

A Contribution to the Ecology of the Kermadec Islands

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IN 1956 and 1957, owing to the kindness of the Civil Aviation Department, to whom especial thanks are due, it was possible for two visits to be made to the Kermadec Islands. These visits were made under the aegis of the Botany Department, Auckland University, though on the first occasion the personnel included members from elsewhere. The first visit took place in May and June, 1956, and the members of the party were Dr. R. C. Cooper (botanist, Auckland Institute and Museum), P. L. Bergquist (Botany Dept.), and J. S. Edwards (Zoology Dept.). This party was originally expected to stay only a fortnight but, owing to circumstances beyond our control, they were there for a month. Transport facilities to the Kermadecs were generously provided by the Royal New Zealand Navy and return transport by the N. Z. Institute of Oceanography, to whom thanks are due. The second visit took place in October, 1957, when only one scientist could be accommodated on the normal supply vessel. The late D. Knowlton went on this occasion, and in the course of the three days available he was able to achieve much valuable work.

The original purpose of these visits was to set up permanent quadrats so that the regeneration of vegetation after the reduction of the goat population could be followed over a course of years. It is therefore hoped that further visits may be made in the future. The first visit in 1956 coincided with the end of a drive to eliminate the goats from the island, when some 1,500 goats were shot. About a hundred more were shot in 1956-57. As a result of these activities the goat population was reduced to the point where it could reasonably be hoped that it might be kept in check. Another purpose of the visits was to study more intensively the algal flora of the Kermadecs. It is true that earlier collections and lists had been made by the Gepps (1911)

and by Cotton (1912), but in view of the importance of the Kermadecs in relation to sea temperatures and tropical influences, it was believed that a more intensive study would reveal the existence of more species of tropical affinities. This has indeed proved to be the case. Later, in another communication, it is intended to compare the flora of these islands with those from the North Cape region of New Zealand and Norfolk Island.

So far as the terrestrial flora is concerned, extensive lists were already in existence as a result of visits by Cheeseman in 1887 and by Oliver in 1909 to the islands. These earlier workers had collected methodically and extensively and there were no outstanding additions to be made to the earlier lists. One feature of interest was the way in which the taro, *Alocasia macrorrhiza*, had spread over the island since its introduction some time after 1909.

ALGAE

In the list that follows, algae recorded also by the Gepps (1911) are noted by *G* and those also recorded by Cotton by *C*. Algae newly added to the New Zealand flora are marked by †. Those not collected in 1956 or 1957 are marked by *.

MYXOPHYCEAE²

Chlorococcales

- Anacystis thermalis* (Menengh.) Dr. & Daily. Supralittoral fringe pool, Lava Pt.
Anacystis montana (Lightf.) Dr. & Daily.
On rotten log, Green Lake; supralittoral fringe pool, Lava Pt.

Pleurocapsales

- Entophyalis conferta* (Kütz.) Dr. & Daily.
Fleetwood Bluff, supralittoral fringe: on
Derbesia 4-8 m. down, Meyer Is.

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² I am grateful to Dr. F. Drouet for determinations of this group.

Nostocales

- Lynghya confervoides* C. Ag. Fleetwood Bluff, supralittoral fringe; mid-littoral pool, Meyer I.; on *Pterocladia*, Lava Pt.
- Lynghya semiplena* (C. Ag.) J. Ag. Fishing Rock, sheltered supralittoral pool, also Hutchinson's Bluff: on *Pterocladia*, Lava Pt.
- Phormidium corium* (Ag.) Gom. On *Pterocladia*, Lava Pt.
- Phormidium autumnale* (Ag.) Gom. Locality unknown.
- Hydrocoleum glutinosum* (Ag.) Gom. Fleetwood Bluff, sheltered crevice (mid-littoral), also supralittoral fringe.
- Haplosiphon laminosus* Hansgirg. On fumarole orifice.
- Tolypothrix tenuis* Kütz. Supralittoral fringe pool, Lava Pt.
- Scytonema hofmani* Ag. On rotten log, Green Lake.
- Amphitrix violacea* (Kütz.) Born. et Flah. Fleetwood Bluff, supralittoral fringe.
- Plectonema nostocorum* Bornet. Supralittoral fringe pool, Lava Pt.
- Calothrix crustacea* Thur. Fishing Rock, sheltered supralittoral pool, also on wet concrete.

CHLOROPHYCEAE

Ulotrichales

- G *Ulva lactuca* var. *rigida* (Ag.) Le Jol.
- G * *Ulva laetevirens* Aresch.
- † *Enteromorpha kylinii* Bliding. The record of this species gives the alga a great discontinuity. In view of the relatively recent recognition of this species, however, it is likely that a wider distribution will be found for it than at present recorded. Supralittoral fringe, Hutchinson's Bluff, on rocks always wet with spray.
- G * *Enteromorpha compressa* Grev.
- Enteromorpha prolifera* (Muel.) J. Ag. f. *crinata* (Roth.) comb. nov. Young plants which probably belong to this species. Supralittoral fringe, Meyer I.

Chaetophorales

Trentepohlia jolithus Wallr.

Oedogoniales

Oedogonium sp. } Neither fertile,
Bulbochaete sp. } Green Lake.

Siphonocladales

Lola tortuosa (Dillw.) Chapm. Fishing Rock, sheltered supralittoral pool.

Rhizoclonium bookeri Kütz. Fleetwood Bluff, on Pohutakawa log.

Rhizoclonium hieroglyphicum Kütz. emend Stockm. Waterfall near Hutchinson's Bluff; Blue Lake.

G C *Cladophora prolifera* (Roth) Kütz. This is recorded as *C. fusca* Marten by both the Gepps and Cotton. For a discussion on this matter the reader is referred to Chapman (1956). Deep mid-littoral pool, Lava Pt.; sublittoral, Meyer I. to 8 m.

Cladophora fracta (Dillw.) Kütz. var. *lacustris* (Kütz.) Brand ex Heering. Waterfall near Hutchinson's Bluff.

Cladophoropsis berpestica (Mont.) Chapm. Boat Cove, Fishing Rock.

† *Cladophoropsis membranacea* Borg.

† *Cladophoropsis membranacea* Borg. var. *repens* (J. Ag.) Phinney. I believe two plants have been confused here. There is a cushion-like *Cladophora*, *C. repens*, and there another plant which is clearly a *Cladophoropsis* in that the branches have no cells at the base. Supralittoral pool, Meyer I.

Microdictyon umbilicatum (Velley) Zarnard. Only occurs elsewhere in New Zealand on Mayor I. (Chapman, 1956).

Dasycladales

† *Acetabularia parvula* Solms-Laubach. Mid-littoral pool, Fishing Rocks.

Siphonales

Derbesia novae-zelandiae Chapm. This was probably the plant that the Gepps recorded as *Vaucheria* sp. Pool in sublittoral fringe, pool mid-littoral, Fishing Rocks; sublittoral, 4-8 m., Meyer I.

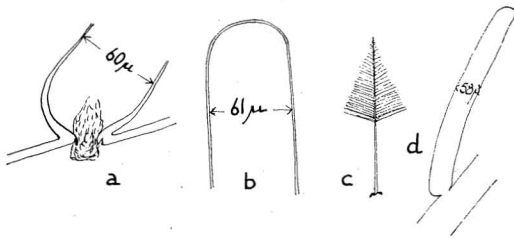


FIG. 1. *Bryopsis kermadecensis*. a, Base of pinnule showing constriction and plug of protoplasm; b, apex of pinnule; c, plant ($\times 2$); d, pinnule.

† *Bryopsis kermadecensis* sp. nov. (Fig. 1).

Plantis 1.5 cm. longis, axe primario distincto, simplici, 149–158 μ dia., pariete 6–6.5 μ crasso, partibus inferioribus nudis; pinnulis inferioribus caducis, pinnulis superioribus radialiter dispositis, basi constrictis, apici obtusis, 44–61 μ dia.

Plants 1.5 cm. long, main axis distinct, unbranched, 149–158 μ diam., wall 6–6.5 μ thick, lower part bare below; lower pinnules deciduous, upper pinnules radially arranged, constricted at the base, obtuse at the apex, 44–61 μ diam.

Type specimen in Lind. Herb. Auckl. Univ.

This species is very close to *B. derbesioides* Chapm., but differs in its smaller size and the greatly constricted bases of the branches. The diameter of the pinnules is also more uniform and the apices obtuse rather than tapering. It appears to be smaller than other species of *Bryopsis* recorded from the Australian mainland. For the present, therefore, it has been regarded as a new species, though extensive collecting will be necessary before any further decision can be made. On *Corallina* in sublittoral pool, Fishing Rocks.

- G * *Codium dichotomum* (Huds.) S. F. Gray f. *novozelandicum* Dellow. This is the plant recorded by Gepp as *C. tomentosum*. (See Chapman, 1956.)

Codium adhaerens (Cabr.) Ag. var. *convolutum* Dellow. Sublittoral, One-rahi Bluff.

- † *Caulerpa racemosa* (Forsk.) J. Ag. var. *peltata* (Lmx.) Eubank, Mid-tide pool, Fishing Rocks.

- G *Caulerpa racemosa* (Forsk.) J. Ag. var. *wifera* (Turn.) J. Ag. f. *intermedia* Web. van Bosse. Fishing Rock, mid-littoral pool: sublittoral, 12 m., and sublittoral fringe, Meyer I.

- † *Caulerpa webbiana* Mont. Deep pool, mid-tide, Fishing Rock with *Corallina*; sublittoral, 12 m., Meyer I.

PHAEOPHYCEAE

Dictyotales

- G *Dictyota prolificans* A. & E. S. Gepp. In red turf, Hutchinson's Bluff, mid-littoral.

- C G *Taonia australasica* (Kütz.) J. Ag. Sublittoral, 4–8 m., Meyer I.

- C G *Pocockiella nigrescens* (Sond.) Papenf. Pool, Boat Cove: in *Corallina* turf, sublittoral, Fishing Rocks.

Padina fraseri (Grev.) J. Ag. (Lindauer, 1957).

Hydroclatrus clatratrus (Bory) Howe (Lindauer, 1957).

- C * *Haliseris kermadecensis* Cotton

Sporochnales

- C * *Perithalia capillaris* J. Ag.

Dictysiphonales

Colpomenia sinuosa (Roth.) Derb. et Sol. Fishing Rocks.

Fucales

- C * *Sargassum sinclairii* Hook. f. & Harv. I think some doubt attaches to this identification.

- G *Sargassum fissifolium* (Mert.) C. Ag. Fishing Rock, mid-tide pool: also in the sublittoral fringe, Lava Pt.

Carpophyllum phyllanthus, *C. plumosum*, *C. maschalocarpum*, *Durvillea antarctica*, and *Hormosira banksii* have all been recorded from the drift (Cotton, Gepp) but there is no evi-

dence that they grow there. The record of *Carpophyllum elongatum* is erroneous, as inspection of the material at Kew and the British Museum shows that the specimens are worn plants of *C. maschalocarpum* (Chapman, in press).

RHODOPHYCEAE

Bangiales

- † *Porphyra denticulata* Levr. Previously only reported from Queensland. Sublittoral fringe, Lava Pt., and supralittoral fringe pool.

Nemalionales

- G* * *Chantransia* sp.
 † *Nemalion helminthoides* (Velley) Batters. Very exposed rock faces, Fishing Rocks.
G * *Galaxaura laxa* Kjellm (as *Brachycladia marginata* Schm. in Gepp).
 † *Galaxaura arborea* Kjellm. Mid-littoral pool, Meyer I.
 † *Galaxaura rudis* Kjellm. Sublittoral, 16 m., Meyer I.
G † *Galaxaura fastigiata* Dcne. (as *G. lapidescens* in Gepp). Sublittoral, 3 m., Meyer I.
G *Asparagopsis taxiformis* (Delile) Collins & Hervey (= *A. sandfordiana*). Very common in sublittoral: extends into sublittoral fringe where exposure and wave action not great.
CG *Delisea fimbriata* (Lamour.) Mont. Sublittoral to 4-5 m., Meyer I. (= *D. pulchra*, *D. serrata*).
Chaetangium corneum J. Ag.
 † *Chaetangium pulvinatum* Levr. Turf, mid-littoral, Fishing Rocks.

Gelidiales

- G* *Gelidium longipes* J. Ag. Fishing Rock. Mid-tide pool.
Gelidium crinale J. Ag. Turf, lower mid-littoral, Hutchinson's Bluff.
Gelidium pusillum Le Jol. Turf, lower mid-littoral, Hutchinson's Bluff.
Gelidium caulacanthum J. Ag.

- CG* *Pterocladia capillacea* (Gmel.) Born. et Thur. Fishing Rock, Lava Pt.: sublittoral, 4-8 m. Meyer I.

Cryptonemiales

- G* * *Peyssonnelia rubra* (Grev.) J. Ag.
CG *Corallina cuvieri* Lmx. Boat Cove (sparse); mid-tide pool, Fishing Rock.
G *Corallina officinalis* L. Mid-tide pool and sublittoral fringe, Fishing Rock; sublittoral, 4-8 m., Meyer I.
Jania rubens Lmx. Mid-tide pool and sublittoral fringe, Fishing Rock. This appears different from the local *J. micrarthrobia*.
G * *Amphiroa anceps* (Lmx.) Dcne.
GC * *Cheilosporum elegans* (Hook. f. & Harv.) Aresch.
Schmitziella cladophorae Chapm. On *Cladophora prolifera*.
Fosliella farinosa. On *Cladophora prolifera*, Lava Pt.

Gigartinales

- C* * *Plocamium costatum* J. Ag.
GC *Plocamium brachiocarpum* Kütz.
Plocamium angustum J. Ag. On *Pterocladia*, lower mid-littoral, Hutchinson's Bluff.
G * *Gracilaria confervoides* (L.) Grev. Drift.

Ceramiales

- G* *Martensia elegans* Hering. Sublittoral fringe in *Corallina* turf, Boat Cove: mid-tide pool, Fishing Rocks: sublittoral, 3 m., Meyer I.
Caloglossa leprieurii J. Ag.
G * *Nitophyllum decumbens* J. Ag. Drift.
G * *Euzoniella incisa* (J. Ag.) Falkbg.
G * *Spongoclonium brownianum* (Hook. f. & Harv.) J. Ag.
Microcladia novae-zelandiae J. Ag. Boat Cove, sparse.
G * *Laurencia forsteri* (Mert.) Grev. Drift.
 † *Ceramium codii* (Richards) G. Mazoyer. On *Codium adbaerens*. The plants were not fruiting but habit and measurements agreed. Onerahi Bluff.
Centroceras clavulatum (C. Ag.) Mont. Epiphytic on *Pterocladia*, Hutchinson's Bluff; sublittoral, 12 m., Meyer I.

Total marine algae: Myxophyceae	12
Chlorophyceae	20
Phaeophyceae	10
Rhodophyceae	35

This is not an impressive list considering the variety of habitats available and the fact that the islands clearly lie in a zone where there is a mingling of cold and warm waters.

BRYOPHYTA

The mosses were kindly determined by the late Mr. G. O. K. Sainsbury and the liverworts by Mrs. Hodgson.

Musci

- Fissidens pungens* C. M. & Hpe.
Fissidens oblongifolius H. f. & W. First record for the Kermadecs.
Rhizogonium ?longiflorum (Mull.) Jaeg.
Rhizogonium spiniforme (Hedw.) Bruch.
 "Differs from type in having male flowers not synoicous and the perichaetial bracts lengthened. It looks as if some people would consider the Kermadecs plant to be a form of *R. longiflorum*."
Isopterygium minutirameum (C. M.) Jaeg.
Leucobryum candidum (Brid.) H. f. & W.
Echinodium hispidum (H. f. & W.) Jaeg.
Oxyrrhynchium compressifolium (Mitt.) Broth. "This is quite different from other allied forms (*Eurhynchium*) in New Zealand."
Papillaria flaxicaulis (Taylor) Jaeg.
Acanthocladium extenuatum (Brid.) Mitt.
 "Another first record" for the Kermadecs.
Rhacopilum ?pacificum

Hepaticae

- Phaeoceros* sp.
Chiloscyphus argutus Nees.
Lophocolea heterophylloides Nees.
Plagiochila sp.
Asterella sp.
Marchantia sp.
Radula sp.

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