

# Biodiversity of the Coastal Littoral Vegetation of Rotuma Island, Fiji

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## ABSTRACT

The coastal littoral vegetation of Rotuma Island (Republic of Fiji) is very important for its ecological, cultural and medicinal values. A survey was conducted of the entire coast of the island using 50 representative sample sites, to obtain baseline information on the present composition of the littoral flora. Ninety-nine species were identified consisting of seven ferns and 92 angiosperms, of which 16 were monocotyledonous and 76 dicotyledonous. There were 51 families comprising of 80 genera, with biodiversity at the generic level being higher than at the species level. Thirty-seven per cent of the total littoral plant species growing along the coast of Rotuma were considered rare or threatened. The main reason for the rarity of these species was identified as the clearance of coastal forests for home building and plantation development. Public awareness programmes should be created to avoid the total loss of these threatened species, many of which have ecological, cultural and medicinal value.

**Key Words:** Coastal ecology; Floral composition; Genetic erosion; Species diversity; Vegetation survey

## INTRODUCTION

Rotuma is a small isolated volcanic oceanic island located some 465 km to the northwest of the Republic of the Fiji Islands. Because of its relative isolation from the rest of the Fiji Group it has been largely neglected in the botanical studies and surveys of the Pacific Islands and Fiji.

There has been a widespread destruction and degradation of the coastal littoral flora in Rotuma. Clearing of forests for plantations and settlement has resulted in the loss of many species and the exposure of the coastline to erosion during frequent heavy rains and high tides. Most coastal plant species are of very high cultural utility (Thaman, 1992). They are used for food, clothing, construction, carving, medicine and cultural attire. These species are frequently removed without replanting.

Besides human activities, periodic natural disasters such as hurricanes and storms, although infrequent, have also caused enormous devastation and destruction to plants. Walkley (1973) has described in detail, the drastic effects of hurricane across the island. In recent years, abnormally high spring tides, associated with high waves and other global warming-induced evidence of sea level rise have become more frequent (Nunn & Mimura, 1997).

No appreciable efforts, individual or communal, have been put into restoring, maintaining or protecting the coastline and its associated vegetation. Lack of restorative measures to replenish these species had led to serious coastal degradation, to the endangerment of a high proportion of littoral species. There is an urgent need to study the flora of oceanic islands such as Rotuma to take inventory of the floral communities and to design strategies

for conservation and rehabilitation of plant communities and genetic resources.

Therefore, the purpose of this study was to provide baseline information on the present composition of Rotuma's coastal littoral flora, to analyse the floristic structure and biogeography of plant communities and to examine their conservation status.

## MATERIALS AND METHODS

A reconnaissance vegetation survey was made of the entire coast of the island using 50 selected sites. The sites were chosen in the close proximity to each other, about 100 m apart, to enable the complete survey of their floral composition and diversity.

Ten by ten metres (100 m<sup>2</sup>) sample quadrats were positioned contiguously by measuring 5 m either side of a transect line, each ten metres inland. Beginning at the mean high tide line the length of the individual transects depended on when typical littoral species were no longer seen. The fifty sample sites or transects were grouped based on the differences in their topography and substrate type, namely cliffs; low rocky shorelines; sandy beaches or plains; spits and mangroves. There were a total of 220 quadrats.

All vascular plants within each quadrat were identified and recorded. The number of individuals of each species were also counted and recorded. Values for cover abundance were recorded for each species using a modified Braun-Blanquet scale adapted from Manner *et al.* (1984) (Table I).

At each transect specific descriptions of growth form were recorded. Plant identifications in the field were

achieved mainly by reference to Whistler (1992, 1995), McClatchey (1996), and the personal knowledge of elderly villagers and traditional healers. Photographs and/or sketches were made of unidentified plants, and voucher specimens were collected.

## RESULTS

Ninety-nine distinct vascular plant species were found in the range of vegetation types, depending on the substrate and topography, ranging from relatively undisturbed forest, shrub and herbaceous associations to more opened associations on disturbed and mixed substrate sites. There were seven ferns and 92 angiosperms of which 16 were monocotyledons and 76 dicotyledons (Table II).

There were 51 families represented in the species found in the coastal flora of Rotuma (Table III). Of these 51 families, seven were represented by species endemic to Fiji. These were Ebenaceae, Euphorbiaceae, Myristicaceae, Myrtaceae, Piperaceae, Rubiaceae and Utricaceae. Endemicity was highest in the tree species, representing 75%, followed by the shrubs and the vines each representing 12.5%. Indigenous species comprised 44 families including all of the six Pterophyte families, Asplenaceae, Davalliaceae, Ophioglossaceae, Polypodiaceae, Pteridaceae and Thelypteridaceae, each represented by one species except for Pteridaceae, which had two species. Three families of Monocotyledonae were represented by indigenous species:

**Table III. Plant families with their respective number of species and growth forms present among coastal vegetation of Rotuma**

Family	No. of species	Growth form	Family	No. of species	Growth form
<b>Pterophytes</b>			<b>Angiosperms Cont.</b>		
Asplenaceae	1	Fern	Goodeniaceae	1	Shrub
Davalliaceae	1	Fern	Gramineae	1	Grass
Ophioglossaceae	1	Fern	Hernandiaceae	1	Tree
Polypodiaceae	1	Fern	Lauraceae	1	Vine
Pteridaceae	2	Fern	Lecythidaceae	1	Tree
Thelypteridaceae	1	Fern	Lythraceae	1	Shrub
<b>Angiosperms</b>			Malvaceae	2	Tree
Aizoaceae	1	Herb	Moraceae	3	Tree(2), Shrub
Amaranthaceae	1	Herb	Myristicaceae	1	Tree
Amaryllidaceae	1	Herb	Myrtaceae	2	Tree
Apiaceae	1	Herb	Nyctaginaceae	2	Herb, Tree
Apocynaceae	4	Tree (2), Vine (2)	Pandanaceae	2	Tree
Arecaceae	2	Vine, Tree	Piperaceae	1	Vine
Asteraceae	2	Vine, Herb	Poaceae	4	Grass
Boraginaceae	2	Tree	Portulacaceae	2	Herb
Casuarinaceae	1	Tree	Rhamnaceae	1	Shrub
Clusiaceae	1	Tree	Rhizophoraceae	1	Tree
Combretaceae	2	Tree	Rubiaceae	5	Shrub(3), Tree (2)
Convolvulaceae	4	Vine	Rutaceae	1	Tree
Cyperaceae	3	Sedge	Sterculiaceae	1	Tree
Dioscoreaceae	1	Vine	Surianaceae	1	Shrub
Ebenaceae	2	Tree	Taccaceae	1	Herb
Elaeocarpaceae	1	Tree	Tiliaceae	1	Herb
Euphorbiaceae	5	Tree (3), Shrub, Vine	Urticaceae	3	Tree, Herb, Shrub
Fabaceae	9	Vine (6), Shrub(2), Tree	Verbanaceae	5	Shrub (5), Herb

**Table I. Modified Braun-Blanquet scale for determination of cover abundance**

Rating	Cover
5	>75%
4	50-75%
3	25-50%
2	10-25%
1	5-10%
+	<5%

**Table II. Numbers of specified categories of vascular plants identified in survey of the coastal vegetation on Rotuma**

Category of plants	Pteridophyta	Monocotyledon	Dicotyledon	Total
Ferns	7	-	-	7
Forbs	-	3	10	13
Grasses/sedges	-	9	-	9
Vines/lianas	-	1	14	15
Shrubs	-	-	17	17
Trees	-	3	35	38
Total	7	16	76	99

Poaceae, Cypraceae and Pandanaceae. In the Dicotyledonae, 35 families were represented. These were Fabaceae, Apocynaceae, Euphorbiaceae, Convolvulaceae, Lamiaceae, Moraceae, Rubiaceae, Urticaceae, Boraginaceae, Combretaceae, Malvaceae, Nyctaginaceae, Portulacaceae, Verbenaceae, Aizoaceae, Amaranthaceae, Apiaceae,

**Table IV. Number and antiquity status of species recorded in survey**

Class	Endemic	Indigenous	Aboriginal introductions	Post-European introductions	Total
Pterophytes	-	7	-	-	7
Monocotyledons	-	10	4	2	16
Dicotyledons	8	65	-	3	76
Total	8	82	4	5	99

**Table V. Number and percentage of rare and threatened coastal plant species found only in the Coastal areas of Rotuma**

Type of vegetation	No. of rare species	Percentage
Ferns	1	14
Herbs	6	46
Grasses/sedges	2	25
Vines/lianas	3	20
Shrubs	6	35
Trees	18	49

Asteraceae and Casuarinaceae. The others were Clusiaceae, Ebenaceae, Elaeocarpaceae, Goodeniaceae, Hernandiaceae, Lauraceae, Lecythidaceae, Lythraceae, Meliaceae, Myrtaceae, Rhamnaceae, Rhizophoraceae, Rutaceae, Sterculiaceae, Surianaceae and Tiliaceae.

The number of species in different classes and their antiquity status are presented in Table IV. Only eight species out of 99 were endemic to Rotuma. All the endemic species belonged to class dicotyledonae and the four aboriginal introductions were all monocotyledons. Of the five recent or post-European-contact introductions, two were monocotyledons and three were dicotyledons.

The number and percentage of rare and threatened coastal plant species is presented in Table V. The largest number of these were tree species (49%) followed by herbs (46%) and shrubs (35%). Least number of rare and threatened species was recorded in Ferns (14%). Vines and grasses each had 3(20%) and 2(25%) species under threat.

## DISCUSSION

The coastal flora of Rotuma has been impoverished. Thirty seven percent of the total number of littoral plant species growing along the coast were considered rare or threatened, notably the tree and herb species. The representation of plant species by antiquity status on the island still follows the descriptions of Smith (1979, 1991).

Reasons that account for the rarity of tree species include the clearance of coastal forests for homes and plantations when local plantations, attracted by trading with

European traders and whalers, moved to the coast for convenience of trade and transport. It appears that the only coastal areas still undisturbed were cliffy and rocky areas, where there was little topsoil and were unsuitable for settlement or agriculture. All the species, which were found to be rare, had been used excessively in the past for construction, carving, cultural attire and medicine (Thaman, 1992; McClatchey, 1993). Furthermore, lack of replanting programmes for these useful species has led to their present low numbers on the Rotuma Island.

The rare occurrence of some herbs may be due to their constant removal as weeds since settlements and agricultural activities became established along the coastal areas. These herbs are now restricted to few uninhabited, sandy coastal sites, where they are rather less adapted to compete with more vigorous vines. The vines and climbers have disappeared under conditions similar to those of the herbs, and similarly the shrubs.

Considering the high number and percentage of rare and threatened species recorded in the present study, it was recommended that the government should take appropriate measures to protect these species. One way of achieving this goal is to create awareness and educate local population about these rare and threatened plant communities and the need to save and conserve them for current and future uses.

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