

Observations on Marine Macrophytes of the Republic of Seychelles

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Abstract

The distribution of macrophytes was studied from the major islands (Mahé, Praslin and La Digue) of the Seychelles Archipelago. The macrophytes were represented by 72 species of seaweeds, 8 species of mangroves and 6 species of seagrasses. The dominant seaweeds were species of *Sargassum* and *Turbinaria* and the biomass of *Sargassum* was observed in the range of 0–8 kg m⁻² (wet weight). Approximately 30% of the total lagoon area was covered by seagrass meadows and *Thalassia hemprichii* was dominant. The dominant mangrove species were *Avicennia marina*, *Rhizophora mucronata* and *Sonneratia alba*.

Introduction

Marine macrophytes such as seaweeds, seagrasses and mangroves form an economically important resource. Seaweeds are in demand by industry for agar-agar, alginate and carageenan while mangroves and seagrass ecosystems are of great value in checking coastal erosion as well as for aquaculture. These macrophytes may be utilized as food, feed, fodder, fertilizer and also for energy. However, the developing countries, particularly those surrounding the Indian ocean, have paid very little attention to the use of these valuable resources. There have been a few earlier accounts of the marine macrophytes from the Seychelles (Gepp and Gepp 1908, Weber Van Bosse 1913, Price 1971, Untawale *et al.* 1985, Mshigeni 1985, Mshigeni *et al.* 1987). In the present investigation, observations were made on marine macrophytes from the major islands of Seychelles, during cruise No. 134, of R. V. *Gaveshani*.

The Seychelles archipelago has a land area of 443 sq km and stretches across about 400 000 km² of Indian ocean. The archipelago comprises over 100 islands and tiny islets. The main island Mahé (Fig. 1) is situated south of the equator (between 4°33'–4°47'S and 55°22'–55°32'E) and is 27 km long (NS) and 7 km wide (EW). Ninety percent of the total population of the archipelago (approx. 70 000) live in

Mahé. The second largest island, Praslin, lies within 56.3 km of Mahé and third largest island La Digue is close to Praslin (Fig. 2).

The Seychelles archipelago is located within the Seychelles Bank, forming a part of the extensive Mascarene submarine plateau. The bank is situated between 3°33'S latitude and 55°56'E longitude. All lithification stages of carbonate rocks from carbonate silt and sand to fully crystallized limestones are found in this area. The islands are volcanic in origin and are surrounded by coral reefs which form extensive lagoons (Lewis 1968, Ustinovskiy 1986).

The climate of the Seychelles is subequatorial and the atmospheric temperature varies between 26 °C and 31 °C. Total annual rainfall averages about 2300 mm and most of this is received during January and February from a north westerly monsoon (November–March).

Material and Methods

Aerial observations were made with locally available aircraft to locate the regions of coastal vegetation. The sampling sites, 13 at Mahé, 7 at Praslin and 5 at La Digue (Figs 1 and 2) were selected by studying the available maps (scale 1:32 000). At each site, quali-

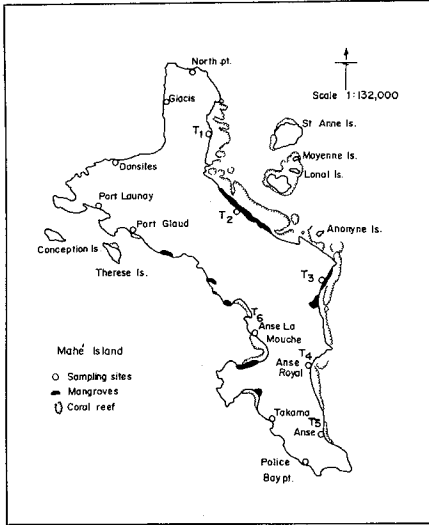


Fig. 1. Geographical position of Mahé.

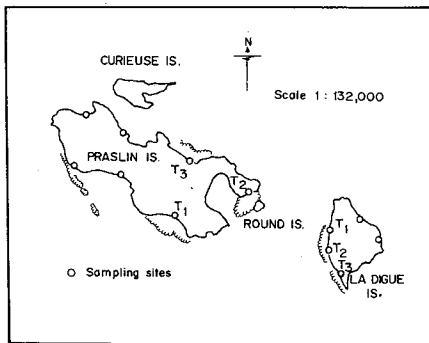


Fig. 2. Geographical position of Praslin and La Digue islands.

tative and quantitative observations were made on seaweeds from the intertidal and subtidal zones (lagoon, fore-reef, reef and reef slope along a transect). Observations on the subtidal (3–20 m) seaweeds were made by snorkeling and SCUBA diving. The biomass (wet weight) of the dominant seaweed, *Sargassum* and seagrasses was determined using 1 m² quadrats. Transects (T1–T6) were positioned at each island site as shown in Figures 1 and 2. Along each transect, at 50 m intervals, *Sargassum* and seagrass communities (in the lagoon) along with their root systems, were removed entirely from five quadrats, and weighed

after removal of adhering epiphytes and blotting to remove water. Biomass was expressed as an average for the whole region. The reef area was estimated from the map (scale 1:132,000), using transparent graph sheets. Low lying coastal wetlands were visited for the survey of mangroves.

Seaweed specimens (liquid preserved and herbarium) were identified with the help of the publications of Børgesen (1940–56), Taylor (1969 a, b), Abbott and Hollenberg (1976), Jaasund (1976) and Tseng (1983). Mangroves and seagrasses were identified by using floras of India (Hooker 1897, Cooke 1967 and Gamble 1967) and other literature available on seagrasses from Indian ocean regions (Hartog 1970, 1977, Untawale and Jagtap 1984, Brown 1985 and Ogawa 1987).

The specimens which were preserved dry and in 4% seawater formalin, have been deposited at the National Institute of Oceanography, C. S. I. R., Goa, India.

Results and Discussion

The littoral flora of Seychelles, mainly from Mahé and Praslin, was represented by 72 species of marine algae (25 Rhodophyta, 21 Chlorophyta, 22 Phaeophyta and 4 Cyanophyta), 6 species of seagrasses and 8 species of mangroves (Table I). Mangroves and most of the seaweed species were observed at Mahé and Praslin while seagrass meadows were common to the lagoons of islands visited.

A distinct zonation in the distribution of marine macrophytes from intertidal to subtidal regions beyond the coral reef (Fig. 3), was observed along the east coast of these islands. The low lying marshy areas along the coast of Mahé and Praslin were observed to have patchy growth of mangroves. Sandy beaches were found to mainly support a growth of *Ipomea pes-caprae*. The intertidal belt was about 20–30 m in

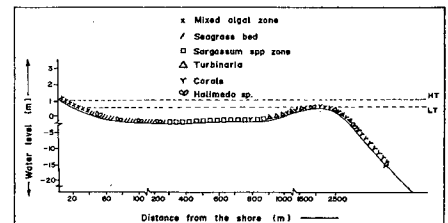


Fig. 3. General profile depicting algal distribution along the east coast of Mahé and Praslin islands.

Table I. Marine flora of Mahé and Praslin Islands (Seychelles) (collected during March 1984)

Marine algae	Mahé	Praslin
Cyanophyta		
<i>Microcystis</i> sp.	—	+
<i>Oscillatoria</i> spp.	+	+
<i>Phormidium</i> sp.	+	+
<i>Lyngbya</i> sp.	+	+
<i>Rivularia</i> sp.	—	+
<i>Stigonema</i> sp.	+	—
Chlorophyta		
<i>Ulva fasciata</i> Dellile	+	—
<i>Enteromorpha</i> sp.	—	+
<i>Cladophora constricta</i> Coll.	—	+
<i>C. fascicularis</i> (Mert.) Kuetz.	+	+
<i>C. prolifera</i> (Roth) Kuetz.	—	+
* <i>Pithophora</i> sp.	+	+
<i>Chaetomorpha linum</i> (Muell.) Kuetz.	—	+
<i>Rhizoclonium</i> sp.	+	—
<i>Caulerpa microphysa</i> (Weber Van Bosse) J. Feldman	+	+
<i>C. serrulata</i> (Forssk.) J. Ag.	—	+
<i>C. cupressoides</i> var. <i>lycopodium</i> f. <i>elegans</i> (Crouan) Weber Van Bosse	+	—
<i>C. taxifolia</i> (Vahl.) C. Ag.	+	—
<i>Valonia ventricosa</i> J. Ag.	+	—
<i>Halimeda opuntia</i> Lamour.	+	+
<i>H. tuna</i> (Ell. et Sol.)	+	+
<i>H. gracilis</i> Harv. ex J. Ag.	—	+
<i>Codium repens</i> (Crouan) Vickers.	—	+
<i>Chlorodesmis hildbrandtii</i> A. et E. S. Gepp	+	+
<i>Averainvillea geppi</i> Boerg.	—	+
<i>Dictyosphaeria cavernosa</i> (Forssk.) Boerg.	+	+
<i>Borgesenia forbesii</i> (Harv.) Feldmann	+	+
Phaeophyceae		
<i>Ectocarpus</i> sp.	—	+
<i>Giffordia</i> sp.	+	—
<i>Sphacelaria</i> sp.	+	—
<i>Dictyota dichotoma</i> (Hud.) Lamour.	+	+
<i>D. bartayresia</i> Lamour.	+	+
<i>D. atomaria</i> Lamour.	+	—
<i>Dictyopteris plagiogramma</i> (Mont.) Vickers.	+	—
<i>Padina gymnospora</i> (Kuetz.) Vickers	+	—
<i>P. tetrastratica</i> Hauck.	—	+
<i>P. pavonica</i> (L.) Thivy ex Taylor	—	+
<i>Lobophora variegata</i> (Lamx.) Womersley	+	—
<i>Colpomenia sinuosa</i> (Derb. et Sol.)	+	—
<i>Turbinaria conoides</i> Kuetz.	—	+
<i>T. ornata</i> J. Ag.	+	+
<i>T. decurrens</i> Bory	+	+
<i>Sargassum ilicifolium</i> (Turn.) J. Ag.	+	+
<i>S. vulgare</i> C. Ag.	+	—
<i>S. hystrix</i> V. <i>spinulosa</i> (Kuetz.)	+	+
<i>S. aquifolium</i> Turn. (J. Ag.)	+	+
<i>S. duplicatum</i> J. Ag.	+	+
<i>Sargassum</i> sp.	—	+
<i>Sargassum</i> sp.	+	+
Rhodophyceae		
<i>Galaxaura obtusa</i> (Ell. et Sol.) Lamour.	—	+
<i>Asparagopsis taxiformis</i> (Del.) Coll.	+	—
<i>Geldiella acerosa</i> (Forssk.) Feld. et Hamel	+	—
<i>Geldidium crinale</i> (Turn.) Lamour.	+	—
<i>Amphiroa fragilissima</i> (L.) Lamour.	+	—
<i>Jania adherens</i> Lamour.	—	+

Table I (continued)

Marine algae	Mahé	Praslin
<i>Chelosporium</i> sp.	—	+
<i>Grateloupia filicina</i> (Wulf) A. G.	—	+
<i>Dermonema frapperi</i> (Mont. et Millardet) Boerg.	+	—
<i>Polyides caprinus</i> (Gunn.) Papenfuss	—	+
<i>Gracilaria crassa</i> Harv.	+	+
<i>G. salicornia</i> (J. Ag.) Dawson	+	+
<i>G. folifera</i> (Forssk.) Boerg.	—	+
<i>G. ferox</i> J. Ag.	+	+
<i>Gigartina teedi</i> (Roth) Lamour	+	—
<i>Gelidiopsis</i> sp.	+	—
<i>Chondrus</i> sp.	+	+
<i>Hypnea musciformis</i> (Wulf) Lamour.	—	+
<i>H. cervicornis</i> J. Ag.	+	—
<i>Hypnea</i> sp.	—	+
<i>Ceramium</i> sp.	—	+
<i>Griffithsia tenuis</i> C. Ag.	+	—
<i>Laurencia columellaris</i> Boerg.	+	—
<i>Acanthopora spicifera</i> (Vahl.) Boerg.	—	+
<i>A. muscoides</i> (Linn.) Bory	—	+
<i>Bostrychia mortiziana</i> (Sonder) J. Ag.	+	—
Seagrasses		
<i>Halophila ovalis</i> (R. Brown) Hook. f.	+	—
<i>Thalassia hemprichii</i> (Ehrenb.) Ascherson	—	+
<i>Enhalus acoroides</i> (L. f.) Royle	+	+
<i>Thalassodendron ciliatum</i> (Forssk.) Den Hartog	—	+
<i>Halodule univervis</i> (Forssk.) Ascherson	+	+
<i>Cymodocea rotundata</i> (Ehrenb.) Hempr. ex Ascherson	+	+
Mangroves		
<i>Avicennia marina</i> Vierh.	+	+
<i>Rhizophora mucronata</i> Lamk.	+	+
<i>R. apiculata</i> Bd.	+	—
<i>Bruguiera gymnorhiza</i> (L.) Lamk.	+	+
<i>Lumnitzera racemosa</i> Gaertn.	+	+
<i>Ceriops tagal</i> (Perr.) C. B. Robins	+	—
<i>Sonneratia alba</i> Smith	+	—
<i>Acrostichum aureum</i> L.	—	+
<i>Thespesia populnea</i> Cav. (associate mangrove)	+	+
Sand-Dune		
<i>Ipomea pes-caprae</i> Sweet	+	+

+ observed

— not observed

* Collected from freshwater stream, influenced by marine environment.

width and either rocky, sandy or with pebbles. A seagrass bed, averaging about 300 m wide, was common in the shallow lagoons with clear waters. Beyond the seagrass zone, a seaweed belt of *Sargassum*, of about 300 m width, occurred. Mixed with the *Sargassum* zone was a *Turbinaria* zone on the fore-reef and the reef along with *Acropora* communities, which were the dominant corals on the reef and reef slopes.

Species of *Turbinaria* and *Halimeda* were associated with corals beyond the reef on the slope. Species of *Turbinaria* and *Halimeda* have been reported as forming a characteristic associated flora of coral reefs in the tropics (Barton 1903, Hackett 1977, Untawale and Jagtap 1984). The west coasts of Mahé, Praslin and La Digue Islands were more rocky than the east coasts. *Gracilaria* spp. and narrow belts of *Sargassum* spp. were observed in the intertidal and subtidal regions along the west coasts of Mahé and Praslin, respectively. The seagrass patches were found in the subtidal zones where pocket beaches are formed along the west coast.

Although the largest number of species was found to be from the Rhodophyta, the highest biomass consisted of *Sargassum* and *Turbinaria* species. Occasionally *Padina tetrastomatica* was also observed growing luxuriantly. *Gracilaria salicornia* which has been reported as common along the coast of Tanzania, Madagascar (Jaasund 1976) and Mauritius (Jagtap, personal observations 1987), was dominant among the Rhodophyta. Members of the Chlorophyta were limited to the intertidal belt and mainly represented by *Ulva fasciata*, *Enteromorpha* spp., *Caulerpa* spp., all in small quantities. However, at La Digue, the seaweed growth was observed to be limited both qualitatively and quantitatively to the western side near the jetty. *Sargassum* was observed to be totally absent along the coast of La Digue, during the period of investigation.

The total reef area (exclusive of seagrass beds) covered by marine algae was estimated to be 27.7 km² for Mahé and 31.4 km² for Praslin. The biomass of *Sargassum* from the islands varied from 0 to 8 kg m⁻² (wet weight) with an average of 3.5 kg m⁻². Total biomass of *Sargassum* spp. was estimated to be about 42 500 tonnes (wet weight) at Mahé and Praslin, during the sampling period. It has been reported that these islands supported a large biomass of *Sargassum* (over 100 000 tonnes, wet weight approximately) (Mshigeni *et al.* 1987).

Mangroves were mainly observed in the low lying wetlands of Mahé, however, at Praslin a few patches of mangroves were recorded from backwaters. The dominant mangrove species observed were *Avicennia marina*, *Rhizophora mucronata* and *Sonneratia alba* along the coast of Mahé. However, these were absent from Praslin. *Acrostichum aureum* was observed in upstream backwaters influenced by freshwater at Praslin. Mangroves occur in the belt of 30°N to 44°S (Walter 1971), however, they are best represented, qualitatively and quantitatively on the coast of Malaysia, Philippines, Indonesia, Papua, New Guinea, Thailand and India. The mangrove flora at Mahé

consisted of a greater number of species than has been reported from Maldives, Lakshadweep group of islands (Hackett 1977, Spicer and Newberry 1977, Untawale and Jagtap 1984) and also from Mauritius, which is closer to the Seychelles. Mangroves have also been reported from Aldabra Island of the Seychelles (Newberry and Hill 1981). *Thespesia populnea* was commonly associated with the mangroves from Mahé. A mangrove conservation plan has been implemented at Mahé.

Almost 30% of the lagoon area was covered by different species of seagrasses and the standing crop of seagrasses was estimated to be 3.5 kg m⁻². The dominant species observed were *Thalassia hemperichii*, *Halodule uninervis* and *Cymodocea rotundata*. A few patches of *Enhalus acoroides* were observed in the *Thalassia* meadows at Mahé, however, it was dominant in the bay regions of Praslin. *Halophila ovalis* which was observed at Mahé was not observed at Praslin.

Some patches of *Thalassodendron ciliatum* were also observed at 3–5 m depth, at La Digue. *Thalassodendron* species have been reported to be common in the tropics from Indo-Pacific regions (Hartog 1970, Brown 1985). The seagrass species observed from the Seychelles, except *T. ciliatum*, form a characteristic flora in tropical lagoons (Hartog 1977). Seagrass beds also serve as a good substratum for various epiphytic algae. During the present studies, members of the Cyanophyceae were observed to be associated with seagrass beds. Most of the Mahé coast has a severe erosion problem. If, seagrass species are properly used in the submerged sandy areas of the coastal slopes and lagoons, this problem can be to a large extent minimized since the seagrasses are well known for controlling coastal erosion (Orth 1977).

The present observations indicate that there is considerable potential for harvesting the seaweed biomass particularly of alginophytes along the coast of Seychelles. However, detailed studies are required to know the seasonal and spatial growth of marine algae, and the ecological changes likely to occur after such harvesting activities. Proper management of mangrove areas and seagrass beds may prove effective in checking erosion.

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