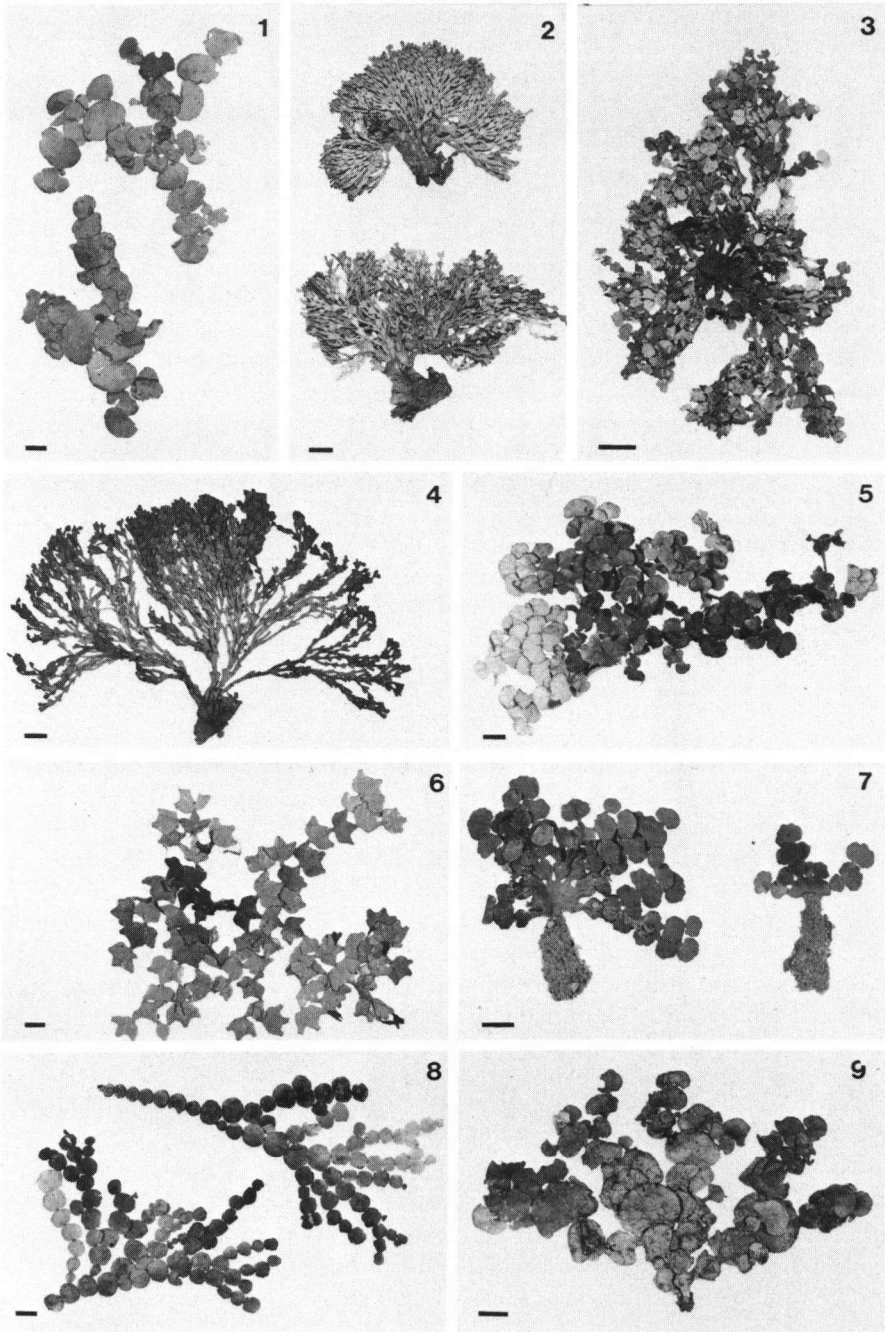


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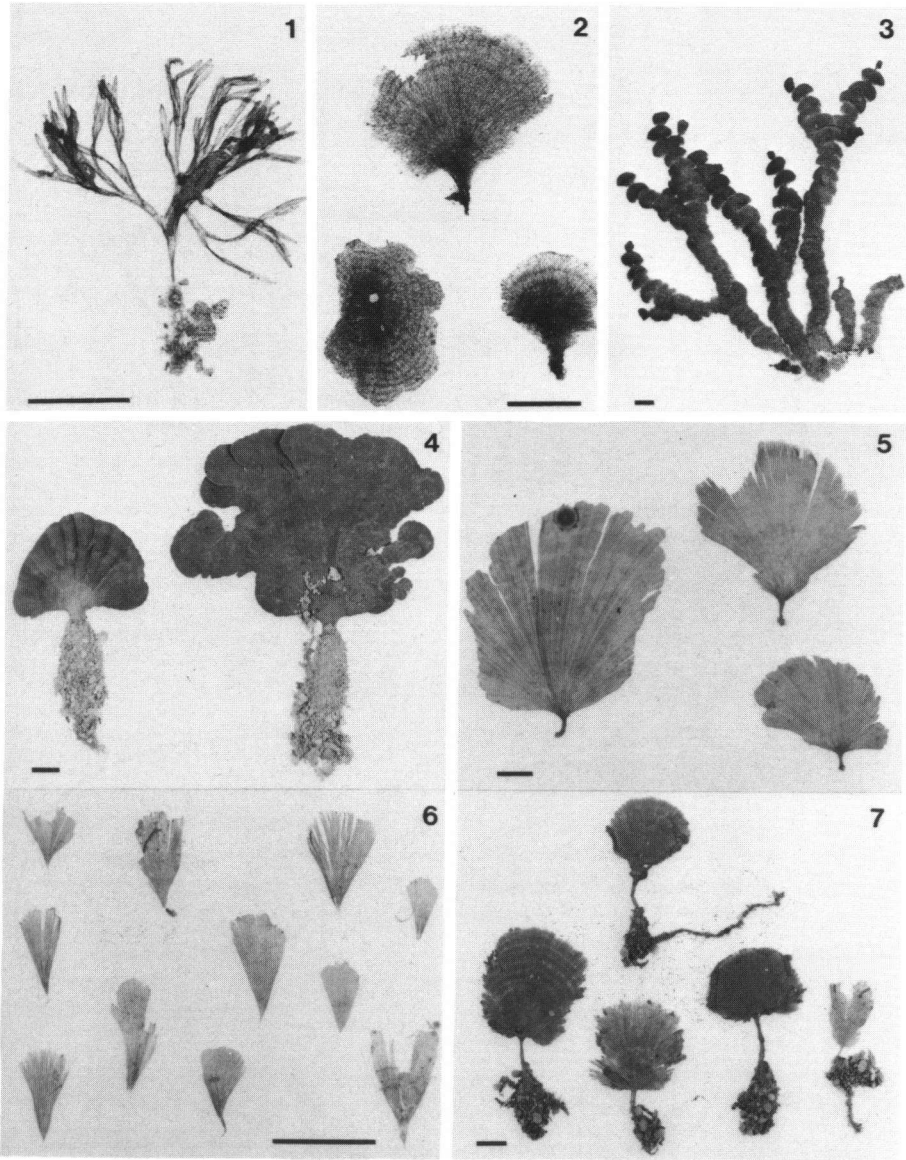


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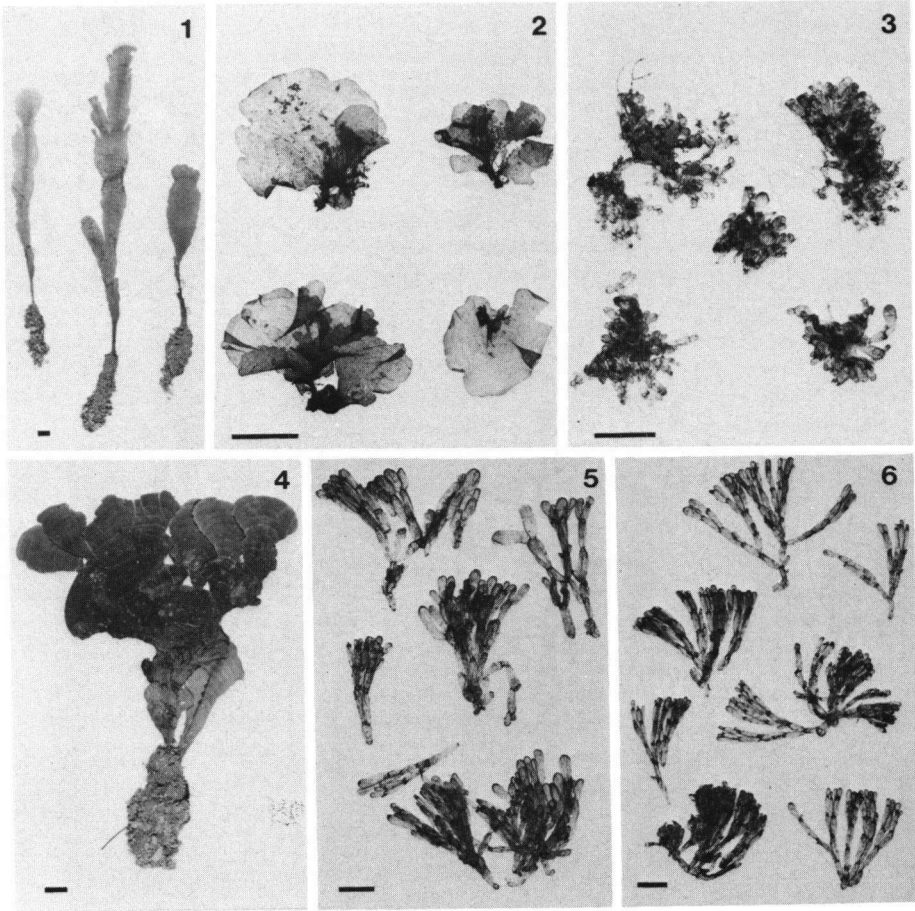


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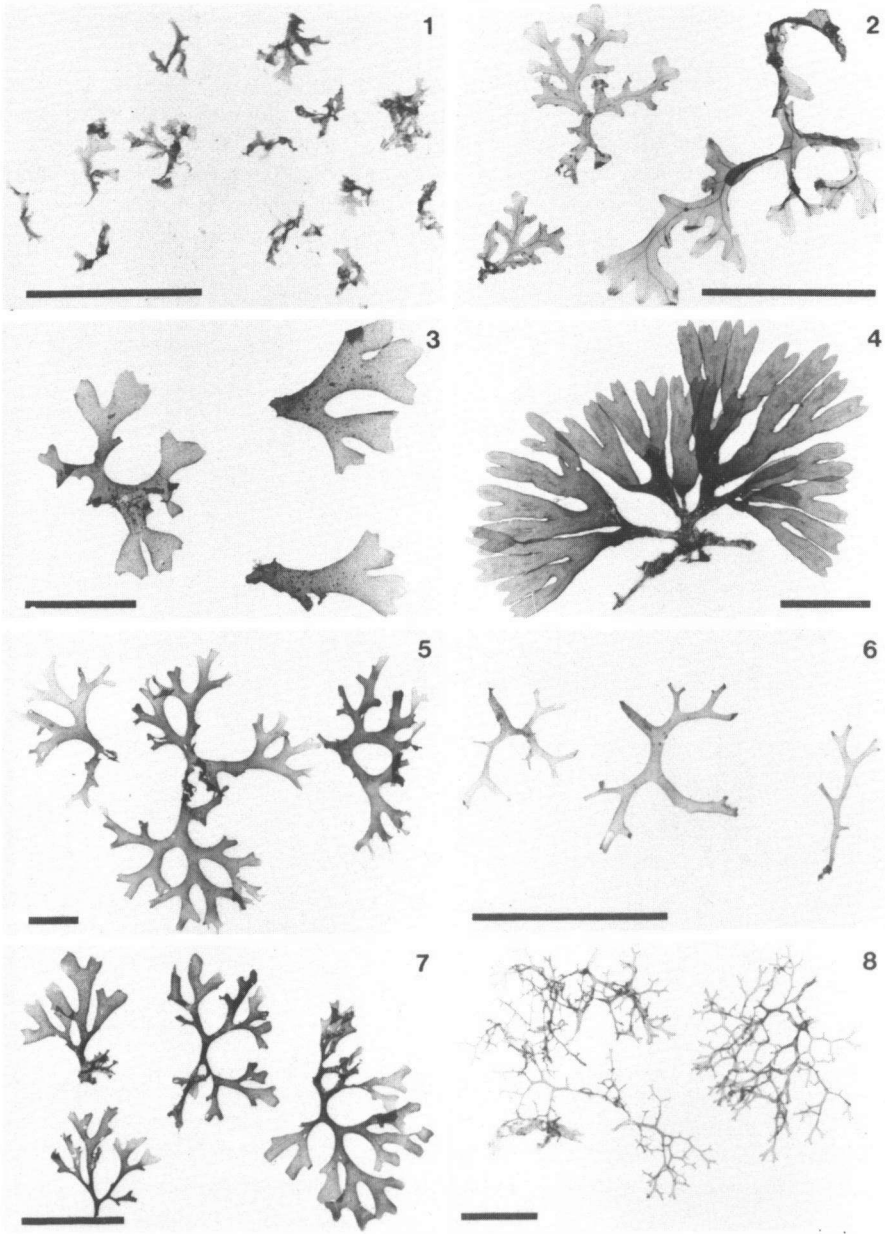


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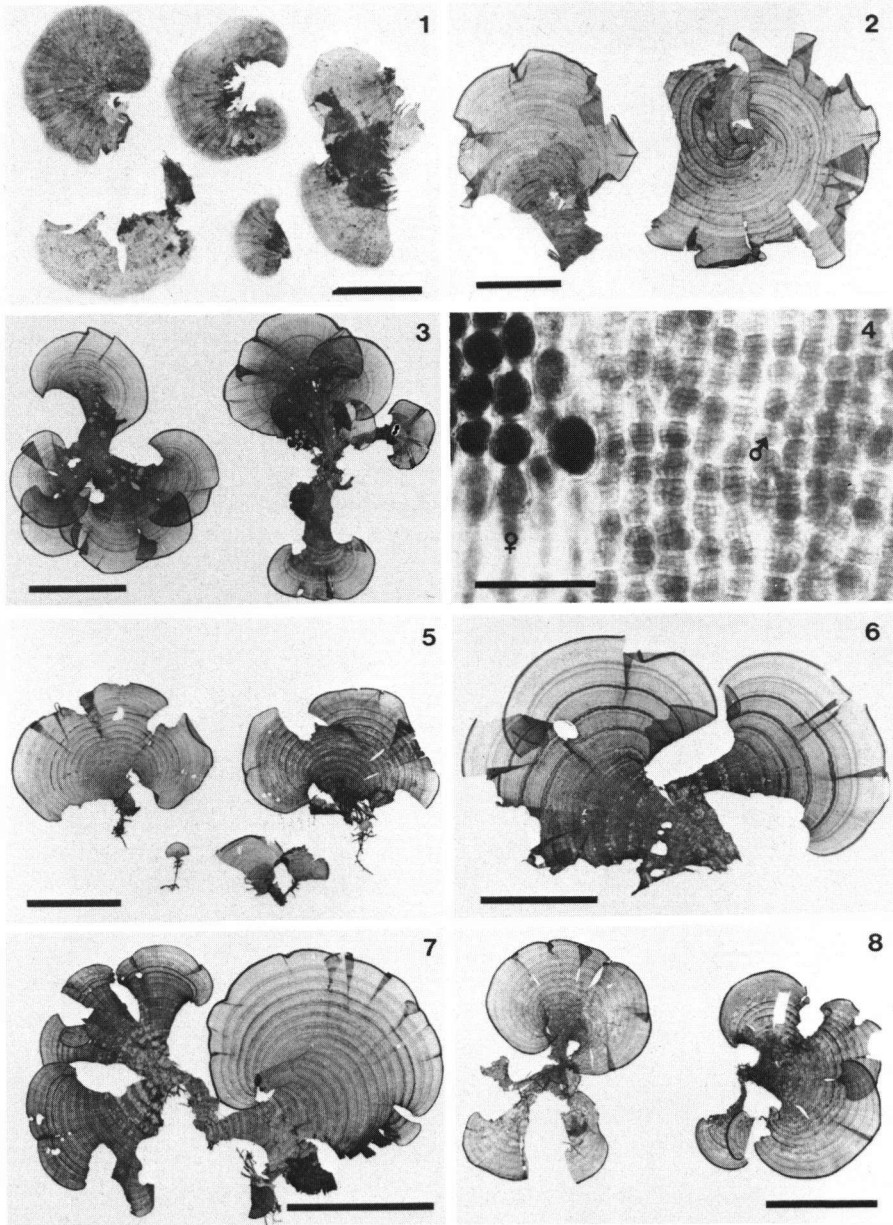


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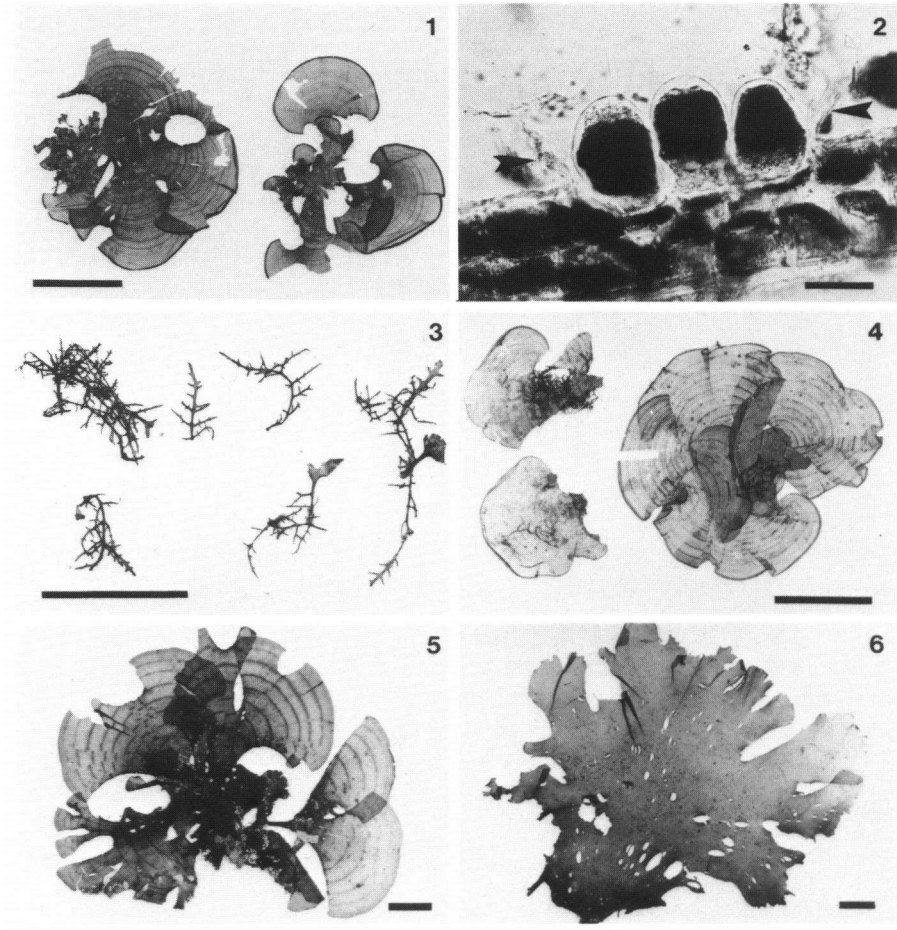


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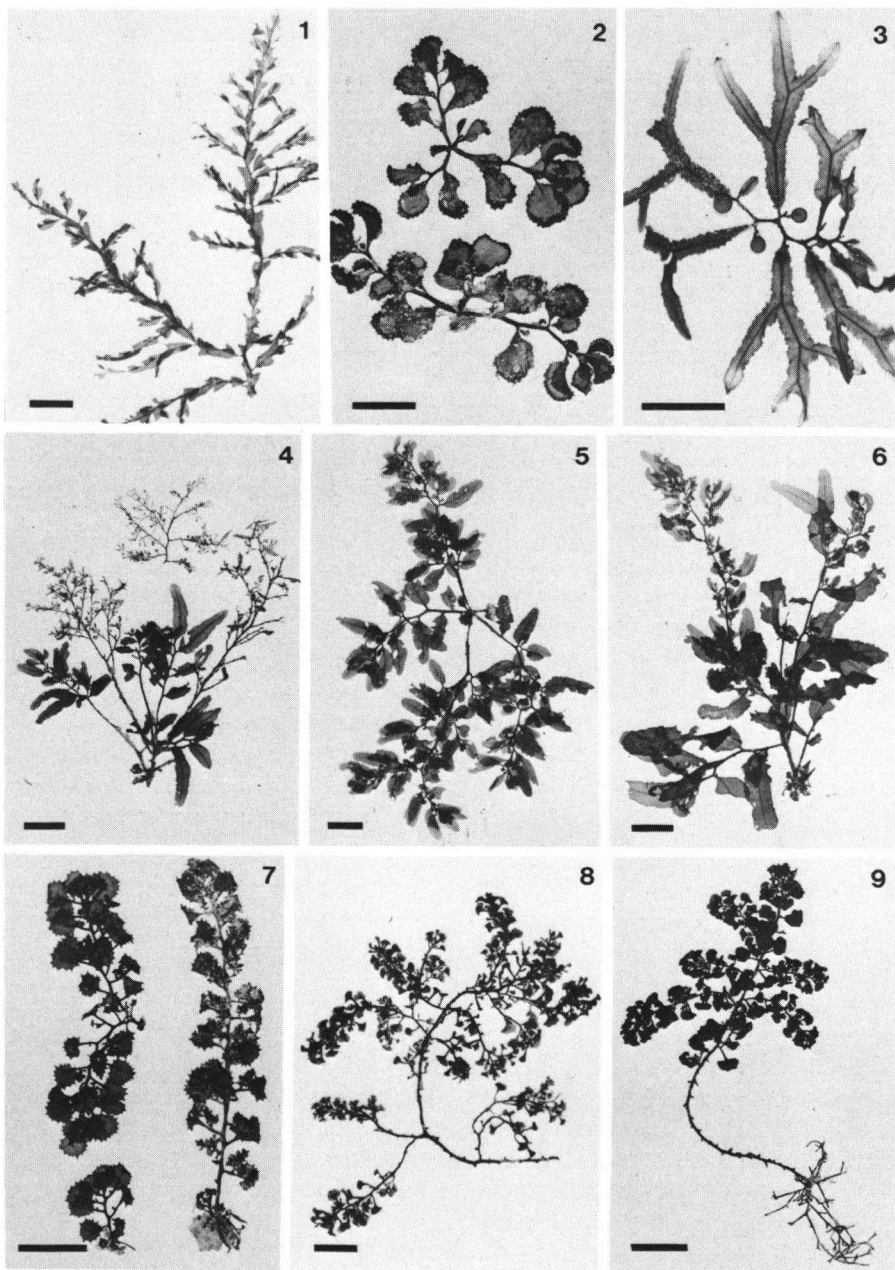


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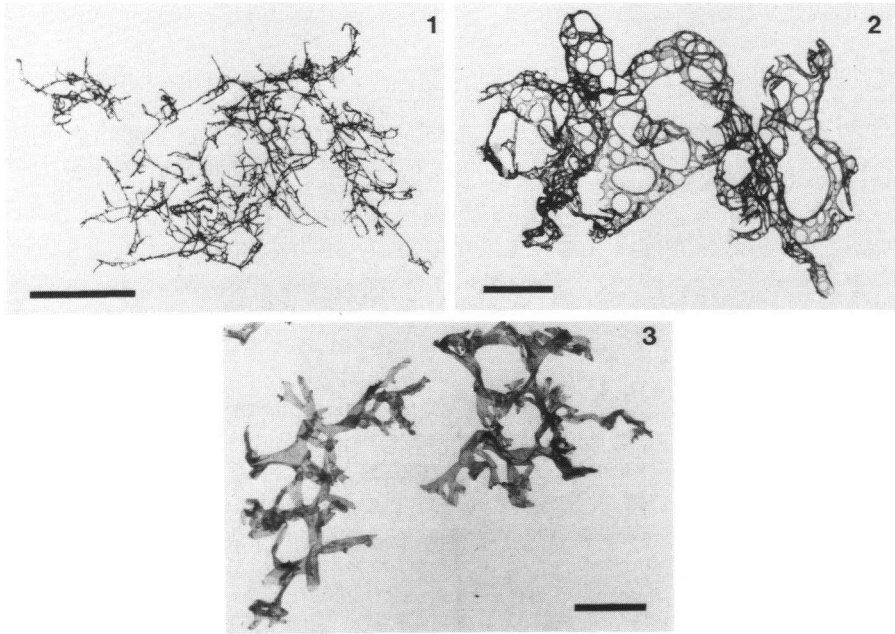


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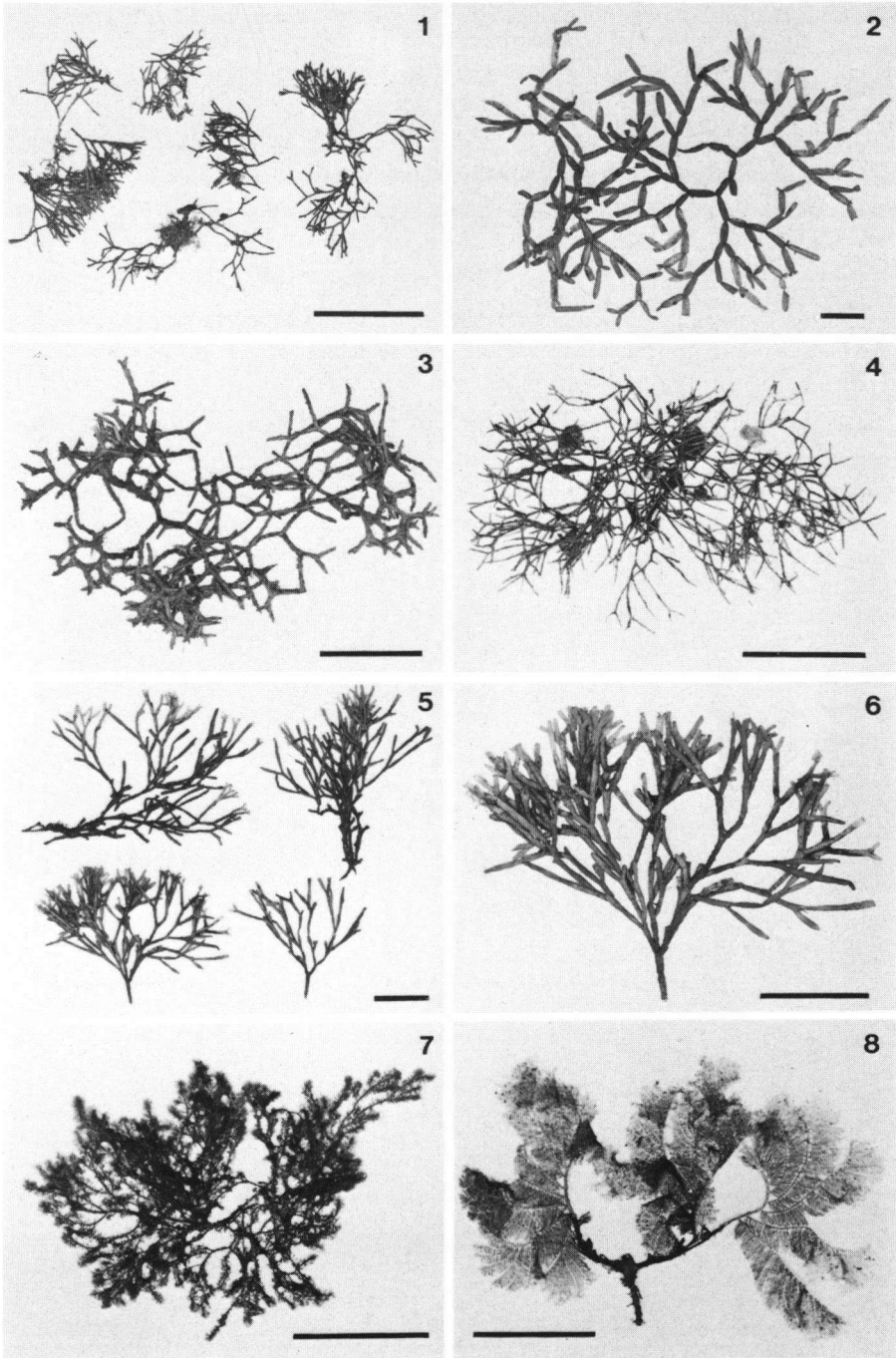


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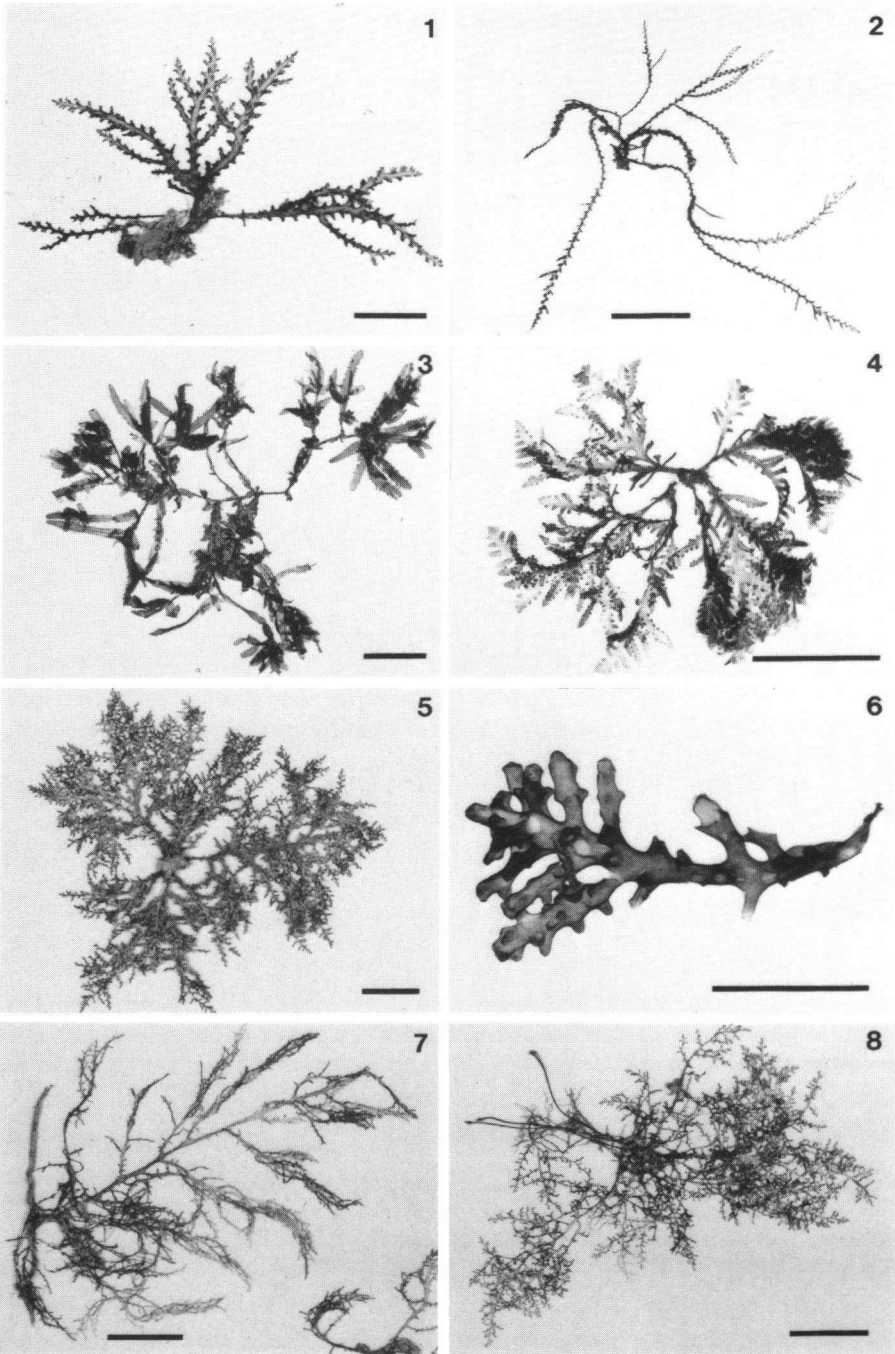


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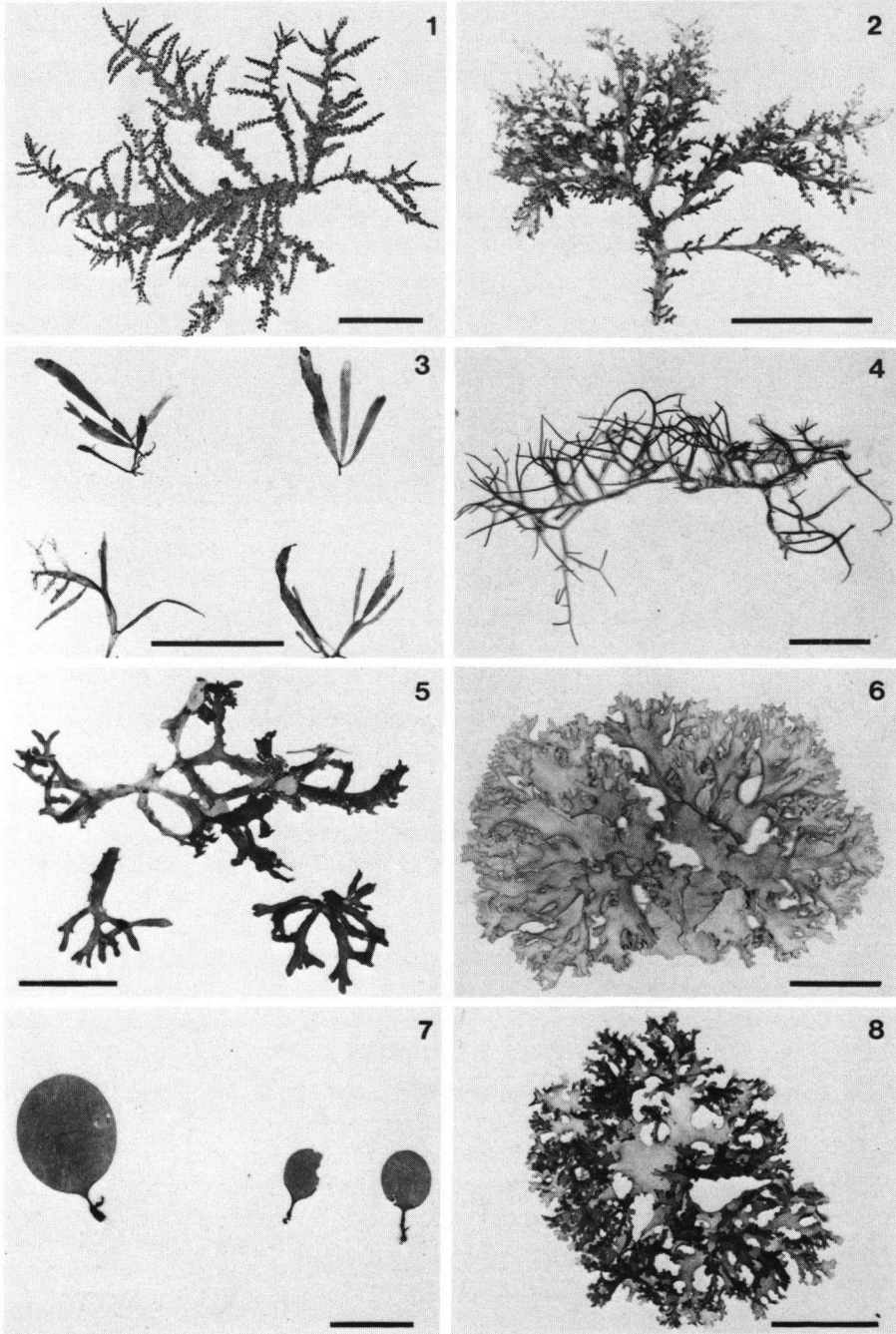


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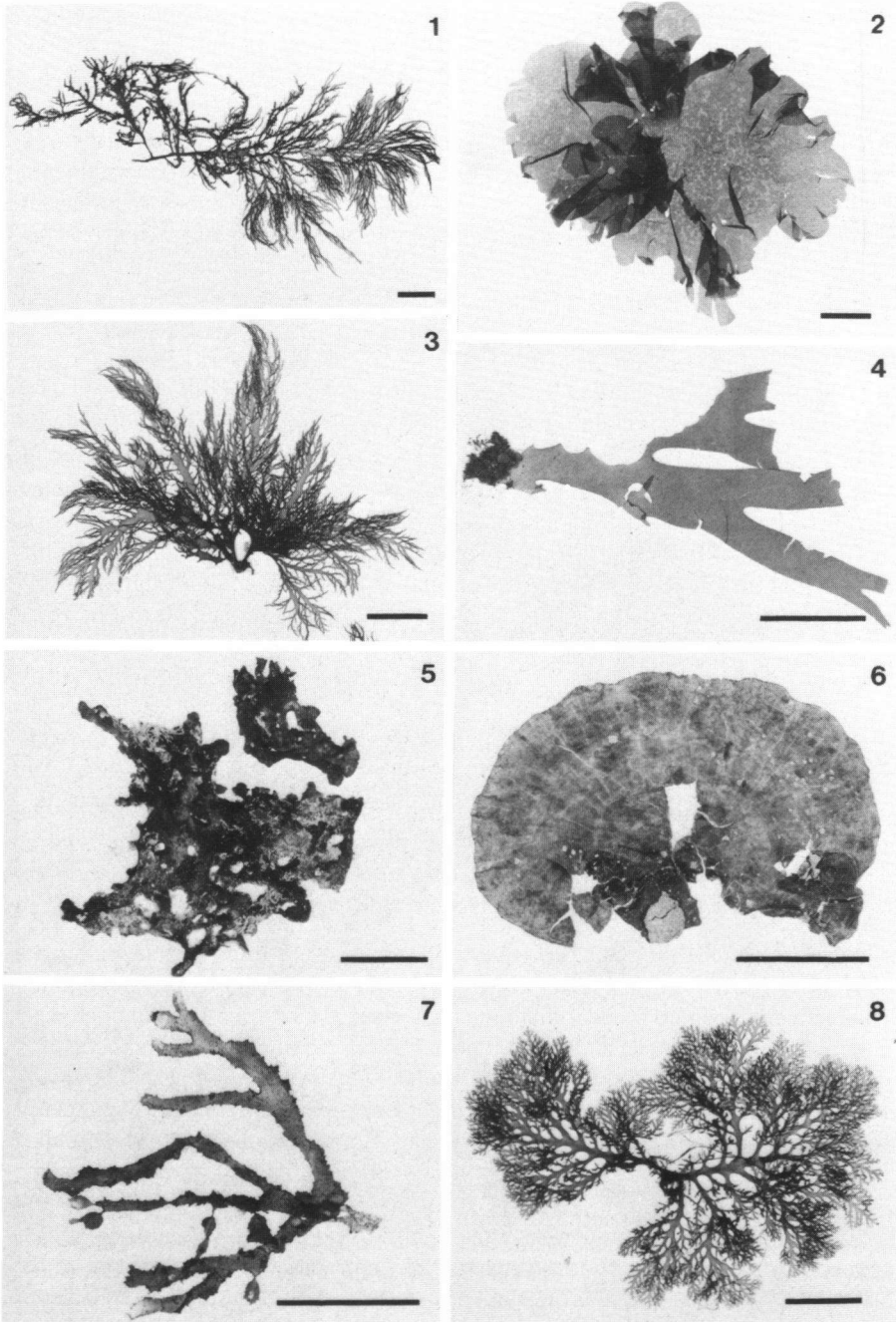


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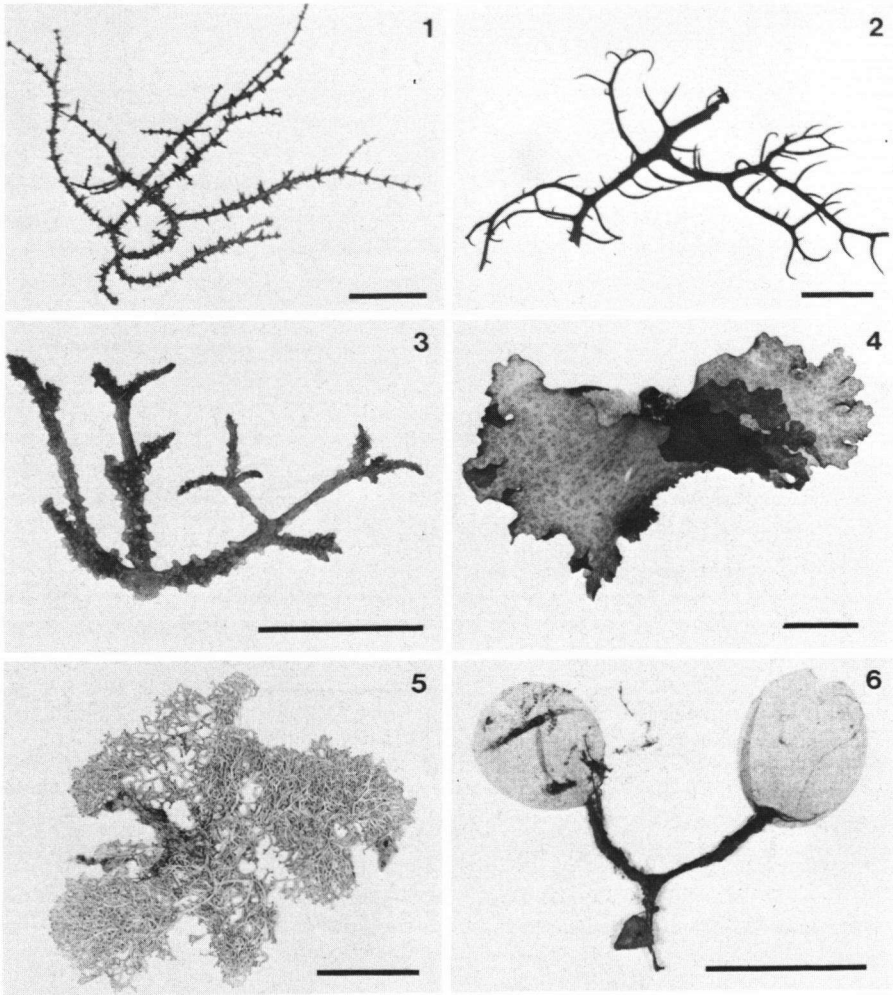


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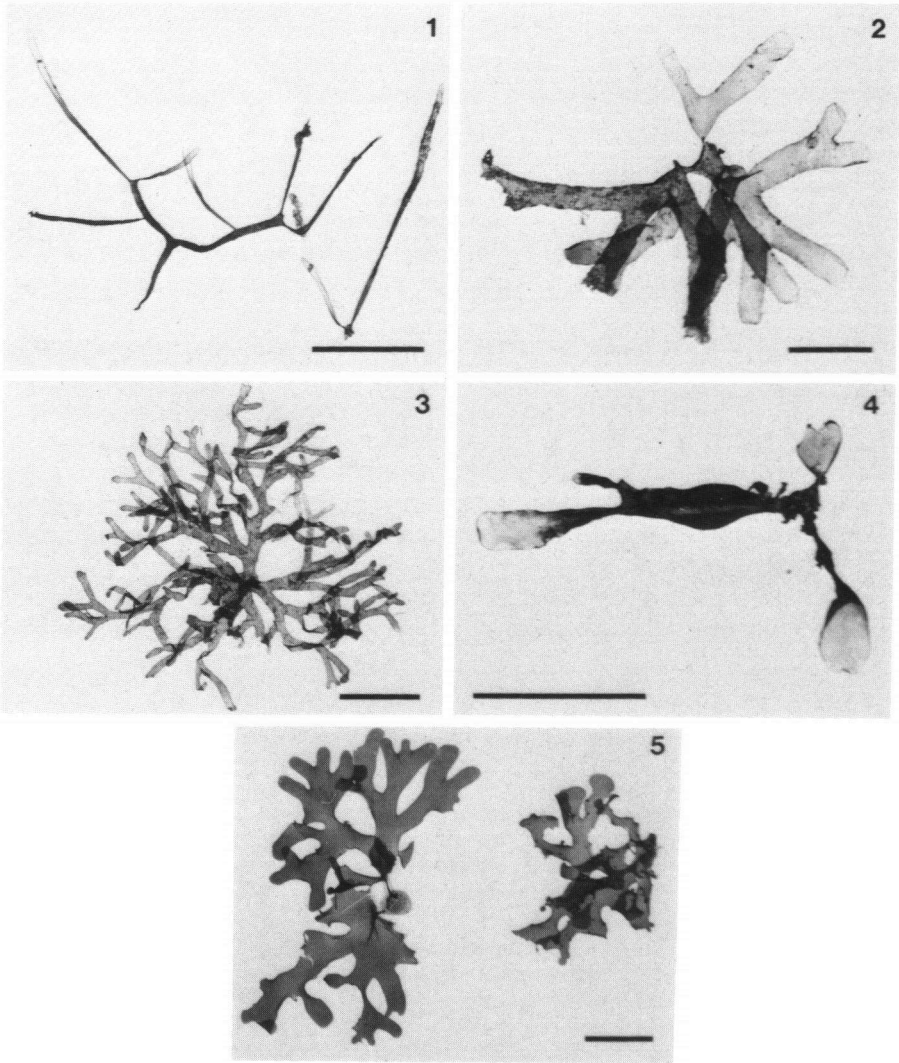


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