



*Marine Studies*

The University of the South Pacific

# Technical Report

## A PRELIMINARY CHECKLIST OF THE MARINE BENTHIC MACROALGAE OF ROTUMA

Antoine De Ramon N'Yeurt  
Marine Studies Programme  
The University of the South Pacific  
Suva, Fiji

by

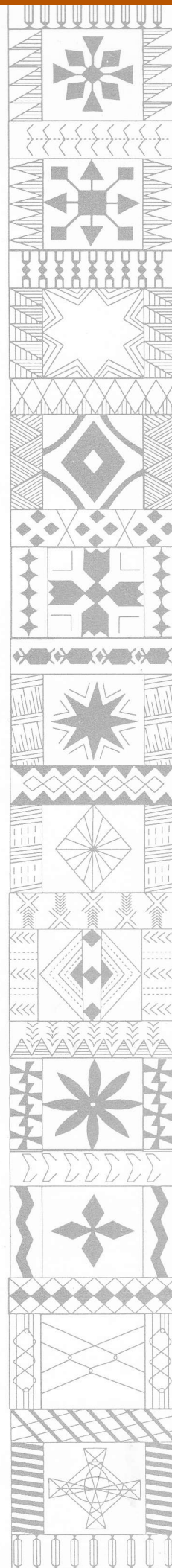
**Antoine De Ramon N'Yeurt**  
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Series  
Number

93/2

ISSN 1018-2896



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June 1, 1994

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## INTRODUCTION

Rotuma (Fig. 1) is a small volcanic island about 465 km north of the main Fiji group, and is located at 12°30' South; 177°05' East. It occupies about 44 km<sup>2</sup>, and lies in fair isolation from other island groups. Being six degrees North of Fiji, Rotuma experiences a rather more equatorial climate, and is quite distinct in terms of its structure, age and geography (Woodhall, 1987). It is encircled by a mostly fringing reef about 16 km<sup>2</sup> in area, which supports a varied algal flora.

To the author's knowledge, no phycological investigation of Rotuma took place prior to the present research, although the nearby Fijian algal flora has been fairly well studied (*vide* South and Kasahara, 1992). Hence this present checklist represents the first record of the Rotuman algal flora, which is dealt with in more detail by N'Yeurt (1993), South and N'Yeurt (1992) and South *et al.* (1993).

## METHODS

Extensive algal collections were made on Rotuman reefs from January 1992 to May 1992, and also from December 1992 to February 1993, as part of the author's MSc Thesis project. Owing to the absence of diving, collections were limited to intertidal benthic habitats. Specimens were preserved in 5% formaldehyde in seawater, and shipped back to the University in Suva for eventual identification. Voucher specimens of all identified algae were deposited in the Phycological Herbarium, South Pacific Regional Herbarium, as either pressed specimens or slide collections. Statistical analysis on the results was carried out, including the computation of

Jaccard Indices (Hoek, 1975) as a means of comparison between floras at different locations, namely between Fiji and Rotuma.

## LIST OF SPECIES

A total of one hundred and six species are listed, comprising twenty-one Cyanophyceae, forty Rhodophyceae, nine Phaeophyceae and thirty-six Chlorophyceae. Taxa preceded by an asterisk (\*) are new records for the Fijian algal flora, comprising forty-five taxa. A cross (+) indicates potentially new species.

The systematic order adopted, wherever possible, is that of Silva *et al.* (1987). Genera are listed alphabetically within each family, and species are listed alphabetically within each genus. The Cyanophyceae section broadly follows the classification in Bourrelly (1970) and most of the specimens were personally reviewed by B.A. Whitton during his visit to Fiji in March-April 1993.

### SYSTEMATIC LIST CYANOPHYCEAE CHROOCOCCALES Chroococcaceae

**Aphanocapsa** Nägeli

\**Aphanocapsa* sp.

**Gomphosphaeria** Kützing

\**Gomphosphaeria* sp.

### Entophysalidaceae

**Entophysalis** Kützing

\**Entophysalis* sp.

### PLEUROCAPSALES Hyllaceae

**Pleurocapsa** Thuret ex Hauck

\**Pleurocapsa* sp.

**Dermocarpa** P. Crouan et H. Crouan

\**Dermocarpa* sp.

**Oncobyrsa** Meneghini

\**Oncobyrsa* sp.

## CHAMAESIPHONALES

### **Chamaesiphonaceae**

**Chamaesiphon** A. Braun et Grunow

\**Chamaesiphon* sp.

### **Siphononemataceae**

**Siphononema** Geitler

\**Siphononema polonicum* Geitler

## NOSTOCALES

### **Nostocaceae**

**Anabaena** Bory de St. Vincent

\**Anabaena* sp.

### **Oscillatoriaceae**

**Lyngbya** C. Agardh

\**Lyngbya aestuarii* (Mertens) Lieberman

*Lyngbya "epiphytica"* Hieron

*Lyngbya majuscula* (Dillwyn) Harvey

**Oscillatoria** Vaucher

\**Oscillatoria* sp.

**Schizothrix** Kützing

\**Schizothrix* sp.

**Spirulina** Turpin

\**Spirulina tenerrima* Kützing

\**Spirulina subtilissima* Kützing

**Symploca** Kützing

*Symploca* sp.?

### **Rivulariaceae**

**Calothrix** C. Agardh

*Calothrix* sp.

**Homoeothrix** (Thuret) Kirchner

\**Homoeothrix* sp.

## Scytonemataceae

**Tolypothrix** Kützing

*Tolypothrix* sp.

**Plectonema** Thuret

*Plectonema* sp.

## CHLOROPHYCEAE

### ULVALES

#### Ulvaceae

**Enteromorpha** Link in Nees

*Enteromorpha flexuosa* (Wulfen) J. Agardh

### CLADOPHORALES

#### Cladophoraceae

**Cladophora** Kützing

\**Cladophora conferta* P. Crouan et H. Crouan

**Rhizoclonium** Kützing

\**Rhizoclonium africanum* Kützing

\**Rhizoclonium grande* Børgesen

### SIPHONOCLADALES

#### Boodleaceae

**Boodlea** Murray et De Toni

\**Boodlea coacta* (Dickie) Murray et De Toni

**Struvea** Sonder

*Struvea anastomosans* (Harvey) Piccone et Grunow ex Piccone

#### Siphonocladaceae

**Boergesenia** J. Feldmann

*Boergesenia forbesii* (Harvey) J. Feldmann

**Cladophoropsis** Børgesen

*Cladophoropsis sundanensis* Reinbold

#### Valoniaceae

**Dictyosphaeria** Decaisne ex Endlicher  
*Dictyosphaeria cavernosa* (Forsskål) Børgesen  
**Valonia** C. Agardh  
*Valonia aegagropila* C. Agardh  
**Ventricaria** Olsen et West  
*Ventricaria ventricosa* (J. Agardh) Olsen et West

## BRYOPSIDALES

### Bryopsidaceae

**Bryopsis** Lamouroux  
*Bryopsis harveyana* J. Agardh  
\**Bryopsis plumosa* (Hudson) C. Agardh

### Caulerpaceae

**Caulerpa** Lamouroux  
*Caulerpa cupressoides* (Vahl) C. Agardh  
var. *lycopodium* Weber-van Bosse  
\*var. *lycopodium* (Weber-van Bosse) f. *elegans* (P. Crouan et H. Crouan) Weber-van Bosse  
var. *mamillosa* (Montagne) Weber-van Bosse  
*Caulerpa racemosa* (Forsskål) J. Agardh  
var. *clavifera* (Turner) Weber-van Bosse  
var. *peltata* (Lamouroux) Eubank  
\*var. *turbinata* (J. Agardh) Eubank  
var. *uvifera* (Turner) J. Agardh  
intermediate variety between vars. *turbinata* (J. Agardh) Eubank and *peltata* (Lamouroux) Eubank  
*Caulerpa serrulata* (Forsskål) J. Agardh  
\*var. *boryana* (J. Agardh) Gilbert f. *occidentalis* (Weber-van Bosse) Yamada et Tanaka

### Codiaceae

**Codium** Stackhouse  
*Codium arabicum* Kützing  
*Codium bulbopilum* Setchell  
+ \**Codium* sp. nov.

### Halimediaceae

**Halimeda** Lamouroux

*Halimeda bikinensis* W.R. Taylor

*Halimeda cuneata* Hering

*Halimeda discoidea* Decaisne

*Halimeda macrophysa* Askenasy

\**Halimeda micronesica* Yamada

*Halimeda opuntia* (Linnaeus) Lamouroux

var. *opuntia* (Decaisne) J. Agardh

var. *hederacea* (Barton) Hillis

*Halimeda simulans* Howe

*Halimeda taenicola* W.R. Taylor

*Halimeda tuna* (Ellis et Solander) Lamouroux

**Udoteaceae**

**Avrainvillea** Decaisne

*Avrainvillea amadelpa* (Montagne) Gepp et Gepp

+ \**Avrainvillea rotumensis* N'Yeurt, Littler et Littler

**Chlorodesmis** Harvey et Bailey

*Chlorodesmis hildebrandtii* A. Gepp et E.S. Gepp

\**Chlorodesmis major* Zanardini

**Rhipidosiphon** Montagne

*Rhipidosiphon javensis* Montagne

**Rhipilia** Kützing

\**Rhipilia* sp.

DASYCLADALES

**Polyphysaceae**

**Acetabularia** Lamouroux

*Acetabularia parvula* Solms-Laubach

**Dasycladaceae**

**Neomeris** Lamouroux

*Neomeris vanbosseae* Howe

**PHAEOPHYCEAE**



ECTOCARPALES  
**Ectocarpaceae**

**Hincksia** J.E. Gray

\**Hincksia breviarticulata* (J. Agardh) P.C. Silva

SPHACELARIALES  
**Sphacelariaceae**

**Sphacelaria** Lyngbye

*Sphacelaria rigidula* Kützing

DICTYOTALES  
**Dictyotaceae**

**Dictyopteris** Lamouroux

*Dictyopteris repens* (Okamura) Børgesen

**Dictyota** Lamouroux

*Dictyota friabilis* Setchell

**Dilophus** J. Agardh

*Dilophus radicans* Okamura

**Lobophora** J. Agardh

*Lobophora variegata* (Lamouroux) Womersley

DICTYOSIPHONALES  
**Chnoosporaceae**

**Chnoospora** J. Agardh

\**Chnoospora minima* (Hering) Papenfuss

FUCALES  
**Sargassaceae**

**Sargassum** C. Agardh

*Sargassum polycystum* C. Agardh

**Turbinaria** Lamouroux

*Turbinaria ornata* (Turner) J. Agardh

**RHODOPHYCEAE**

**Bangiophycidae**

BANGIALES

**Erythropeltidaceae**

**Erythrotrichia** J.E. Areschoug

*Erythrotrichia carnea* (Dillwyn) J. Agardh

**Florideophycidae**

ACROCHAETIALES

**Acrochaetiaceae**

**Audouinella** Bory

\**Audouinella polyblasta* (Rosenvinge) J. Price, Lawson et John

BONNEMAISONIALES

**Galaxauraceae**

**Actinotrichia** Decaisne

*Actinotrichia fragilis* (Forsskål) Børgesen

GELIDIALES

**Gelidiellaceae**

**Gelidiella** Feldmann et Hamel

*Gelidiella acerosa* (Forsskål) Feldmann et Hamel

**Gelidium** Lamouroux

*Gelidium pusillum* (Stackhouse) Le Jolis

NEMALIALES

**Liagoraceae**

**Liagora** Lamouroux

\**Liagora valida* Harvey

CRYPTONEMIALES

**Peyssonneliaceae**

**Peyssonnelia** Decaisne

*Peyssonnelia* sp.

CORALLINALES

**Corallinaceae**

**Cheilosporum** (Decaisne) Zanardini

*Cheilosporum spectabile* Harvey ex Grunow

**Fosliella** Howe

*Fosliella farinosa* (Lamouroux) Howe

**Jania** Lamouroux

*Jania adhaerens* Lamouroux

\**Jania rubens* (Linnaeus) Lamouroux

**Lithophyllum** Philippi

\**Lithophyllum tamiense* Heydrich

GIGARTINALES

**Gracilariaceae**

**Gelidiopsis** Schmitz

*Gelidiopsis intricata* (C. Agardh) Vickers

**Gracilaria** Greville

*Gracilaria* sp. aff *G. textorii* (Suringar) De Toni

**Solieriaceae**

**Meristotheca** J. Agardh

\**Meristotheca procumbens* P. Gabrielson et Kraft

RHODYMENIALES

**Champiaceae**

**Champia** Desvaux

*Champia parvula* (C. Agardh) Harvey

**Rhodymeniaceae**

**Coelarthrum** Børgesen

\**Coelarthrum boergesenii* Weber-van Bosse

**Coelothrix** Børgesen

\**Coelothrix irregularis* (Harvey) Børgesen

**Rhodymenia** Greville

\**Rhodymenia divaricata* Dawson

## CERAMIALES

### Ceramiaceae

**Centroceras** Kützing

*Centroceras apiculatum* Yamada

*Centroceras clavulatum* (C. Agardh) Montagne

**Ceramium** Roth

\**Ceramium codii* (Richards) Mazoyer

*Ceramium mazatlanense* Dawson

*Ceramium vagans* P.C. Silva

\**Ceramium zaca* Setchell et Gardner

**Griffithsia** C. Agardh

\**Griffithsia subcylindrica* Okamura

**Wrangelia** C. Agardh

*Wrangelia argus* (Montagne) Montagne

### Dasyaceae

**Heterosiphonia** Montagne

*Heterosiphonia crispella* (C. Agardh) Wynne

var. *laxa* (Børgesen) Wynne

*Heterosiphonia subsecunda* (Suhr) Falkenberg

### Delesseriaceae

**Hypoglossum** Kützing

\**Hypoglossum caloglossoides* Wynne et Kraft

**Martensia** Hering

*Martensia elegans* Hering

### Rhodomelaceae

**Amansia** Lamouroux

*Amansia glomerata* C. Agardh

**Bostrychia** Montagne

*Bostrychia tenella* (Lamouroux) J. Agardh

**Chondria** C. Agardh

*Chondria dasyphylla* (Woodward) C. Agardh

\**Chondria sedifolia* Harvey

\**Chondria simpliciuscula* Weber-van Bosse

**Herposiphonia** Nägeli

*Herposiphonia secunda* (C. Agardh) Ambronn f. *tenella* (C. Agardh) Wynne

**Laurencia** Lamouroux

\**Laurencia venusta* Yamada

*Laurencia* sp.

**Polysiphonia** Greville

*Polysiphonia scopulorum* Harvey

var. *scopulorum* (Harvey) Hollenberg

## DISCUSSION

From the present list, it follows that forty-five fully identified taxa, or about 42% of the total Rotuman algal flora listed, represent new records for Fiji while two (*Avrainvillea* N'Yeurt, Littler et Littler, *Codium* sp.) represent new species, to be described elsewhere. Figure 3 shows the composition of the four main groups of Rotuman algae, while figure 4 compares the respective compositions of the Fijian and Rotuman algal floras. Figure 2 presents a summary of algal species at each station sampled; see N'Yeurt (1993) for further explanations. From Table I, It is immediately clear that the Fijian flora is much larger in terms of number of species; however the apparent impoverishment of the Rotuman flora is almost certainly a consequence of the lack of subtidal collections. Looking at Jaccard comparison indices (Table II; Figure 5), it appears that the Rotuman flora is quite dissimilar to the Fijian algal flora ( $P_o = 18.3$ ); however once again this is largely a result of the vast size difference of the two floras and the absence of Rotuman subtidal collections, particularly Rhodophyta. It is pertinent to note that the two floras are most comparable in terms of Chlorophyta ( $P_g = 27.5$ ), which are mostly found in intertidal habitats.

A particularly interesting observation is that one species of Rhodophyta found in Rotuma (*Meristotheca procumbens* P. Gabrielson et Kraft) represents the first observed record outside the type locality (Lord Howe Island; *vide* Gabrielson and Kraft, 1984), while a number of the Rotuman species are otherwise typically occurring in Northern Pacific waters. The latter biogeographic considerations are dealt with in more detail in N'Yeurt (1993).

The present preliminary research revealed quite interesting aspects of the Rotuman algal flora, providing an impetus for further work in this area. In particular, it would be most useful to obtain subtidal collections from Rotuman waters, especially Rhodophyta, in order to reassess biogeographical comparisons of the Rotuman flora with neighbouring island groups.

## ACKNOWLEDGEMENTS :

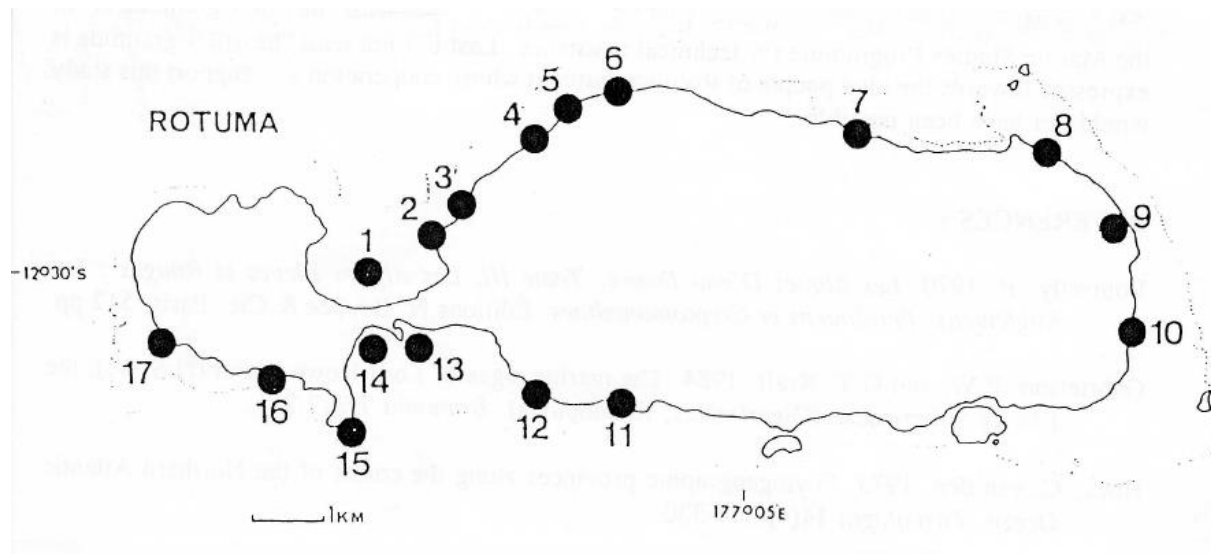
The author gratefully acknowledges financial support from the University of the South Pacific (URC grant # 0713-9106) and from the International Centre for Ocean Development (ICOD; Canada). I thank Dr. B.A. Whitton for his review of the Cyanophyceae, Dr. D.W. Keats for examining specimens of *Peyssonnelia* and *Lithophyllum*, and Dr. G.T. Kraft for examining material of *Meristotheca*. I also wish to thank my supervisor, Professor G. Robin South, for unfailing support and encouragement throughout my research, and the staff of the Marine Studies Programme for technical assistance. Last but not least, heartfelt gratitude is expressed towards the kind people of Rotuma, without whose cooperation and support this study would not have been possible.

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Woodhall, D. 1987. Geology of Rotuma. *Fiji Mineral Resources Dept. Bull.* 8:40pp+ map.



**Figure 1**

**LEGEND TO LOCATIONS ON MAP**

- |             |                  |             |            |
|-------------|------------------|-------------|------------|
| 1. Maka Bay | 2. 'Ahau         | 3. Jölmea   | 4. Mea     |
| 5. Ropure   | 6. Hoféa         | 7. Lopta    | 8. Oinafa  |
| 9. Paptea   | 10. Noa'tau      | 11. Tua'koi | 12. Saolei |
| 13. Isilepi | 14. Hapmafau Bay | 15. Kelega  | 16. Fapufa |
| 17. Losa    |                  |             |            |

**Table I**

**Numbers of Algal Species : Fiji and Rotuma**

	<b>Fiji *</b>	<b>Rotuma</b>	<b>New Records</b>	<b>Shared Species</b>
<b>All Species</b>	314	106	45	66
<b>Cyanophyceae</b>	12	21	15	6
<b>Chlorophyceae</b>	94	36	13	28
<b>Phaeophyceae</b>	38	9	2	7
<b>Rhodophyceae</b>	170	40	16	25

\* Excludes species occurring in Rotuma and not in Fiji.

**Table II**

**Flora Comparisons : Fiji and Rotuma**

	Jaccard Index (P)
<b>All Species</b>	18.3
<b>Cyanophyceae</b>	N/A
<b>Chlorophyceae</b>	27.5
<b>Phaeophyceae</b>	4.4
<b>Rhodophyceae</b>	13.5



Rotuman Algal Flora  
Composition At Each Station

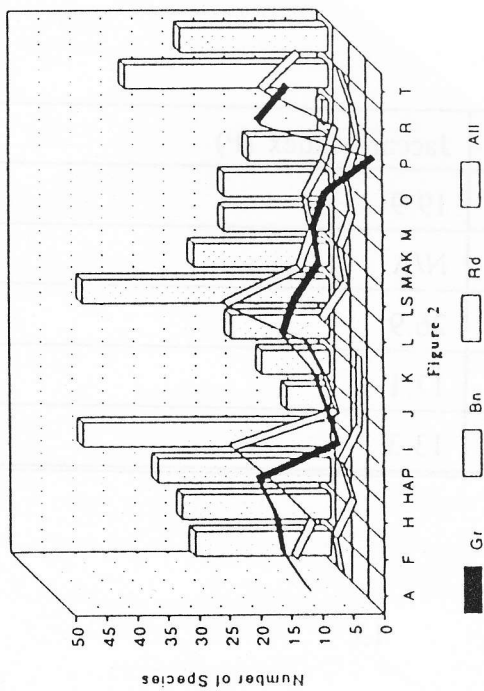


Figure 2

Rotuman and Fijian Algal Floras  
Overall Composition

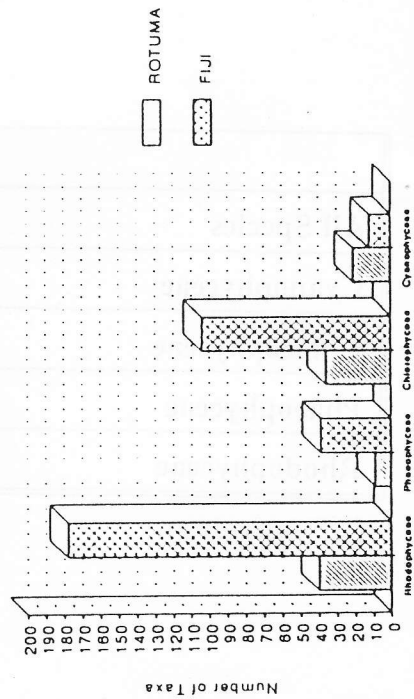


Figure 4

Rotuman Algal Flora  
Overall Composition

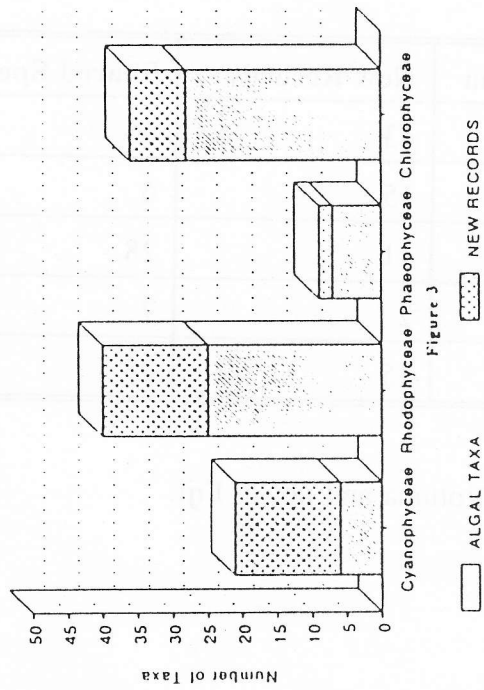


Figure 3

Rotuman and Fijian Algal Floras  
Flora Comparisons : Jaccard Indices

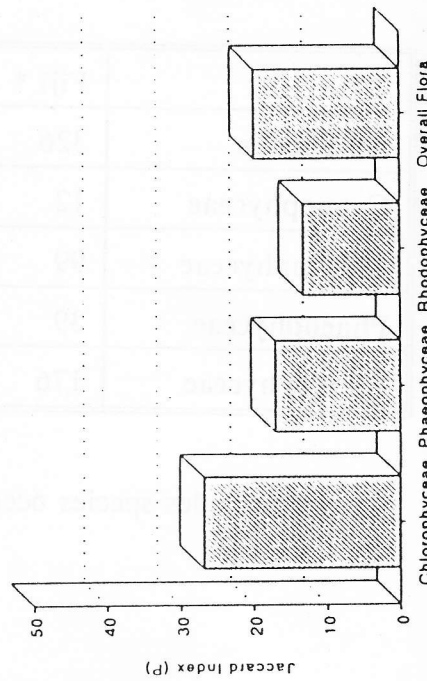


Figure 5