Scientific Research Publishing

Open Journal of Ecology, 2022, 12, 51-65
https://www.scirp.org/journal/oje
ISSN Online: 2162-1993
ISSN Print: 2162-1985

Floral Diversity Status in Urban Coastal Wetland & Associated Coastal Ecosystems of Crow Island Mattakkuliya, Sri Lanka

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How to cite this paper: Yapa, N., Amarasekara, K. and Rathnasri, S. (2022) Floral Diversity Status in Urban Coastal Wetland & Associated Coastal Ecosystems of Crow Island Mattakkuliya, Sri Lanka. *Open Journal of Ecology*, **12**, 51-65.
https://doi.org/10.4236/oje.2022.121003

Received: December 14, 2021
Accepted: January 17, 2022
Published: January 20, 2022

Abstract

Colombo is the capital of Sri Lanka and the only wetland city in South Asia under the Ramsar Convention. Crow Island Beach Park and associated coastal area belong to the Colombo urban coastal wetland ecosystems. Crow Island wetland contributes diverse habitats for numerous flora and fauna species. The present study was conducted to assess the status of floral diversity in the Crow Island Beach Park and associated coastal ecosystem during the months of August to October 2021. Study area is divided in to three sites (A, B, C). Line transects method and field observations were used in the study. This coastal wetland consists of mosaic of five major vegetation types: Herbaceous, tree, shrub, creeper, grass and other than that marine algae namely *Chaetomorpha antennina, Rhizoclonium africanum, Ulva compressa* belonging to chlorophyta (green algae) and *Grateloupia lithophila* belonging to rhodophyta (red algae) were found in the study area. A total number of 102 flora species belonging to 50 families were recorded from the study area. There were two true mangrove species and 16 mangrove associated species in the study sites. Out of the 102 plant species 46 were recognized and documented as plants with medicinal values. Shannon-Wiener diversity indexes for mangrove and mangrove associated species were recorded as 2.378, 2.304 and 1.676 in site A, B and C respectively. Simpson's diversity index for mangrove and mangrove associated species was recorded as 0.889, 0.874 and 0.735 respectively in site A, B and C and Jaccard index of similarity between three study sites showed high values ranging from 41% to 69% for mangrove and mangrove associated species.

Keywords

Beach Park, Coastal Ecosystem, Floral Diversity, Seaweeds, Urban Wetland, Mangrove

1. Introduction

Sri Lanka has a diverse range of coastal habitats that include estuaries and lagoons (214,522 ha), mangroves (11,656 ha), seagrassbeds (37,137 ha) salt marshes (27,520 ha), coral reefs (not determined) and large extents of beaches including barrier beaches [1]. Each of these coastal habitats possesses a significant amount of species and provides an array of ecosystem services vital to human. In addition to the environmental services, these habitats support livelihoods of the coastal communities in significant manner to enhance their economic status and maintain social integrity [2]. Sri Lankan coastline is approximately 1585 km [1]. Coastal habitats comprise a rich component of the country's coastal and marine biodiversity. Genetic diversity within coastal habitats is also believed to be high with a possible economic value [1]. The non-extractive value of coastal habitats such as coral reefs, mangroves, estuaries/lagoons and beaches, is very high with the ecosystem services they provide. The water bodies of lagoon and estuaries function like buffer zones, protect coastal communities from full force of weather related events, such as storm surges, floods and cyclones by damping wave action, dissipating river discharge and temporarily storing water. The habitats such as mangroves, sea grass beds and salt marshes function as large filters to extract pollutants, excess nutrients and sediment carried out from municipal and industrial wastewater inland and storm water runoff [3]. Although mangroves occur on saline soils, they have the usual plant requirement of freshwater, nutrients and oxygen. Mangrove area represents a small percent of Sri Lanka's total low energy coastal habitat [4]. The width of mangrove forest depends on the tidal amplitude (5) and in Sri Lanka where tidal amplitude is very low (75 cm) [5], mangroves are usually limited to rather narrow belts. The major mangroves in Sri Lanka are located around Jaffna, Wadamarchchi, Thondamanar lagoons Kokilai, Navaru, Trincomalee, Kathiraveli, Valaichcenai, Batticaloa, Pothuvil, Weligama, Gintota, Balapitiya, Bentota, Negombo, Chilawlagoon, Puttalamlagoon, Mannar [6]. Mangroves in Sri Lanka have been discontinuously distributed along the coast around lagoons, bays and estuaries covering an area between 8000 - 7000 hectares [7]. However a recent estimate showed that the extent of mangroves in Sri Lanka is about 15,670 hectares [8]. Although records on the true Mangrove species from Sri Lanka are inconsistent, occurrence of 21 species of mangroves [9] is widely accepted now. The region is very narrow and extends only 300 m along the stretch of the country Beach flora such as *Pandanus odorifer, Barringtonia asiatica, Ipomoea pes-caprae, Scaevola taccada and Scaevola plumieri* can be identified [1]. Wetlands are habitats with permanent or temporary accumulation of water with associated floral and faunal communities.

Colombo is the capital of Sri Lanka and it is also south Asia's only Wetland City under the Ramsar Convention since 2018 [10]. The Crow Island beach park is situated in the Coastal boundary in Mattakkuliya, Colombo North. The Crow Island and associated area belongs to the coastal plain and the flood plain of the Kelani River [11]. Therefore, much of the area is less than five meters above sea

level. The physiography can be described in terms of its dominant landscape units according to their possible origin. At least three such units could be identified in the immediate environs of Crow Island namely, coastal, fluvial and denudation [12]. Wetlands comprise of a combination of soils, water, plants and animals. The interplay between these elements allows wetlands to perform several functions that are beneficial to humankind, while generating healthy wildlife, fisheries and forest resources. The combination of these functions, together with the rich biological diversity and cultural heritage of wetlands makes these ecosystems invaluable to people all over the world [12]. The majority of the land in crow island study area is flat land with sandy beach distributed along the west coastal band, and there is a small lagoon at the southern corner with associated mangrove vegetation which is fed by the Crow Island canal started from Kelani river. The Crow Island beach is a certain land section with high aesthetic natural excellence. Numerous birds and plant species are associated with coastal vegetation and the mangrove patch that gives a higher ecological value and a scenic beauty to the area. Preliminary study of the avifaunal diversity of Crow Island Beach Park revealed that this coastal wetland is a suitable habitat for variety of birds including water birds [13]. Therefore Crow Island Beach Park and associated area is comprised of high faunal and floral diversity. This might be due to different type of habitats in one place as well as availability of food and shelter in the area [13]. Various studies on floral and faunal diversity of wetlands in Sri Lanka have been conducted by different authors however very few studies have done so far for this Beach Park which is coming under the Colombo Ramsar Wetland City. Conversely as a result of not having formal extension and management mechanism in the beach park area this floral diversity and the other resources are being misused and ecological quality is degrading day by day. Therefore Floristic inventories and diversity assessments are necessary to understand the present diversity status and conservation of this coastal wetland ecosystem.

2. Methodology

The study was conducted at the Crow Island Beach Park and associated wetland area in western province (6˚58'24.1"N, 79˚52'09.9"E) of Colombo 15, during the months of August to October. The overall study area's land extends approximately 15 hectares. Study area was divided into three major areas for sampling purposes.

The site A (**Figure 1**) is identified as Crow Island Beach Park situated in the coastal boundary in Mattakkuliya, Colombo North. The area is owned and managed by the Colombo Municipal Council. Boundaries of this landscape are, naval base and NARA (National Aquatic Resources Research and Development Agency) premises (North), small lagoon (South), domestic and commercial area (East), sea (Western). Site B (**Figure 1**) is identified as a small lagoon associated area located in the backyard of NARA premises. Boundaries are, small canal that

Figure 1. Satellite image of the study area (6˚58'24.1"N, 79˚52'09.9"E) *source Google Map*.

start from Kelani River (North), sea beach road, Crow Island (South), backyard area of NARA premises and water logged small canal (East), lagoon area (Western). This area is owned and managed by NARA. Site C (**Figure 1**) is identified as periodically inundated low land area. This land area is owned and managed by National Aquatic Resources and Research Development Authority. Boundaries are, neighboring houses (North), canal that started from Kelani river lagoon (South), Sri Lanka Transport Board Mattakkuliya Depot premises (East), lagoon area (Western).

Data was collected from August to October using field observation and line intersect method. In this study, one meter transects were used to count small herbs. Two meter transects were used for the tall grass and herbs. Three transect lines were used for each sampling sites. Seaweeds were collected by hand using a scraper and a stout knife. Collected seaweed was transferred in to plastic bags with sea water and labeled them for further assessment. Recommended guide books and plant identification application were used for identification and nomenclature of flora species.

Data analysis was performing using Microsoft Excel and some statistical tools. Plant diversity in the three study sites of the study area was calculated using Shannon-Wiener diversity index [14] as below,

$$H = -\sum_{i=1}^{S} p_i \left(\ln p_i\right)$$

where,

H = the Shannon wiener diversity index.

p_i = fraction of the entire population made up of species i. (p_i is the proportion (n/N) of individuals of the one particular species found (n) divided by the total number of individuals found (N).

S = Number of species encountered.

Species richness of the three study sites calculated using Menhinick's index,

$$D = S/\sqrt{N}$$

where, "S" is the number of different species represented in the sample. "N" is the total number of individual organisms in the sample.

Species evenness was calculated as below, Shannon equitability is taken as a measurement of species evenness [15].

$$\text{Evenness}\left(E\right) = H/H_{\max}$$

where, H is the Shannon Wziener index and $H_{\max}$ is the ln(N); N is the number of species.

Species probability measured by Simpson's Diversity Index (D).

$$D = \frac{\sum n\left(n-1\right)}{N\left(N-1\right)}$$

where, "n" is number of individuals of each species. "N" is total number of individuals of all species.

Diversity between sampling sites were measured using Jaccard index of similarity

$$J = \frac{Sc}{Sa + Sb + Sc} * 100$$

where, "J" is Jaccard Index of similarity. "Sc" is number of species common to the two samples. "Sa" is number of species unique to station a. "Sb" is number of species unique to station b [16].

3. Results

A total of 102 flora species belonging to 50 families were recorded from the study area (**Figure 2** and **Table 1**), Crow Island Beach Park and associated coastal ecosystem was consisted of a mosaic of five major vegetation types: Herbaceous, tree, shrub, creeper, grass. Other than that marine algae was also present. From the total number of plant species 37% is tree type plants, 21% is shrub flora, 16% is creepers, 18% is herbaceous, 4% is grass vegetation type and 4% is marine algae (**Figure 2**).

Proportional representation of flora species according to the vegetation type at site A comprised of 32% tree type vegetation, 26% herbaceous, 21% shrub, 15% creeper and 6% grass type (**Figure 3**). Proportional representation of flora at Site

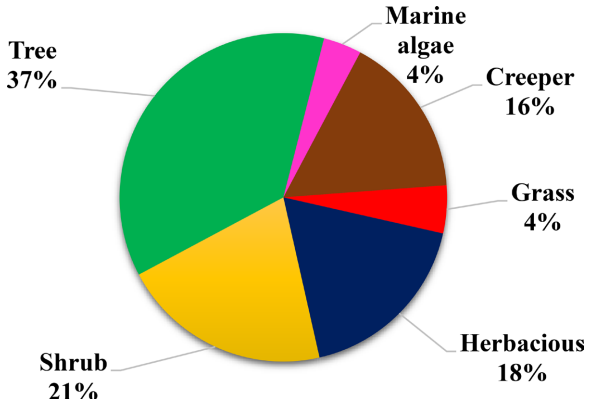

Figure 2. Proportional representation of flora species according to the vegetation type of the study area.

Table 1. Flora species composition at three study sites (site A, B and C).

No	Family	Species	Site A	Site B	Site C	Vegetation type	Medicine value
1	Acanthaceae	*Hygrophila schulli*		+		S	+
2	Acanthaceae	*Acanthus ilicifolius*			+	S	+
3	Aizoaceae	*Sesuvium portulacastrum*	+			H	+
4	Amaranthaceae	*Aerva lanata*	+	+		H	+
5	Amaranthaceae	*Amaranthus spinosus*	+	+		H	
6	Amaranthaceae	*Amaranthus viridis*	+			H	
7	Amaranthaceae	*Nothosaerva brachiata*		+	+	H	
8	Amaranthaceae	*Suaeda monoica*	+			S	
9	Annonaceae	*Annona glabra*	+	+	+	T	
10	Apiaceae	*Centella asiatica*	+			H	+
11	Apocynaceae	*Adenium obesum*	+			S	
12	Apocynaceae	*Calotropis gigantea*		+		S	+
13	Apocynaceae	*Cascabela thevetia*	+			T	
14	Apocynaceae	*Catharanthus roseus*	+			H	
15	Apocynaceae	*Cerbera odollam*	+	+	+	T	
16	Apocynaceae	*Chonemorpha fragrans*	+			C	
17	Apocynaceae	*Ichnocarpus frutescens*	+	+	+	C	
18	Araceae	*Colocasia esculenta*	+			H	
19	Arecaceae	*Cocos nucifera*	+	+		T	+
20	Asperagaceae	*Asparagus racemosus*		+		C	
21	Asteraceae	*Eclipta prostrata*	+		+	H	+
22	Asteraceae	*Mikania cordata*		+		C	+
23	Asteraceae	*Sphagneticola trilobata*	+			H	+

Continued

24	Asteraceae	*Vernonia cinerea*	+	+		H	
25	Asteraceae	*Zinnia peruviana*	+			H	
26	Bignoniaceae	*Dolichandrone spathacea*		+	+	T	+
27	Calophyllaceae	*Calophyllum inophyllum*	+	+	+	T	+
28	Capparaceae	*Capparis sepiaria*			+	C	
29	Caricaceae	*Carica papaya*	+	+		T	+
30	Caryophyllaceae	*Polycarpaea corymbosa*	+	+		H	
31	Colchicaceae	*Gloriosa superba*	+		+	C	
32	Combretaceae	*Terminalia catappa*	+	+		T	
33	Commelinaceae	*Commelina diffusa*		+	+	H	
34	Convolvulaceae	*Cuscuta chinensis*	+			C	
35	Convolvulaceae	*Ipomoea aquatica*	+	+		H	
36	Convolvulaceae	*Ipomoea obscura*	+	+	+	S	
37	Convolvulaceae	*Ipomoea pes-caprae*	+			C	+
38	Convolvulaceae	*Acalypha indica*	+			H	
39	Euphorbiaceae	*Ricinus communis*		+	+	T	+
40	Euphorbiaceae	*Tragia hispida*		+	+	C	+
41	Euphorbiaceae	*Macaranga tanarius*			+	T	
42	Fabaceae	*Acacia auriculiformis*	+	+	+	T	
43	Fabaceae	*Amorpha fruticosa*	+		+	S	
44	Fabaceae	*Caesalpinia bonducella*		+		C	+
45	Fabaceae	*Caesalpinia pulcherrima*			+	S	+
46	Fabaceae	*Cassia tora*	+			S	+
47	Fabaceae	*Crotalaria retusa*	+			S	+
48	Fabaceae	*Cynometra iripa*		+	+	T	
49	Fabaceae	*Derris trifoliata*		+		C	+
50	Fabaceae	*Guilandina bonduc*		+		S	+
51	Fabaceae	*Leucaena leucocephala*		+		T	
52	Fabaceae	*Mimosa pudica*	+	+	+	H	+
53	Fabaceae	*Pongamia pinnata*	+	+	+	T	
54	Fabaceae	*Senna alata*			+	T	+
55	Fabaceae	*Tamarindus indica*		+		T	+
56	Flagellariaceae	*Flagellaria indica*		+		C	
57	Goodeniaceae	*Scaevola taccada*	+	+		S	+
58	Hamamelidaceae	*Loropetalum chinense*	+			S	

Continued

59	Lamiaceae	*Premna serratifolia*		+		S	+
60	Lecythidaceae	*Barringtonia asiatica*	+	+	+	T	
61	Lecythidaceae	*Barringtonia racemosa*		+		T	+
62	Lythraceae	*Sonneratia caseolaris*	+	+	+	T	
63	Malvaceae	*Abutilon indicum*	+	+		S	+
64	Malvaceae	*Hibiscus rosa-sinensis*	+			T	
65	Malvaceae	*Hibiscus tiliaceus*	+	+		T	
66	Malvaceae	*Thespesia populnea*	+	+	+	T	
67	Malvaceae	*Urena lobata*			+	S	
68	Menispermaceae	*Tinospora cordifolia*	+		+	C	+
69	Meliaceae	*Azadirachta indica*		+		T	+
70	Meliaceae	*Swietenia mahagoni*		+		T	
71	Moraceae	*Artocarpus camansi*			+	T	+
72	Moraceae	*Ficus benjamina*	+			T	
73	Moraceae	*Ficus hispida*		+		T	
74	Moraceae	*Ficus mollis*			+	T	+
75	Moraceae	*Ficus racemosa*	+			T	+
76	Muntingiaceae	*Muntingia calabura*	+			T	
77	Musaceae	*Musa balbisiana*		+		T	+
78	Myrtaceae	*Psidium guajava*		+		T	+
79	Myrtales	*Syzygium samarangense*		+		T	
80	Nyctaginaceae	*Bougainvillea spectabilis*	+			C	
81	Oleaceae	*Jasminum angustifolium*	+	+		T	
82	Onagraceae	*Circaea lutetiana*	+			S	+
83	Pandanaceae	*Pandanus tectorius*	+			S	+
84	Passifloraceae	*Passiflora foetida*	+			C	+
85	Plantaginaceae	*Bacopa monnieri*		+		H	+
86	Poaceae	*Aristida setacea*	+	+	+	G	
87	Poaceae	*Cenchrus echinatus*	+			G	
88	Poaceae	*Cenchrus purpureus*		+	+	G	
89	Poaceae	*Chrysopogon aciculatus*	+	+	+	G	
90	Poaceae	*Poa pratensis*	+			G	
91	Portulacaceae	*Portulaca grandiflora*	+			C	
92	Pteridaceae	*Acrostichum aureum*			+	S	+
93	Rhizophoraceae	*Bruguiera* sp			+	T	

Continued

94	Rubiaceae	*Ixora coccinea*	+			S	
95	Rubiaceae	*Morinda citrifolia*		+	+	T	+
96	Rubiaceae	*Neolamarckia cadamba*		+		T	
97	Rubiaceae	*Pavetta indica*		+	+	S	+
98	Sapindaceae	*Filicium decipiens*	+			T	
99	Sapotacea	*Mimusops elengi*	+			T	+
100	Verbenaceae	*Lantana camara*	+	+	+	S	+
101	Verbenaceae	*Stachytarpheta jamaicensis*	+			H	
102	Vitaceae	*Cissus vitiginea*		+		C	

(Vegetation type: H: Herbaceous, T: Tree, S: Shrub, C: Creeper, G: Grass).

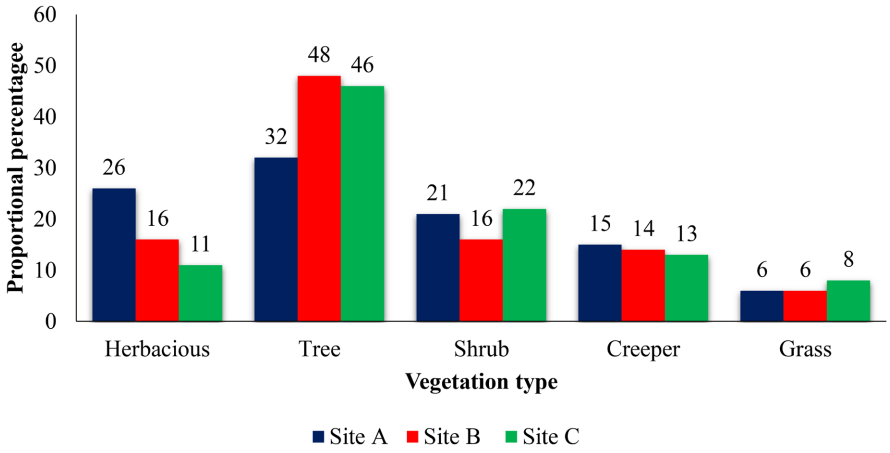

Figure 3. Proportional representation of flora species according to the vegetation type at all three sites.

B was consisted of 48% tree type vegetation, 14% creeper, 16% shrub, 16% herbaceous and 6% grass type flora species as presented in **Figure 3**. Flora representation for the site C included 46% tree types, 22% shrub, 13% creeper, 11% herbaceous and 8% grass (**Figure 3**). According to the **Table 1**, there were 46 plant species with medicinal value. From those 46 species, 16 were trees, 15 were shrubs, 8 were herbaceous and 7 were identified as creeper.

There were two true mangrove species in all three study sites namely *Bruguiera* sp and *Sonneratia caseolaris* and 16 mangrove associate species (**Table 2**). *Sonneratia caseolaris* was identified at all three study sites. While the *Bruguiera* sp was only found at the site C area. As presented in the **Table 2**, *Mimusops elengi*, *Pandanus tectorius* and *Suaeda monoica* was only found at the study site A, Whereas *Calotropis gigantea* was only found at the site B area, and *Bruguiera* sp and *Acanthus ilicifolius* was only found at the study site C.

The indices which are used to assess the species diversity of the study area are shown in **Figure 4**. The results from **Table 2** revealed that the study area had a

Table 2. No of individuals of Mangrove and Mangrove associates species recorded in site A, B and C.

	Species	No of individuals		
		Site A	Site B	Site C
1	*Bruguiera* sp	_	_	1
2	*Sonneratia caseolaris*	12	36	44
3	*Acanthus ilicifolius*	_	_	23
4	*Annona glabra*	7	8	4
5	*Barringtonia asiatica*	16	5	3
6	*Calophyllum inophyllum*	3	6	4
7	*Calotropis gigantea*	_	7	_
8	*Cerbera odollam*	24	7	3
9	*Cynometra iripa*	_	4	2
10	*Hibiscus tiliaceus*	12	5	_
11	*Mimusops elengi*	9	_	_
12	*Pandanus tectorius*	38	_	_
13	*Pongamia pinnata*	5	16	8
14	*Premna serratifolia*	12	9	6
15	*Scaevola taccada*	13	4	_
16	*Suaeda monoica*	4	_	_
17	*Terminalia catappa*	43	6	_
18	*Thespesia populnea*	12	14	_

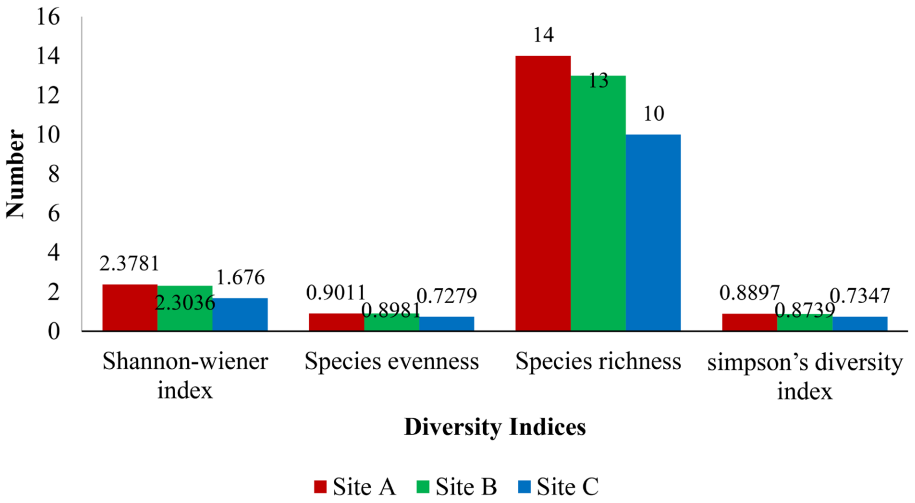

Figure 4. Diversity indices for the Mangrove & mangrove associates at all three study sites.

total no of 18 species with 435 individuals. The Shannon-Wiener diversity index values for the study sites were 2.378, 2.303, and 1.676 respectively. Simpson's diversity index for the study sites are 0.889, 0.873 and 0.734 correspondingly.

Highest species richness was observed in site A while the lowest species richness was recorded at site C with 10 species. Species evenness for three study sites A, B and C were 0.901, 0.898 and 0.728 respectively (Figure 4).

According to the study, species richness was high in all three sites (Figure 4). Species evenness and Simpson's diversity index were almost similar in all three sites. Shannon-Wiener index was less than 2 in all the three sites but it is high in the site A when compared to site C.

Jaccard index of similarity showed high values ranging from 41% to 69% between three study sites (site A, B, C) (Figure 5). In this study jaccard index registered 69% similarity between the site A and site B (Figure 5). Eleven (11) species of mangrove and mangrove associated were found common in the two study sites namely *Sonneratia caseolaris, Terminalia catappa, Cerbera odollam, Pongamia pinnata, Barringtonia asiatica, Thespesia populnea, Calophyllum inophyllum, Premna serratifolia, Annona glabra, Hibiscus tiliaceus and Scaevola taccada* (Table 2). Jaccard index registered 41% similarity between the site A and C (Figure 5). Seven (7) species of mangrove and mangrove associated were found common in the two study sites namely *Sonneratia caseolaris, Cerbera odollam, Pongamia pinnata, Barringtonia asiatica, Calophyllum inophyllum, Premna serratifolia, Annona glabra* (Table 2). Jaccard index registered 67% similarity between the site B and C (Figure 5). Eight species (8) of mangrove and mangrove associated were found common in the two study sites namely *Sonneratia caseolaris, Cerbera odollam, Pongamia pinnata, Barringtonia asiatica, Calophyllum inophyllum, Premna obtusifolia, Annona glabra, Cynometra iripa* (Table 2).

There were four seaweed species found near the coastal waters of Crow Island Beach Park. They were found attached to the boulders which was laid to protect the coast from erosion. They were *Chaetomorpha antennina* and *Rhizoclonium africanum* belonging to family Cladophoraceae, *Ulva compressa* belonging to family Ulvaceae and *Grateloupia lithophila* belonging to family Halymeniaceae (Figure 6). Among those four species of algae *Grateloupia lithophila* was observed abundantly.

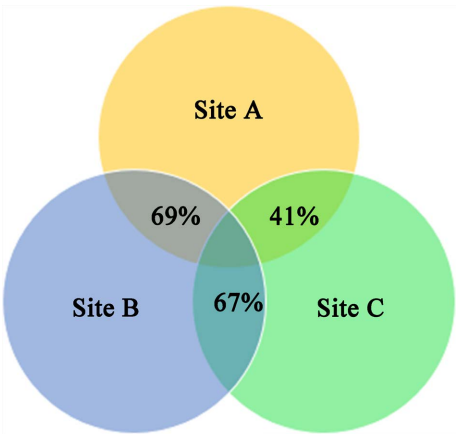

Figure 5. Jaccard index of similarity between the study sites (site A, B and C).

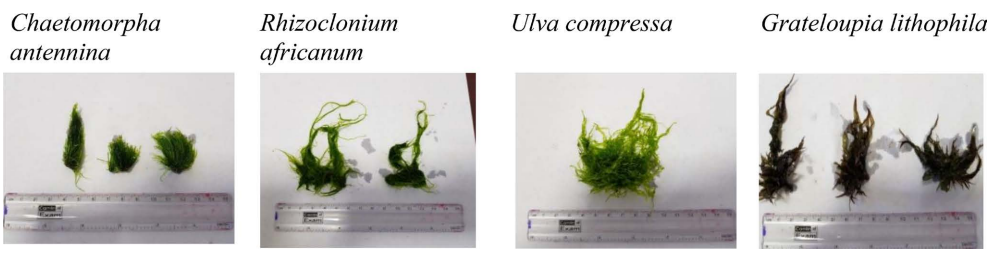

Figure 6. Seaweed species found near coastal waters of Crow Island Beach Park.

4. Discussion

Functions of the wetland or any other ecosystem mainly depend on its embodied biotic and abiotic components and their interaction. These components can be described as floral composition, faunal diversity, water sources of the ecological area. These components have strong bond between each other and they act as exclusive ecological system. Most of the wetlands in and around the Colombo including Crow Island are under threaten condition. The main reasons are pollution, human intervention and disturbances. Lack of baseline data makes it more difficult to assess the actual risk of these threats. Therefore, conducting a proper scientific survey is an important and a timely requirement. This study about the floral diversity of Crow Island and associated coastal ecosystems is a systematic study, conducted to in fulfill the above-mentioned requirement.

In this research, diversity indices such as Shannon-Wiener index, Simpson's diversity index, species richness, species evenness and Jaccard index of similarity for mangrove and mangrove associated species were computed in three study sites for comparison purposes. Shannon-Wiener index were high and generally range between 1.5 and 3.5. The higher Shannon Wiener-index indicates greater species richness and evenness [16]. Therefore, these high index values clearly illustrated the high floral diversity of the study sites. But site C reported relatively less Shannon index value than the other two sites. On the other hand, Simpson's diversity index ranges from 0 to 1 with higher values indicating presence of dominant species [17]. A, B, C study sites were registered relatively higher values of Simpson's diversity. *Pandanus tectorius* dominated the site A while *Sonneratia caseolaris* in the site B and site C. Simpson's diversity index is said to be opposite of evenness and the value gathered of three study sites supported this. In general, the diversity indices of three study sites (site A, B, C) did not differ significantly from each other. But when considering the summary of diversity indices at site A, B, C, generally the highest values recorded at site A. Further diversity indices of site B are higher than that of site C. According to the Annual Report of NARA 2006 [18], some tree plantation programs were conducted by NARA in this site B area. "Coastal recreation Nature Park at NARA premises" was one of such project activity. Therefore Mangrove and associated mangroves were introduced time to time by NARA in this site B.

Moreover, Jaccard index of similarity showed high values ranging from 41% to 69% between three study sites (site A, B, C). The Jaccard index of similarity

the values range from 0% to 100%. The higher the percentage, the more similar the two populations [16]. Therefore the present study about an assessment of the floral diversity of Crow Island Beach Park and associated area, also detected most diverse mangrove and mangrove associated ecosystem of the area by comparing diversity indices such as Simpson's, Margalef's and Shannon-Wiener's index in three main study sites of the Crow Island area.

There are some similar studies conducted in Sri Lanka in similar ecosystems previously. A study on species composition, abundance and diversity of mangroves in selected sites in Ampara district in the east coast of Sri Lanka was carried by [19]. In this study, diversity indices for mangroves based on species richness (Margalef index), proportional abundance (Shannon Wiener index) were computed. Species dominance was estimated using Simpson index and Shannon evenness were also computed. These indices were used to explain and compare the diversity of selected mangrove ecosystems. Shannon index of each mangrove site were compared with others using Hutchesont-test.

This urban coastal wetland provide habitat, shelter, nursery ground, breeding ground for numerous faunal and floral species. According to [20], a total of 30 birds species were recorded belong to 15 orders and 24 families representing 6.09% of the birds recorded in Sri Lanka also recorded from the Crow Island Beach Park area. Furthermore acts as a barrier against adverse weather and climatic condition such as storm surges, seasonal flooding and tidal fluctuation [11]. Mangrove vegetation also act as carbon sink in the area. Another study carried out a study to find the diversity, abundance and composition of phytoplankton in coastal waters of off Crow Island Beach Park and 108 phytoplankton species were recorded during the study [21]. According to the case study conducted by Rewathy and Hafsa, 2019 [22] about Crow Island Beach Park, they were detected that the public open spaces such as wetland, mangrove forest, beaches and parks are often being target on the thought of tourism development and urban development. So it is most important to protect this urban wetland system because it is the only remnant natural landscape in this area. Other land parts of the Crow Island were depleted and fragmented as a result of urbanization, industrial extension, population growth and infrastructure development of the area. This research study covers a complete description about status of floral diversity in the area. The data from the present study can be used as baseline information for future ecological studies in the area.

5. Conclusion

Floral diversity of the Crow Island Beach Park and associated area revealed that this coastal wetland is rich with different kinds of vegetation including plants with the medicinal values. Other than that being the coastal wetland it is also rich with mangrove and mangrove associate plants. As this park is the only coastal park in the Colombo District with this much of floral diversity this park can be used for the educational activities for the students without going far from

their locations. General public has an inherent right of access to the Beach Park and the beaches hence local authorities have the primary authority to develop and maintain public access to Beach Park. Not all the areas of coastal Beach Park appropriate for heavy recreational use or significant human presence since it can impede upon sensitive ecological coastal resources. Therefore it is important to protect and manage this diverse landscape for current and future generations. Proper management and conservation activities should be introduced and implemented in this area. Not only that it is important to aware coastal communities through communication and education to safeguard this area to protect and conserve flora and fauna species in this.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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