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STUDIES ON PHILIPPINE CHLOROPHYCEAE—II. SURVEY OF LITERATURE AND LIST OF RECORDED SPECIES PRIOR TO 1940

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Although the first list of Philippine marine algae was published a little more than a century ago, the number of papers or books that refer to them since that time is surprisingly small. Probably the first record of a marine alga from this region is to be found in the first edition of Blanco's *Flora de Filipinas,* published in 1837. In this work Blanco described nine plants, apparently all from the island of Luzon, to which he gave names that were applicable to alga-like plants. Most of the binomials were preëxisting, but there was no citation of authorities. The descriptions that accompany the names are very general, so that for the most part they cannot be used for determining anything more than the genus to which the plants are to be referred. The difficulties of knowing the particular species with which Blanco was dealing are further increased because there is no permanent record known of the plants he studied.

Among the Thallophyta in Blanco's first edition of *Flora de Filipinas* are to be found the following: *Fucus prolifer* Blanco, *F. denticulatis* Blanco, *F. gulaman* Blanco, *Ulva umbilicalis* Blanco, *U. compressa* Blanco, *U. reticulata* Blanco, *U. intestinalis* Blanco, *Conferva littoralis* Blanco, and *C. setosa* Blanco.

The description of *Fucus prolifer* Blanco unmistakably refers to a species of *Halimeda,* but because of its incompleteness could be applied to one of at least three different species that are relatively common in the Philippines, namely *Halimeda macroloba* Decaisne, *H. Tuna* (Ellis & Solander) Lamouroux f. *platydisca* (Decaisne) Barton, or *H. discoidea* Decaisne. It is interesting to point out that all three of these were described subsequently to Blanco's original work. The plant distributed by Merrill as *Species Blancoanae No. 993,* which he thought duplicated *Fucus prolifer* Blanco, is *Halimeda macroloba* Decaisne.

The second name in the list above, *Fucus denticulatus,* is apparently a *Sargassum;* in the second edition (1845) of the *Flora de Filipinas F. denticulatus* is replaced by the name *F. natans* Blanco. *F. gulaman,* called *F. edulis* in the second edition, may be a *Gracilaria.* The plant listed as *Ulva umbilicalis* seems to be a species of *Padina.* The *Ulva compressa* of Blanco appears undoubtedly to be a species of *Enteromorpha,* and his *Ulva reticulata* does not appear to be *U. reticulata* Forsskål, but it is more likely

a species of *Hydroclathrus,* for in the description he speaks of its brown color. Blanco's *Ulva intestinalis* does seem to correspond with *U. intestinalis* Linnaeus, now known as *Enteromorpha intestinalis* (L.) Link. The last names in the list above are not marine plants, for the description of *Conferva littoralis* refers to a species of *Chara,* and *Conferva setosa* Blanco is probably not an alga, for it is reported growing from the leaves of trees and looking like the hairs of a horse. The latter may have been a species of the algal genus *Trentepohlia* or a representative of the lichen family Usneaceae.

From this list it is possible, therefore, to claim only three of the nine species as marine Chlorophyceae, being fairly certain of the identity of *Enteromorpha intestinalis* (L.) Link, and knowing only the genera of the other two with certainty (*Enteromorpha* sp. and *Halimeda* sp.).

Five years later Berkeley (1842) in his "Enumeration of fungi collected by H. Cuming in the Philippine Islands," described as a fungus under the name *Dichonema erectum* a plant that A. Gepp and E. S. Gepp later showed to be an alga, and which they named *Avrainvillea erecta* (Berkeley) A. & E. S. Gepp.

Following this by two years, a paper by Montagne (1844) dealing with the plants collected by H. Cuming in the Philippines, listed the following seven species of green algae: *Cladophora pellucida* (Hudson) Kützing, *Ulva reticulata* Forsskål, *Caulerpa taxifolia* (Vahl) C. Agardh, *C. plumaris* (Forsskål) C. Agardh, *Codium tomentosum* (Hudson) Stackhouse, *Udotea sordida* Montagne, and *Halimeda discoidea* Decaisne. In this list *Cladophora pellucida, Ulva reticulata, Caulerpa taxifolia,* and *Halimeda discoidea* are still accepted species. Of the others, *Caulerpa plumaris* is synonymous with *C. sertularioides* (Gmelin) Howe, *Codium tomentosum* is synonymous with *C. dichotomum* (Hudson) S. F. Gray, and *Udotea sordida* (described by Montagne as new in his paper) is *Avrainvillea erecta* (Berkeley) A. & E. S. Gepp.

The Chlorophyceae from the Philippines are next mentioned by G. von Martens (1866), reporting on the botany of the Prussian Expedition to East Asia, who listed the following nine species from the region of Zamboanga, Mindanao: *Chaetomorpha inflata* Kützing, *Ulva reticulata* Forsskål, *Chauvinia clavifera* Turner, *Halimeda Opuntia* (L.) Lamouroux, *H. discoidea* Decaisne, *H. cuneata* Kützing, *Valonia utricularis* Roth, *V. macrophysa* Kützing, and *Microdictyon clathratum* Martens.

Regarding the first of the preceding list, this is one of the very few reports of *Chaetomorpha inflata* since it was first described by Kützing from Java, and because Martens described it so briefly and the occurrence of the species appears to be so rare, it is to be considered a doubtful record until it can be verified. *Chauvinia clavifera* is now synonymous with *Caulerpa racemosa* (Forsskål) J. Agardh var. *clavifera* (Turner) Weber-van

Bosse. *Halimeda cuneata* Kützing (not *H. cuneata* Hering) is listed by Barton (1901) among the synonyms of *H. gracilis* Harvey. *Valonia macrophysa* is not definitely known from the Pacific or Indian Oceans, and since the report of it was not accompanied by a description the record is to be seriously questioned. *Microdictyon clathratum,* described by Martens as new, is actually *Anadyomene Leclancherii* Decaisne. Interestingly enough, this same year Gray (in his article "On *Anadyomene* and *Microdictyon,* with the description of three new allied genera," etc.) referred a specimen from the Sulu Archipelago that Harvey had sent him to *Cystodictyon Leclancherii* (Decaisne) Gray, having considered that *Anadyomene Leclancherii* Decaisne was sufficiently different from other species of *Anadyomene* to constitute the type of a new genus.

Dickie (1876), in his "Contributions to the botany of the expedition of H. M. S. 'Challenger.'—Algae, chiefly Polynesian," adds considerably to the list of Philippine marine Chlorophyceae. He lists about 47 species of algae from the Philippines and among them are the following Chlorophyceae: From the island of Mactan, opposite the Harbor of Cebu, *Halimeda Opuntia* (L.) Lamouroux, *H. macroloba* Decaisne, *Codium tomentosum* (Hudson) Stackhouse, *C. adhaerens* (Cabrera) C. Agardh, *Polyphysa spicata* Kützing, *Ulva reticulata* Forsskål; from Zamboanga, Mindanao, *Caulerpa peltata* Lamouroux, *C. clavifera* (Turner) C. Agardh, *Halimeda Tuna* Lamouroux, *Valonia utricularis* Roth, *Dictyosphaeria favulosa* (C. Agardh) Decaisne, *Ulva reticulata* Forsskål, *Cladophora mauritiana* Kützing; from Big Santa Cruz Island, opposite Zamboanga, *Caulerpa plumaris* (Forsskål) C. Agardh, *Halimeda Opuntia* (L.) Lamouroux, *Valonia fastigiata* Harvey, and *Anadyomene flabellata* Lamouroux.

The determination of the material which Dickie called *Polyphysa spicata* is incorrect, and the specimens should have been named *Halicoryne Wrightii* Harvey according to Solms-Laubach (1895) who saw the material while preparing his "Monograph of the Acetabularieae." *Caulerpa clavifera* is synonymous with *C. racemosa* var. *clavifera,* and *Dictyosphaeria favulosa* is now known as *D. cavernosa* (Forsskål) Børgesen. *Cladophora mauritiana* is known only from the Indian Ocean, except for this report from the Philippines, and the determination is therefore questionable, especially since it is not accompanied by a description. *Anadyomene flabellata* is now known as *A. stellata* (Wulfen) C. Agardh, but the writer is inclined to feel that the material here reported is more likely either *Anadyomene Wrightii* Harvey or *A. plicata* C. Agardh, both of which are common species of this region.

Just a year later Dickie (1877) published an additional paper which was entitled "Supplementary notes on algae collected by H. N. Moseley of H. M. S. 'Challenger' from various localities." In this paper he listed a

few additional species from the Philippines, and among them (from Zamboanga) is included a single marine chlorophycean, *Acetabularia Calyculus* Quoy & Gaimard.

Piccone (1886) in his *Alghe del viaggio di circumnavigazione della Vettor Pisani* listed the following Chlorophyceae from the island of Ticao, Masbate Province: *Ulva reticulata* Forsskål, *Enteromorpha flexuosa* J. Agardh, *Caulerpa laetevirens* Montagne, and *Codium tomentosum* (Hudson) Stackhouse. Of these four species *Enteromorpha flexuosa* had not been previously reported. *Caulerpa laetevirens* is synonymous with *C. racemosa* (Forsskål) J. Agardh var. *laetevirens* (Montagne) Weber-van Bosse.

From the results of the Siboga Expedition are added several more species to the list of marine Chlorophyceae from the Philippines. Barton (1901) in her monograph on "The genus *Halimeda*" reported that *Halimeda Opuntia* (L.) Lamouroux and *H. macroloba* Decaisne are found among the Siboga collections from the Sulu Archipelago. Ten years later A. Gepp and E. S. Gepp (1911) add the following seven species in the report of "The Codiaceae of the Siboga Expedition," these also being from the region of the Sulu Archipelago: *Udotea orientalis* A. & E. S. Gepp, *U. argentea* Zanardini var. *spumosa* A. & E. S. Gepp, *U. Flabellum* (Ellis & Solander) Lamouroux, *Codium difforme* Kützing, *C. ovale* Zanardini, *C. tenue* Kützing, and *C. elongatum* C. Agardh.

Mme. Weber-van Bosse (1913) in the "Liste des algues du Siboga, I" reported the following Chlorophyceae as occurring among the collections from the Sulu Archipelago in addition to the species from the Siboga Expedition mentioned in the two preceding articles: *Ulva Lactuca* L., *U. reticulata* Forsskål, *Enteromorpha crinita* (Roth) C. Agardh, *Cladophoropsis sundanensis* Reinbold, *Valonia utricularis* C. Agardh, *V. fastigiata* Harvey, *Bornetella sphaerica* Zanardini, *B. oligospora* Solms-Laubach, *Caulerpa sertularioides* (Gmelin) Howe, *C. Selago* (Turner) C. Agardh, *C. Freycinettii* (C. Agardh) Weber-van Bosse, and *C. crassifolia* (C. Agardh) J. Agardh. In the list above *C. Freycinettii* has become *C. serrulata* (Forsskål) J. Agardh *emend.* Børgesen.

In 1918 Merrill published his "Species Blancoanae," a critical revision of the Philippine species of plants described by Blanco and Llanos, and in it three species are referred to the Chlorophyceae, namely *Enteromorpha intestinalis* (L.) Link, *E. prolifera* J. Agardh, and *Halimeda Opuntia* (L.) Lamouroux. There is no reason to doubt the accuracy of the first two determinations, but the plant which Merrill distributed in the exsiccata as *Species Blancoanae No. 993* is not *Halimeda Opuntia,* but rather *H. macroloba* Decaisne.

According to the late Dr. M. A. Howe (1932), there are the following Chlorophyceae among the algae collected at Panay Island by Lieut. H. C.

Kellers, M.D., who was attached as surgeon to the Naval Eclipse Expeditions of 1929 and 1930: *Enteromorpha lingulata* J. Agardh, *Chaetomorpha Kellersii* Howe, *Caulerpa clavifera* (Turner) C. Agardh, *C. macrodisca* Decaisne, and *Acetabularia major* Martens. The plant which Howe called *Caulerpa macrodisca* is *C. peltata* Lamouroux var. *macrodisca* (Decaisne) Weber-van Bosse.

SUMMARY OF RECORDS

Following is a check-list of all Philippine marine Chlorophyceae appearing in the literature before 1940; it has been arranged systematically so that the species come under the order and family to which they belong; each species is followed by the name of the author or authors reporting it, and the name under which it was listed if that name differs from the present accepted name. When the accuracy of a determination is in doubt the specific name is preceded by a question mark; species for which the Philippines is the type locality are marked by an asterisk.

ULOTRICHALES

ULVACEAE

ENTEROMORPHA CRINITA (Roth) C. Agardh. (Weber-van Bosse, 1913.)
E. FLEXUOSA (Wulfen) J. Agardh. (Piccone, 1886.)
E. INTESTINALIS (L.) Link. (Blanco, 1837, as *Ulva intestinalis;* Merrill, 1918.)
E. LINGULATA J. Agardh. (Howe, 1932.)
E. PROLIFERA J. Agardh. (Merrill, 1918.)
ULVA LACTUCA L. (Weber-van Bosse, 1913.)
U. RETICULATA Forsskål. (Montagne, 1844; Martens, 1866; Dickie, 1876; Piccone, 1886; Weber-van Bosse, 1913.)

SIPHONOCLADALES

VALONIACEAE

DICTYOSPHAERIA CAVERNOSA (Forsskål) Børgesen. (Dickie, 1876, as *D. favulosa.*)
VALONIA FASTIGIATA Harvey. (Dickie, 1876; Weber-van Bosse, 1913.)
? V. MACROPHYSA Kützing. (Martens, 1866.)
V. UTRICULARIS Roth. (Martens, 1866; Dickie, 1876; Weber-van Bosse, 1913.)

BOODLEACEAE

CLADOPHOROPSIS SUNDANENSIS Reinbold. (Weber-van Bosse, 1913.)

ANADYOMENACEAE

ANADYOMENE LECLANCHERII Decaisne. (Martens, 1866, as *Microdictyon clathratum;* Gray, 1866, as *Cystodictyon Leclancherii.*)
? A. STELLATA (Wulfen) C. Agardh. (Dickie, 1876, as *A. flabellata.*)

CLADOPHORACEAE

? CLADOPHORA MAURITIANA Kützing. (Dickie, 1876.)
C. PELLUCIDA (Hudson) Kützing. (Montagne, 1844.)
? CHAETOMORPHA INFLATA Kützing. (Martens, 1866.)
* C. KELLERSII Howe. (Howe, 1932.)

DASYCLADALES

DASYCLADACEAE

BORNETELLA SPHAERICA (Zanardini) Solms-Laubach. (Weber-van Bosse, 1913.)
B. OLIGOSPORA Solms-Laubach. (Weber-van Bosse, 1913.)
HALICORYNE WRIGHTII Harvey. (Dickie, 1876, as *Polyphysa spicata.*)
ACETABULARIA CALYCULUS Quoy & Gaimard. (Dickie, 1877.)
A. MAJOR Martens. (Howe, 1932.)

SIPHONALES

CAULERPACEAE

CAULERPA CRASSIFOLIA (C. Agardh) J. Agardh. (Weber-van Bosse, 1913.)
C. PELTATA Lamouroux, (Dickie, 1876; Howe, 1932, as *C. macrodisca.*)
C. RACEMOSA (Forsskål) J. Agardh
var. *clavifera* (Turner) Weber-van Bosse. Martens, 1866, as *Chauvinia clavifera;* Dickie, 1876, as *Caulerpa clavifera;* Howe, 1932, as *C. clavifera.*)
var. *laetevirens* (Montagne) Weber-van Bosse. (Piccone, 1886, as *C. laetevirens.*)
C. SELAGO (Turner) C. Agardh. (Weber-van Bosse, 1913.)
C. SERRULATA (Forsskål) J. Agardh *emend.* Børgesen. (Weber-van Bosse, 1913, as *C. Freycinettii.*)
C. SERTULARIOIDES (Gmelin) Howe. (Montagne, 1842, as *C. plumaris;* Dickie, 1876, as *C. plumaris;* Weber-van Bosse, 1913.)
C. TAXIFOLIA (Vahl) C. Agardh. (Montagne, 1844.)

CODIACEAE

* AVRAINVILLEA ERECTA (Berkeley) A. & E. S. Gepp. (Berkeley, 1842, as *Dichonema erectum;* Montagne, 1844, as *Udotea sordida;* A. & E. S. Gepp, 1911.)
UDOTEA ARGENTEA Zanardini var. *spumosa* A. & E. S. Gepp. (A. & E. S. Gepp, 1911; Weber-van Bosse, 1913.)
U. FLABELLUM (Ellis & Solander) Lamouroux. (A. & E. S. Gepp, 1911; Weber-van Bosse, 1913.)
U. ORIENTALIS A. & E. S. Gepp. (A. & E. S. Gepp, 1911; Weber-van Bosse, 1913.)
CODIUM ADHAERENS (Cabrera) C. Agardh. (Dickie, 1876.)
? C. DICHOTOMUM (Hudson) S. F. Gray. (Montagne, 1844, as *C. tomentosum;* Dickie, 1876, as *C. tomentosum;* Piccone, 1886, as *C. tomentosum.*)
C. DIFFORME Kützing. (A. & E. S. Gepp, 1911; Weber-van Bosse, 1913.)
C. ELONGATUM C. Agardh. (A. & E. S. Gepp, 1911; Weber-van Bosse, 1913.)
C. OVALE Zanardini. (A. & E. S. Gepp, 1911; Weber-van Bosse, 1913.)
C. TENUE Kützing. (A. & E. S. Gepp, 1911; Weber-van Bosse, 1913.)
HALIMEDA DISCOIDEA Decaisne. (Montagne, 1844; Martens, 1866.)
H. GRACILIS Harvey. (Martens, 1866, as *H. cuneata* Kützing.)
H. MACROLOBA Decaisne. (Dickie, 1876; Barton, 1901; Weber-van Bosse, 1913; Merrill, 1918, as *H. Opuntia.*)
H. OPUNTIA (L.) Lamouroux. (Martens, 1866; Dickie, 1876; Barton, 1901; Weber-van Bosse, 1913.)
H. TUNA Lamouroux. (Dickie, 1876.)

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