

COMMONWEALTH OF AUSTRALIA

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A CRITICAL SURVEY OF THE MARINE ALGAE OF
SOUTHERN AUSTRALIA

I. CHLOROPHYTA

By H. B. S. WOMERSLEY

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Summary

This paper is a survey of all the known marine Chlorophyta of southern Australia, from the south-west corner of Western Australia to about the Victoria-New South Wales border, and including Tasmania. Full references to each species are given, all established synonymy, the type locality of each species and where the type specimen is deposited, and a summary of the known distribution. Critical notes on many species are given also.

INTRODUCTION

The need for a critical survey of the marine algae of southern Australia has been obvious for many years. The lists of Lucas (1912, 1913) of the marine algae of Australia were little more than an extraction from De Toni's "Sylloge Algarum" (De Toni 1889), without references, and with distribution records summarized so much as to be of little value. Lucas's (1928) list of Tasmanian algae has the same limitations, while his (1936) account of the marine algae of South Australia gives no references and is now very incomplete. May (1938 and later papers) has given a better account of many of the New South Wales species, but a complete survey of the known species of both the eastern and western coasts of Australia, as well as the north, is needed. In many cases it is still necessary to refer to Harvey's "Phycologia Australica" (1858-1863) for a reasonable account of any species.

Some years ago the writer compiled a card index of all names that have been applied to southern Australian algae, with all references and distribution records. During 1952 it was possible to visit herbaria in Britain, Europe, and the United States which house the type specimens of southern Australian marine algae. The vast majority of the types were studied, and specimens from the writer's collections were compared with them. In most cases it was possible to designate homeotypes, which are now housed in the Herbarium of the University of Adelaide. In some cases type fragments were made available, and photographs of all the macroscopic types were taken or are being obtained for the Adelaide University Herbarium.

The location of the type of each species is given in the following account, using the standard abbreviations of Lanjouw and Stafleu (1952). These abbreviations are given below. Notes on the location of the type specimens of the various collectors and authors are also given below.

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This paper, and accounts of the brown and red algae of southern Australia which will follow later, are based on the above information. While it is probably too much to hope that the references and synonymy are complete, it is hoped that future changes and additions will be minor ones. This and the succeeding accounts should enable future systematic and ecological studies to be based on a firm foundation, and limitations to algal studies in southern Australia should be largely removed.

This list is regarded as a preliminary to taxonomic revisions of genera and groups and to a future algal flora of the region.

In compiling this list, references have been checked if there were cause for doubt and much synonymy has been clarified. References to species in strictly ecological papers have been omitted. Unfortunately it has not been possible to check all locality records or specimens in all Australian herbaria (those in AD, MEL, and HO have been examined), so distribution ranges may have to be extended slightly in future. Very few specimens were designated as types by early authors, but where the original description is based on a single specimen this is regarded as the type. The type number is given when available, but as most collections are not numbered, the type specimen has been marked as such if this had not already been done. Where the original description is based on a number of specimens, or where there is doubt as to the original, a lectotype has been designated.

Unfortunately, an inadequate and misleading list of Tasmanian marine algae has been published recently (Guiler 1952). This is no more than a repetition of that of Lucas (1928) with some additions of species and localities (many of which are doubtful), and shows Guiler's lack of familiarity with his subject. No references are given and clearly there has been no attempt to check on literature or herbarium records. The green algae in the Herbarium of the Botany Department, University of Tasmania, have been checked by the writer, and some of Guiler's errors are corrected in this paper; little reliance can be placed on many other records. This type of paper, with its many spelling errors of specific names and of authors, will, it is hoped, be the last of such lists of Australian algae to be published.

The region included in this survey, from the south-west corner of Western Australia to about the Victoria–New South Wales border, and including Tasmania, is a distinct floristic region. Many species occur throughout it, and the algal flora is quite different from that of the warmer western and eastern Australian coasts. A few warmer-water species which do extend into southern Australia on the western or eastern coasts are included.

STANDARD ABBREVIATIONS OF HERBARIA (LANJOUW AND STAFLEU 1952)

AD	Department of Botany, University of Adelaide, South Australia.
B	Botanisches Museum, Berlin—Dahlem, Germany.
BM	British Museum (Natural History), London, England.
C	Botanical Museum and Herbarium, Copenhagen, Denmark.
CANB	Division of Plant Industry, C.S.I.R.O., Canberra, Australia.
CN	Institut Botanique, Caen, France.
E	Royal Botanic Garden, Edinburgh, Scotland.
ER	Botanisches Institut und Herbarium der Universität, Erlangen, Germany.
FI	Herbarium Universitatis Florentinae, Firenze, Italy.

HO	Department of Botany, University of Tasmania, Hobart, Tasmania.
K	Herbarium, Royal Botanic Gardens, Kew, London, England.
KIEL	Botanisches Institut der Universität, Kiel, Germany.
L	Rijksherbarium, Leiden, Holland.
LD	Botanical Museum and Herbarium, Lund, Sweden.
LINN	Linnean Society of London, London, England.
LIV	Herbarium, Public Museums, Liverpool, England.
M	Botanische Staatssammlung, München, Germany.
MEL	National Herbarium of Victoria, Melbourne, Australia.
NSW	National Herbarium of New South Wales, Sydney, Australia.
O	Botanisk Museum, Oslo, Norway.
PC	Laboratoire de Cryptogamie, Muséum d'Histoire Naturelle, Paris, France.
S	Naturhistoriska Riksmuseet, Stockholm, Sweden.
TCO	School of Botany, Trinity College, Dublin, Eire.
TRH	Botanical Department, Museum of the Royal Norwegian Society, Trondheim, Norway.
UC	Herbarium, University of California, Berkeley, California, U.S.A.
UPS	Botaniska Museet, Uppsala Universitet, Uppsala, Sweden.
W	Naturhistorisches Museum, Wien, Austria.

NOTES ON THE LOCATION AND STATE OF TYPES OF SOUTHERN AUSTRALIAN MARINE ALGAE

The following list of authors includes all who have described more than a very few southern Australian marine algae. Authors of one or a few species or of some cosmopolitan species are excluded, and information is given under the particular species.

Agardh, C. A.—The Agardh herbarium (C. A. and J. G. Agardh) is housed as a separate unit in the Botaniska Museet, Lund, Sweden (LD). The collection is maintained exactly as left by J. G. Agardh, but each specimen or sheet of notes is numbered. C. A. Agardh's types are often small and fragmentary. Many were described from specimens (of Montagne, Desfontaines, Gaudichaud, etc.) in the Paris Museum (PM), and the best specimen is often here; Agardh presumably was given or kept part of the original specimen, though in some cases no specimen could be located in PM. Agardh's species were nearly always described from a single specimen.

Agardh, J. G.—His collections form the bulk of the Agardh herbarium in Lund, and comprise the second most important collection of Australian algal types. In many cases where there are several collections under a species, more than one species is present, and in all cases it is necessary to locate or choose the type, on which the specific concept can be fixed. This has been done, and the type numbers are given below under the species. Much of J. G. Agardh's material was very inadequate, and often his specific concepts were not good. As a result he tended to be a "splitter", and often described a species under different names, especially in the Rhodophyta. J. G. Agardh's studies, based entirely on dried material and without having ever seen Australian algae in the field, were remarkable for their thoroughness, but much taxonomic revision of the Australian material is now necessary.

Areschoug, J. E.—The Australian types of Areschoug are in the Botanical Department, Riksmuseet, Stockholm, Sweden (S). The specimens are mostly reasonably good ones.

Bornet, E.—See under "Paris Museum".

Bory de St. Vincent, J. B. M.—See under "Paris Museum".

Brown, R.—Brown's main collections are at the British Museum (Natural History), South Kensington, London (BM). No Australian marine algae were described by Brown, but those were passed over to Dawson Turner. Turner's figures are usually accurate representations of the type specimen, which can be well matched (but are reversed in printing). The Australian types credited to Brown by Turner are mostly in BM, but sometimes are in Kew (K) (i.e. the Kew specimen is the one Turner figured). Isotypes of most are at Kew, and other duplicates are in the

herbarium (E) of the Royal Botanic Gardens, Edinburgh, Scotland (herb. Greville). The specimens in BM are in good condition, the types in separate folders.

Crouan, P. L., and Crouan, H. M.—Their collection is said to be at Concarneau, France. Only two Australian species are involved, and an authentic (type?) specimen of one (*Ophiodocladus simpliciusculus*) is in the herbarium Thuret-Bornet, PM.

Decaisne, J.—See under "Paris Museum".

Derbes, A., and Solier, A.—Their collection is supposed to be at Marsoilles, France, but the Botanical Department of the University there knows nothing of it. The only species from Australia involved is *Girardinia sphacelarioides*; no type of this could be found in PM.

Dillwyn, L. W.—Several cosmopolitan species, described by Dillwyn from England, occur in Australia. The types of these have not been located. In the Linnean Society, London, are four thin books named "British Confervae. Fasc. I-IV", and these contain most of the species figured by Dillwyn in plates 1-38, but none figured in later plates.

Esper, E. J. C.—Esper's Australian species were described from specimens sent him by Turner, and in most cases the figures are poor and based on fragments only. Esper's specimens are supposed to be in the Botanical Institute, the University, Erlangen, Germany (ER), but enquiries have brought to light only one species. There is no apparent way of checking from material in Kew, which specimens were sent to Esper by Turner. An account of Esper's work is given by Silva (1953).

Falkenberg, P.—Several Australian Rhodomelaceae and Dasycaceae were described by Falkenberg from collections borrowed from various herbaria. These will be dealt with under each species.

Foslie, M. H.—All Foslie's species and varieties of Australian coralline algae were located in his collections at the Trondheim Museum, Norway (TRH), except var. *australasica* of *Goniolithon elatocarpum*. The specimens are in good condition, with full collection data on the boxes. Foslie did not specify types, but in all cases the collection used by Foslie (made before his published description) was located. Owing to the abundant collections in most cases, isotype specimens were kindly presented to the writer and are now deposited in AD.

Gepp, A., and Gepp, E. S.—These types are all in BM and are well preserved in type folders.

Greville, R. K.—All Greville's Australian types are in E, and are all in good condition. These specimens probably all came from Fraser, who collected near the Swan River, W.A.; this is given on many but not all of the specimens.

Grunow, A.—Grunow's collections are in the Botanischen Abteilung, Naturhistorischen Hofmuseum, Wien, Austria (W), and are in good condition. Grunow's Australian types are mostly species and varieties of *Sargassum* from northern Australia.

Harvey, W. H.—The herbarium of W. H. Harvey is of first importance to Australian algologists. All except two of his Australian species were located in the Herbarium of the Botany Department, Trinity College, Dublin, Eire (TCD). The condition of the specimens is generally good, and types have been marked as such by the writer. Harvey used two distinct series of numbers on his Australian specimens:

- (1) Numbered specimens in his travelling sets (originally in books, now incorporated in the herbarium proper). These numbers, mainly of Western Australian algae, are given in his (1854) account, and must apply to the types of the species concerned. Unfortunately many of the specimens had been previously torn out of the travelling sets; some were in the herbarium, but many are missing. Where they are missing, a specimen of the same collection in the herbarium was taken as the type.
- (2) Numbers used in his "Algae Australiae Exsiccatae", with a letter for the locality.

Hooker, J. D.—Hooker's collection is at the Royal Botanic Gardens, Kew, England (K). The Australian species were probably all described by W. H. Harvey, and the main specimen is usually in Kew. Isotypes are frequently found in Harvey's collections at TCD, and in some cases the true type may be here. Hooker's specimens are generally in good condition, in type folders.

Hudson, G.—Only cosmopolitan species, mostly well known, are involved here. Hudson's types are mostly lost, but a type specimen of *Plocamium coccineum* is in BM.

Kjellmann, F.—The Australian *Galaxaura*'s described by Kjellmann are either in herb. Areschoug (S) or in Herbarium Uppsaliensis, Botanical Institute, Uppsala, Sweden (UPS). In several cases the species are based on very poor fragments, and some uniting of so-called species is necessary.

Kützing, P. T.—Most of Kützing's types of Australian algae are in the Rijksherbarium, Leiden, Holland (L), but many he described from herbarium Sonder, which is in Melbourne National Herbarium, Australia (MEL). The types in L are all well and carefully preserved, and marked as such. Many of Kützing's specimens, however, were small and not very adequate. Sometimes a specimen from herbarium Sonder is represented by a small fragment in L. Kützing's figures in "Tabulae Phycologicae" are generally fairly good of the specimens available, and he referred to his description and figure on the particular specimen sheet. This makes his types easy to identify.

Labillardiere, J. J.—The nine species of brown and red algae, comprising the first descriptions of Australian algae, are in the Herbarium Universitatis Florontinae, Firenze, Italy (FI).

Lamarck, J. B. de.—See under "Paris Museum".

Lamouroux, J. V. F.—His herbarium is at the Botanical Institute, Caen, France (CN). Most, but not all, of the Australian types were located there, and Lamouroux' original labels are usually with the specimens. Some specimens are good, others inadequate. In a few cases there is isotype material in the General Herbarium, PM.

Lenormand, S. R.—Lenormand did not describe any Australian species, but the three species described from his herbarium are at CN. Two of these were also located at PM.

Lewring, T.—His Australian collections, made during 1948, are in his personal herbarium, Marinbotaniska Institut, Göteborg, Sweden. The types of his smaller species are kept as slides or in alcohol. Isotypes of all his new species of Bangiales and Nematinales are also at AD.

Linnaeus, C.—The main collections of Linnaeus are in the Linnean Society of London, England (LINN). Specimens of many, but not all, of Linnaeus's species which occur in Australia are there, but there is some doubt whether these are always the original specimens, and not later replacements.

Lucas, A. H. S.—The Lucas herbarium is owned by the Division of Plant Industry, C.S.I.R.O., Canberra, but is on loan to the National Herbarium of New South Wales, Sydney, Australia (NSW). Lucas's species are usually represented by a good series of specimens, and an isotype series is at AD.

Mertens, F. C.—See under "Paris Museum".

Montagne, J. P. C.—See under "Paris Museum".

Mueller, F. von.—F. von Mueller's collections were described by other workers, and are located in the herbarium concerned. Many specimens, however, are at MEL.

Müller, O. F.—The species involved here are cosmopolitan ones, described in 1778, and probably no authentic specimens were kept. It seems best to use specimens from the type localities for comparison.

Paris Museum

Collections of numerous French authors are housed at the Laboratoire de Cryptogamie, Muséum National d'Histoire Naturelle, 12 Rue Buffon, Paris 5^e (PC). The collections are divided into:

- (1) Herbarium Thuret-Bornet, which includes material of these two authors and of Bory de St. Vincent, and some other old specimens.
- (2) Herbarium Sauvageau.
- (3) Herbarium Montagne.
- (4) France herbarium.
- (5) General herbarium—the remaining collections.

Some trouble was experienced in locating specimens, as many are loose and the types are not marked. The following authors of Australian specimens are represented in the collections:

- Agardh, C. A. Agardh received and described numerous specimens from PM, collected by Desfontaines, Gaudichaud, and others on French expeditions. While the actual type may be in Lund, in some cases better specimens are in the general herbarium (5), and a few species may only be represented in the latter.
- Bornet, E. The type specimen of the single species of Bornet which occurs in southern Australia is in the Thuret-Bornet herbarium (1).
- Bory de St. Vincent, J. B. M. All Bory's specimens were located in (1).
- Decaisne, J. His specimens are in (5); most but not all were located.
- Lamarck, J. B. de. Lamarck described four species of corallines which occur in southern Australia, and a single, rather fragmentary specimen of each was located in (5).
- Mertens, F. C. Mertens, a Danish algologist, described a number of species from (5). In most cases, but not all, the type was located, some being found amongst unsorted "indeterminata". The specimens were variable in quality, but had Mertens's original label with them. Some species credited to Mertens were described by Turner.
- Montagne, J. F. C. All the required specimens were located in herbarium Montagne (3).
- Quoy and Gaimard. The type specimen of *Acetabularia calyculus* was not found at PM.
- Rosanoff, S. Rosanoff described two Australian corallines from herb. Lamouroux, and these were located in herbarium Lamouroux in CN.
- Sauvageau, C. Some of Sauvageau's species (of Sphacelariales) were described from other herbaria (e.g. TCD) in which case fragments only are in herbarium Sauvageau (2). Original specimens and others examined by Sauvageau are clearly indicated with his attached annotation labels.

Quoy and Gaimard.—See under "Paris Museum".

Reinbold, T.—The main herbarium of Reinbold is at the Botanical Museum, Monzingerstrasse 13, München 38, Germany (M), and most of his Australian specimens were seen (on loan). Some isotypes are in the Rijksherbarium, Loidon (L), and others in AD.

Reinke, J.—His collections are in the Botanisches Institut der Universität, Kiel, Germany (KIEL). During the war they were crated and have not yet been available for study.

Rosanoff, S.—See under "Paris Museum".

Roth, A. W.—Roth's collections were in Berlin, but are reported to have been lost during the Second World War.

Sauvageau, C.—See under "Paris Museum".

Setchell, W. A.—Setchell's herbarium, including the types of three Australian species, are in the Department of Botany, University of California (UC).

Sonder, O. W.—Sonder's herbarium is incorporated in MEL. The types are usually easily selected from Sonder's notes and accompanying drawings. Sonder's herbarium includes many species described by Kützing.

Suhr, J. N.—Some, but not all, of Suhr's types are at L.

Turner, D.—Turner's Australian species were mostly collected by Robert Brown, and in many cases the name is credited to Brown by Turner. In nearly all cases a specimen which matches Turner's figure was found, either at K or at BM. Turner's collections are housed at K, Brown's at BM. Turner also described some specimens received from Mertens from PM. These were credited to Mertens, but in some cases it is not certain whether Turner's or Mertens's description has priority, being published in the same year. Mertens's specimens which were figured by Turner are at K. All Turner's type specimens are in good condition, and labelled as such.

Velley, T.—Velley's types of three Australian species are preserved in the Herbarium, Public Museums, Liverpool, England (LIV).

Weber van Bosse, A.—The three Australian *Caulerpa* described by Weber van Bosse were from other herbaria than her own, which is now housed in Leiden.

Wilson, J. B.—Wilson's specimens, from the vicinity of Port Phillip, Victoria, were described by J. G. Agardh, and the types are at LD. Other representative collections are found at MEL and at BM.

Zanardini, G.—Zanardini described a considerable number of Australian species, now preserved in the Museo Civico Correr, Venezia, Italy. Many of these have been seen, on loan at BM, but others represented by only one specimen are not sent on loan, and remain virtually unknown.

Order CHLOROCOCCALES
Family CHLOROCOCCACEAE
 Genus CODIOLUM Braum

Codiolum kuckuckii Skottsberg & Levring in Levring 1941: 604, fig. 1A.

Type locality.—Juan Fernandez I. (Skottsberg) (presumably, though other localities given). *Type.*—Skottsberg herbarium (probably at S).

Distribution.—Epiphytic in *Splachnidium rugosum*; South Africa, New Zealand, Juan Fernandez and San Felix Is., and southern Australia (no localities given by Levring, but *Splachnidium* occurs sporadically in southern Australian waters, mainly on granite or Pro-Cambrian rocks).

Order ULOTRICHALES
Family ULOTRICHACEAE
 Genus ULOTRICH Kützing

Ulothrix pseudoflaccida Wille 1900: 22, pl. 2, figs. 64–81. Hamel 1931: 22, figs. 6E, F. Jonsson 1904: 55–7, fig. 7. Kylin 1949: 12. Levring 1944: 2. Setchell and Gardner 1920: 285.

Ulothrix implexa Kützing sensu Womersley 1950: 141.

Type locality.—Drobak, Norway (Wille). *Type.*—O.

Distribution.—Northern Europe; Mediterranean; Alaska to California; Tristan da Cunha; Crozet Is. In Australia, from American River inlet, Kangaroo I.

The American River inlet material agrees well with a specimen of Wille's from Drobak in L. The filaments are 10–11 μ thick, cells $\frac{1}{2}$ – $1\frac{1}{2}$ times as long as broad (mostly $\frac{1}{2}$ –1), with a thin wall and usually 1 pyrenoid. This material had been previously referred to *U. implexa* Kützing, the type of which is in L (No. 938, 174 . . . 397), labelled "Goes (Zelande) in submarinis. 150" in Lenormand's writing, and "*Ulothrix implexa*" written in ink over "*Hormidium implexum*" by Kützing. However, I could find no trace of a *Ulothrix* in the specimen (nor could Dr. J. Th. Koster after considerable search), which consists almost entirely of a *Rhizoclonium* and diatoms. Kützing's description and figure (1852: 30, pl. 94, fig. 2) are not very good, but in his original description (1847: 177, as *Hormidium implexum*) he refers to "gonidiis (sacpe pectinatis) punctato-granulosis". The only thing in the type that this fits are cells of *Melosira* which are present. As no *Ulothrix* could be found in the type of *U. implexa* Kützing, it seems necessary to completely reject this name, as was done by Wille on other grounds.

Order CHAETOPHORALES
Family CHAETOPHORACEAE
Genus ENTOCLADIA Reinke

Entocladia viridis Reinke. Levring 1946: 216. Setchell and Gardner 1920: 289. Smith 1944: 35.

Endoderma viride De Toni 1889: 209.

Type locality.—Naples, Italy (in *Derbesia lamourouxii*). *Type*.—Germany?

Distribution.—Probably cosmopolitan. Recorded by Levring from "Sydney" and "Melbourne", epiphytic in *Lomentaria australe* and *Hymenema curdieana*, but probably much more widespread along southern Australia.

Order ULVALES
Family ULVACEAE
Genus BLIDINGIA Kylin

Blidingia minima (Naegeli in Kützing) Kylin 1947: 181; 1949: 30, figs. 30, 31. Womersley 1950: 142; 1953: 36.

Enteromorpha minima Naegeli in Kützing 1849: 482; 1856: 16, pl. 43, fig. 3. Bliding 1938: 84, figs. 1-6. Doty 1947: 17. Sjøstedt 1939: 18, fig. 1.

Enteromorpha nana (Sommerfelt) Sjøstedt 1939: 29, fig. 4.

Enteromorpha gunniana J. Agardh 1883: 122. De Toni 1889: 119. Guiler 1952: 73. Lucas 1912: 165; 1928: 9. Sjøstedt 1939: 54, fig. 11.

Type locality.—Heligoland, Germany (Naegeli). *Type*.—L.

Distribution.—Probably almost cosmopolitan. In Australia, known from the Recherche Archipelago, W.A.; Kangaroo I. and Outer Harbour, S.A.; Bridgewater Bay, Vic.; Georgetown and Thonin Bay, Tas. Probably it is generally distributed, though spasmodic, along southern Australia.

The type of *E. gunniana* is in LD (herb. Agardh, No. 13412) and appears conspecific with *B. minima*. Sjøstedt has previously discussed their very close relationships. The only apparent difference lies in the more massive basal layer, from which tubular fronds arise, in *E. gunniana*.

Genus ENTEROMORPHA Link

Few genera are as troublesome as *Enteromorpha*. The systematics of the genus are still very confused, largely owing to the limitations of dried material. The most satisfactory recent work is that of Bliding, who has used living material, studying the cell morphology—arrangement, size, and pyrenoids—and experimentally testing conjugation between gametes from apparently different forms. In *E. clathrata* Bliding has shown that three morphological forms occur, but are all inter-fertile; these forms (and others) had previously been regarded as distinct species.

Until cultural studies similar to Bliding's can be made on southern Australian forms of *Enteromorpha*, the species occurring in Australia must remain doubtful. Bliding's concepts based on cell morphology can be used for a rough grouping, and this has been done below. Dried material is often virtually useless, but liquid-preserved specimens have been available from many South Australian collections. As the type

specimens of nearly all species are dried, it seems best to follow Bliding's concepts and application of the names. Culture work is also needed to determine whether any of the species newly described by Bliding occur in Australia. It is likely that his *E. ahlneriana* does occur, but confirmation is needed. *E. kylinii* may also occur.

The references given below include only those involving Australian records and some of the most useful ones to the cosmopolitan species.

Enteromorpha acanthophora Kützing 1849: 479; 1856: 12, pl. 34, fig. 1. J. Agardh 1883: 157. De Toni 1889: 135. Guiler 1952: 72. Lucas 1912: 166; 1928: 9. *Type locality*.—New Zealand (Hooker). *Type*.—L (No. 938, 19 . . . 134).

Distribution.—New Zealand. Other records doubtful.

This species was recorded from Tasmania (R. Gunn) by J. Agardh, Guiler, and Lucas, and from Kangaroo I. by Womersley (1950: 142). I have seen Kützing's type and the Kangaroo I. specimens are clearly different; probably they are forms of *E. clathrata*. The Tasmanian specimens have not been seen. In other collections I have not seen specimens identical with the New Zealand *E. acanthophora*, and whether this species occurs in Australia must be regarded as doubtful.

Enteromorpha ahlneriana Bliding 1944: 338, figs. 10–18. Doty 1947: 15. Kylin 1949: 26, figs. 21–24.

Bliding described this species from Sweden on the basis of culture work on living material. Included under it are some forms previously referred to *E. procera*. Bliding (1944: 355) considers the name *E. procera* should be abandoned, as Ahlner's original figure shows cell arrangement as in the *E. compressa-intestinalis* group. Bliding believes *E. ahlneriana* is probably represented amongst specimens from American River inlet, Kangaroo I., sent him by the writer. Further confirmation is needed to establish this record.

Guiler (1952: 73) records *E. procera* forma *subundulata* Schiff. from Tasmania, on Chapman's determination, with no details. This may or may not be a form of *E. ahlneriana*.

Enteromorpha bulbosa (Suhr) Montagne 1846: 3. J. Agardh 1883: 139. De Toni 1889: 127. Guiler 1952: 72. Kützing 1849: 482. Levring 1944: 3, figs. 1c-f. Lucas 1912: 165; 1928: 9. Taylor 1938: 130; 1947: 59. Wilson 1892: 189.

Solenia bulbosa Suhr 1839: 72, pl. 4, fig. 46.

Enteromorpha novae-hollandiae Kützing 1856: 14, pl. 38, fig. 3?

Type locality.—Peru. *Type*.—L.

Distribution.—West coast of South America; sub-antarctic regions. Recorded from Tasmania by J. Agardh and by Kützing (as *E. novae-hollandiae*). I have not been able to check these records.

Chapman (1949: 496, fig. 3) described *E. bulbosa* forma *foliacea* from specimens from American River inlet, Kangaroo I. (not "R.I., Adelaide" as in description) sent him by the writer. The cells are arranged in rows in the lesser branches, partly so in older parts, and are 15–30 μ across in surface view of mature parts, with 2 or 3 pyrenoids per cell. Chapman's description is not accurate; the main thallus is scarcely compressed and his measurements are faulty (and some apparently misprinted). Bliding regards these specimens as a form of *E. clathrata*, with which I agree. This form is only one of many at American River inlet which are referable to *E. clathrata*.

The concept of *E. bulbosa* needs clarification. The type (in L) has cells mostly 8–12 μ across (slightly larger in older parts) in surface view, irregularly arranged, whereas Taylor (1947) gives "cells to 15–22 μ diam". Levring's (1944: 3, figs. 1c–f) concept appears to agree with the type.

Enteromorpha clathrata (Roth) Greville 1830; 181. J. Agardh 1883: 153. Bliding 1933: 236; 1944: 331, figs. 1–9. De Toni 1889: 133. Doty 1947: 16. Guiler 1952: 73. Harvey 1863: synop. 760. Kylin 1949: 28, figs. 27–29. Lucas 1912: 166; 1928: 9; 1936: 23. Reinbold 1897: 44. Sonder 1852: 659; 1853: 506; 1880: 40. Wilson 1892: 189. Womersley 1950: 142.

Enteromorpha ramulosa (Smith) Hooker. J. Agardh 1883: 154, pl. 4, figs. 117–118. De Toni 1889: 134. Guiler 1952: 73. Harvey 1851: pl. 245. Lucas 1912: 166; 1928: 9.

Desmotrichum plumosum Sonder 1852: 662.

Schizogonium pallidum Kützting. Tate 1882: 93?

Enteromorpha lingulata J. Agardh 1883: 143. De Toni 1889: 128. Guiler 1952: 73. Lucas 1912: 165; 1928: 9. May 1938: 211. Wilson 1892: 189.

Enteromorpha hopkirkii sensu Wilson 1892: 189.

Enteromorpha crinita sensu Reinbold 1898: 33. Lucas 1936: 23.

Enteromorpha bulbosa forma *foliacea* Chapman 1949: 496, fig. 3 (see under *E. bulbosa*).

Enteromorpha acanthophora sensu Womersley 1950: 142 (not Kützting).

Type locality.—Europe. *Type*.—Probably not in existence.

Distribution.—Cosmopolitan.

Bliding recognizes three forms of this species, the third of which is often known as *E. plumosa*. *E. clathrata* is probably the commonest species along southern Australia, occurring almost everywhere in one form or another. *E. ramulosa* was described by Smith from Bantry Bay, Ireland, and recorded from Tasmania by J. Agardh. The type is in K. Cotton remarks on the species folder that it is *E. clathrata*, with which I agree.

J. Agardh gave several localities, including Tasmania, in his description of *E. lingulata*. This species has been recognized by some other workers (e.g. Newton 1931: 69) but the cell form appears to fall within that of *E. clathrata*. The Australian specimens from Georgetown, Tas., in LD, appear to be forms of *E. clathrata*. May places *E. lingulata* under the group with cells not in longitudinal rows, but this is at variance with J. Agardh's conception. May's New South Wales specimens appear more like *E. compressa*.

E. opposita J. Agardh was published as a nomen nudum by Wilson (1892: 189). Two of Wilson's specimens from Western Port and Port Phillip Heads are in MEL. It is scarcely possible to determine them with any certainty, but they may be forms of *E. clathrata*.

Enteromorpha compressa (Linnaeus) Greville 1830: 180. J. Agardh 1883: 137.

Bliding 1948: 128, figs. 6–9. De Toni 1889: 126. Doty 1947: 14. Guiler 1952: 73. Harvey 1844: 454; 1854: 566; 1860b: 341; 1863: synop. 759. Hooker and Harvey 1847: 417. Kützting 1849: 480. Kylin 1949: 22, figs. 14–15. Lucas 1912: 165; 1928: 9; 1936: 23. May 1938: 211. Reinbold 1897: 44. Sonder 1852: 659; 1853: 506; 1880: 40. Womersley 1950: 142.

Enteromorpha chlorotica J. Agardh 1883: 136. De Toni 1889: 125. Lucas 1912: 165.

Type locality.—Sweden. *Type*.—LINN.

Distribution.—Cosmopolitan.

The type of *E. chlorotica* is in LD (No. 14029, with a few other specimens), from Swan River, W.A. The type consists of several thalli, branched near the base, widening to about 1 cm above. The cells are fairly large and irregularly arranged. J. Agardh separated *E. chlorotica* from *E. compressa* because of its pale colour, but there seems to be no justification for this; such bleached drift specimens of *E. compressa* are of frequent occurrence.

Enteromorpha flexuosa (Wulfen in Roth) J. Agardh 1883: 126. De Toni 1889: 121. Guiler 1952: 73. Lucas 1912: 165; 1928: 9. Wilson 1892: 189.

Type locality.—Adriatic Sea. *Type*.—Probably not in existence.

Distribution.—Widely distributed according to J. Agardh and recorded by him from Tasmania (coll. R. Gunn). I have not seen this specimen, and both the record and relationships of *E. flexuosa* need clarification.

Enteromorpha intestinalis (Linnaeus) Link. Bliding 1948: 123, figs. 1–4. De Toni 1889: 123. Doty 1947: 14. Guiler 1952: 73. Harvey 1860b: 341. Kylin 1949: 22, fig. 13. Levring 1946: 215. Lucas 1928: 9; 1936: 23. May 1938: 211. Sonder 1880: 40. Womersley 1950: 142.

Type locality.—Sweden. *Type*.—? (Not in LINN.)

Distribution.—Cosmopolitan, probably occurring generally around southern Australia.

Bliding separates *E. intestinalis* as being unbranched while *E. compressa* is branched. If this distinction is strictly upheld, relatively few collections from southern Australia are referable to *E. intestinalis*, as the thalli in most specimens of this group are branched at least a very few times near the base.

Enteromorpha linza (Linnaeus) J. Agardh 1883: 134, pl. 4, figs. 110–112. Bliding 1933: 234; 1939: 139, figs. 4–7. De Toni 1889: 124. Doty 1947: 18. Guiler 1952: 73. Kylin 1949: 19, fig. 12. Lucas 1912: 165; 1928: 9.

Ulva linza Linnaeus. Harvey 1851: pl. 39. May 1938: 211.

Type locality.—Europe. *Type*.—? (Not in LINN.)

Distribution.—Widely distributed. Australian records are those of De Toni from Tasmania and May from Port Jackson, N.S.W. I have not seen true *E. linza* on southern Australian coasts, and if it does occur it is probably rare. The old records need checking.

Enteromorpha prolifera (Müller) J. Agardh 1883: 129, pl. 4, figs. 103–104. Bliding 1933: 240; 1939: 134, figs. 1–3. De Toni 1889: 122. Doty 1947: 14. Guiler 1952: 73. Kylin 1949: 25, fig. 20. Levring 1946: 215. Lucas 1928: 9. May 1938: 211.

Type locality.—Lolland, Denmark. *Type*.—Not in existence.

Distribution.—Widely distributed. This species probably occurs along the southern Australian coast generally, but is not common. Critical work is needed, however, on Australian specimens called *E. prolifera*, following Bliding's concepts.

Genus ULVA Linnaeus

Ulva lactuca Linnaeus. C. Agardh 1821: 409. De Toni 1889: 111. Guiler 1952: 72. Harvey 1863: synop. 758. Kylin 1949: 17, fig. 11. Levring 1946: 215. Lucas 1912: 165; 1928: 9; 1936: 22. May 1938: 211. Setchell and Gardner 1920: 265. Sonder 1852: 659; 1853: 506. Womersley 1950: 141.

- Ulva latissima* C. Agardh 1821: 407. Harvey 1844: 454; 1860b: 342; 1863: synop. 756. Hooker and Harvey 1847: 417. Lucas 1912: 165. Sonder 1880: 39.
- Phycoseris ulva* Sonder 1845: 49; 1846: 153; 1852: 659; 1853: 506. Harvey 1854: 565. Kützting 1849: 477.
- Phycoseris gigantea* var. *perforata* Kützting 1849: 476.
- Phycoseris latissima* Harvey 1854: 565.
- Ulva australis* Areschoug 1854: 370. Sonder 1880: 39.
- Ulva laetevirens* Areschoug 1854: 370. J. Agardh 1883: 167. De Toni 1889: 114. Guiler 1952: 72. Lucas 1912: 165; 1928: 9; 1936: 22. May 1938: 211. Sonder 1880: 40.
- Ulva rigida* J. Agardh 1883: 169. Harvey 1863: synop. 757. Levring 1946: 215. Reinbold 1897: 44. Sonder 1880: 39.

Type locality.—Sweden. *Type*.—LINN.

Distribution.—Cosmopolitan.

The great majority of the forms of *Ulva* along southern Australia can probably be classed under *U. lactuca*. Some authors (e.g. Setchell and Gardner) have recognized several segregate species, but until culture work similar to Bliding's on *Enteromorpha* can be carried out on the forms of *Ulva* it seems best to lump the intergrading forms under *U. lactuca*. The type of *Phycoseris ulva* Sonder is in MEL and is only a small specimen of *U. lactuca*.

The type of *Phycoseris gigantea* var. *perforata* Kützting is in L (No. 938, 19 . . . 34) and appears to be fairly typical *U. lactuca*.

The type of *Ulva australis* Areschoug (from Port Adelaide, S.A.) is in S and comprises four similar specimens on one sheet. They appear to be only a stout and thicker form (especially at the base) of *U. lactuca*. The type of Areschoug's *U. laetevirens* from Port Phillip is also in S, but again appears to be *U. lactuca* with a broadly expanded thallus.

Tepper (1883: 66) recorded *Letterstedtia australis* as a nomen nudum, based on a determination by J. G. Agardh. This specimen is in an old collection in AD and appears to be only a very poor fragment of *Ulva lactuca*.

Ulva petiolata (J. Agardh) comb. nov.

Letterstedtia petiolata J. Agardh 1883: 176, pl. 4, figs. 123–124. De Toni 1889: 139. Lucas 1912: 166; 1936: 22.

Type locality.—Port Phillip, Vic. (F. von Mueller, on stems of *Cymodocea*). *Lectotype*.—LD (herb. Agardh, No. 14551).

Distribution.—Port Phillip, Vic.; Point Sinclair (east part of Great Australian Bight), S.A.; Port Jackson and Lake Illawarra, N.S.W. (in MEL).

This species has long and narrow (1–3 mm wide) stipes in mature plants, with expanded terminal parts. In the stipes (which may be up to 6 cm long) rhizoid development is considerable; the stipe may reach 500 μ in thickness, with the rhizoids traversing a central space between the cell rows. This stipe and rhizoid development is greater than in most species of *Ulva*, but is only a further development of the trend seen in some.

The generic distinctness of *Letterstedtia* is doubtful and it seems best to refer *L. petiolata* to *Ulva*. *U. petiolata* is common on very rough reefs at Point Sinclair but has not been found in similar localities eastwards in South Australia.

***Ulva reticulata* Forskål**

U. reticulata was recorded by Guiler (1952: 72) from "Tasmania" on a personal communication by Chapman. No details or support for this are given, and the specimen is not in H.O. In the absence of any evidence for this record it should not be accepted as a southern Australian marine alga.

U. reticulata is typically a tropical species which may occur on the Queensland coast.

Order SCHIZOGONIALES**Family SCHIZOGONIACEAE****Genus GAYELLA** Rosenvinge

Gayella polyrhiza Rosenvinge 1893: 937, figs. 45-46. Hamel 1931: 18, fig. 5. Knebel 1936: 52, fig. 27. Setchell and Gardner 1920: 280.

Type locality.—Gothalb, Greenland (Rosenvinge). *Type*.—C.

Distribution.—Greenland; Alaska; Faroes. In Australia, from American River inlet and Pennington Bay on Kangaroo I., occurring near shag or penguin colonies, above high tide level but subject to salt spray.

In C are three sheets of Rosenvinge's original collection and also some preserved material. The Kangaroo I. specimens seem identical with Rosenvinge's in all ways—form, thickness of filaments, and cell size and shape. Although the localities are so far apart, the habitats of the Greenland and Kangaroo I. specimens are similar, and there seems no reason to separate the latter from *G. polyrhiza*.

Some authors consider *Gayella* a form of *Prasiola*, through Knebel maintains *Gayella* as a distinct genus and also recognizes similar forms under *Prasiola crispa*. The Kangaroo I. specimens are always of the *Gayella* form only, never becoming flattened, so this name seems most applicable.

Order CLADOPHORALES**Family CLADOPHORACEAE****Genus CHAETOMORPHA** Kützting

Chaetomorpha aerea (Dillwyn) Kützting 1849: 379; 1853: 19, pl. 59, fig. 1. Cribb 1954: 17, pl. 1, fig. 7. De Toni 1889: 272; 1896: 231. Guiler 1952: 73. Harvey 1863: synop. 779. Kylin 1949: 48, fig. 50. Lucas 1912: 166; 1928: 11; 1936: 26, figs. 7 and 9. May 1938: 213. Newton 1931: 92, fig. 60. Setchell and Gardner 1920: 200, pl. 14, figs. 9-11. Sonder 1880: 41. Taylor 1937: 81, pl. 1, figs. 10-12. Womersley 1950: 143.

Conserva aerea Dillwyn 1806: pl. 80. Harvey 1861: pl. 99B.

Type locality.—Cromer, Britain. *Type*.—K. This species was described from specimens sent to D. Turner by Dr. Goodenough, and in Kew are three such specimens, two from Cromer and another without locality but with "*C. aerea*" and "Mr. Dillwyn 1806" on it. These are clearly type material, and the southern Australian plant appears identical with the type.

Distribution.—Almost cosmopolitan. Widely distributed along southern Australia and around Tasmania, being of common occurrence in littoral rock pools.

Chaetomorpha billardieri Kützting 1847: 166; 1849: 379; 1853: 19, pl. 59, fig. 3. De Toni 1889: 275. Lucas 1912: 166.

Type locality.—"Novae Hollandia" (La Billardiere). *Type*.—L (No. 937, 158 . . . 402).

Distribution.—From Esperance, W.A., to American River inlet on Kangaroo I. (but probably more widespread along southern Australia). The type came from either King George's Sound in Western Australia or southern Tasmania, both of which are outside the above range. This species seems characteristic of calm bays and inlets, and in American River inlet forms dense yellowish-green mats in the lower littoral, up to 10 or 20 yards across and 50 or more yards long. The filaments show very occasional branches.

Chaetomorpha capillaris (Kützing) Borgesen 1925: 45, fig. 13. Feldmann 1937: 208, fig. 17.

Rhizoclonium capillare Kützing 1847: 166.

Chaetomorpha implexa Kützing 1849: 376; 1853: 17, pl. 51, fig. 3. Lucas 1912: 166.

Chaetomorpha tortuosa Kützing 1849: 376; 1853: 17, pl. 51, fig. 2. De Toni 1889: 266 (in part).

Chaetomorpha breviarticulata Hauck 1885: 440.

Lola capillaris Hamel 1931: 25, fig. 37, (8).

Type locality.—Nice, south of France. *Type*.—L (No. 937, 155 . . . 45).

Distribution.—Mediterranean and nearby Atlantic Ocean. In Australia, from American River inlet, Kangaroo I., where it forms tangled masses under samphires (*Salicornia*) in the mid and upper littoral. Also from Russell, New Zealand (Lindauer No. 305 as *Ch. tortuosa* Kützing).

The American River inlet specimens agree well with Kützing's type of *Ch. capillaris* and also the figures of Feldmann. Kützing's type has "*Ch. capillaris* Kütz." crossed out and "*Ch. tortuosa*" written below by Kützing, who referred his own *Ch. capillaris* to *Ch. tortuosa*. Borgesen (1925: 45), however, considered Kützing's *Ch. tortuosa* not the same as Dillwyn's original *Conferva tortuosa* (from England and northern Europe) and this has been followed by several other authors. *Ch. tortuosa* (Dillwyn) Kleen and *Ch. capillaris* Kützing are clearly very closely related, and monographic studies are needed to establish their relationships. Kützing's *Ch. implexa* from Granville, Normandy (L, No. 937, 158 . . . 330) appears identical with his *Ch. capillaris*, and *Ch. breviarticulata* Hauck (L, No. 937, 158 . . . 313, ex herb. Hauck, from Pirano, with "*Ch. implexa* Kütz" in Hauck's writing, though it is probably type material of *Ch. breviarticulata*) seems to be the same species.

Chaetomorpha coliformis (Montagne) Kützing 1849: 380; 1853: 20, pl. 62, fig. 2.

De Toni 1889: 275. Guiler 1952: 73. Harvey 1863: synop. 778. Lucas 1912: 166; 1928: 9; 1936: 26. Sonder 1880: 40.

Conferva coliformis Montagne 1842: 16; 1845: 5. Harvey 1860b: 341.

Type locality.—Toud I., Torres Strait (Durville). *Type*.—PC (herb. Montagne).

Distribution.—Only known from the type locality and from Tasmania (Southport (Stuart) and Triabunna (Cribb)). This is an unusual distribution, but the Tasmanian specimens of Cribb match the type very well. Re-examination of the type locality is indicated.

Ch. coliformis is closely related to *Ch. darwinii* but the upper mature cells are barrel-shaped (about twice as long as broad) in the former and almost spherical in the latter.

Chaetomorpha darwinii (Hooker) Kützing 1849: 380. De Toni 1889: 271. Guiler 1952: 73. Harvey 1860b: 341; 1863: synop. 777. Lucas 1912: 166; 1928: 9; 1936: 25, figs. 6 and 8. Reinbold 1897: 44. Sonder 1852: 658; 1853: 506; 1880: 41. Womersley 1950: 143.

Conferva clavata sensu Hooker & Harvey 1847: 416.

Conferva clavata var. *darwinii* Hooker 1847: 493, pl. 192, fig. 1.

Type locality.—Cape Tres Montes, South America (Darwin). *Type*.—K.

Distribution.—Southernmost South America; New Zealand; southern Australia from Venus Bay on Eyre Peninsula to Western Port in Victoria and around Tasmania.

Chaetomorpha indica (Kützting) Kützting 1849: 376. De Toni 1889: 275. Lucas 1912: 166. Tate 1882: 93.

Conferva indica Kützting 1843: 259; 1853: 11, pl. 52, fig. 3.

Chaetomorpha implexa sensu Tate 1882: 93 (not other authors).

Type locality.—Tranquebar, India (Klein). *Type*.—L (No. 936, 249 . . . 72).

Distribution.—Probably widely distributed in the Indian Ocean and West Indian Ocean. In southern Australia, from Coffin's Bay on Eyre Peninsula and Port Adelaide (Tate); Tasmania? (Lucas).

This is a tropical species (occurring on Moreton I., Qld.) found only in some bays along southern Australia. Tate's records (1882: 93) have been checked from the specimens in MEL.

Chaetomorpha brachygona (Harvey 1858b: 87, pl. 46A; Borgeson 1913: 18; De Toni 1889: 267; Taylor 1928: 60, pl. 4, fig. 12) from Florida and the West Indian region is probably identical with *Ch. indica*.

Chaetomorpha linum (Müller) Kützting 1843: 204; 1849: 378; 1853: 18, pl. 55, fig. 3. Borgeson 1925: 44. Cribb 1954: 17, pl. 1, fig. 10. De Toni 1889: 269. Hamel 1931: 30, fig. 38B. Harvey 1851: pl. 150A. Kylin 1949: 49. Newton 1931: 91. Taylor 1937: 80, pl. 1, figs. 1 and 2. Womersley 1950: 143.

Conferva linum Müller 1778: 7, pl. 771, fig. 2.

Type locality.—Lolland, Denmark. *Type*.—Probably not in existence.

Distribution.—Europe; east coast of North America. In Australia, from the Bay of Shoals, Kangaroo I.

This material agrees well with the usual concept of *Ch. linum* and with a specimen of Levring's (in AD) from Sweden. The filaments are 290–330 μ thick and the cells about as long as wide.

Chaetomorpha valida (Hooker & Harvey) Kützting 1849: 379. De Toni 1889: 274. Guiler 1952: 73. Harvey 1863: synop. 780. Lucas 1912: 166; 1928: 11. Sonder 1880: 41. Wilson 1892: 190. Womersley 1950: 143.

Conferva valida Hooker & Harvey 1847: 416. Harvey 1855b: 263; 1860b: 341. Wilson 1892: 190.

Type locality.—Georgetown, Tas. (Gunn 1345). *Type*.—K.

Distribution.—Venus Bay and American River inlet (Kangaroo I.) in South Australia; Port Phillip Heads, Vic.; Tamar Estuary and Port Arthur, Tas. This species appears to be largely confined to calm, shallow bays or inlets. The record of Harvey (1855b: 263) from New Zealand needs checking.

Genus CLADOPHORA Kützting

The following is only a survey of what is known of this difficult genus in southern Australia. Several other species occur, probably undescribed. Many Australian specimens have been identified with European species, but most appear to be distinct from the latter. A fuller treatment must wait on monographic studies.

Cladophora bainesii Harvey 1859: pl. 112; 1860*b*: 340; 1863: synop. 767. De Toni 1889: 319. Guiler 1952: 73. Levring 1946: 216. Lucas 1912: 166; 1928: 11. Sonder 1880: 40.

Type locality.—Port Phillip, Vic. (Harvey). *Lectotype*.—TCD.

Distribution.—Port Phillip, Vic.; Georgetown, Derwent Estuary, Tas. Also recorded from St. Vincent's Gulf by Tate (1882: 93). In MEL there is a specimen labelled "*Cladophora Hainesii* H. & M." from "Halletts Cove, T.G.O.T. 12.4.82, Agardh vid. No. 712". I suspect Tate's record is based on this, the specific name being misspelt. However, the plant is not *C. bainesii*.

Cladophora fascicularis (Mertens in C. Agardh) Kützting 1843: 268; 1849: 393; 1853: 26, pl. 90, fig. 2. Borgesen 1940: 34, fig. 10; 1946: 21, figs. 8–10. De Toni 1889: 316. Levring 1941: 610. Vickers 1908: 18, pl. 13. Womersley 1950: 143.

Conferva fascicularis Mertens in C. Agardh 1824: 114.

Cladophora daveyana Reinhold 1899: 40. Lucas 1936: 29.

Siphonocladus nitidulus Reinhold 1899: 39.

Cladophora buchingeri sensu Lucas 1912: 167.

Cladophora "flaccida" Guiler 1952: 73.

Type locality.—West Indies. *Type*.—LD (herb. Agardh).

Distribution.—Widely distributed in warmer Atlantic and Indian Oceans; Chile and Peru; Juan Fernandez I. In southern Australia, probably general, at least from Venus Bay (Eyre Peninsula) eastwards to Queensland, and around Tasmania. Often plentiful in calm bays and inlets.

This species in southern Australia is rather variable, depending on the environment, but at least some forms of the complex agree well with West Indian specimens. The lower cells are 130–220 μ wide, the upper 40–80 μ wide, with rare to frequent opposite branching (often with the branches both lying on one side) and unilateral, curved branching of upper ramuli.

A type specimen of *C. daveyana* Reinhold (No. 199) in AD (also in MEL) is a form of *C. fascicularis*. Reinhold's specimen of *Siphonocladus nitidulus* in M (No. 54633) from Investigator Strait is also *C. fascicularis*. Some of Reinhold's specimens under *S. nitidulus*, however, are very stunted and may be *C. valonioides*.

Lucas's record of "*C. buchingeri*" seems to be a misprint for *C. ruchingeri*, and is apparently based on a specimen of Sonder's named this in MEL. This specimen does not agree with Kützting's figure of *C. ruchingeri*, but is one of the forms here classed under *C. fascicularis*.

The specimens in HO (Rodway Herbarium) which Guiler gave as *C. flaccida* (misread for *C. flaccida*) are within this complex.

Cladophora feredayi Harvey 1858*a*: pl. 47; 1860*b*: 339; 1863: synop. 768. De Toni 1889: 323. Guiler 1952: 73. Lucas 1912: 166; 1928: 9. Sonder 1880: 40. Wilson 1892: 190. Womersley 1950: 143.

Cladophora pellucida sensu Harvey 1863: synop. 769. Guiler 1952: 73? Lucas 1912: 166; 1928: 9. Sonder 1880: 40.

Type locality.—Georgetown, Tas. (Harvey). *Lectotype*.—TCD.

Distribution.—From Cottesloe, W.A., to Port Phillip, Vic., and around Tasmania. Harvey's specimens in TCD named *C. pellucida* (No. 583 from Rottneest I.) are identical with his *C. feredayi*. Lindauer has also distributed this species as *C. pellucida* (Alg. Nova-Zelandiae Exsicc. No. 202).

Cladophora gracilis (Griffiths in Harvey) Kützing 1845: 215; 1849: 403; 1854: 5, pl. 23, fig. 2. De Toni 1899: 322. Guiler 1952: 73. Harvey 1851: pl. 18; 1860b: 340; 1863: synop. 770. Kylin 1949: 55, fig. 56. Lucas 1912: 166; 1928: 9. Setchell and Gardner 1920: 216. Sonder 1880: 40.

Type locality.—Tor Abbey, England. *Type*.—TCD.

Distribution.—Northern Europe. Recorded from Tasmania by Harvey. Whether the Tasmanian plants are specifically identical with the English is doubtful. No Australian specimens were located in herb. Harvey, TCD.

Cladophora harveyi nom. nov.

Cladophora gracillima Harvey 1860b: 340; 1863: synop. 771. De Toni 1889: 323. Guiler 1952: 73. Lucas 1912: 166; 1928: 9. Sonder 1880: 40.

Type locality.—Georgetown, Tas. (Harvey). *Type*.—TCD. Isotype in MEL.

Distribution.—Only known from the type locality.

The earlier *C. gracillima* Kützing (1849: 400) from England necessitates the renaming of this species. It is distinguished by the excessive fineness of the ramuli (30–45 μ thick below, 10–20 μ thick above, with rather distinct branching).

Cladophora repens (J. Agardh) Harvey 1851: pl. 236. De Toni 1889: 345. Hamel 1928: 70, fig. 19C. Kützing 1849: 416; 1854: 15, pl. 70, fig. 2. Newton 1931: 87. Womersley 1950: 143.

Conferna repens J. Agardh 1842: 13.

Cladophora acrosiphonia J. Agardh in Wilson 1892: 100.

Type locality.—Mediterranean. *Type*.—LD (herb. Agardh).

Distribution.—Mediterranean, Europe. In Australia, from Kangaroo I., and Western Port and Port Phillip in Victoria.

These specimens agree so well with the type (and also with a Kützing specimen from Genoa, in AD) that they must be considered co-specific. They are superficially similar to *Cladophoropsis membranacea* (Agardh) Borgesen, but whereas the latter does not have cross walls at the base of the branches, *C. repens* normally does, though the cross wall is sometimes a short distance above the branch base. Rhizoids, 1–3 cells long, are occasionally present in the Kangaroo I. specimens.

Very similar specimens, but slightly more slender with shorter cells and usually no rhizoids, are fairly common on other parts of the southern Australian coasts. This may be a form of *C. repens*.

The Western Port and Port Phillip Heads specimens of Wilson (in MEL) had apparently been determined by J. G. Agardh as belonging to the *Acrosiphonia* group.

Cladophora rugulosa Martens 1866: 112, pl. 2, fig. 3. De Toni 1889: 306. Papenfuss 1943: 79.

Apjohnia rugulosa Murray 1891: 209, pl. 52, fig. 5.

Type locality.—Port Natal, South Africa (Krauss). *Type*.—?

Distribution.—South Africa; Japan. Also from Rottneest L., W.A. (A. B. Cribb in AD). This collection, from lower littoral pools in a limestone ramp, is the first Australian record, but agrees very well with South African material of Papenfuss and a specimen from Natal in AD.

Cladophora stuartii Harvey 1860b: 340; 1863: synop. 772. De Toni 1889: 313. Guiler 1952: 73. Lucas 1912: 166; 1928: 9. Sonder 1880: 40.

Type locality.—Tasmania (Stuart). *Type*.—TCD.

Distribution.—Only known from the type collection and one from "mouth of the Huon" in MEL.

Cladophora valonioides Sonder 1845: 49; 1846: 149; 1880: 40. De Toni 1889: 308. Guiler 1952: 73. Harvey 1854: 565; 1859: pl. 78; 1863: synop. 773. Kützing 1849: 391; 1853: 25, pl. 85, fig. 1. Lucas 1912: 166; 1936: 27, fig. 10. Womersley 1950: 143; 1953: 36.

Cladophora nitidula Sonder 1845: 49; 1846: 149; 1880: 40. De Toni 1889: 308. Harvey 1863: synop. 774. Kützing 1849: 391; 1853: 25, pl. 84, fig. 2. Lucas 1912: 166; 1936: 27.

Cladophora conformis Reinbold 1898: 34. Lucas 1936: 28.

Siphonocladus valonioides Reinbold 1899: 41.

Siphonocladus nitidulus Reinbold 1899: 41 (in part, also = *C. fascicularis*).

Type locality.—Western Australia (Preiss). *Type*.—MEL.

Distribution.—From Champion Bay, W.A., to Portland, Vic.

The type material of *C. conformis* Reinbold is in M and is normal and fairly well-developed *C. valonioides*. The type of *C. nitidula* Sonder (in MEL) is a loosely branched form of *C. valonioides*.

SPECIES OF CLADOPHORA INCORRECTLY RECORDED FROM SOUTHERN AUSTRALIA

Cladophora callicoma Kützing 1843: 267.

Recorded by Tate (1882: 93) (and Lucas 1912: 166) from St. Vincent's Gulf, S.A., based on an F. v. Mueller collection determined by J. G. Agardh. This, however, is a freshwater species. There is no marine specimen under this name in MEL.

Cladophora ceratina Kützing 1843: 267.

Recorded by Womersley (1950: 142) from Kangaroo I. Comparison with the type material of Kützing (in L) shows that this record is not correct.

Cladophora crispata (Roth) Kützing 1843: 264.

Recorded by Tate (1882: 93) (and Lucas 1912: 167) from St. Vincent's Gulf, S.A., based on a Topper collection determined by J. G. Agardh. This is a freshwater species which extends into brackish water, but is not truly marine. The specimen on which this record was based has not been located.

Cladophora crystallina (Roth) Kützing 1845: 213.

Recorded by Tate (1882: 93) (and Lucas 1912: 167) from Holdfast Bay, S.A., based on an F. v. Mueller collection determined by J. G. Agardh. This is the only Australian record of *C. crystallina* and open to doubt. The specimen has not been located, but until the presence of this European species in Australia is confirmed, it is best excluded from the algal flora.

Cladophora delicatula Montagne 1850: 302.

Recorded by Womersley (1950: 143) from Kangaroo I. Examination of the type (PC, herb. Montagne) from South America shows that the Kangaroo I. specimen is not *C. delicatula*.

Cladophora ferruginea Harvey 1860b: 340; 1863: synop. 775. De Toni 1889: 337. Guiler 1952: 73. Lucas 1912: 166; 1928: 9. Sonder 1880: 40.

This species, found on *Hormosira* at Port Arthur, Tas., is a brown alga of the Ectocarpaceae.

Cladophora flavescens (Roth) Kützing 1845: 214; 1854: 5, pl. 22, fig. 1.

Recorded by Guiler (1952: 73) from Dover, Tas., on a Cribb specimen, which, however, came from a brackish creek. *C. flavescens* is regarded by Hauck (1885: 459) as a form of *C. glomerata* and inhabits fresh and brackish waters in Europe. It should not, therefore, be regarded as a marine form. Cribb's specimen does not agree well with Kützing's figure of *C. flavescens*.

Cladophora flexuosa (Griffiths) Harvey 1851: pl. 353.

Recorded by Guiler (1952: 73) from Port Arthur, Tas., on a Cribb specimen. This Tasmanian material does resemble *C. flexuosa* in general form but is considerably more slender than European specimens in AD. The branching is also somewhat different. While it is clearly allied to *C. flexuosa*, it is likely that it is not co-specific with it.

Cladophora fracta (Müller) Kützinger 1843: 263.

Recorded by Tuto (1882: 93) from "Holdfast Bay", S.A., also by Lucas (1912: 166). The specimen is in MEL and the label indicates that it came from stagnant pools with *Ruppia*, *Potamogeton*, etc., so apparently was growing in inland crooks. This species is normally restricted to freshwater habitats, and should be eliminated from marine records. May (1938: 214) records it from Stanwell Park, N.S.W., in a marine list.

Cladophora glomerata (Linnaeus) Kützinger 1845: 212.

Recorded by Lucas (1912: 167) from Australia. This, however, is a freshwater species.

Cladophora gossypina Kützinger 1849: 411.

Recorded by Souder (1852: 658; from a ditch at Port Adelaide, S.A.) and by Harvey (1863: synop. 770). This is a freshwater species.

Cladophora insignis (Agardh) Kützinger 1845: 217.

Recorded by Lucas (1912: 167) from Australia. This, however, is a freshwater species.

Cladophora subsimplex Kützinger 1849: 411. (*C. simpliciuscula* Hooker 1847: 496, pl. 192, fig. 4.)

Recorded from St. Vincent's Gulf, S.A., by Tate (1882: 93). The type locality is Hermite I., Cape Horn, and the species is not likely to occur in Australia. The Australian specimen has not been located, but the type specimen of Kützinger's *C. subsimplex* in L has been examined and I have seen nothing the same in Australian collections. For the time being it seems best to exclude this record.

Cladophora thoreana Kützinger 1843: 268.

Recorded by Tate (1882: 93) from St. Vincent's Gulf, S.A. The specimens are in MEL but are in poor condition and scarcely identifiable. De Toni includes *C. thoreana* under *C. gracilis*, but the St. Vincent's Gulf specimens are not the latter, and do not agree very well with Kützinger's description of *C. thoreana*. This record is best eliminated from the Australian algal flora.

Cladophora vaga Kützinger 1849: 401.

Recorded by Tate (1882: 93) from Holdfast Bay. The specimen is in MEL. I have examined Kützinger's type (in L) from St. Chamas, France, and do not consider the Holdfast Bay specimen to be the same.

Genus RHIZOCLONIUM Kützinger

Rhizoclonium riparium (Roth) Harvey 1851: pl. 239. Cribb 1954: 17, pl. 1, fig. 9.

De Toni 1889: 278. Kylin 1949: 50, fig. 51. Lucas 1936: 29, fig. 11. Newton 1931: 94, fig. 61. Setchell and Gardner 1920: 182. Smith 1944: 63, pl. 7, fig. 4. Taylor 1937: 83, pl. 1, fig. 3.

Conferva riparia Roth 1806: 216.

Type locality.—Northern Europe. *Type*.—Not in existence.

Distribution.—Almost cosmopolitan. In southern Australia it is known from Port Lincoln, Outer Harbour, and American River inlet on Kangaroo I., S.A., and from Port Arthur, Tas. (Cribb).

The Australian specimens agree well with the usual concept of *R. riparium*. Those from Outer Harbour, Port Lincoln, and Port Arthur show abundant

rhizoids, but the American River inlet specimens lack rhizoids and might therefore be placed as var. *implexum*. The record of May (1938: 214) may belong to this latter taxon.

Two other species of *Rhizoclonium* occur in South Australia, but with the prevailing confusion in the genus it has not yet been possible to establish their affinities. Wilson (1892: 190) also recorded *Conferva arenosa* Carmichael (*Rhizoclonium arenosum* (Carm.) Kützing) but Wilson's specimen is not in MEL, and until it is found or the species is re-collected the record must remain as doubtful. One of the undetermined species mentioned above may prove to be the same as Wilson's.

Family ANADYOMENACEAE

Genus MICRODICTYON Decaisne

Microdictyon umbilicatum (Velley) Zanardini. Blackler 1949: 127. A. and E. S. Gepp 1906: 249. De Toni 1889: 361 (in part). Setchell 1929: 503, figs. 21-27; 1935: 130. May 1938: 213. Lucas 1912: 167. Womersley 1950: 144.

Conferva umbilicata Velley 1800: 169, pl. 7.

Microdictyon agardhianum Harvey 1858a: pl. 50; 1863; synop. 748. Kützing 1849: 512 (in part). Sonder 1852: 659; 1880: 39.

Microdictyon tenuis var. *australis* J. Agardh 1894: 106. [See Setchell 1929 for a full account of the synonymy.]

Type locality.—New South Wales (probably Port Jackson). *Type*.—LIV.

Distribution.—Stansbury, Yorke Peninsula, to Southport, Qld., in calm inlets and bays. Friendly Is.

Order SIPHONALES

Family BRYOPSIDACEAE

Genus BRYOPSIS Lamouroux

This is a notoriously difficult genus, and a thorough revision must depend on large numbers of liquid-preserved collections. Many dried specimens are almost useless, and the concept of species such as *B. australis* depends on definite material from near the type locality. At least two other apparently undescribed species occur, but available material is inadequate.

Bryopsis australis Sonder 1845: 49; 1846: 152. J. Agardh 1887: 26. De Toni 1889: 443. Harvey 1854: 565; 1863; synop. 741. Kützing 1849: 492; 1856: 28, pl. 81, fig. 1. Lucas 1912: 168. Sonder 1880: 38.

Type locality.—Western Australia (Preiss). *Type*.—MEL.

Distribution.—Only known for certain from the type collection, which is a poor specimen. Harvey's 569A from Fremantle (in MEL) is probably true *B. australis*.

It is very doubtful whether the records of Hylmo (1921: 15) from Feuerland and the Falkland Is., and of Taylor (1938: 135) from the Falkland Is., apply to true *B. australis*. A. and E. S. Gepp (1908: 170) consider that *B. australis* is distinguished by the ramuli arrangement of two double or triple rows of alternating ramuli. The type specimen, however, shows variation from this to ramuli scattered irregularly over the branches. A critical study of abundant liquid-preserved material from Western Australia to show the variation is needed for an elucidation of this species, and also to clarify the differences between *B. australis* and *B. indica*.

Bryopsis baculifera J. Agardh 1887: 21. De Toni 1889: 428. Lucas 1912: 168; 1913: 57, pl. 5, fig. 4. May 1938: 211. Wilson 1892: 187. Womersley 1950: 144.

Type locality.—Port Phillip Heads, Vic. (Wilson). *Type*.—LD (herb. Agardh No. 14898). Authentic material also in MEL.

Distribution.—Vivonne and Pennington Bays on Kangaroo I., S.A.; Port Phillip, Vic.; Tasmania (Rodway); Ryde, Parramatta River, N.S.W. (Lucas). This last record appears doubtful from Lucas's figure.

Bryopsis foliosa Sonder 1845: 49; 1846: 152; 1880: 38. J. Agardh 1887: 26. De Toni 1889: 432. Harvey 1863: synop. 742. Kützting 1849: 491. Lucas 1912: 168.

Bryopsis gracilis Sonder 1845: 49; 1846: 152; 1880: 38. J. Agardh 1887: 31. De Toni 1889: 438. Harvey 1863: synop. 743. Kützting 1849: 492. Lucas 1912: 168.

Type locality.—Western Australia (Preiss). *Type*.—MEL.

Distribution.—Only known for certain from the type collection. The types of *B. foliosa* and *B. gracilis* (both in MEL) are identical. Sonder (1846: 152) gives the same Preiss number for both species, so presumably they were the same collection. J. Agardh (1887: 26) recorded *B. foliosa* from Guadeloup I., but this record must be regarded as doubtful.

Bryopsis gemellipara J. Agardh 1887: 25. De Toni 1889: 432. Wilson 1892: 187.

Bryopsis hymnoides sensu Lucas 1912: 168; 1928: 9. Guiler 1952: 74.

Bryopsis australis sensu Guiler 1952: 74.

Type locality.—Queenscliff, Vic. (Wilson). *Type*.—LD (herb. Agardh No. 15150).

Distribution.—From Rottnest I. in Western Australia to Phillip I. in Victoria, and around Tasmania. This species appears most plentiful on moderately to very rough coasts at about low tide level, mainly in cooler Victorian and Tasmanian waters.

The ramuli vary from densely and irregularly arranged to sometimes distichous. The statement of A. and E. S. Gepp (1908: 170) that the ramuli are bifurcate at the base is incorrect. Some slender forms approach *B. australis*, but they are best kept separate until the latter is better understood. A collection of Cribb's (recorded by Guiler (1952: 74)) was previously incorrectly determined as *B. australis*.

Bryopsis indica A. & E. S. Gepp 1908: 169, pl. 22, figs. 10 and 11. Cribb 1954: 18, pl. 1, fig. 2.

Type locality.—Original localities are Coetivy, and Chagos Archipelago in the Indian Ocean (Gardiner). *Type*.—Probably in BM.

Distribution.—Indian Ocean; Queensland. In southern Australia, Kingscote, Kangaroo I. (possibly an isolated occurrence). This is typically a tropical species, not previously recorded from southern Australia.

The species is distinguished by the arrangement of the ramuli in two lots of alternating pairs, and the Australian specimens also usually have the older ramuli growing out into long rhizoidal structures. The relationships between this species and *B. australis* need clarifying.

Bryopsis minor Womersley 1955: 387, fig. 1.

Type locality.—American River inlet, Kangaroo I., S.A. (Womersley). *Type*.—AD (No. A4124).

Distribution.—Only known from the type locality.

Bryopsis pennata Lamouroux 1809a: 132, pl. 3, figs. 1a and 1b. J. Agardh 1887: 23. De Toni 1889: 430. Feldmann 1937: 221, fig. 24. Vickers 1908: 30, pl. 52.

Type locality.—West Indies. *Type*.—CN (herb. Lamouroux).

Distribution.—Widely distributed in warmer seas. A collection from Coffin's Bay, Eyre Peninsula, agrees very well with the type. This appears to be the first record from southern Australia.

Bryopsis plumosa (Hudson) C. Agardh 1821: 448. J. Agardh 1887: 24. De Toni 1889: 431. Guiler 1952: 74. Harvey 1851: pl. 3; 1863: synop. 740. Koster 1941: 242, fig. 2 (2-7). Kylin 1949: 66, fig. 64. Lucas 1912: 168; 1928: 9; 1936: 33. May 1938: 211. Newton 1931: 97, fig. 64. Reinbold 1897: 44; 1899: 40. Setchell and Gardner 1920: 161, pl. 14, figs. 1 and 2. Sonder 1853: 507; 1880: 38. Wilson 1892: 187. Womersley 1950: 144.

Type locality.—Exmouth, England. *Type*.—Apparently lost.

Distribution.—Almost cosmopolitan, and recorded from numerous localities along southern Australia.

This is apparently a fairly variable species. While some Australian specimens agree well with European material, having strictly distichous ramuli, others are more doubtful, with ramuli sometimes distichous but often occurring on all sides.

SPECIES OF BRYOPSIS INCORRECTLY RECORDED FROM SOUTHERN AUSTRALIA

Bryopsis cupressoides Lamouroux 1809a: 135, pl. 1, fig. 3.

This species was recorded by Womersley (1950: 144). A study of the type of *B. cupressina* (as the name was originally spelt) shows that the Kangaroo I. plant is quite distinct, probably belonging to an undescribed species. True *B. cupressina* is not known from Australia.

Bryopsis hypnoides Lamouroux 1809a: 135, pl. 1, fig. 2.

The records of Lucas (1912: 168; 1928: 9) and Guiler (1952: 74) apply to a Rodway specimen from Eaglehawk Neck, Tas., which proves on examination to be *B. gemellipara* J. Agardh. True *B. hypnoides* (type in CN (herb. Lamouroux)) does not seem to occur in Australia, though there are at least two closely related species.

Bryopsis vestita J. Agardh 1887: 30.

This is a New Zealand species (type locality, Chatham I.) recorded from Australia by Reinbold (1898: 34) on the basis of a juvenile plant. This specimen has not been located, but in the absence of any other collection of true *B. vestita* from the Lacépède Bay region of Reinbold's record, I am not prepared to accept the record. Very likely Reinbold's specimen was *B. gemellipara*, which is common in that region.

Family CAULERPACEAE

Genus CAULERPA Lamouroux

Caulerpa alternans nom. nov.

Caulerpa alternifolia J. Agardh 1887: 129. De Toni 1889: 449. Lucas 1912: 169; 1931a: 87. Weber van Bosse 1898: 208, pl. 15, fig. 1. Wilson 1892: 188.

Type locality.—Port Phillip Heads, Vic. (Wilson). *Lectotype*.—LD (herb. Agardh No. 16416). Isotype in MEL.

Distribution.—Only known from St. Vincent's Gulf, S.A. ("dredged in 20 fathoms"), and Port Phillip Heads, Vic.

The renaming of this species is necessary owing to the earlier *Caulerpa alternifolia* Crouan and Crouan (1865: 41), which is given by Weber van Bosse as a synonym of *C. cupressoides*.

Caulerpa annulata Lucas 1931b: 410, pl. 27, fig. 1. Guiler 1952: 74.

Caulerpa cactoides sensu Guiler 1952: 74 (in part, as to Actaeon I. specimen).

Type locality.—Port Arthur, Tas. (Lucas). *Type*.—CANB (herb. Lucas, temporarily at NSW). Isotype in AD.

Distribution.—Only known from Port Arthur and Actaeon I., Tas., Portland, Vic., and Ardrossan, S.A.

This is apparently a rare species, closely related to but distinct from *C. articulata* (*C. hodkinsoniae*) from New South Wales and New Zealand.

Caulerpa brownii (C. Agardh) Endlicher 1843: 16. J. Agardh 1872: 28. De Toni 1889: 468. Guiler 1952: 74. Harvey 1855b: 260, pl. 121A; 1860b: 337; 1863: synop. 723. Hooker and Harvey 1847: 416. Levring 1945: 7. Lucas 1912: 169; 1928: 10; 1931a: 89, fig. 1; 1935: 199; 1936: 42, figs. 23 and 24. Reinbold 1898: 35; 1899: 41. Sonder 1880: 37 (not 1852: 661 = *C. longifolia*). Weber van Bosse 1898: 306, pl. 25, fig. 3. Womersley 1950: 146.

Caulerpa selago var. *brownii* C. Agardh 1821: 442; 1824: 183.

Caulerpa selago sensu Sonder 1852: 661; 1853: 507.

Chauvinia brownii Trovisan 1849: 138.

Chauvinia selago var. *brownii* Kützting 1849: 497.

Caulerpa furcifolia Hooker and Harvey 1847: 416. Harvey 1854: 504; 1855b: 200, pl. 221B; 1860b: 337; 1863: synop. 724.

Chauvinia furcifolia Kützting 1849: 497; 1857: 5, pl. 11, 2. Trovisan 1849: 139.

Type locality.—Kent I., Bass Strait (R. Brown). *Type*.—LD (herb. Agardh, No. 16647).

Distribution.—From Cape Leeuwin, W.A., to Walkerville, Vic., and around Tasmania, New Zealand; Chatham I.; Stewart I.; Lord Howe I. (?)

Two varieties (var. *minor* and var. *selaginoides*) were described by J. Agardh, and also recognized by Weber van Bosse. Var. *minor* includes slender plants, var. *selaginoides* larger, more robust ones. The differences are probably due to ecological factors as all grades between the varieties occur. The New Zealand forms, however, all fall within var. *selaginoides*.

Caulerpa cactoides (Turner) C. Agardh 1821: 439; 1824: 182. J. Agardh 1872: 44. De Toni 1889: 485; 1896: 231. Endlicher 1843: 16. Guiler 1952: 74. Greville 1830: lxiii. Harvey 1858a: pl. 26; 1860b: 338; 1863: synop. 718. Levring 1946: 216. Lucas 1912: 170; 1928: 10; 1931a: 93, fig. 6; 1936: 48. May 1938: 213. Murray 1891: 211, pl. 52, figs. 6 and 8. Reinbold 1897: 44; 1899: 41. Sonder 1852: 661; 1853: 507; 1880: 37. Weber van Bosse 1898: 390. Womersley 1950: 146.

Fucus cactoides Turner 1811: 90, pl. 171.

Almfeldtia cactoides Trovisan 1849: 142.

Chauvinia cactoides Kützting 1849: 499; 1857: 6, pl. 15, fig. 4.

Tricladia australis Decaisne 1842: 337; 1864: 6, pl. 1, fig. 2. Endlicher 1843: 17. Kützting 1849: 494. Trovisan 1849: 144.

Caulerpa corynephora sensu Harvey 1854: 504 (non Montagne).

Type locality.—"Southern coast of Australia" (R. Brown). *Type*.—BM.

Distribution.—From Port Denison, W.A., around southern Australia to the Richmond River, N.S.W. (possibly to Cape Upstart in Queensland), and around Tasmania.

Caulerpa corynephora Montagne (1842: 14) was described from a specimen collected by D'Urville at Toud I. in Torres Strait. This specimen, now in the Paris Museum, is similar to a slender *C. cactoides*. Harvey considered Montagne's species identical with *C. cactoides*, but Weber van Bosse (1898: 364) classes it as a variety of *C. racemosa*. A specimen in herb. Harvey (TCD) named *C. corynephora* var. *minus*, from Tasmania (C. Stuart), is probably *C. annulata* Lucas.

Murray (1891: 211, pl. 52, fig. 8) described var. *gracilis* of *C. cactoides*, but this does not seem to warrant varietal rank.

Caulerpa cliftoni Harvey 1863: synop. 728. De Toni 1889: 487. Lucas 1912: 169; 1931a: 89; 1931b: 411, pl. 25, fig. 2; 1936: 41, fig. 22. Reinbold 1890: 41. Sonder 1880: 37. Weber van Bosse 1898: 303.

Caulerpa abies-marina J. Agardh 1872: 18. De Toni 1889: 456. Lucas 1912: 169. Sonder 1880: 37. Wilson 1892: 188.

Type locality.—Western Australia (Clifton). *Type*.—TCD.

Distribution.—Western Australia (probably Fremantle) to Port Phillip Heads, Vic. A comparatively rare species.

Caulerpa distichophylla Sonder 1845: 50; 1846: 150; 1880: 37. J. Agardh 1872: 25. De Toni 1889: 464. Harvey 1860a: pl. 161; 1863: synop. 717. Kützing 1849: 496; 1857: 4, pl. 8, fig. 2. Weber van Bosse 1898: 341, pl. 31, fig. 1.

Caulerpa tenella Harvey 1854: 564.

Corradoria distichophylla Trevisan 1849: 134.

Type locality.—Western Australia (Preiss). *Type*.—MEL.

Distribution.—Rottneet I. and near Fremantle, W.A.; Kangaroo I.; Bridgewater Bay, Vic. This is apparently a rare species, except possibly in Western Australia where it occurs in rock pools on reefs.

Caulerpa ellistoniae Womersley 1955: 387, fig. 2.

Type locality.—Elliston, S.A. (Womersley). *Type*.—AD (No. A13426).

Distribution.—Only known from the type locality.

Caulerpa flexilis Lamouroux 1813: 283, pl. 13, fig. 3. C. Agardh 1821: 443; 1824: 183. J. Agardh 1872: 29. De Toni 1889: 469. Endlicher 1843: 16. Greville 1830: lxiv. Guiler 1952: 74. Lucas 1912: 169; 1928: 10. Reinbold 1898: 35. Sonder 1880: 37. Tate 1882: 93.

Chawinia flexilis Kützing 1849: 497; 1857: 7, pl. 18, fig. 2. Trevisan 1849: 139.

Fucus hypnoides R. Brown in Turner 1811: 94, pl. 173.

Caulerpa hypnoides C. Agardh 1821: 443; 1824: 183. J. Agardh 1872: 30. De Toni 1889: 470; 1896: 231. Endlicher 1843: 16. Greville 1830: lxiv. Guiler 1952: 74. Harvey 1854: 564; 1855b: 260; 1859: pl. 84; 1860b: 337; 1863: synop. 725. Hooker and Harvey 1847: 416. Lucas 1912: 169; 1928: 10; 1931a: 91; 1936: 44, fig. 27. May 1938: 212. Reinbold 1898: 35. Sonder 1846: 150; 1852: 662; 1880: 37. Tepper 1883: 66. Weber van Bosse 1898: 342, pl. 29. Wilson 1892: 188. Womersley 1950: 146.

Chawinia hypnoides Kützing 1849: 497; 1857: 7, pl. 18, 1. Trevisan 1849: 138.

Caulerpa turneri Lamouroux 1823: 282.

Type locality.—Esperance, W.A. (see C. Agardh 1821: 443). *Type*.—CN.

Distribution.—Champion Bay, W.A., around southern Australia to about Sydney in New South Wales, and around Tasmania. New Zealand (North Island).

var. *muelleri* (Sonder) comb. nov.

Caulerpa muelleri Sonder 1852: 661; 1880: 37. J. Agardh 1872: 31. De Toni 1889: 470. Harvov 1854: 564; 1858a: pl. 2; 1863: synop. 726. Lucas 1912: 169; 1928: 10; 1931a: 91; 1936: 46, fig. 28. May 1938: 212. Wilson 1892: 189.

Caulerpa hypnoides var. *muelleri* (Sonder) Weber van Bosse 1898: 349, pl. 20, figs. 5 and 6. Guilor 1952: 74. Womersley 1950: 146.

Type locality.—Rivoli Bay, S.A. (F. v. Mueller). *Type*.—MEL.

Distribution.—Rottnest I., W.A., around southern Australia to New South Wales, and the north coast (at least) of Tasmania.

Unfortunately the well-known *C. hypnoides* R. Brown is invalidated by *C. hypnoides* Lamouroux (1809b; 141) which is considered (Weber van Bosse 1898: 323) as a synonym of *C. cupressoides*. The earliest available name is *C. flexilis* Lamouroux, described in 1813 only by means of a figure. This figure, however, is recognizable as the upper part of a loosely branched plant, and agrees well with the type specimen in herb. Lamouroux, Caen. Although no description was given by Lamouroux, his recognizable figure validates the name under Art. 44 (3) of the International Rules of Botanical Nomenclature.

This species is very variable, depending on its habitat. Weber van Bosse recognized four varieties, as well as several forms, of *C. hypnoides*: viz. var. *flexilis*, var. *laxa*, var. *typica*, and var. *muelleri*. Of these, var. *muelleri*, with denser and more crowded rammenta, is probably the only one worth recognizing.

Caulerpa hedleyi Weber van Bosse 1910: 1, pl. 1, figs. 1-4. Lucas 1912: 169; 1927: 559; 1936: 43, fig. 25. Womersley 1950: 146.

Type locality.—"Off Kangaroo Island" (dredged in 8 fathoms) (Hedley). *Type*.—NSW.

Distribution.—Only known from the original collection, although intensive collecting around Kangaroo I. has occurred in recent years.

Caulerpa longifolia C. Agardh 1821: 437; 1824: 181. J. Agardh 1872: 16. De Toni 1889: 455. Endlicher 1843: 16. Greville 1830: lxiii. Guilor 1952: 74. Kützing 1849: 496. Lucas 1912: 169; 1931a: 88; 1936: 38, fig. 18. Sonder 1880: 37. Womersley 1950: 146.

Corradoria longifolia Trevisan 1840: 134.

Caulerpa harveyi F. von Mueller in Harvey 1859: pl. 95; 1860b: 338; 1863: synop. 729. J. Agardh 1872: 17. De Toni 1889: 455. Lucas 1912: 160; 1928: 10; 1931a: 88; 1936: 41, fig. 21. Reinbold 1898: 35. Sonder 1880: 37. Weber van Bosse 1898: 209. Wilson 1892: 188.

Caulerpa brownii Sonder 1852: 661 (non Endlicher).

Chuvinia brownii Kützing 1857: 5, pl. 12, fig. 1.

Type locality.—Southern Australia. *Type*.—PC.

Distribution.—Elliston in South Australia to Wilson's Promontory in Victoria and around Tasmania.

forma **crispata** (Harvey) Womersley 1950: 147. Guiler 1952: 74.

Caulerpa harveyi var. *crispata* Harvey 1859: pl. 95 (var. β); 1860b: 338. Weber van Bosse 1898: 300.

Caulerpa curvifolia J. Agardh in Wilson 1892: 188 (nomen nudum).

Type locality.—Port Phillip Heads, Vic. (Harvey). *Type*.—TCD.

Distribution.—Garden I., W.A., to Western Port, Vic., and around Tasmania.

An account of this species has been given previously (Womersley 1950: 147). The type sheet of *C. longifolia* bears one good specimen which is intermediate between the form known as *C. harveyi* and Harvey's var. *crispata*, but closer to the former. It seems best to reduce *crispata* to a form only, as the variation from one extreme to the other is continuous, and plants have been seen with young parts of the *crispata* form and older parts typical *C. longifolia* (*C. harveyi*). However, the extreme forms are usually so distinctive that they can usefully bear distinguishing names.

Caulerpa obscura Sonder 1845: 50; 1846: 150; 1853: 507. Guiler 1952: 74. Harvey 1854: 564; 1860b: 337. Lucas 1931a: 89; 1936: 38, fig. 19. Reinbold 1899: 41. Weber van Bosse 1898: 301. Womersley 1950: 147.

Chauvinia obscura Kützting 1849: 497; 1857: 7, pl. 17, fig. 2. Trevisan 1849: 139.

Caulerpa sonderi F. v. Mueller in Sonder 1852: 661; 1853: 507; 1880: 37. J. Agardh 1872: 18. De Toni 1889: 456. Harvey 1860a: pl. 167; 1863: synop. 727. Kützting 1857: 4, pl. 7. Lucas 1912: 169; 1928: 10. Reinbold 1897: 45. Wilson 1892: 189.

Caulerpa superba Greville 1854: 197, pl. 10.

Caulerpa abies Areschoug 1854: 366. De Toni 1889: 471. Lucas 1912: 169; 1931a: 92.

Type locality.—Western Australia (Preiss). *Type*.—Not located in MEL.

Distribution.—Cottesloe in Western Australia to Western Port in Victoria, and around Tasmania.

Although the type of *C. obscura* has not been located in MEL, where it should be, there seems no doubt from Sonder's description that it is identical with his *C. sonderi*, the type of which is in MEL. The type of Greville's *C. superba* also could not be found at E, but his figure leaves no doubt concerning the name. Weber van Bosse recognized two forms, *typica* and *sonderi*, which are apparently only growth forms.

Caulerpa papillosa J. Agardh 1872: 42. De Toni 1889: 483. Lucas 1912: 170; 1931a: 93; 1936: 48. May 1951: 93. Sonder 1880: 37. Weber van Bosse 1898: 383, pl. 34, fig. 8. Wilson 1892: 189.

Type locality.—Queenscliff, Vic. (F. v. Mueller). *Type*.—LD (herb. Agardh No. 16849).

Distribution.—From Venus Bay, Eyre Peninsula, to Phillip I., Vic., and near the mouth of the Currie River, Tas. Also recorded from Brampton I., Qld., by May.

Caulerpa racemosa (Forskål) J. Agardh var. **laetevirens** (Montagne) Weber van Bosse forma **cylindracea** (Sonder) Weber van Bosse 1898: 366, pl. 33, figs. 17, 19, and 20.

Caulerpa cylindracea Sonder 1845: 50; 1846: 151; 1880: 37. J. Agardh 1872: 34. De Toni 1889: 474. Harvey 1854: 564; 1858a: pl. 30; 1863: synop. 719. Lucas 1912: 169.

Chauvinia cylindracea Kützting 1849: 498; 1857: 6, pl. 15, fig. 2.

Ahnfeldtia cylindracea Trevisan 1849: 144.

Caulerpa laetevirens Harvey 1854: 563.