

MARINE FLORA AROUND MOTUPORE ISLAND ON THE SOUTH COAST OF PAPUA NEW GUINEA

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Introduction

It has been reported that the highest numbers of genera of reef corals are found in the waters around Indonesia, the Philippines and Papua New Guinea in the Indo-Pacific Ocean (STODDART, 1969 ; VERON, 1986). The diversity of reef corals gradually decreases beyond these area. The distribution and diversity of tropical seaweeds are not so clear as those of reef corals in the Indo-Pacific Ocean. Thus, it is important for the analysis of the geographical distribution of tropical seaweeds to investigate the marine flora in the waters around Papua New Guinea. Recently, some nations in coral-reef regions have been begun to support aquaculture, for example, the cultivation of fishes, prawns, snails and seaweeds, both for food and for other commercial purposes. Seaweeds are of importance as food for man and aquacultural animals in these regions. There are a few reports about the marine flora of Papua New Guinea (HEYDRICH, 1892 ; SCHMIDT, 1928 ; ENOMOTO and AJISAKA, 1984 ; COPPEJANS and MEINESZ, 1988 ; AJISAKA, 1990 ; ENOMOTO, 1990 ; KING, 1990). The present survey was made for the dual purpose of making clear the marine flora of Papua New Guinea and of finding useful seaweeds.

Materials and Methods

The survey of marine flora was carried out around the Motupore Island Research Center (MIRC) of the University of Papua New Guinea, near Port Moresby, from the 2nd to the 4th of December, 1989 and from the 21st to the 23rd of November, 1990. Five localities for the survey were chosen (Fig. 1 and Table 1). The survey of the marine vegetation and the collection of seaweeds were made by Scuba diving to a depth of 40 m. The collected materials were preserved with 3.5% formalin in seawater and transported to our laboratory in Japan. The specimens were deposited in the herbarium of the Laboratory of Phycology, Tokyo University of Fisheries (TUF), and in the herbarium of the Marine Biological Station of Kobe University.

Results and Discussion

The seaweeds identified included a total of 122 taxa, of which 31 were Chlorophyta (green algae), 32 were Phaeophyta (brown algae), 48 were Rhodophyta (red algae), 4 were Cyanophyta (blue-green algae) and 7 were Spermatophyta (seagrasses) (Table 2). In general, in tropical waters, fewer taxa belong to Phaeophyta than to Chlorophyta, unlike in temperate and subarctic waters (SEGAWA, 1956), but in this locality the identified taxa of Phaeophyta were relatively abundant.

Among the Chlorophyta, *Ventricaria ventricosa*, *Dictyosphaeria cavernosa*, *D. ver-sluyssii*, *Chlorodesmis fastigiata*, *Avrainvillea lacerata*, *Halimeda discoidea*, *H.*

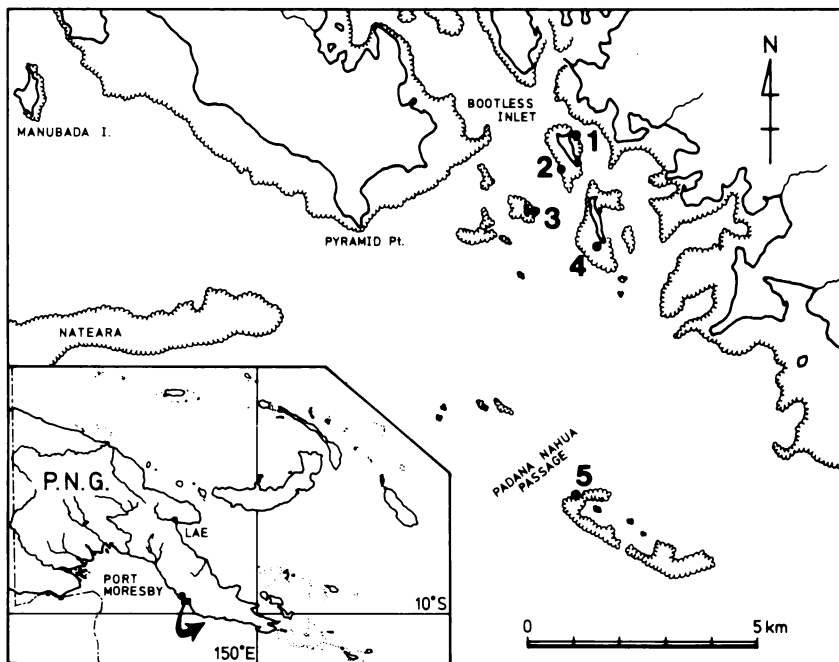


Fig. 1. Map of Motupore Island and its vicinity, Papua New Guinea, showing the localities in which the marine flora were surveyed. The numbers of the localities correspond to those in Table 1.

Table 1. Localities and dates of the investigations of seaweeds

No.	Locality	Date
1	Northeast coast of Motupore I.	Nov. 23, 1990
2	Southwest coast of Motupore I.	Dec. 3, 1989
		Nov. 21, 1990
3	Southeast coast of Manunouha (Lion) I.	Dec. 4, 1989
		Nov. 23, 1990
4	Southwest coast of Loloata I.	Dec. 3, 1989
		Nov. 21, 1990
5	North part of Horse Shoe Reef	Dec. 2, 1989
	(on the side of Padana Nahua Passage)	Nov. 22, 1990

macrophysa and *H. opuntia* were common in this area. It was characteristic of the marine Chlorophyta in this area that there were many species of *Halimeda* but few species of *Caulerpa*. The genera *Microdictyon*, *Cladophoropsis* and *Acetabularia*, which have often been found in tropical waters (WEBER-VAN BOSSE, 1913; TAYLOR, 1950, 1960; DAWSON, 1954; EGEROD, 1974, 1975), were not found in the present survey. Some taxa of *Ulva*, *Enteromorpha*, *Caulerpa* and *Codium* are utilized as food by inhabitants of Polynesia and Southeast Asia (CHAPMAN and CHAPMAN, 1980; ABBOTT, 1984). These useful seaweeds were

rare in this area.

Among the Phaeophyta, *Dictyota* species, *Lobophora variegata*, *Padina australis*, *P. japonica*, *P. minor*, *Turbinaria* species and *Sargassum* species were widely distributed in this area. At locality 4, *Sargassum*, *Turbinaria*, *Dictyota* and *Padina* species formed dense tufts on the small knolls that were scattered over the seagrass bed. At locality 5, *Turbinaria murrayana* predominated and formed a large association on the reef flat.

Among the Rhodophyta, *Actinotrichia fragilis*, *Galaxaura* species, *Gelidium* species, Coralline algae, *Gracilaria edulis*, *Coelothrix irregularis* and *Spiridia filamentosa* were common. However, the genera *Liagora*, *Rhodopeltis*, *Plocamium*, *Rhodymenia*, *Martensia*, *Vanvoorstia* and *Digenea*, which have been widely distributed in tropical waters, were not found in the present survey. Species of *Euचेuma*, *Hypnea* and *Gracilaria*, which are useful as sources of carrageenan, were sparsely distributed in this area.

Seagrass beds were well developed around Motupore Island and Loloata Island, where many species of marine Spermatophyta (seagrasses) were abundantly distributed. Ten species of seagrass were found in this area by BROUNS and HEIJS (1985). Seven of these species of seagrass were collected by us in this area, with *Cymodocea serrulata*, *Halodule uninervis* and *Halophila ovata* being absent.

It appeared that useful algae, such as *Euचेuma*, *Hypnea*, *Gracilaria* and *Digenea*, were rare because there was little stable substratum, for example, rocky flats, in the tidal and shallow subtidal zone. It is possible that mass production of these useful algae could be achieved by use of artificial substrata (e. g., nets or ropes) at a moderate depth in a lagoon.

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Table 2. Distribution of seaweeds around Motupore Island and its vicinity on the southern coast of Papua New Guinea. The numbers of the localities correspond to those in Table 1

Species	Locality				
	1	2	3	4	5
«CHLOROPHYTA»					
CHLOROPHYCEAE					
Ulvales					
Ulvaceae					
<i>Enteromorpha</i> sp.	+				
Cladophorales					
Cladophoraceae					
<i>Cladophora meridionalis</i> SAKAI <i>et</i> YOSHIDA (?)					+
Anadyomenaceae					
<i>Anadyomene wrightii</i> HARVEY	+	+		+	
Siphonocladales					
Boodleaceae					
<i>Boodlea coacta</i> (DICKIE) MURRAY <i>et</i> DE TONI	+			+	
Siphonocladaceae					
<i>Valonia aegagropila</i> C. AGARDH				+	
<i>Valonia fastigiata</i> HARVEY <i>ex</i> J. AGARDH					+
<i>Ventricaria ventricosa</i> (J. AG.) OLSEN <i>et</i> WEST	+	+	+	+	+
<i>Dictyosphaeria cavernosa</i> (FORSK.) BØRGESEN	+	+	+	+	
<i>Dictyosphaeria versluisii</i> W.-V. BOSSE	+	+	+	+	+
Dasycladales					
Dasycladaceae					
<i>Bornetella nitida</i> MUNIER-CHALMAS <i>ex</i> SONDER	+	+		+	
Codiales					
Caulerpaceae					
<i>Caulerpa webbiana</i> MONTAGNE		+			
<i>Caulerpa serrulata</i> (FORSK.) J. AGARDH var. <i>serrulata</i>	+	+		+	
<i>Caulerpa sertularioides</i> (GMEL.) HOWE		+			
<i>Caulerpa taxifolia</i> (VAHL) C. AGARDH		+			
<i>Caulerpa racemosa</i> (FORSK.) J. AGARDH var. <i>peltata</i> (LAMX.) EUBANK		+	+		

Table 2. continued

Species	Locality				
	1	2	3	4	5
Codiaceae					
<i>Chlorodesmis fastigiata</i> (C. AG.) DUCHER	+	+	+	+	+
<i>Avrainvillea erecta</i> (BERKEL.) A. et E.S. GEPP	+				
<i>Avrainvillea lacerata</i> HARVEY ex J. AGARDH f. <i>lacerata</i>	+	+	+	+	
<i>Halimeda discoidea</i> DECAISNE	+		+	+	+
<i>Halimeda tuna</i> (EL. et SOL.) LAMOUROUX					+
<i>Halimeda bikinensis</i> TAYLOR (?)					+
<i>Halimeda fragilis</i> TAYLOR					+
<i>Halimeda velasquezii</i> TAYLOR			+		+
<i>Halimeda macrophysa</i> ASKENASY	+	+	+	+	+
<i>Halimeda opuntia</i> (L.) LAMOUROUX	+	+		+	+
<i>Halimeda hederacea</i> (BARTON) COLINVAUX	+	+			+
<i>Halimeda copiosa</i> GOREAU et GRAHAM (?)			+		+
<i>Halimeda macroloba</i> DECAISNE	+				
<i>Codium divaricatum</i> HOLMES		+			
<i>Codium intricatum</i> OKAMURA	+			+	
<i>Codium</i> sp.	+	+			
«PHAEOPHYTA»					
PHAEOPHYCEAE					
Ectocarpales					
Ectocarpaceae					
<i>Ectocarpus</i> sp.	+				+
Scytosiphonales					
Scytosiphonaceae					
<i>Colpomenia sinuosa</i> (MERT. ex ROTH) DERBÈS et SOLIER	+				
<i>Hydroclathrus clathratus</i> (C. AG.) HOWE	+			+	
<i>Rosenvingea intricata</i> (J. AG.) BØRGESEN				+	
<i>Rosenvingea</i> sp.	+				
Sphacelariales					
Sphacelariaceae					
<i>Sphacelaria</i> sp.	+			+	+
Dictyotales					
Dictyotaceae					
<i>Dictyota apiculata</i> J. AGARDH	+	+			
<i>Dictyota bartayresii</i> LAMOUROUX	+			+	+
<i>Dictyota dentata</i> LAMOUROUX (?)				+	
<i>Dictyota divaricata</i> LAMOUROUX (?)	+		+	+	
<i>Dictyota friabilis</i> SETCHELL				+	+
<i>Dictyota</i> sp.				+	+
<i>Dictyopteris repens</i> (OKAM.) BØRGESEN		+	+	+	
<i>Dictyopteris</i> sp.					+

Table 2. continued

Species	Locality				
	1	2	3	4	5
<i>Lobophora variegata</i> (LAMX.) WOMERSLEY	+	+	+	+	+
<i>Styopodium zonale</i> (LAMX.) PAPENFUSS		+	+		
<i>Padina australis</i> HAUCK	+	+		+	
<i>Padina japonica</i> YAMADA	+	+	+	+	+
<i>Padina minor</i> YAMADA	+	+		+	
<i>Padina</i> sp.					+
Fucales					
Cystoseiraceae					
<i>Hormophysa cuneiformis</i> (GEML.) SILVA	+			+	
Sargassaceae					
<i>Turbinaria ornata</i> (TURN.) J. AGARDH					+
<i>Turbinaria murrayana</i> BARTON			+		+
<i>Turbinaria conoides</i> (J. AG.) KÜTZING	+	+		+	
<i>Turbinaria</i> sp.		+			+
<i>Sargassum duplicatum</i> (J. AG.) J. AGARDH					+
<i>Sargassum polycystum</i> C. AGARDH	+			+	
<i>Sargassum swartzii</i> (TURN.) C. AGARDH					+
<i>Sargassum peronii</i> (MERT.) C. AGARDH		+		+	
<i>Sargassum</i> sp. 1	+	+		+	
<i>Sargassum</i> sp. 2	+			+	
<i>Sargassum</i> sp. 3		+	+		
《RHODOPHYTA》					
RHODOPHYCEAE					
Nemaliales					
Helminthocladiaceae					
<i>Trichogloea requienii</i> (MONT.) KÜTZING					+
Galaxauraceae					
<i>Actinotrichia fragilis</i> (FORSK.) BØRGESEN	+		+		+
<i>Galaxaura fasciculata</i> KJELLMAN	+	+	+	+	+
<i>Galaxaura fastigiata</i> DECAISNE	+	+	+		+
<i>Galaxaura subfruticulosa</i> CHOU (?)			+	+	+
<i>Galaxaura cuculligera</i> KJELLMAN	+	+			+
<i>Galaxaura veprecula</i> KJELLMAN (?)		+	+		+
<i>Galaxaura robusta</i> KJELLMAN		+	+		+
Bonnemaisoniaceae					
<i>Asparagopsis taxiformis</i> (DELILE) TREVISAN					+
Gelidiales					
Gelidiaceae					
<i>Gelidium pusillum</i> (STACKH.) LE JOLIS				+	
<i>Gelidium</i> sp.			+	+	+
Gelidiellaceae					

Table 2. continued

Species	Locality				
	1	2	3	4	5
<i>Gelidiella acerosa</i> (FORSK.) FELDMANN <i>et</i> HAMEL	+				+
Cryptonemiales					
Peyssonneliaceae					
<i>Peyssonnelia</i> sp.					+
Corallinaceae					
<i>Porolithon</i> sp.					+
<i>Lithophyllum moluccense</i> FOSLIE f. <i>moluccense</i>		+	+		
<i>Lithophyllum</i> sp.		+		+	+
<i>Lithothamnion</i> (?) sp.					+
<i>Amphiroa foliacea</i> LAMOUROUX	+	+	+		+
<i>Amphiroa fragilissima</i> (L.) LAMOUROUX	+		+		+
<i>Amphiroa</i> sp.					+
<i>Jania capillacea</i> HARVEY	+	+	+	+	+
Halymeniaceae					
<i>Halymenia dilatata</i> ZANARDINI		+	+		
<i>Carpopeltis</i> (?) sp.					+
Gigartinales					
Rhizophyllidaceae					
<i>Portieria hornemannii</i> (LYNGB.) SILVA				+	
Hypneaceae					
<i>Hypnea charoides</i> LAMOUROUX					+
<i>Hypnea pannosa</i> J. AGARDH					+
<i>Hypnea</i> sp.	+	+		+	
Gracilariaceae					
<i>Gracilaria crassa</i> HARVEY	+	+	+		
<i>Gracilaria edulis</i> (GMEL.) SILVA	+	+		+	
<i>Gracilaria</i> sp.	+	+			
<i>Gelidiopsis intricata</i> (C. AG.) VICHERS	+		+		
<i>Gelidiopsis repens</i> (KÜTZ.) SCHMITZ					+
<i>Ceratodictyon spongiosum</i> ZANARDINI	+				
Rhodymeniales					
Rhodymeniaceae					
<i>Coelothrix irregularis</i> (HARV.) BØRGESEN	+			+	+
Champiaceae					
<i>Champia parvula</i> (C. AG.) J. AGARDH (?)				+	+
Ceramiales					
Ceramaceae					
<i>Spyridia filamentosa</i> (WULF.) HARVEY	+	+	+		
<i>Centroceras distichum</i> OKAMURA	+				
Dasyaceae					
<i>Rhodoptilum plumosum</i> (HARV. <i>et</i> BAIL.) KYLIN (?)					+

Table 2. continued

Species	Locality				
	1	2	3	4	5
Delesseriaceae					
<i>Zellera tawallina</i> MARTENS					+
Rhodomelaceae					
<i>Polysiphonia</i> sp.			+		
<i>Tolypiocladia glomerulata</i> (C. AG.) SCHMITZ	+				
<i>Chondria ryukyuensis</i> YAMADA					+
<i>Laurencia cartilaginea</i> YAMADA	+	+			
<i>Laurencia parvipapillata</i> TSENG				+	
<i>Laurencia</i> sp.	+	+			
<i>Acanthophora specifera</i> (VAHL) BØRGESEN	+				+
<i>Leveillea jungermannioides</i> (MART. et HERING) HARVEY				+	
<i>Amansia glomerata</i> C. AGARDH				+	
«CYANOPHYTA»					
CYANOPHYCEAE					
Oscillatoriales					
Oscillatoriaceae					
<i>Lyngbya sordida</i> (ZANARD.) GOMONT		+			+
<i>Symploca hydroides</i> KÜTZING	+	+	+		
<i>Hydrocoleum cantharidosum</i> (MONT.) GOMONT (?)	+				
Rivulariaceae					
<i>Gardnerula</i> sp.	+				
«SPERMATOPHYTA»					
MONOCOTYLEDONEAE					
Helobiales					
Potamogetonaceae					
<i>Cymodocea rotundata</i> EHRENBERG et HEMPRICH ex ASCHERSON	+			+	
<i>Syringodium isoetifolium</i> (ASCHERS.) DANDY	+			+	
<i>Halodule pinifolia</i> (MIKI) DEN HARTOG	+				
Hydrocharitaceae					
<i>Enhalus acoroides</i> (L.) ROYLE	+			+	
<i>Thalassia hemprichii</i> (EHRENB.) ASCHERSON	+			+	
<i>Halophila ovalis</i> (R. BR.) HOOK.	+	+		+	
<i>Halophila decipiens</i> OSTENFELD		+		+	