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MARINE STUDIES PROGRAMME

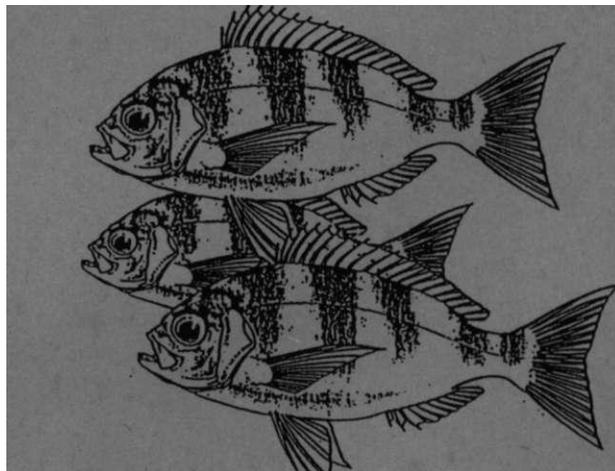
TECHNICAL REPORT

BENTHIC MARINE ALGAE FROM DRAVUNI ISLAND,
ASTROLABE ISLANDS, KADAVU, FIJI.

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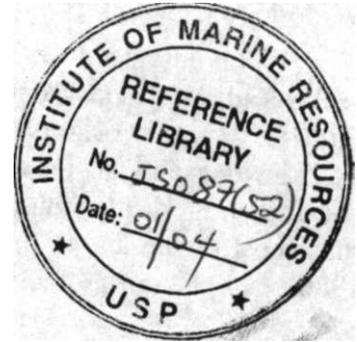
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INTRODUCTION

Dravuni Island (Fig. 1) is the site of the University of the South Pacific's Marine Field Station, where it is proposed that intensive studies in association with the University's Marine Studies Programme, under the auspices of the Coral Reef Programme will be undertaken (South, 1991).

To date few collections of benthic marine algae have been made at Great Astrolabe or at Dravuni. In 1978, a field excursion was made to Dravuni by some 70 participants at the Symposium on Biogeography of the Southern Oceans, held following meetings in Auckland, New Zealand; no publications on any marine algae that might have been collected have resulted from this visit. Kasahara (1985) has produced the only known written account of benthic algae from Dravuni, based on the results of two Kagoshima-Maru expeditions to Fiji made in 1982. These collections were made by Dr Hiroshi Itono and Dr Tetsuru Ajisaka, in January, and by Dr Sachito Enomoto and Dr Ajisaka in November. In 1972, Dr Bruce Carlson collected algae at nearby Namara Island, part of the Astrolabe Group; his collections are housed in the herbarium at the Institute of Marine Resources, University of the South Pacific. The species recorded were incorporated in the list published by Chapman (1977).

For the Fiji Group, there are various published accounts of the marine algae, beginning with that of Grunow (1874). Brief historical accounts of earlier lists can be found in Kasahara (1985); in South & Kasahara (1992) a checklist is provided of all previously known records of Fijian benthic marine algae. As is evident from the most recent checklist, the Fijian flora still remains poorly known, and many important areas have never been visited by a phycologist.

With the inauguration of the USP Coral Reef Programme, and with the establishment of the scientific programme in association with Astrolabe, Inc., of Washington, D.C. (Astrolabe, Inc., 1990), it is anticipated that researchers visiting Fiji will be encouraged to focus their attention on the Great Astrolabe Lagoon. An important aspect of the research programme is to establish a proper understanding of the biodiversity of this pristine tropical environment. The purpose of this short list is to bring together those records of algae currently reported from Dravuni, and to report additional species found by the author during 1990 - 1991.

DESCRIPTION OF DRAVUNI ISLAND

Dravuni Island lies in the Great Astrolabe Lagoon, and is one of the Astrolabe Islands in the Kadavu Island group (Figure 1), some 70km south of Suva, Viti Levu, Republic of Fiji. Of volcanic origin, the island lies in an approximately NNE-SSW orientation, and is 2.23km long and, at its widest point, 500m wide. The highest point is the remnant of a volcanic plug, at the southern end, with an elevation of 110m; a ridge of basaltic formation runs most of the length of the island, with a lower elevation at the northern end (Carman, 1986).

Approximately 60% of the Dravuni shoreline is composed of Recent beach deposits in the form of coral sand beaches, loose gravel, rubble and beach rock. Hard basaltic outcrops provide firm substratum at the southern end of the island, and at several points along the eastern shore (Carman, 1986). To the east, the sandy bottom falls away fairly rapidly to a depth of 6 - 10m, where there are substantial seagrass beds that have been the subject of intensive investigations by the Ocean Research Institute, University of Tokyo (Koike et al. 1991; Yamamuro et al. 1991; Fig. 1). Where there are basaltic outcrops on the eastern shore, extensive beds of soft and hard corals occur, together with a fairly rich algal flora. Along the eastern shore of the island, there is a much more gradual fringing reef slope, composed of coral rubble and, with increasing depth, live hard and soft corals. This highly variable substratum provides the richest collecting area for shallow-water algae. The boulder, coarse rock and gravel beach at the northern tip of the island is relatively unstable and is less favourable for algae. At the southern end of the island, there is a richly varied habitat which provides good collecting.

The flora will be limited by the lack of a mangrove environment, by the protection provided by the Great Astrolabe Reef, and by a general lack of tide pools, surge channels and other topographic features that favor algal growth.

The unstable shorelines of Dravuni Island are very susceptible to erosion during major events such as cyclones. Since the Kadavu Group lies in the path of most cyclonic disturbances that affect the Fiji Group, shoreline erosion is a fairly frequent event. Following several successive cyclones in January 1990, for instance, much of the coral sand was eroded away from the eastern shoreline, leaving exposed beach rock.

The waters of the Great Astrolabe Lagoon are essentially pollution-free, and are very clear during calm weather. A summary of some physical parameters is shown in Table I. A general survey of some water chemistry parameters has been made by the Marine Pollution Group, University of the South Pacific, and a summary is provided in Table II.

There is no fresh-water run-off from Dravuni Island, and therefore no small or large-scale reductions in salinity; the nearest significant sources of run-off are found on Kadavu Island, some 20km distant. There is no evidence of a thermocline in the Great Astrolabe Lagoon. There are a few point-sources of organic pollution, although from the survey conducted by Bell (1991) there is no evidence suggesting that these are likely to have any significant effect on the biota.

COLLECTIONS

Apart from the species reported in Kasahara (1985), records are included here of collections made by the author in 1990 and 1991. All collections were made by snorkeling, to a maximum depth of 4m below low tide level. While collections were made around the entire island, concentrated collections were made in April 1991 in the vicinity of the rock outcrops at the northeastern end of the island, from the extensive reef platform along the western shore, and from the small embayment to the east of the volcanic plug (Figure 1).

Collections were preserved in 4% formaldehyde in seawater. Voucher specimens of all of the author's collections are preserved in the Phycological Herbarium (South Pacific Regional Herbarium), University of the South Pacific, as herbarium mounts, liquid preserved specimens or microscope slides.

LIST OF SPECIES

A total of seventy-one species is listed. Those species not previously reported from Dravuni by Kasahara (1985), and collected by the author, are marked (*). Species not previously recorded from Fiji are marked (+) *Martensia elegans* Hering was collected from nearby Namara Island by Dr B. Carlson in 1972, and is included in this list. The systematic order is that of Silva et al. (1987), where appropriate. Genera are listed alphabetically within each family, and species are listed alphabetically within each genus. Reference should be made to South & Kasahara (1992) for taxonomic and distributional notes relevant to species in this list.

CYANOPHYCEAE

NOSTOCALES

Oscillatoriaceae

Lyngbya C. Agardh

*+L. epiphytica

*L. majuscula (Dillwyn) Harvey

Microcoleus Desmazieres

*M. chthonoplastes (Mertens) Zanardini

Oscillatoria

*O. sp.

Phormidium

*P. sp. aff. P. neevearum Grunow

Rivulariaceae

Calothrix C. Agardh
*+C. pilosa Harvey
C. sp.

CHLOROPHYCEAE

ULVALES

Ulvaceae

Enteromorpha Link in Nees
*E. prolifera (O.F. Muller) J.Agardh

CLADOPHORALES

Anadyomenaceae

Microdictyon Decaisne
M. sp.

SIPHONOCLADALES

Siphonocladaceae

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

Yaloniaceae

Dictyosphaeria Decaisne ex Endlicher
D. versluysii Weber-van Bosse

Valonia J.Agardh
V. utricularis (Roth) C.Agardh

Ventricaria Olsen et West
V. ventricosa (J.Agardh) Olsen et West

BRYOPSIDALES

Bryopsidaceae

Bryopsis Lamouroux
B. harveyana J.Agardh

Caulerpaceae

Caulerpa Lamouroux
*C. cupressoides (Vahl) C.Agardh
 var. lycopodium Weber-van Bosse
C. racemosa (Forsskal) J.Agardh
 var. macrophysa (Kutzing) W.R.Taylor
 var. peltata (Lamouroux) Eubank
 *var. uvifera (Turner) J.Agardh
C. serratula (Forsskal) J.Agardh emend. Bory
C. taxifolia (Vahl) C.Agardh
C. urvilliana Montagne

Codiaceae

Codium Stackhouse
C. bolbopilum Setchell

Halimnidiaceae

Halimeda Lamouroux
H. cylindracea Decaisne
H. cuneata Hering
 f. undulata Barton
H. incrassata (Ellis) Lamouroux
*H. macroloba Decaisne
*H. opuntia (Linnaeus) Lamouroux

Udoteaceae

Chlorodesmis Harvey et Bailey
C. fastigiata (C.Agardh) Ducker

Rhipidosiphon Montagne
*R. javensis Montagne

Tydemannia Weber-van Bosse
T. expeditionis Weber-van Bosse

Udotea Lamouroux
*+U. glaucescens Harvey ex J. Agardh

DASYCLADALES

Polyphysaceae

Acetabularia Lamouroux

*A. ?clavata Yamada

Bornetella Munier-Chalmas

B. oligospora Solms-Laubach

B. sphaerica (Zanardini) Solms-Laubach

Neomeris Lamouroux

*N. vanbosseae Howe

PHAEOPHYCEAE

ECTOCARPALES

Hinksia J.E. Gray

*H. Mitchelliae (Harvey) P.C Silva

SPHACELARIALES

Sphacelariaceae

Sphacelaria Lyngbye

*S. novae-hollandiae Sonder

DICTYOTALES

Dictyotaceae

Dictyota Lamouroux

*D. bartayresii Lamouroux

*D. cervicornis Kiitzing

*D. dichotoma (Hudson) Lamouroux

*D. divaricata Lamouroux

Padina Adanson

*P. australis Hauck

FUCALES

Sargassaceae

Turbinaria Lamouroux

**T. ornata* (Turner) J. Agardh

RHODOPHYCEAE

Bangiophycidae

BANGIALES

Erythropeltidaceae

Erythrotrichia J.E. Areschoug

**E. carnea* (Dillwyn) J. Agardh

Florideophycidae

ACROCHAETIALES

Acrochaetiaceae

Audouinella Bory

**A. microscopica* (Nageli) Woelkerling

BONNEMAISONIALES

Bonnemaisoniaceae

Asparagopsis Montagne

**A. taxiformis* (Delile) Trevisan

Galaxauraceae

Actinotrichia Decaisne

A. fragilis (Forsskal) Bory

Galaxaura Lamouroux

G. apiculata Kjellman

**G. filamentosa* Chou

G. rugosa (Ellis et Solander) Lamouroux

GELIDIALES

Gelidiaceae

Gelidiella J. Feldmann et Hamel
G. acerosa (Forsskal) Feldmann et Hamel

Helminthocladiaceae

Liagora Lamouroux
L. setchellii Yamada

CORALLINALES

Corallinaceae

Amphiroa Lamouroux
A. annulata Lemoine
A. fragilissima (Linnaeus) Lamouroux
A. sp.

GIGARTINALES

Rhizophyllidaceae

Portieria Zanardini
P. hornemannii (Lyngbye) P.C. Silva

Hypneaceae

Hypnea Lamouroux
*H. esperi Bory
H. pannosa J. Agardh

CERAMIALES

Ceramiaceae

Centroceras Kiitzing
*C. minutum Yamada

Ceramium Roth
*C. gracillimum (Kiitzing) Zanardini
C. masonii Dawson

Haloplegma Montagne
H. duperreyi Montagne

Wrangelia C. Agardh
W. argus (Montagne) Montagne

Dasyaccae

Heterosiphonia Montagne

*H. wurdemanii (Bailey) Falkenberg

Delesseriaceae

Martensia Hering

+M. elegans Hering

[Collected by B. Carlson from Namara Island, Gt. Astrolabe; in herb. Institute of Marine Resources, University of the South Pacific. Not listed by Chapman (1977)].

Vanvoorstia Harvey

V. coccinea J.Agardh

Rhodomelaceae

Amansia Lamouroux

A. glomerata C.Agardh

Herposiphonia Nageli

*+H. parca Setchell

*H. secundata (C.Agardh) Ambronn

f. tenella (C.Agardh) Wynne

Polysiphonia Greville

*P. scopulorum Harvey

Tolypocladia Schmitz

*T. glomerulata (C. Agardh) Schmitz

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TABLE I

Surface water physical parameters, Dravuni Island. 1989 - 1990. Data courtesy of Pro. R.J Morrison, USP Marine Pollution Group; records are from Station 3 (Dravuni Island).

	April	July	September	January
pH	7.9	7.9	8.4	7.8
T°C	27.8	26.3	27.2	27.8
DO	6.1	6.5	n.d.	6.3
Salinity (ppt)	33.5	n.d	32.0	37.0

TABLE II

Surface water chemical parameters, Dravuni Island, 1989. Data courtesy of Prof. R.J. Morrison, USP Marine Pollution Group; records are from Station 3 (Dravuni Island).

$\mu\text{mol/L}$	Jan.	April	July	Sept.	Dec.
nitrate	0.35	3.9	0.35	<0.15	n.d.
ammonia	n.d.	<0.5	n.d.	<0.5	n.d.
phosphate	0.78	<0.1	0.21	0.1	n.d.

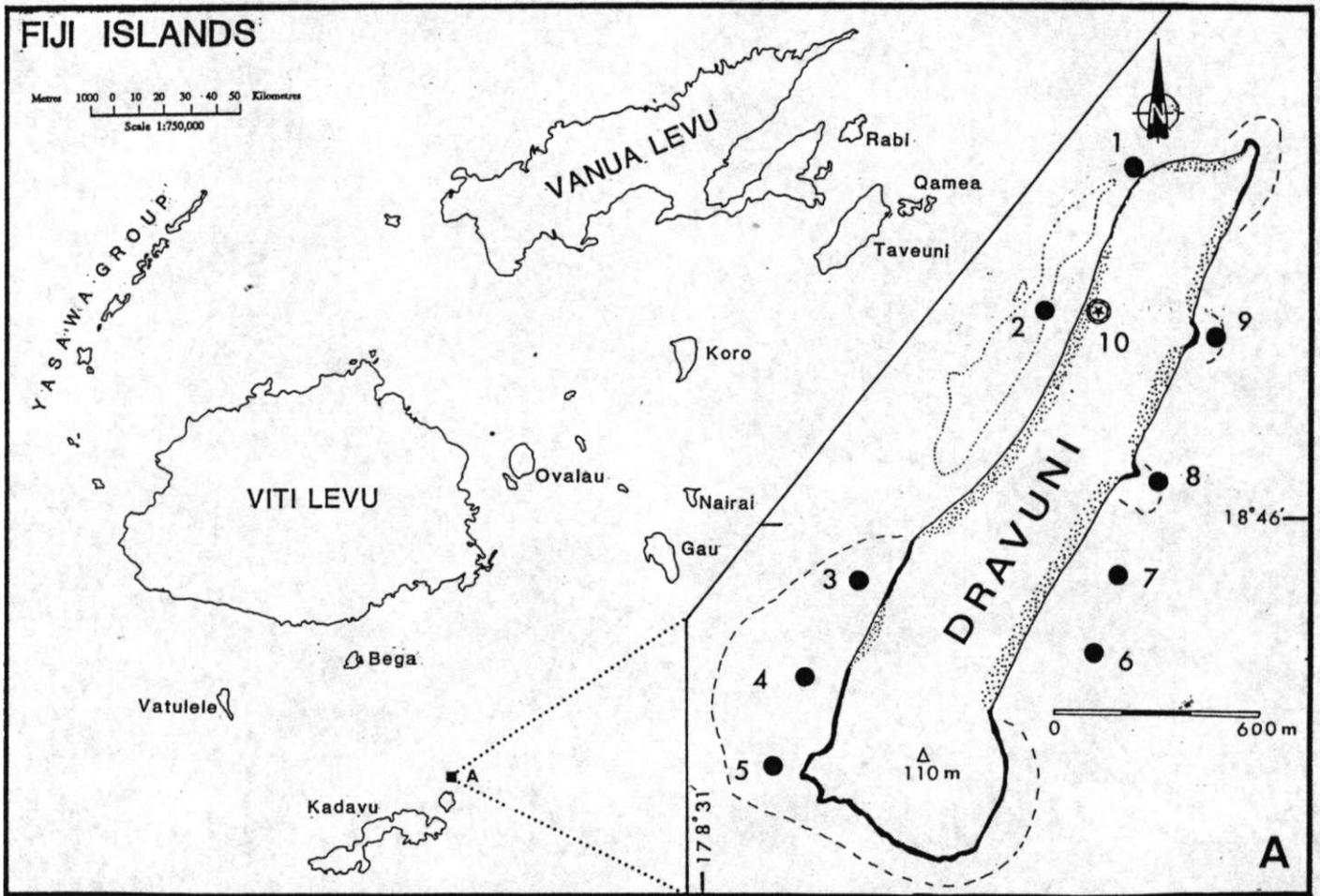


Figure 1. Map of the Fiji Islands, showing Dravuni Island (A, inset). 1-9 indicate the author's principal collecting sites. 10, location of University of the South Pacific Field Station. Sandy beaches are shown by stippling, rocky beaches by a thick line. Site 2 is a monospecific bed of the seagrass *Syringodium isoetifolium*. The limits of fringing reefs are shown by a dashed line. Redrawn from Carman (1986), with additions from Yamamuro et al, (1991).