

## Records of Asian and Western Pacific Marine Algae, Particularly Algae from Indonesia and the Philippines

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THIRTY YEARS AGO the marine algal flora of the Philippines was practically unknown. Records of the occurrence of several species have existed, of course, from the time of Blanco (1837) onward, but they are few in number and can hardly be accepted as equivalent to current critical identifications. Strongly pressed by the late Professor H. H. Bartlett, a devoted promoter of Philippine botanical exploration and research, the present writer began the assembly of materials available in the herbaria in the United States, notably at the University of California at Berkeley. Of these the collections of the late Professor W. A. Setchell, partly determined by him, were an important part. Much material was collected on request by correspondents in the Philippines, particularly by Professors Bartlett and G. T. Velasquez, and their assistants.

For the identification of this material the descriptions by Mme. Anna Weber-van Bosse and her collaborators in the "Siboga" reports were the best available; so materials from Java were secured for comparison. Support for the study of this rich accumulation was not continuous, and other major opportunities with support came about, and so the writer's personal participation in the project languished. The project was not altogether abandoned, however. A general account of the Chlorophyceae has appeared (Gilbert, 1942, 1943, 1946, 1947, 1961), together with a brief outline of the history of algal work in the area. The Halimeda was revised in a general study of that genus (Hillis, 1959), the Padinas similarly (Thivy, 1945, *inedit.*), the Turbinarias and a few other genera studied (Taylor, 1961, 1962, 1964, 1966 in press). Significant publication has come from the University of the Philippines (Velasquez, 1952, 1957, and several papers on Myxophyceae). A number of determinations,

particularly in *Chaetomorpha*, were originally made by Professor A. J. Bernatowicz. Likewise, many specimens collected by Dr. D. P. Abbott were determined by Dr. I. A. Abbott. The writer has again been able to devote time to determining this material, and it is proposed to give here a supplementary account of Chlorophyceae and of Phaeophyceae from localities not reported earlier. This is not intended to be a complete list of all species in these groups, for some of the records published earlier could not be confirmed.

### ACKNOWLEDGMENTS

For the loan of a very large amount of material from the University of California the writer is deeply indebted to Professor G. F. Papenfuss, for other materials to the curators at the New York Botanical Garden, the Farlow Herbarium, Cambridge, the U. S. National Museum, the Rijksmuseum, Leiden, the Naturhistorisches Museum, Vienna, the Museum Nationale d'Histoire Naturelle, Paris, the British Museum (Natural History), London, and the Naturhistoriska Riksmuseum, Stockholm. Specimens frequently received from Dr. H. M. Burkill (Botanic Gardens, Singapore) have been very valuable for comparison. Those from Dr. D. P. Abbott have extended many records southward in the Philippines. Dr. H. T. Croasdale has kindly provided the Latin descriptions necessary. Support for the project has come from the Faculty Research Fund of the Horace Rackham Graduate School of the University of Michigan and, lately, from the National Science Foundation, Washington, D. C.

### EXPLANATION OF TREATMENT

Because of the many station records offered here, an explanation of the pattern of treatment is in order. Since a great proportion of the specimens are in the herbarium of the University of California at Berkeley, only nonconforming cases are noted. The dates given are of the 20th century unless otherwise stated fully.

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Collector's initials may be ascertained from the list given below. Troublesome as it is to establish a system, papers in which localities are not treated in any geographic order are all but useless to the phyto-geographer. Here stations are cited from the Philippines southward and eastward in the northern hemisphere and then from Malaya eastward in the southern. Islands of archipelagos are generally listed from north to south, provinces and stations clockwise from the north around them. Great difficulty was met in dealing with station names from several languages or dialects, often recorded phonetically. An effort has been made to secure conformity and proper sequence, using in particular the map of the Philippine Republic issued by the J. P. Juan Co. of Ermita, Manila (1960), to some extent the maps of the United States War Department Corps of Engineers 1:50,000 series issued about 1945, and especially the gazetteers of the United States Board on Geographical Names. Considerably less satisfaction was achieved with respect to Indonesian localities.

The chief collectors were: Abbott, D. P.; Alcasid, G. L.; Balhani (Moro fisherman); Bano, G. E.; Bartlett, H. H.; Birtwhistle, W.; Blanco, G. J.; Christopherson, E.; Clemens, M. J.; Collado, E. G.; Copeland, E. B.; Corner, E. J. H.; Crus, M. T.; Curran, H. M.; Edaño, G.; Erlanson, E. W.; Fénix, E.; Fosberg, F. R.; Guitterez, E.; Henderson, M. R.; Janaki-Ammal, E. K.; Keefe, A. M.; Kienholz, R.; Kostermans, A. J.; Kruckeberg, A. R.; Manacop, P. R.; Mangubat, L.; McGregor, R. C.; McKern, W. C.; Medina, E.; Merrill, E. D.; Metraux, E. M.; Möller, H.; Moore, G. C.; Newhall, P. M.; Nur, M.; Oie Yong Seng; Pullai, R. S.; Quisumbing, E.; Radin, R.; Ramirez n.n.; Ramos, M.; Robinson, C. B.; Rosario, F. del; Santos, J. V.; Setchell, W. A. (often with C. B. Setchell); Shaw, W. R.; Vasconcellos, M.; Vatter, A. E., Jr.; Velasco, D.; Velasquez, G. T.; Vivas, F.; Yates, H. S.

## CHLOROPHYCEAE

## ULVALES

## ULVACEAE

*Enteromorpha* Link, 1820*Enteromorpha flexuosa* (Wulf.) J. Ag.

PHILIPPINES. Batanes Pr., Batan I., McGregor, vi 07. Luzon I.: Cagayan Pr., Calayan I., McGregor P43, 03, Gonzaga, Edaño 77293, 94, x 29; Quezon Pr., Tualog, Ramos and Edaño 29165, v 17; Rizal Pr., Malata, McGregor, 14 i 05; Ilocos Sur Pr., Magsingal, Collado 9, vi 20. Palawan Pr., Balabac I., Mangubat 519, iii-iv 06. INDONESIA. Bali: Kampoengan, Setchell BK4, 19 vi 29, Sanoer, Setchell BS137, 7 vi 29.

f. *submarina* Coll. and Herv.—PHILIP-

PINES. Luzon I.: Rizal Pr., Malabon, Quisumbing 262e, 16 x 31, Pasay Beach, McGregor 20 ii 15, Las Piñas, Quisumbing 6, 16 x 31. These may all be marine records. In the Berkeley herbarium there are several collections from freshwater localities in Batangas, Rizal, and Bataan provinces.

*Enteromorpha lingulata* J. Ag.

PHILIPPINES. Luzon I.: Rizal Pr., Pasay Beach, McGregor P44, v 14, Manila Bay, Merrill 4113, iv 05; Pangasinan Pr., Hundred Islands, Santos 1153, 9 v 38; Ilocos Norte Pr., Bonbon, Blanco 3067, 35. MARIANAS ISLANDS. Guam I., Nelson 500, 18, mouth of Pago R., Vatter 21, 25 i 46 (but cells rather large). MALAYA. Singapore, Holtum, 28-30. INDONESIA. Bali, Panganan, Setchell BP40, 46, 17 vi 29, Sanoer, Setchell BS136, 139, 7-15 vi 29.

*Enteromorpha ramulosa* (J.E. Smith) Hooker, *prox.*

PHILIPPINES. Luzon I.: Rizal Pr., Parañaque, Cruz 19550, viii 33; Ilocos Sur Pr., Magsingal, Collado, vi 20.

*Enteromorpha spinescens* (Kütz.) Kütz.

PHILIPPINES. Luzon I.: Ilocos Norte Pr., Paoay, Blanco 3074, ii 35.

*Monostroma* Thuret, 1854*Monostroma latissimum* (Kütz.) Wittr.

PHILIPPINES. Palawan Pr., Palawan I., Taytay, Merrill 9157, iv 13.

*Ulva* Linn., 1753*Ulva fasciata* Delile

INDIA. Travancore St., Trivandrum, Janaki and Erlanson, i 32, Cape Comorin, Janaki, 17 xii 32. INDONESIA. Sumatra: Belimbing, Kostermans 798, 20 x 38 (MICH). Java: Oedjoengkoelon, Kostermans 665, 18 x 38 (MICH), Pajoeng I., Kostermans 473, 14 x 38 (MICH), Parangtritis, Setchell JP451, Pameungpeuk, Setchell JP610, 613b, 617, 26 v 29, "South Coast," Teysman n.d. Bali: Panganan, Setchell BP79, 17 vi 29, Karang Asem, Pullai BK374, vi 33, Sanoer, Setchell BS150a, 198, 200, 15 vi 29.

*Ulva lactuca* L.

INDIA. Madras St., Krusadai I., Galaxie Reef, Janaki 924, 23 vi 32. PHILIPPINES. Luzon I.: Batanes Pr., Batan I., McGregor, vi 07; Cagayan Pr., Calayan I., McGregor, vi 07, Dalipuri I., Bartlett 15023, 31 x-5 xi 35 (MICH), Menabel, Edaño 78985, iv 30; Rizal Pr., Manila Bay, Ramirez 1, 5, 22 vi 35 (MICH); Ilocos Norte Pr., Bonbon, Blanco 3060, 35. INDONESIA. Moluccas: Ambon I., Robinson 575, 8 viii 13.

*Ulva reticulata* Forssk.

INDIA. Madras St., Krusadai I., Galaxie Reef, Janaki 26 vi 32 (MICH). PHILIPPINES. Luzon I.: Cagayan Pr., Menabel, Edaño, iv 30. Bohol Pr., Bohol I., Dimiao, McGregor, 4 vii 06. Cebu Pr., Bantayan I., McGregor, viii 06, Liloan, Bartlett 16204, 20 ii 35 (MICH). Mindanao I.: Zamboanga Pr., Pangapuyan I., Balhani 466, i-ii 41 (MICH), Lanhil I., Balhani 153, i-ii 41 (MICH). Basilan Pr., Sangboy I., Balhani 231, i-ii 41 (MICH), Saluping I., Balhani 871, i-ii 41 (MICH), Baluk-Baluk I., Balhani 731, 732, i-ii 41 (MICH). Sulu Pr., Tapul Group, Laminusa I., Abbott, 29 i 57 (BISH), Tawitawi I., Abbott, 12 ii 57 (BISH), Sitankai Reef, Yates 36275, x 19. MALAYA. Singapore, St. Johns I., Corner 23198, 31 xi 29. INDONESIA. Sumatra: Belimings, Kostermans 780, 17 x 38 (MICH), "Sunda Strait" Teysman (MICH). Java: Taboehan, Kostermans 635, 17 x 38 (MICH). Bali: Sanoer, Setchell BS199, 15 vi 29, Kampoengan, Setchell BK22, 23, 19 vi 29.

CLADOPHORALES  
CLADOPHORACEAE

*Chaetomorpha* Kützing, 1845*Chaetomorpha aerea* (Dillw.) Kütz.

INDONESIA. Java: Pameungpeuk, Setchell JP631j, 26 v 29.

*Chaetomorpha antennina* (Bory) Kütz.

INDONESIA. Sumatra: Benkuelen, v. Martens, 20 v 62. Java: Pameungpeuk, Setchell JP617, 618, 26 v 29, Parangtritis, Setchell JP454, 460, 461, v 29.

*Chaetomorpha brachygona* Harv.

PHILIPPINES. Luzon I.: Rizal Pr., Pasay Beach, McGregor, 28 ii 14 (in part).

*Chaetomorpha crassa* (C. Ag.) Kütz.

MALAYA. Singapore, Holttum 1928-30.

*Chaetomorpha gracilis* Kütz.

INDONESIA. Java: Tandjong Priok, Sandpoort, Setchell JT576, v 29.

*Chaetomorpha indica* Kütz.?

INDONESIA. Java: Pameungpeuk Reef, Setchell JP613g, 26 v 29. Filaments 70-100µ diam, cells 1.0-1.5, rarely 3 diam. long. Walls thin; cells not turgid (Børgesen, 1935:12).

*Chaetomorpha linum* (Müll.) Kütz.

PHILIPPINES. Batanes Pr., Batan I., McGregor 97, vi 07. Luzon I.: Cagayan Pr., Menabel, Edaño 78995B, 5 iv 30; Albay Pr., Albay Gulf, Curran 12264, vi 08; Rizal Pr., Montalban, Merrill 5096, iii 06; Ilocos Sur Pr., Magsingal, Collado, vi 20. INDONESIA. Java: Djakarta, Sakit I., Pullai JS594, 12 ix 29, Parangtritis, Setchell JP450, 462, 463, v 29. Bali: Patas, Pullai BP346, vi 33, Panganan, Setchell BP35, 17 vi 29, Sanoer, Setchell BS182, 7 vi 29.

*Chaetomorpha spiralis* Okam.

INDONESIA. Bali: Panganan, Setchell BP37, 17 vi 29. Specimens reported from the Philippines under the name of *C. torta* should probably be referred here (Okamura, 1936:68).

*Chaetomorpha tortuosa* (Dillw.) Kütz.

PHILIPPINES. Luzon I.: Cagayan Pr., Caminguin I., McGregor, Manila F.D., Manila, Merrill 7456, i-ii 11.

*Rhizoclonium* Kützing, 1843*Rhizoclonium crassipellitum* W. and G.S. West, v. *robustum* W. and G.S. West

PHILIPPINES. Luzon I.: Rizal Pr., Las Piñas, Rosario, 4 iii 62.

*Rhizoclonium hookeri* Kütz.

PHILIPPINES. Luzon I.: Bataan Pr., Lamao, Merrill 3516, x 03. INDONESIA. Java: Panganan, Setchell JP534, v 29.

*Cladophora* Kützing, 1843*Cladophora aokii* Yamada

PHILIPPINES. Luzon I.: Bataan Pr., Limay, Shaw 1106, 24 iv 11. INDONESIA. Java: Pameungpeuk, Setchell JP597, 26 v 29. This, except for the heavy rhizoidal investment on the main axes, comes close to *C. prolifera* (Roth) Kütz.

*Cladophora fascicularis* (Mert.) Kütz.

INDIA. Madras St., Krusadai I., Janaki, 23 vi 32 (MICH). This may very well be the *C. monumentalis* Børgesen (1935:24), but the distinctions set up by him seem inadequate in view of the variability of the older species.

*Cladophora quisumbingii* n. sp.

## Fig. 1

Plants tufted, 2–7 cm tall, not blackening when dried; basal cells distinct, without rhizoidal reinforcement; branching dense, the main axes not persisting, branches below opposite or 3–4-verticillate, or irregular, those above opposite, pseudodichotomous or alternate; cells near the base femur- to club-shaped with swollen ends, above becoming more cylindrical and in the ramelli cylindrical to slightly cask-shaped, the branchlet tips blunt and often a little enlarged; near the base the median cell diameter to 450 $\mu$ , the cells about 7 diameters long, in the middle portion of the plant 270–310 $\mu$  diam, the cells 4–5 diameters long, and in the ultimate ramelli 225–360 $\mu$  diam, the cells 1.5–7.0 diameters long; cell walls below very thick (to 70–90 $\mu$ ) and often not collapsing when dried, but the walls in the ramelli about 7 $\mu$  thick. PHILIPPINES. Batanes Pr., Batan I., R.C. McGregor P45, vi 07 (UC-TYPE). Cagayan Pr., Cagayan Islands, Bawa, Edaño 78189, 3 xii 29.

Among the Philippine *Cladophoras* from Berkeley there were several mounts which seemed to be grouped under the name *C. prolifera* (Roth) Kütz., a rather improbable ascription considering the type locality of that species. Closer examination suggested the presence of at least two species: one, with rhizoids heavily covering the axes for three or even more degrees of branching from the base, which seemed to agree well with *C. aokii* Yam., while another of somewhat different habit lacked rhizoidal development altogether and was lighter in color, with heavy-walled lower cells.

From *C. aokii* the absence of rhizoids and coarser branches readily distinguish this second species. From *C. prolifera* the absence of rhizoids and lack of blackening, with details of habit, are sufficient. Some mounts bore the manuscript name of *C. quisumbingii*, which appears not to have been published, so it would seem appropriate to adopt it in recognition of the merits of the Philippine botanist, Dr. Eduardo Quisumbing.

*Cladophora quisumbingii* n. sp.

## Fig. 1

Plantae fruticulosae, 2–7 cm altae, dum siccatae, nigrae non factae; cellulae basales perspicuae, sine rhizoideis; ramificatio densa, axibus principalibus non persistentibus, rami inferiores oppositi aut 3- aut 4-verticillati aut irregulares, superiores oppositi pseudodichotomi aut alterni; cellulae prope basim femoriformes ad clavatas, extremitatibus inflatis, supra magis cylindricae, in ramellis cylindricae ad paululum cupiformes, cacuminibus ramulorum obtusis et saepe aliquantum dilatatis; prope basim diametrus cellulae media ad 450 $\mu$ , cellulis ca. 7 plo longioribus quam latae, in partibus plantae mediis cellulae 270–310 $\mu$  diam, 4–5 plo longiores quam latae, in ramellis ultimis 225–360 $\mu$  diam, 1.5–7.0 plo longiores; membranae cellularum inferiorum crassissimae (ad 70–90 $\mu$ ) dum siccatae saepe non collapse, membranae cellularum ramellorum, autem, ca. 7 $\mu$  crass. Plantae typicae in loco Batan I., Batan Pr., Rep. Philippinensis dicto, ab R.C. McGregor P45, m. Jun. 1907 lectae, in herb. Univ. Californiensis (Berkeley) depositae.

*Cladophora sibogae* Reinb.

INDONESIA. Java: Pangendaran, Setchell JP535, 536, v 29. Axes to 165 $\mu$ , branchlets to 60 $\mu$  diam.

*Cladophora socialis* Kütz.

INDONESIA. Java: Pangendaran, Setchell (det.) JP533, v 29. Axes to 80 $\mu$ , branchlets to 45 $\mu$  diam, and flagellar branchlets frequent.

SIPHONOCLADIALES  
DASYCLADACEAE*Dasycladus* C. Agardh, 1827*Dasycladus australicus* (Sond.) Cram.

PHILIPPINES. Catanduanes Pr., Catanduanes I., Calolbon, Ramos and Edaño 77262. Sporangia 360–400 $\mu$  diam, spores 66–73 $\mu$  diam, sporangia solitary-terminal on the first ramular segment. The 4 secondary segments are quickly dropped.



*Halicoryne* Harvey, 1859

*Halicoryne wrightii* Harv.

PHILIPPINES. Luzon I.: Pangasinan Pr., Hundred Islands, Santos 1154, 9 v 38. INDONESIA. Bali: Boeleng, Setchell *BB103*, 19 v 29, Karang Asem, Pullai *BK358*, vi 33, Kampo-

engan, Setchell *BK646*, vi 29, Patas, Pullai *BP344*, vi 33.

*Neomeris* Lamouroux, 1816

*Neomeris annulata* Dickie

INDONESIA. Bali: Kampoengan, Setchell *BK650c*, vi 29.

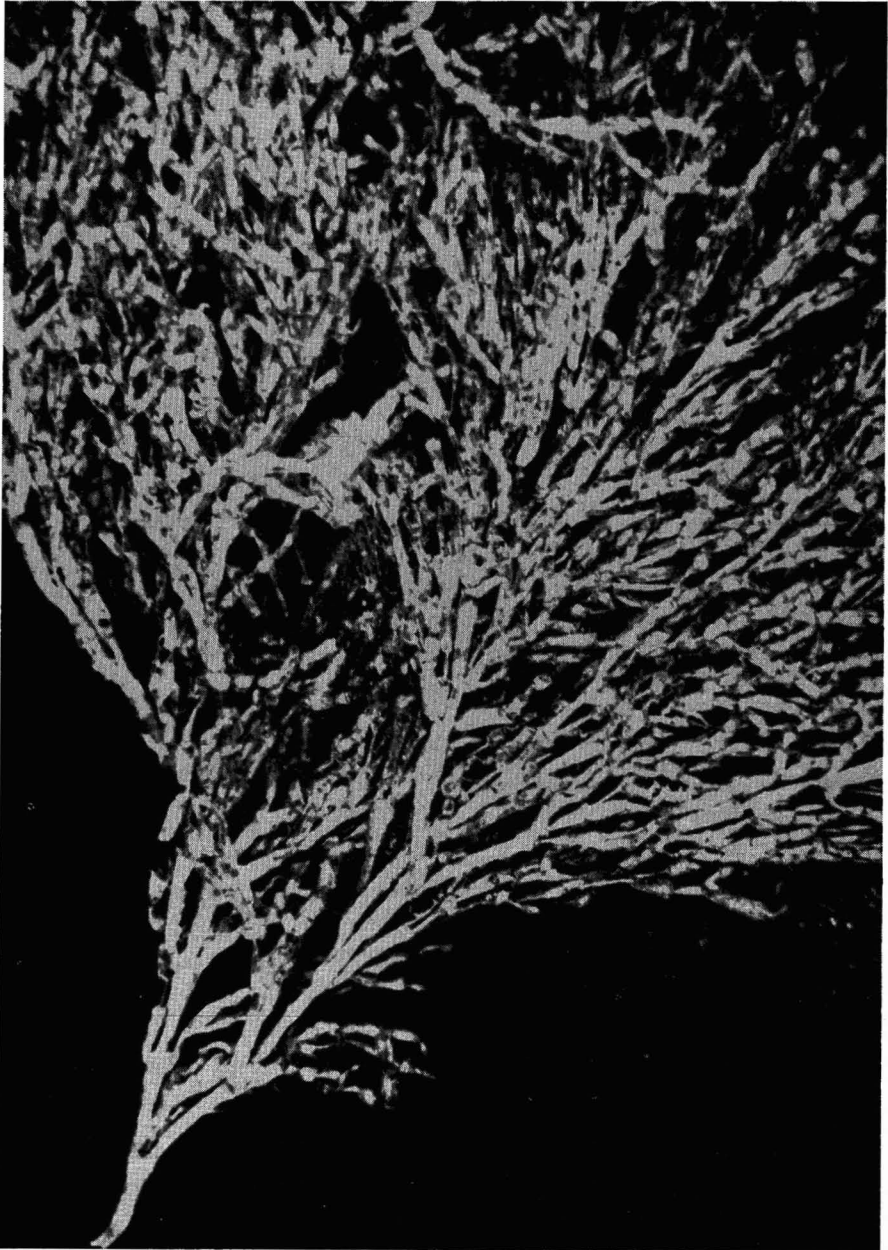


FIG. 1. *Cladophora quisumbingii*, a small plant showing the coarse branching,  $\times 65$ .

*Neomeris dumetosa* Lamour.

INDONESIA. Java: Djakarta Bay, Amsterdam I., Kostermans 410, 11 x 38 (MICH).

*Neomeris vanbosseae* Howe

PHILIPPINES. Palawan Pr., Balabac I., Abbott, 1 iii 57 (BISH). MALAYA. Singapore, Punggol, Holttum, 6 viii 28. INDONESIA. Java: Thousand Islands, Kaliage I., Kostermans 174, 5 x 38 (MICH), Tjina I., Kostermans 342, 6 x 38 (MICH), Pangendaran, Setchell 550B, 550C, v 29. Bali: Boeleleng, Setchell BB103B, 20 vi 29.

*Bornetella* Munier-Chalmas, 1877*Bornetella capitata* (Harv.) J. Ag.

INDONESIA. Java: Thousand Islands, Amsterdam I., Kostermans 415, 11 x 38 (MICH), Kaliage I., Kostermans 197 p.p., 5 x 38 (MICH), Kelapa I., Kostermans 276, 5 x 38 (MICH), Ijina I., Kostermans 346, 6 x 38 (MICH).

*Bornetella nitida* (Harv.) Munier-Chalmas

PHILIPPINES. Mindoro I.: Mindoro Oriental Pr., Puerto Galera, Medina 571, 23 iv 29. INDONESIA. Bali: Boeleleng, Setchell BB97, 19 vi 29, Kampoengan, Setchell BK3, 16 vi 29. Celebes: Macassar, Setchell M502, 503, 22-23 vi 29.

*Bornetella oligospora* Solms-Laub.

INDONESIA. Java: Thousand Islands, Kaliage I., Kostermans 173, 5 x 38 (MICH), Ijina I., Kostermans 341, 6 x 38 (MICH), Kelapa I., Kostermans 274, 5 x 38 (MICH).

*Bornetella sphaerica* (Zanard.) Solms-Laub.

PHILIPPINES. Mindoro I.: Mindoro Oriental Pr., Puerto Galera, Medina 556, n.d. Bohol Pr., Bohol I., McGregor 64, vii 06. INDONESIA. Java: Kaliage I., Kostermans 197, 5 x 38 (MICH).

*Acetabularia* Lamouroux, 1816*Acetabularia philippinensis* Gilbert

PHILIPPINES. Luzon I.: Pangasinan Pr., Anda I., Clemens 6884, 31 iii 25. Palawan Pr., Palawan I., Puerto Princesa, McGregor, x 25.

## VALONIACEAE

*Valonia* Ginnani, 1757*Valonia aegagropila* C. Ag.

PHILIPPINES. Basilan Pr., Sibakel I., Balhani, i-ii 41 (MICH). INDONESIA. Java: Djakarta Bay,

Leiden I., Kostermans 74, 28 ix 38 (MICH). Bali: Panganan, Setchell BP44, 652c, 17 vi 29. Sanoer, Setchell BS135, 141, 15 vi 29.

*Valonia fastigiata* Harv.

PHILIPPINES. Mindanao I.: Zamboanga Pr., Pangapuyon I., Balhani 174a, i-ii 41 (MICH), Cabulay I., Balhani 286, i-ii 41 (MICH). Sulu Pr., Sibutu I., Abbott, 19 ii 57 (MICH). INDONESIA. Sumatra: Lampoeng Bay, Seboekoe, Kostermans 722, 19 x 38 (MICH). Celebes I.: Macassar, Weber-van Bosse 929, xi 88 (MICH).

*Valonia ventricosa* J. Ag.

PHILIPPINES. Cebu Pr., Cebu I., Minglanilla, McGregor, 16 x 06. Sulu Pr., Sibutu I., Abbott, 19 ii 57 (BISH). INDONESIA. Java: Thousand Islands, Ijina I., Kostermans 345, 6 x 38 (MICH).

*Boergesenia* Feldmann, 1938*Boergesenia forbesii* (Harv.) Feldm.

PHILIPPINES. Luzon I.: Cagayan Pr., Calayan I., McGregor, vi 07; Ilocos Norte Pr., Currimao, Bartlett 14972, 14973, 28 x 35 (MICH). INDONESIA. Sumatra: Belimbing, Kostermans 757, 20 x 38 (MICH). Java: Oedjoengkoelon, Kostermans 662, 18 x 38 (MICH), Djakarta Bay, Amsterdam I., Kostermans 414, 11 x 38 (MICH), Leiden I., Kostermans 75, 28 ix 38 (MICH), Ijina I., Kostermans 344, 6 x 38 (MICH), Pangendaran, Setchell JP630, v 29.

*Valoniopsis* Børgesen, 1934*Valoniopsis pachynema* (Mart.) Børg.

PHILIPPINES. Luzon I.: Cagayan Pr., Babuyan Islands, Dalupiri I., Bartlett 15027, 35 (MICH); La Union Pr., San Fernando, Fénix 13007, xii 10. These were confirmed earlier (Taylor, 1961), but in general Philippine records were at that time referred to *Cladophoropsis philippinensis*. INDONESIA. Sumatra: Benkuelen, *ex herb.* v. Martens and probably an isotype specimen. Java: Oedjoengkoelon, Kostermans 661, 18 x 38 (MICH). Taboehan, Kostermans 663, 17 x 38 (MICH), Parangtritis, Setchell JP464, v 29, Pangendaran, a particularly fine mount, Setchell JP531, v 29, Pameungpeuk, Setchell JP596, 619b, 26 v 29. Bali: Karang Asem,

Pullai BK367, vi 33, Sanoer, Setchell BS140, 7 vi 29, Panganan, Setchell BP14-43, 46a, 17 vi 29.

*Dictyosphaeria* Decaisne, 1842

*Dictyosphaeria cavernosa* (Forssk.) Børg.

PHILIPPINES. Luzon I.: Batangas Pr., Batangas Channel, Bartlett 14615, 35 (MICH). Palawan Pr., Palawan I., Taytay, Merrill 9045, iv 13, Puerto Princesa, Santos 703, 8 iv 37 (MICH). Sulu Pr., Tawitawi I., Abbott, 12 ii 57 (BISH), Tijiitiji Reef, Abbott, 15 ii 57 (BISH), Sibutu I., Abbott, 17 ii 57 (BISH), Sitankai Reef, Abbott, 17 ii 57 (BISH), Turtle Islands Balabac I., Abbott, 2 iii 57 (BISH). MALAYA. Singapore, Binder n.d., St. Johns I., Corner 23677, 31 xii 29. INDONESIA. Java: Djakarta Bay, Amsterdam I., Kostermans 418, 11 x 38 (MICH), Kelapa I., Kostermans 298, 5 x 38 (MICH).

*Dictyosphaeria intermedia* Weber-van Bosse

PHILIPPINES. Luzon I.: Cagayan Pr., Bawa, Edaño 78192, xii 29, Menabel, Edaño 78994, n.d. MARSHALL ISLANDS. Kwajalein Atoll, Loj-jairok I., Fosberg 3412, 15 i 52 (MICH).

*Dictyosphaeria setchellii* Børg.

INDONESIA. Java: Oedjoengkoelon, Kostermans 663, 18 x 38 (MICH), Toenda I., Kostermans 574, 15 x 38 (MICH), Djakarta Bay, Amsterdam I., Kostermans 418, 11 x 38 (MICH).

*Dictyosphaeria versluisii* Weber-van Bosse

INDONESIA. Bali: Oie Yong Seng B322, 1929-1930, Sanoer, Setchell BS214, 250, 7-15 vi 29.

*Cladophoropsis* Børgesen, 1905

*Cladophoropsis membranacea* (Forssk.) Børg.

MARIANAS ISLANDS. Guam I., Radin, viii 45, Vatter 20, 25 i 46 (with rather slender filaments). INDONESIA. Bali: Sanoer, Setchell BS6536, 15 vi 29 (filaments to 135 $\mu$  diam).

*Cladophoropsis philippinensis* Taylor

(For numerous stations see Taylor, 1961). PHILIPPINES. Mindanao I.: Zamboanga Pr., Manicaan, Balhani 383, Logoy, 438, Bolong, 273, 506, Taluksangay, 404, Pangapuyon I.,

173, Buena Vista, 482, Panubigan I., 496, all Balhani i-ii 41 (MICH). Basilan Pr., Basilan I., Lamitan 322, Kilay I., 697, Tundun Pasil, 377, Panigayan Islands, 628, all Balhani i-ii 41 (MICH). It is curious that this species, so far, appears endemic to the area about Basilan I. and neighboring Zamboanga.

*Cladophoropsis sundanensis* Reinb.

INDONESIA. Java: Oedjoengkoelon, Kostermans 657, 18 x 38 (MICH), Djakarta Bay, Leiden I., Kostermans 77, 28 ix 38 (MICH), Parangtritis, Setchell JP466, v 29.

*Spongocladia* Areschoug, 1853

*Spongocladia vaucheriaeformis* Aresch.

PHILIPPINES. Sulu Pr., Tawitawi Group, Tawitawi I., Abbott, 13 ii 57 (BISH). MALAYA. Singapore, ii 83 (*ex herb.* Hauck, MICH). INDONESIA. Java: Thousand Islands, Amsterdam I., Kostermans 409, 11 x 38 (MICH), Hoorn I., Setchell JH581, 1 v 29, Kelapa I., Kostermans 277, 5 x 38 (MICH). These are large plants, exceeding 15 cm in height, freely if irregularly branched, the dried divisions 5-8 mm diam. The habit is similar to some of the bushy codiums, or sometimes the terminal divisions are rather crowded and erect. Comparison was made with Mauritius specimens from Areschoug's herbarium in the Rijksmuseum, Stockholm.

*Spongocladia dichotoma* Zanard.

PHILIPPINES. Luzon I., Pangasinan Pr., Alocinos, Fénix, x 28 (? in part) (UC). NEW GUINEA: Tami, 75, 1894 (NY). Some plants in the Fénix collection were very loosely and irregularly branched, and suggest *S. dichotoma*; others had the habit of *S. vaucheriaeformis*, but these may not be different species after all. Comparison was made with Sorong, New Guinea material *leg.* Beccari in the British Museum N.H. herbarium, for which Zanardini originally intended the name *Spongocladia dichotomum*. In the Tami material the filament diameter ranged from 55 to 330 $\mu$ , in that from Sorong 80-200 $\mu$ .

*Spongocladia neocaledonica* Grunow

INDONESIA. Bali: Oie Yong Seng, B322a, 29-30; Panganan, Setchell BP71, 17 vi 29; Sanoer, Setchell BS251, 15 vi 29 (all UC). Com-

parison was made with Poro, New Caledonia material *leg.* Grunow in the British Museum N.H., and in Grunow's herbarium in the Naturhistorisches Museum, Vienna. All had the same cushion form, often with short prominences 0.5–1.0 cm high on the upper side. The degree of compactness varied considerably. The filaments were commonly clavate at the tips, often irregularly so and lobed, leading to irregular branching, although the basic branching was dichotomous. Whereas the filaments in the general mass were 100–200 $\mu$  diam, in these tips they commonly ranged from 150 to 400 $\mu$  and, if lobed for forking, to 625 $\mu$ . Cross-walls were very irregularly placed and were seldom seen near the tips, often not for distances as much as 1 cm from the tips, so that branching and rebranching might occur several times before a cross-wall intervened.

The writer is reluctant to follow Papenfuss' (1950) relegation of these plants to *Cladophoropsis*, not having had field experience with them. So far as he can see, the branch tips of the erect forms, where the plant shape is established, are relatively free from associated sponge tissue, and the plant form does not seem to vary with the degree of sponge investment. Association of other green and red algae with sponges is often met in the tropics, and no special plant form appears to result—notably, indeed, in the case of *Cladophoropsis* itself, in Caribbean waters.

*Boodlea* Murray & DeToni, 1890

This genus always seems difficult, the species ill-defined. While other genera, such as *Microdictyon*, sometimes show boodleoid proliferations, it is not these which cause the trouble, but rather tussocks which seem generically characteristic but specifically intermediate.

*Boodlea composita* (Harv.) Brand

INDONESIA. Java: Oedjoengkoelon, Kostermans 658, 18 x 38 (MICH), Toenda I., Kostermans 578, 15 x 38 (MICH), Kaliage I., Kostermans 198, 5 x 38 (MICH), Pameungpeuk, Setchell JP613f, 15 vi 29.

*Boodlea paradoxa* Reinb.

INDONESIA. Bali: Kampoengan, Setchell BK463 (*prox.*), vi 29.

*Microdictyon* Decaisne, 1839

*Microdictyon montagnei* Harv.

PHILIPPINES. Mindanao I.: Zamboanga Pr., San Ramon, Copeland, n.d. Sulu Pr., Siasi I., Abbott, 28 i 57 (BISH), Sitankai Reef, Yates 36277, x 19, Tawitawi I., Abbott, 12 ii 57 (BISH). MALAYA. Singapore, St. Johns I., Nur, ix 27. INDONESIA. Bali: Sanoer, Den Pasao, Setchell BS177, 7 vii 29, Sanoer Reef, Setchell BS185, 236, 15–18 vii 29, Panganan, Setchell BP69, 70, 17 vi 29. Plants of this species (and in fact, though to a lesser degree, many members of the genus) proliferate very considerably out of the initial plane, sometimes appearing with plane blades, sometimes simulating minute *Boodlea* plants.

*Anadyomene* Lamouroux, 1812

*Anadyomene brownii* (Gray) J. Ag.

PHILIPPINES. Palawan Pr., Balabac I., Abbott, 1 iii 57 (BISH); Sulu Pr., Turtle Islands, Taganak I., Abbott, 23 ii 57 (BISH). INDONESIA. Bali: Boeলেখeng, Setchell BB108 20 vi 29. Frequency of septa is a very variable character in this species, which *A. esepitata* Gilbert much resembles.

*Anadyomene plicata* C. Ag.

PHILIPPINES. Mindoro I.: Mindoro Occidental Pr., Lubang, Villaflores 35, 11–17 ix 35 (MICH). INDONESIA. Java: Oedjoengkoelon, Kostermans 669, 18 x 35 (MICH), Pajoeng I., Kostermans 462, 14 x 38 (MICH), Ijina I., Kostermans 374, 6 x 38 (MICH), Pameungpeuk Reef, Setchell JP597, 26 v 29, Kelapa I., Kostermans 270, 5 x 38 (MICH). Bali: Kampeongan, Setchell BK641, 649c, vi 29, Panganan, Setchell BP83d, 17 vi 29.

SIPHONALES  
BRYOPSIDACEAE

*Bryopsis* Lamouroux, 1809

*Bryopsis plumosa* (Huds.) C. Ag., *prox.*

MALAYSIA. Singapore, St. Johns I., Corner 23197, 31 xii 29. While the specimens in this collection agree quite well with this species in a coarse form, having the branchlets to 265 $\mu$  diam, others from the Singapore area showed

repeated divisions of the main axes, with very numerous penultimate divisions but few ramelli upon them, producing a quite different habit. In the herbarium of the University of California they have been referred to *B. harveyana* J. Ag., but that name is based on *B. plumosa* v. *secunda* Harv. (*B. pennata* v. *secunda* [Harv.] Coll. & Herv.), a West Indian plant not identical in character.

## CAULERPACEAE

*Caulerpa* Lamouroux, 1809*Caulerpa brachypus* Harv.

PHILIPPINES. Sulu Pr., Sibutu I., Abbott, 19 ii 57 (BISH). INDONESIA. Bali: Sanoer, Setchell *BS131*, 7 vi 29.

*Caulerpa cupressoides* (West) C. Ag., v. *cupressoides*

MARIANAS ISLANDS. Saipan I., Tanapag Harbor, Kruckeberg, 15 vi 45 (MICH). INDONESIA. Java: Pameungpeuk Reef, Setchell *JP605*, 25 v 29.

v. *disticha* Weber-van Bosse—INDIA. Madras St., Krusadai I., Pamban, Janaki 933, 24 vi 32 (MICH).

v. *lycopodium* (J. Ag.) Weber-van Bosse—MARIANAS ISLANDS. Guam I., Thompson 460, ca. 1912.

v. *mamillosa* (Mont.) Weber-van Bosse—LINE ISLANDS. Christmas I., London, Fosberg and Metraux 13240, 26 viii 30 (MICH).

*Caulerpa lentillifera* J. Ag., v. *lentillifera*

PHILIPPINES. Luzon I.: Camarines Norte Pr., Malbulao, Vivas and Roma, 21 i 35. Palawan Pr., Palawan I., Puerto Princesa, McGregor *P36*, x 25. Mindanao I.: Misamis Occidental Pr., Baliangao, Cabugan I., Manacop 5135, iv 36. Sulu Pr., Turtle Islands, Taganak I., Abbott, 23 ii 57 (BISH).

v. *longistipitata* Weber-van Bosse—MALAYA. Singapore, Holttum, 1928–30. PHILIPPINES. Sulu Pr., Sibutu I., Abbott, 19 ii 57. The stalks are much longer than the distal diameter of the ramelli, but these are not distichous in arrangement.

*Caulerpa mexicana* (Sond.) J. Ag.

INDIA. Madras St., Krusadai I., Pamban, Janaki 934, 24 vi 32 (MICH). MALAYA. Singa-

pore, Blakang Mati I., Corner 23190, ii 30. PHILIPPINES. Palawan Pr., Palawan I., Taytay, Merrill 9143, iii 13, Balabac I., Calandorang Bay, Abbott 1 iii 57 (BISH). HAWAII. Laysan I., Tanager Exped. 56, 60b, 1923 (MICH). This species appeared in earlier publications on Philippine algae under the name *C. crassifolia* (C. Ag.) J. Ag.

*Caulerpa microphysa* (Weber-van Bosse) Feldm.

MAURITIUS. Îlot Barkly, G. Morin 813 (isotype of *C. lentillifera* f. *parvula* Børg.), 24 iv 48, 861, 10 v 48, 1174, 30 x 51 (all WRT). *Cfr* Børgesen 1949, p. 18. PHILIPPINES. Basilan Pr., Basilan I., Boboh, Balhani 754, i–ii 41 (MICH), Atong Atong, Balhani 62, i–ii 41 (MICH), Lukapsi, Balhani 616, i–ii 41 (MICH), Mindanao I.: Zamboanga Pr., Labuan, Balhani 428, i–ii 41 (MICH), Manicahan, Balhani 389, i–ii 41 (MICH), Sakol I., Balhani 428, i–ii 41 (MICH). INDONESIA. Java: Toenda I., Kostermans 589, 15 x 38 (MICH), Pajoeng I., Kostermans 468, 14 x 38 (MICH).

*Caulerpa peltata* Lamour., v. *peltata*

INDIA. Madras St. Krusadai I., Pamban, Janaki 927, 24 vi 32. PHILIPPINES. Luzon I.: Pangasinan Pr., Lingayen Gulf, Santos 1151, 9 v 38; Ilocos Sur Pr., Magsingal, Collado, n.d. MALAYA. Singapore, Holttum, 1928–30. INDONESIA. Java: Djakarta, Sakit I., Pullai *JS593*, ix 29. Bali: Boeileleng, Setchell *BB99*, 20 vi 29, Panganan, Setchell *BP30*, 17 vi 29.

v. *macrodisca* (Dec.) Weber-van Bosse—MALAYA. Singapore, Holttum 1928–30. Disks ranged to 20 mm diam when soaked (16 mm when dry). Gilbert's paper (1942) reports them even larger from Panay.

*Caulerpa racemosa* (Forssk.) J. Ag. (specimens typical or not varietally distinctive)

INDIA. Madras St., Visakhaptnam, T. Sreeramulu, 1961 (WRT). PHILIPPINES. Luzon I.: Cagayan Pr., Claveria, Velasco 3011, n.d.; Ilocos Sur Pr., Magsingal, Collado, vi 20; Ilocos Norte Pr., Bonbon, Blanco, 1936. Panay I.: Antique Pr., Semirara I., Alcasid 6923, iii 40. Palawan Pr., Balabac I., Abbott, 1 iii 57 (BISH). Sulu Pr., Tawitawi Group Tawitawi I., Tjijitiji Reef, Abbott, 15 ii 57 (BISH); Sibutu I., Tun-

undao Reef, Abbott, 17 ii 57 (BISH); Cagayan Sulu I., Jurata Bay, Abbott, 23 ii 57 (BISH), Turtle Islands, Taganak I., Abbott, 23 ii 57 (BISH). INDONESIA. Bali: Sanoer, Setchell *BS128-130*, 132, 133, 6-15 vi 29, Panganan, Setchell *BP652B*, vi 29. Celebes: Macassar, Weber-van Bosse, 1888. MARIANAS ISLANDS. Saipan I., Tanapag Harbor, Kruckeberg, 3 vii 45 (MICH). Guam I., Thompson 427, v 12, Pago R., Vatter 16, 25 i ? HAWAII. Laysan I., Tanager Exped. 28, n.d. (MICH).

v. *chemnitzia* (Esper) Weber-van Bosse—INDIA. Madras St., Trivandrum, Janaki and Erlanson, i 34 (MICH), Krusadai I., Pamban, Janaki 928, 932, 940, 946, 26 vi 32 (MICH).

v. *clavifera* (Turn.) Weber-van Bosse—PHILIPPINES. Luzon I.: Pangasinan Pr., Alaminos, McGregor xii 22, Dagupam, Bureau of Forestry 3128, vi 34. Mindanao I.: Zamboanga Pr., Sibago I., Balhani 125, i-ii 41; Misamis Occidental Pr., Baliangao, Manacop 5126, iii 36 (MICH). Basilan Pr., Basilan I., Lamitan, Balhani 528, i-ii 41 (MICH). MARIANAS ISLANDS. Guam I., Thompson 1912. MALAYA. Singapore, Tanjong Panggol, Holttum, 27 xi 27. INDONESIA. Celebes, Macassar, Weber-van Bosse 1888.

v. *corynephora* (Mont.) Weber-van Bosse—INDIA. Madras St., Krusadai I., Janaki 928, 931, 23, 24 vi 32.

v. *laetevirens* (Mont.) Weber-van Bosse—PHILIPPINES. Cebu Pr., Bantayan I., Manacop 5141, v 36. Mindanao I.: Zamboanga Pr., Pangapuyon I., Balhani 179, i-ii 41 (MICH). Sulu Pr., Sibutu I., Abbott, 19 ii 57 (BISH), Sitankai Reef, Yates, n.d. MARIANAS ISLANDS. Guam I., Thompson 428, 1912. HAWAII. Laysan I., Tanager Exped., 1923 (MICH). Necker I., Christophersen, vii 24 (MICH).

v. *lamourouxii* (Turn.) Weber-van Bosse—TONGA ISLANDS. Tonga Tapu, McKern 29, ix 20-vi 21 (MICH).

v. *macrophysa* (Kütz.) Taylor—The several specimens reported by Gilbert (1942, 1961) under this name hardly reach the size to be expected, and come close to v. *occidentalis*. Even in those reported here, which agree more closely in this respect, the ramelli are rather small and hardly as depressed on the end as in the Florida form (Taylor, 1928, 1960). However, this character does not seem to have been

a criterion applied by Kützing in distinguishing the variety. PHILIPPINES. Cebu Pr., Bantayan I., Manacop 5144, v 36. INDONESIA. Bali: Panganan, Setchell *BP31*, 17 vi 29.

v. *occidentalis* (C. Ag.) Børg.—PHILIPPINES. Luzon I.: Rizal Pr., Manila Bay, Quisumbing 82258, 16 v 29. Mindanao I.: Zamboanga Pr., Little Santa Cruz I., Bartlett 16144, 19 ix 35 (MICH). Sulu Pr., Tapul Group, Laminusa I., Abbott, 30 i 57 (BISH).

*Caulerpa serrulata* (Forssk.) J. Ag.

PHILIPPINES. Luzon I.: Pangasinan Pr., Hundred Islands, Santos 1149, 9 v 38; Ilocos Sur Pr., Cabugao, Blanco 3075, Magsingal, Collado 10, vi 20. Mindoro I.: Mindoro Oriental, Puerto Galera, Santos 565, 31 xii 36. Palawan Pr., Balabac I., Abbott, 2 iii 57 (BISH). INDONESIA. Bali: Boeleleng, Setchell *BB98a*, vi 29, Kampoengan, Setchell *BK645a*, 646, 650a, e, vi 29. MARSHALL ISLANDS. Ujae Atoll, Bock I., 34348a; Lae Atoll, Enament I., 34086, Pokak Atoll, Sibylla I., 34514; Bikar Atoll, Bikar I., 34561; Utirik Atoll, Eluk I., 33706a; Ailuk Atoll, Ailut I., 33954, all Fosberg 1951-52 (MICH). LINE ISLANDS. Palmyra I., Vasconcellos 2951, vii 40.

*Caulerpa sertularioides* (Gmel.) Howe (specimens typical or not varietally distinctive)

PHILIPPINES. Mindoro I.: Mindoro Oriental Pr., Puerto Galera, Santos 573, 31 xii 36, Velasquez 747, 31 iii 41 (MICH), Balatera Malaki, Velasquez 7689, iv 41 (MICH). MARIANAS ISLANDS. Guam I., between Ylig and Togcha Bays, Moore 401, 7 iv 46 (MICH). CAROLINE ISLANDS. Truk Group, Moen I., Stone 2181, viii 57 (MICH). INDONESIA. Java: Djakarta, Sakit I., Pullai *JS592*, 12 ix 29, Kampoengan, Setchell *BK643*, vi 29.

v. *sertularioides* f. *brevipes* (J. Ag.) Sved.—INDIA. Madras St., Krusadai I., Pamban, Janaki 24 vi 32 (MICH). PHILIPPINES. Luzon I.: Rizal Pr., Manila Bay, Quisumbing 5204, 12 ix 28. Sulu Pr., Pearl Bank, Kienholz, vi 23, Turtle Islands, Taganak I., Abbott, 23 ii 57 (BISH). INDONESIA. Bali, Boeleleng, Pullai *BB387*, vii 33.

v. *sertularioides* f. *longiseta* (Bory) Sved.—PHILIPPINES. Luzon I.: Rizal Pr., Manila Bay, Guitierrez 85755, viii 33; Ilocos Sur Pr., Mag-



singal, Collado, vi 20; Ilocos Norte Pr., Currimao, Collado, vi 20. Palawan Pr., Palawan I., Puerto Princesa, Santos 646, 3 iv 37 (MICH). Mindanao I.: Zamboanga Pr., Little Santa Cruz I., Bartlett 4203, i-ii 41 (MICH), Lanhil I., Bartlett 162, i-ii 41 (MICH). Basilan Pr., Saluping I., Balhani 874, i-ii 41 (MICH), Malamaui, Balhani 64, i-ii 41 (MICH). MALAYA. Singapore, Tandjung Punggol, Holttum, 27 xi 27. INDONESIA. Java: Tjina I., Kostermans 324, 6 x 38 (MICH).

*Caulerpa taxifolia* (Vahl) C. Ag.

INDIA. Madras St., Krusadai I., Pamban, Janaki 936, 24 vi 32 (MICH). MALAYA. Singapore, Holttum, 1928-30. INDONESIA. Java: Anger, Kostermans 611a, 16 x 38 (MICH); Pajoeng I., Kostermans 467c, 14 x 38 (MICH); Djakarta, Setchell JB567, v 29.

*Caulerpa urvilliana* Mont.

PHILIPPINES. Palawan Pr., Palawan I., Puerto Princesa, McGregor, x 25. Sulu Pr., Pearl Bank, Kienholz, vi 23; Sibutu I., Abbott, 19 ii 57 (BISH). MARSHALL ISLANDS. Ujelang Atoll, Ujelang I., 34191; Wotho Atoll, Wotho I., 3417, Eneobank I., 34437; Ujae Atoll, Bock I., 34348b; Bikar Atoll, Jaliklik I., 34583; Utirik Atoll, Eluk I., 33706b; Likiep Atoll, Lado I., 33795, all Fosberg 1951-52 (MICH); Arno Atoll, Pikarej I., Anderson 3755, 23 v 50.

*Caulerpa vesiculifera* (Harv.) Harv.

PHILIPPINES. Palawan Pr., Palawan I., Puerto Princesa, McGregor, x 25.

CODIACEAE

*Chlorodesmis* Harvey & Bailey, 1851

*Chlorodesmis comosa* Harv. and Bail.

PHILIPPINES. Luzon I.: Pangasinan Pr., Alaminos, Fénix, x 28.

*Chlorodesmis bildebrandtii* A. and E.S. Gepp

PHILIPPINES. Sulu Pr.; Sibutu I., Abbott, 19 ii 57 (BISH). MARIANAS ISLANDS. Saipan I., Tanapag Harbor, Kruckeberg, 3 vii 45 (MICH).

*Chlorodesmis torresiensis* Taylor

PHILIPPINES. Luzon I.: Cagayan Pr., Menabel, Edaño 79001, 78995A, iv 30. Filament diame-

ters to 350 $\mu$ . Segments transverse-ended, with the constrictions equally placed.

*Avrainvillea* Decaisne, 1842

*Avrainvillea erecta* (Berk.) A. and E.S. Gepp

PHILIPPINES. Palawan Pr., Balabac I., Abbott, 2 iii 57 (BISH). MALAYA. Singapore, Holttum, 1928-30, Tanjong Ponggol, Holttum, 27 xi 27.

*Avrainvillea lacerata* J. Ag.

PHILIPPINES. Luzon I.: Pangasinan Pr., Alaminos, Fénix 13, 7 x 28. INDONESIA. Java: Pangendaran, Setchell JP547, 549c, v 29.

*Avrainvillea obscura* J. Ag.

MARIANAS ISLANDS. Saipan I., Tanapag Harbor, Kruckeberg, 5 vii 45 (MICH). The habit of these plants agrees excellently with this species, better than with *A. erecta*, but the surface filaments show a little brown discoloration.

*Cladocephalus* Howe, 1905

*Cladocephalus* sp.

PHILIPPINES. Palawan Pr., Balabac I., Gnat Reef, Abbott, 4 iii 57 (BISH). These specimens were in the form of a small tuft, with several short, stout, erect stems terminating in groups of rounded, slightly zonate blades 1-2 cm broad. The central blade filaments reached 15.5 $\mu$  diam. Those at the surface were 5.5-7.8 $\mu$  diam, less densely entangled than those of the West Indian *C. luteofuscus* (Crouan) Børg. This is a most interesting thing to find in the area, but one hesitates to describe it as new on so little material, and material which is possibly dwarfed.

*Tydemania* Weber-van Bosse, 1911

*Tydemania expeditionis* Weber-van Bosse

PHILIPPINES. Sulu Pr., Tawitawi I., Abbott, 12 ii 57 (BISH). INDONESIA. Java: Thousand Islands, Kostermans 177, 5 x 38 (MICH).

*Udotea* Lamouroux, 1812

*Udotea argentea* Zanard., v. *spumosa* A. and E. S. Gepp.

PHILIPPINES. Palawan Pr., Palawan I., Taytay,

Merrill 9140, iv 13; Balabac I., Abbott, 2 iii 57 (BISH). Sulu Pr., Turtle Islands, Taganak I., Abbott, 24 ii, 23 iii 57 (BISH).

*Udotea flabellum* (E. and S.) Howe

MALAYA. Singapore, Binder (*ex herb.* Trinity Coll., Dublin).

*Udotea glaucescens* Harv.

MALAYA. Singapore, Dodol I., Burkill 3007 (WRT).

*Udotea javensis* A. and E.S. Gepp

INDONESIA. Java: Thousand Islands, Amsterdam I., Kostermans 416, 11 x 38 (MICH), Kaliage I., Kostermans 201, 5 x 38 (MICH), Kerkhof I., Kostermans 7, 26 ix 38 (MICH).

*Udotea orientalis* A. and E.S. Gepp

PHILIPPINES. Cagayan Pr., Babuyan Islands, Calayan I., McGregor, *p.p.*, 1903. Palawan Pr., Balabac I., Abbott, 2 iii 57 (BISH). Sulu Pr., Turtle Islands, Taganak I., Abbott 24 ii 57 (BISH). INDONESIA. Bali: Boeleleng, Pullai BB395, viii 33, Kampoengan, Setchell BK2, 642, 643, 16 vi 29.

*Halimeda* Lamouroux, 1812

This genus has recently been reviewed by L. W. Hillis (1959), who included most of the Pacific material available at that time in her report. Her listings, therefore, should be considered together with the specimens cited here in reaching a conception of the *Halimeda* flora of the Indian and Pacific Oceans.

*Halimeda bikimensis* Taylor

INDONESIA. Bali: Karang Asem, Pullai BK-376, vi 33.

*Halimeda cylindrica* Dec.

PHILIPPINES. Luzon I.: Quezon Pr., Tayabas Bay (?), Yates 25831, xii 16. Palawan Pr., Culion I., Culion, Bartlett 15578, 27 vii 35 (MICH).

*Halimeda discoidea* Decaisne v. *discoidea*

PHILIPPINES. Palawan Pr., Palawan I., Taytay, Merrill 9147, vi 13, Balabac I., Pasig Bay, Abbott, 1 iii 57 (BISH). Sulu Pr., Tapul Group, Laminusa I., Abbott, 29 i 57 (BISH), Pearl

Bank, Kienholz, vi 23, Cagayan Sulu, Abbott, 4 iii 57 (BISH). INDONESIA. Bali: Sanoer, Setchell BS145, 15 vi 29.

v. *discoidea* f. *subdigitata* Gilbert—PHILIPPINES. Palawan Pr., Balabac I., Abbott, 4 iii 57 (BISH). Sulu Pr., Sibutu I., Abbott, 19 iii 57 (BISH).

*Halimeda gracilis* Harv.

MALAYA. Singapore, Holttum, 1928–30.

*Halimeda macroloba* Decaisne

PHILIPPINES. Luzon I.: Quezon Pr., Alabat I., Santos 794, 20 x 37; Camarines Norte Pr., Basiad, Yates 25829, xii 16; Pangasinan Pr., Hundred Ids., Santos 1150, 9 v 38, Alominos, Fénix, x 28. Mindoro I.: Mindoro Oriental Pr., Batangas Channel (?), Santos 571, 31 xii 36, Puerto Galera, Alcasid 3126, iv 34. Leyte Pr., Biliran I., McGregor P20, vi 14. Bohol I., Cabasihan, Franco 27347, vi–viii 18. Palawan Pr., Palawan I., Puerto Princesa, McGregor, x 25. Sulu Pr., Sibutu I., Abbott, 19 ii 57 (BISH), Turtle Islands, Taganak I., Abbott, 23 ii 57 (BISH), Pearl Bank, Kienholz, x 28. MARIANAS ISLANDS. Saipan I., Kruckeberg, 3 vii 45 (MICH), Guam I., Thompson, 1912. MALAYA. Singapore, Holttum, 1928–30, Panggol, Burkill, 14 i 22. INDONESIA. Java: Djakarta, Hoorn I., Setchell JH579, v 29, Pangendoran, Setchell JP545, v 29. Bali: Sanoer, Setchell BS146, vi 29, Kampoengan, Setchell BK647, 19 vi 29.

*Halimeda macrophysa* Asken.

PHILIPPINES. Sulu Pr., Turtle Islands, Taganak I., Abbott, 24 ii 57 (BISH).

*Halimeda micronesica* Yamada

PHILIPPINES. Sulu Pr., Tawitawi Group, Tawitawi I., Abbott, 15 ii 57 (BISH).

*Halimeda opuntia* (L.) Lamour.

PHILIPPINES. Luzon I.: Cagayan Pr., Calayan I., McGregor, 1903; Quezon Pr., Alabat I., Santos 793, 20 x 37; Camarines Norte Pr., Basiad, Yates, xii 16. Catanduanes Pr., Catanduanes I., Ramos and Edaña, vii–ix 28. Mindoro I.: Mindoro Oriental Pr., Batangas Channel, Santos 566, 31 xii 36. Leyte Pr., Biliran I., McGregor, vi 14. Negros I.: Occidental Negros Pr., Baliangao, Manacop 5118, iii 36. Palawan

Pr., Palawan I., Taytay, Merrill 9141, Puerto Princesa, McGregor, x 25, Balabac I., Abbott, 1 iii 57 (BISH). Sulu Pr., Tapul Group, Siasi I., Abbott, 28 i 57 (BISH), Laminusa I., Abbott, 29 i 57 (BISH), Tawitawi Group, Tawitawi I., Abbott, 30 i 57 (BISH), Sibutu I., Abbott, 17 ii 57 (BISH), Turtle Islands, Taganak I., Abbott, 23 ii 57 (BISH), Sitankai Reef, Yates 36229, x 19. MARIANAS ISLANDS. Guam I., Radin, viii 45. MALAYA. Singapore, Holttum, 1928-30. INDONESIA. Sunda Strait, Teysman. Java: Djakarta, Hoorn I., Setchell *JH580*, v 29, Panganan, Setchell *BP54*, 17 vi 29. Bali: Boeileng, Pullai 382c, vii 33, Sanoer, Setchell *BS143*, 7 vi 29, Kampoengan, Setchell *BK8*, 9, 641, 651a, 1 vi 29, Panganan, Setchell *BP54*, 17 vi 29.

*Halimeda tuna* (E. and S.) Lamour., v. *tuna*

PHILIPPINES. Batanes Pr., Batan I., Ramos 80122, vi-vii 30. INDONESIA. Bali: Oie Yong Seng *B191*, 1929-30.

v. *platydisca* (Dec.) Bart.—INDONESIA. Boeileng, Pullai *BB382*, vii 33, Setchell *BB102*, 19 vi 29, Kampoengan, Setchell *BK649*, vi 29.

*Halimeda velasquezii* Taylor

PHILIPPINES. Luzon I.: Cagayan Pr., Sta. Ana, Velasquez 2379, 17 vi 50.

*Codium* Stackhouse, 1797

Codiums of Indonesia have been published upon by the Gepps (1911) and those of the Philippines by Gilbert (1947, 1961). Since Dr. P. C. Silva may be expected to review them in due time in monographic fashion together with other western Pacific specimens, probably with considerable change in species delimitation, no further treatment is appropriate at this time. The Gepps recognized 6 species from the Indonesian area and the Sulu Archipelago; Gilbert (1961) recognized 12 from the Philippines, including all the Indonesian species except the very small Borneo Bank species, *C. petaloideum* A. & E.S. Gepp.

PHAEOPHYCEAE

To judge by the Siboga expedition reports this group, with the exception of a very few genera, is ill-represented in the area from which

the materials available to me have come. It seems very improbable that the representation is adequate, though in truth the variety of Phaeophyceae is not great in the tropics, but it is probably as complete as that of the other major groups. In the present case the genus *Sargassum*, which appears to be best represented in the collections, has been put aside for lack of authentic material for comparison. A special study has been made of the genus *Turbinaria* (Taylor, 1964, 1966), and its distribution recorded in a far more detailed way than would have been possible here. The genus *Padina*, also frequently encountered, was studied several years ago by Dr. Francesca Thivy, and the writer hesitates to draw heavily on her unpublished dissertation, though many of her determinations are incorporated. Delicate forms like *Ectocarpus* were commonly too ill-preserved for determination, and in general small types were entirely unrepresented in the collections.

DICTYOTALES  
DICTYOTACEAE

*Dictyota* Lamouroux, 1809

Materials of *Dictyota* from this area are relatively scanty, and often seem dwarfed; in any case they do not fall readily into distinct species groups. Plants of the genus are often variable in form, and require great care in the field to search out fully developed specimens. One may assume something less than adequacy in this respect, since Setchell is the only fully qualified phycologist whose collections are largely represented (and even so, chiefly by native assistants) in this report. It is remarkable that this Pacific area does not appear to have developed any particularly distinctive species of *Dictyota*.

*Dictyota bartayresii* Lamour.

PHILIPPINES. Mindoro I.: Mindoro Oriental Pr., Puerto Galera, Santos 563 (*prox.*), 31 xii 36. Palawan Pr., Balabac I., Calendorang Bay, (apices acute and perhaps a distinct entity), Abbott, 1 iii 57 (BISH), Gnat Reef (apices obtuse), Abbott, 4 iii 57 (BISH). Sulu Pr., Turtle Islands, Abbott, 23 ii 57 (BISH).

*Dictyota cervicornis* Kütz.

PHILIPPINES. Palawan Pr., Balabac I., Abbott, 2 ii 57 (BISH).

*Dictyota dichotoma* (Huds.) Lamour.

PHILIPPINES. Luzon I., Pangasinan Pr., Hundred Ids., Santos 1158, 9 v 38. Palawan Pr., Balabac I., Abbott, 1 iii 57 (BISH). Sulu Pr., Siasi Group, Laminusa I., Abbott, 29 i 57 (BISH), Tawitawi I., Abbott, 12 ii 57 (BISH).

*Dictyota linearis* (C. Ag.) Grev.

PHILIPPINES. Luzon I.: Pangasinan Pr., Hundred Ids., Santos 1160, 9 v 38. Sulu Pr., Turtle Ids., Taganak I., Abbott, 23 ii 57 (BISH).

*Padina* Adanson, 1763

This genus was reviewed by Dr. Francesca Thivy (1945), but the general results have not been published. Identifications reported here were made on the basis of the Thivy study by Dr. L. W. (Hillis) Colinvaux, and later checked in part by the present writer.

*Padina australis* Hauck

PHILIPPINES. Luzon I.: Quezon Pr., Tayabas, Curran 11128, iii 08; Bataan Pr., Lamao, Shaw 1089, 30 v 09; Pangasinan Pr., Alominos, Fénix, x 28; Ilocos Norte Pr., Burgos, Bonbon, Blanco 3057, 35. Leyte Pr., Leyte I., Tacloban, McGregor, vi 14. Palawan Pr., Palawan I., Taytay, Merrill 9168, v 13, Balabac I., Mangubat 521, iii-iv 06. Mindanao I.: Misamis Occidental Pr., Baliangao, Manacop 5125, iii 36. INDONESIA. Celebes, Macassar, Setchell M480, 481, 22 vi 29.

*Padina boryana* Thivy n. sp.

## Fig. 2

Plants 3–10 cm tall, thin and papery, with a stupose holdfast and stalk; blade about 100 $\mu$  thick near the stalk, of two cell layers, that above at least 0.75 as thick as the lower; upper surface hair zones 1–4 mm broad, those on the lower rudimentary, delimiting narrower sterile zones from broader fertile ones, or absent; tetrasporangia about 120 $\mu$  diam, in linear non-indusiate sori in the lower portion of the fertile bands, seldom in a median position; oögonia 60–80 $\mu$  diam, in similar indusiate sori; antheridial sori in 1–2 rows. Type specimen coll. W. H. Harvey, no. 1 of Friendly Island Algae, in the herbarium of the New York Botanical Garden.

*Padina boryana* Thivy n. sp.

Plantae 3–10 cm altae, tenues chartaceaeque stuposae super stipitem et discum basalem, orbiculari-reniformes aut in segmenta flabellata usque ad 4 cm lat. divisae; lamina 2-stratosa, ca. 100 $\mu$  crass. prope stipitem, strato superiore aequo crasso ac inferiore vel 0.25 tenuiore. Zonae piliferae superficiei superioris aequaliter evidentes, 1–4 mm distantes, zonae superficiei inferioris plerumque rudimentariae vel nullae. Sori tetrasporangiales non-indusiati, in unicum zonam 0.2–1.0 mm lat. super lineas piliferae superficiei superioris, intervallo distincto (0.2–0.5 mm), plerumque in dimidio inferiore zonarum glabrarum; tetrasporangia ca. 120 $\mu$  diam. Sori oogoniales lineares, 0.1–0.8 mm lat., paululum super zonas piliferae superficiei superioris dispositi, indusio persistente, oogoniis maturis 60–80 $\mu$  diam. Sori antheridiales in zonis fertilibus omnibus in 1 vel 2 seriebus, 0.2–0.5 mm lat., aut parce aggregati, plus quam 0.2 mm supra lineas piliferae. Specimen typicum (tetrasporacum) legit W. H. Harvey, no. 1 in Insulis Amicorum, Polynesia, conservatum in herb. Hort. Bot. Neo-Eborascensis.

PHILIPPINES. Luzon I.: Cagayan Pr., Babuyan Ids., Calayan I., n.c., ix 03; Quezon Pr., Baler, Edaña 5128, iii 39, Polillo, Robinson 6887, viii 09; Catanduanes Pr., Catanduanes, Ramos and Edaña 77621, vii-ix 28. Panay I.: Antique Pr., Semirara Ids., Pasal Pt., Alcasid 6921, iii 40. Palawan Pr., Balabac I., Abbott, 4 iii 57 (BISH). Sulu Pr., Jolo I., Bartlett 16042, 16 ix 35 (MICH). INDONESIA. Bali: Kampoengan, Singaraja, Setchell BK20, 19 vi 29, Patas, Setchell BP349, 1929. Amboina: Robinson 2395, vii-viii 13.

These are plants which would hitherto have passed under the name of *Padina commersonii* Bory (1829:144). The history of this name is confused. Bory used it for Mauritius material which he mistakenly identified with *Zonaria pavonia* (L.) C. Ag., var. *tenuis* C. Agardh from the Marianas Islands (1824:263), the type of which seems actually to have been a *Pocockiella*. Of this Bory appears not to have been aware, but thought it a *Padina* as, of course, was the parent species (J. G. Agardh 1882: 119, as *Zonaria*; Papenfuss 1943:467, as *Pocockiella*). Bory described his plant, but based it on *Zonaria pavonia* var. *tenuis*. Not being able to use the name *tenuis* because of his own *P. tenuis* (Bory, 1827:590), a different thing, he proposed the new name *P. commersonii*, citing *Zonaria pavonia* var. *tenuis* in synonymy. The basis of this new name is, then, the type of var. *tenuis*, and the species name *commersonii* goes

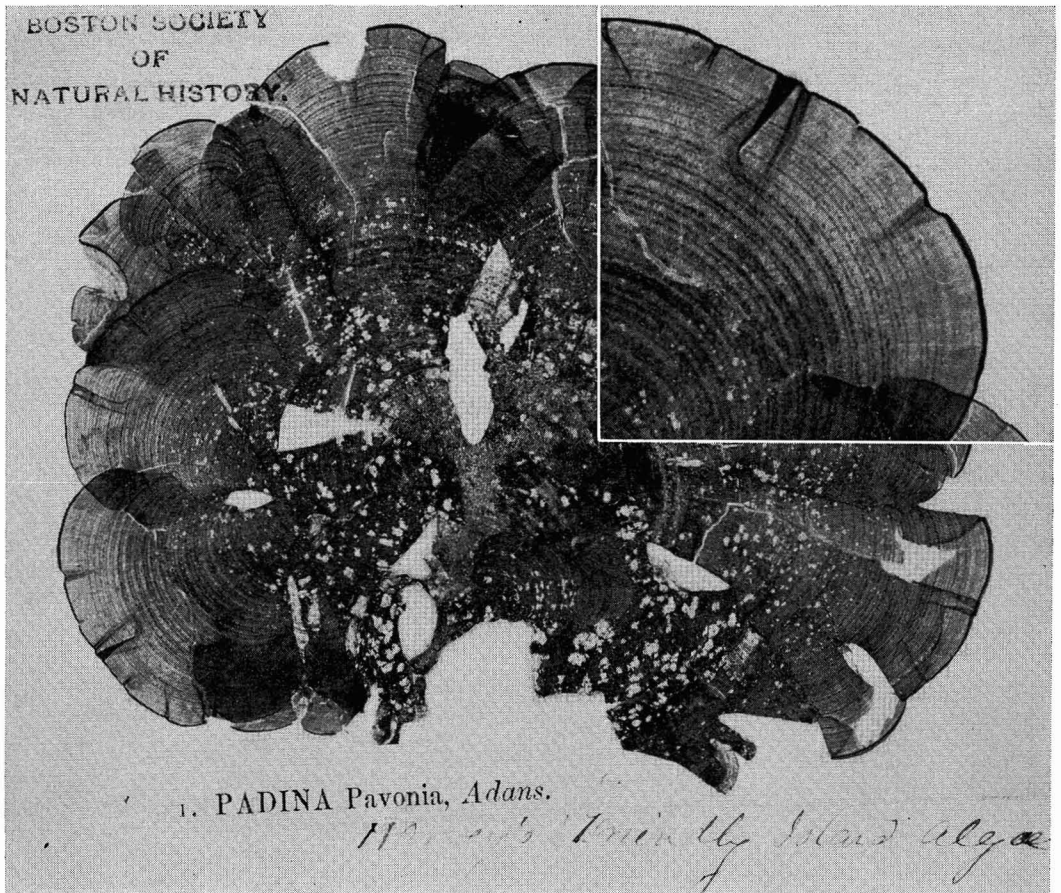


FIG. 2. *Padina boryana*, the major part of the specimen selected as the type,  $\times 1$ . Inset (upper right): A fertile lobe of this specimen showing paired lines, of which the more basal is the hair line, the more distal the line of spores,  $\times 2$ .

into the synonymy of *Pocockiella variegata* (Lamour.) Papenf. The widespread *Padina* which has gone under the name of *P. comersonii* is left without a legitimate name. Dr. Francesca Thivy recognized this in 1945 when studying the genus, but has not hitherto published the new name and description needed.

*Padina distromatica* Hauck

PHILIPPINES. Luzon I.: Pangasinan Pr., Hundred Ids., Santos 1157, 9 v 38. Mindoro I.: Puerto Galera, Alcasid 3125, iv 34. Bohol I.: Bohol Pr., Guindulman, McGregor, 5 vi 06.

*Padina fraseri* Grev.

PHILIPPINES. Luzon I.: Cagayan Pr., Gonzaga, Edaño 77289, x 29; La Union Pr., San

Fernando, Fénix 13011, xii 10; Ilocos Sur, Magsingal, Collado 20, v 21.

*Padina gymnospora* (Kütz.) Vickers

PHILIPPINES. Luzon I.: Quezon Pr., Tualog, Ramos and Edaño 29163, v 17.

*Padina japonica* Yamada

PHILIPPINES. Luzon I.: Camarines Sur Pr., Adiaguao, Robinson 6375, 29 viii 08.

*Padina tetrastromatica* Hauck

PHILIPPINES. Luzon I.: Rizal Pr., Pasay, Cruz 84863, ix 32; Manila Pr., Malate, McGregor, 28 v 13; Bataan Pr., Cababan, Shaw 1132, 7 v 11. INDONESIA. Java: Djakarta, Sakit I., Setchell JS588, 12 vi 29. Bali: Boeleleng, Pullai BB337, Sanoer, Setchell BS175, 15 vi 29.



*Pocockiella* Papenfuss, 1943*Pocockiella variegata* (Lamour.) Papenf.

PHILIPPINES. Palawan Pr., Balabac I., Abbott, 1 iii 57 (BISH). Sulu Pr., Tawitawi Group, Tawitawi I., Abbott, 13 ii 57 (BISH). Doubtless common and widely distributed in the Philippines and Indonesia, but commonly inconvenient to collect.

PUNCTARIALES  
PUNCTARIACEAE*Chnoospora* J. Agardh, 1847.*Chnoospora minima* (Hering) Papenf.

PHILIPPINES. Luzon I.: Pangasinan Pr., Hundred Islands, Santos 1159, 9 v 38.

*Hydroclathrus* Bory, 1826*Hydroclathrus clathratus* (Bory) Howe

PHILIPPINES. Luzon I.: Pangasinan Pr., Hundred Islands, Santos 1161, 9 v 38. Palawan Pr., Balabac I., Abbott, 1 iii 57 (BISH), Gnat Reef, Abbott, 4 iii 57 (BISH). MARIANAS ISLANDS. Guam I., Newhall, 1900-01, Nelson 508, 18.

FUCALES  
CYTOSSEIRACEAE*Cystophyllum* J. Agardh, 1848*Cystophyllum muricatum* (Turn.) J. Ag.

INDONESIA. Celebes: Macassar, Setchell M509, 23 vi 29. Bali: Sanoer, Setchell BS260, 15 vi 29.

*Hormophysa* Kützing, 1843*Hormophysa triquetra* (L.) Kütz.

PHILIPPINES. Luzon I.: Bataan Pr., Lamao, Shaw 1095a, 30 v 11, Limay, Shaw 1110, 24 iv 11; Pangasinan Pr., Alominos, Fénix, x 28; La Union Pr., San Fernando, Fénix 13015, xii 10. MALAYA. Singapore, St. Johns I., Corner 22188, 31 xii 29, Birtwhistle, v 28. INDONESIA. Anambas Islands, Tandjong Padang, Henderson 20434, 16 iv 28. Bali: Sanoer, Setchell BS254, 11 vi 29. Celebes: Macassar, Setchell M483, 23 vi 29.

## SARGASSACEAE

*Sargassum* C. Agardh, 1820

The bulk of available *Sargassum* material from this area far exceeds that of any other genus of Phaeophyceae. Unfortunately, without prolonged access to authentic materials identification of most of it seems impracticable. A few particularly notable specimens, however, are included here with considerable confidence respecting their identity.

*Sargassum crassifolium* J. Ag., *prox.*

MARIANAS ISLANDS. Guam I., Nelson 511, 1918.

*Sargassum cristatum* J. Ag., *prox.*

PHILIPPINES. Luzon I.: Pangasinan Pr., Hundred Islands, Santos 1167, n.d. Perhaps Grunow correctly (1915) reduces this to synonymy under *S. aemulans* Sond.

*Sargassum duplicatum* J. Ag.

PHILIPPINES. Mindoro I.: Mindoro Oriental Pr., Puerto Galera, Bartlett 13797, 12-17 v 35 (WRT). MARIANAS ISLANDS. Guam I., Thompson, 1912. INDONESIA. Java: Palabuhan Bay, Martens (WRT), Zaandbai, Möller, v viii 97 (WRT). Amboina: Robinson 576, vii-ix 13 (to represent *Acetabulum marinum* of Rumphius), (filed as *Turbinaria*, NY). NEW GUINEA. North-east New Guinea, Cape Creten east of Lae, Keefe, 1944 (WRT).

*Sargassum polycystum* C. Ag.

MARIANAS ISLANDS. Guam I.: Newhall, 1900-01, Clemens, 27 xi 11, Thompson, 1912.

*Sargassum sandei* Reinb.

PHILIPPINES. Mindoro I.: Mindoro Oriental Pr., Puerto Galera, Bartlett 13980, 12-15 v 35 (WRT).

*Turbinaria* Lamouroux, 1828

This genus has recently been reviewed (Taylor, 1964, and in press, 1966) and specimens from the sources contributing to this present paper are cited there in a more comprehensive fashion than is possible here. However, a few additions are included, since they apply particularly to the Philippines. It will be seen



by the papers mentioned that *T. ornata* is particularly common and widespread, ranging from northeastern Africa to Malaya and Taiwan, south past Queensland perhaps to Tasmania, and throughout the western Pacific to Hawaii, so that citation of specimens, particularly from the Philippines and the Marshall Islands, had to be restricted to those adequately delimiting the range. However, *T. decurrens* seems more unusual and is much less common in collections, though ranging from Madagascar, Hainan, and southern Luzon to the Solomon Islands. One may expect *T. conoides* from Kenya and Tanganyika in east Africa to India, Malaya, Luzon, thence south and east to the Tonga and Samoan island groups. It is next after *T. ornata* in frequency of collection. So far *T. luzonensis* Taylor is known only from Luzon. *Turbinaria condensata* Sonder, described from somewhere in the China Sea, is definitely known from Somalia and Kenya on the west to Malaya, Luzon, Guam, and western Australia.

*Turbinaria conoides* (J. Ag.) Kütz.

PHILIPPINES. Sulu Pr., Tawitawi Group, Tawitawi I., Tijitiji Reef, Abbott, 15 iii 57 (BISH).

*Turbinaria decurrens* Bory

PHILIPPINES. Sulu Pr., Turtle Islands, Taganak I., Abbott, 24 ii 57 (BISH).

*Turbinaria ornata* (Turn.) J. Ag.

PHILIPPINES. Palawan Pr., Balabac I., Pasig Bay, Abbott, 1 iii 57 (BISH), Sibutu I., Abbott, 19 ii 57 (BISH), Turtle Islands, Taganak I., Abbott, 24 ii 57 (BISH). Sulu Pr., Cagayan Sulu I., Abbott, 27 ii 57 (BISH).

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