A Comparative Study on the Diversity of Seagrass Species in a Selected Area of Puttalam Lagoon

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Introduction

Seagrasses are aquatic angiosperms which are widely spread in shallow marine environment (Kuo and Hartog, 2000). Providing habitat grounds for large numbers of fish and shellfish species, act as a largest carbon sink, support a large number of epiphytic organisms, bind the sediment together and stabilizing sea bottom (Johnson and Johnstone, 1995) are the importance of seagrasses. Puttalam lagoon which is located in Puttalam district of Northwestern Province of Sri Lanka that covers 32700 ha (Johnson and Johnstone, 1995). There are fifteen species of seagrasses have been recorded in Sri Lanka including two families, 12 genera (Amarasinghe and De Silva, 2007). Main objective of the research is to compare changes of seagrass distribution from 1991 to 2013 where as to evaluate relationship between distribution of seagrasses with the states of water quality of selected locations of Puttalam lagoon and to compare the distribution of seagrass species according to salinity levels of each location are specific objectives.

Methodology

The present study was carried out in selected areas of Puttalam lagoon during the period of May to September in 2013. Kalpitiya, Kuringipitiya, Palliwasalthurai, Kandakuda, Palavi and Puttalam were the selected sites for the data collection (Figure 1). Geographic Position System (GPS) data of the site were recorded and point transect method was used for the sampling.

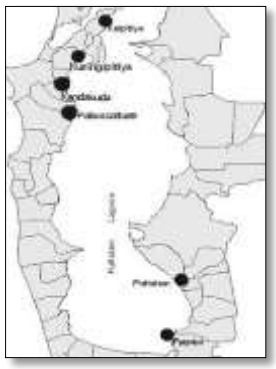

Figure 1. Location of study site.

Three line transects of each location were used. Typically transects were perpendicular to the shore and parallel to each other. Cover of seagrasses within a quadrant with 0.5 m * 0.5 m was measured at every 3 m mark of the 30 m by walking and snorkeling until transect was completed. Transects were selected and procedure was carried out in such a way that as same as Jayasuriya, 1991 conducted. Water quality parameters including water temperature (°C), pH, salinity (ppt), conductivity (mS/cm) and dissolved oxygen (mg/L) were measured at the middle of transect two at 10 cm below to the sea surface using Multiparameter meter (Orion ™ 5). Water quality testing was repeated at the same time in the same place once a month and average

values were calculated. Same procedure was repeated in other selected locations. Average abundance of seagrass distribution of three transects were calculated. Diversity of seagrass species of each sites were calculated using Shannon - Weiner diversity index. Comparision was conducted using analysis of variance (ANOVA). Percentage abundance of each species were calculated by dividing six sites into two regions as Northwestern and Southeastern according to Jayasuriya, 1991 and compared with the values recorded by Jayasuriya, 1991. Linear regression was conducted to find out relationship between seagrass distribution and water quality parameters.

Results

Comparison of percentage abundance values of seagrasses in 1991 and 2013 in Northwestern region and Southeastern region indicated that there was a statistical significant different ($p < 0.05$) between seagrass distribution in 1991 and 2013 in both regions (Table 2). Although *Enhalus acroides*, *Thalassia hemprichii*, *Syringodium isoetifolium*, *Cymodocea rotundata*, *Cymodocea serrulata,* had been recorded in 1991 in Southeastern region those have not been recorded during present study. Statistically significant relationship was found between relative abundance of *Enhalus acroides* and water temperature. There is a relationship between relative abundance of *Cymodocea serrulata, Syringodium isoetifolium* and *Halodule uninervis* (wide variety) and pH of water. There is a relationship between relative abundance of *Halophila decipiens* and Dissolved oxygen content of water.

Table 2. Seagrass species recorded in 1991 and 2013.

Species	Sites											
	1		2		3		4		5		6	
	A	B	A	B	A	B	A	B	A	B	A	B
Enhalus acroides	+	+	+	+	+	+	+	+	-	-	-	-
Thalassia hemprichii	+	+	+	+	+	-	+	+	+	-	-	-
Cymodocea rotundata	+	-	-	-	+	+	-	-	-	-	-	-
Cymodocea serrulata	+	+	+	+	-	-	+	+	-	-	-	-
Halodule uninervis	+	+	+	+	+	+	+	-	+	-	+	+
Syringodium isoetifolium	+	+	+	+	-	-	-	+	-	-	-	-
Halophila ovalis	+	-	+	-	+	+	+	+	+	+	+	+
Halophila decipiens	+	+	-	-	-	-	-	-	-	-	-	-

1- Kalpitiya, 2- Kuringipitiya, 3- Paliwasalthurai, 4- Kandakuda, 5- Palavi, 6- Puttalam. A – 1991, B – 2013. (+) = recorded species and (-) = not recorded species

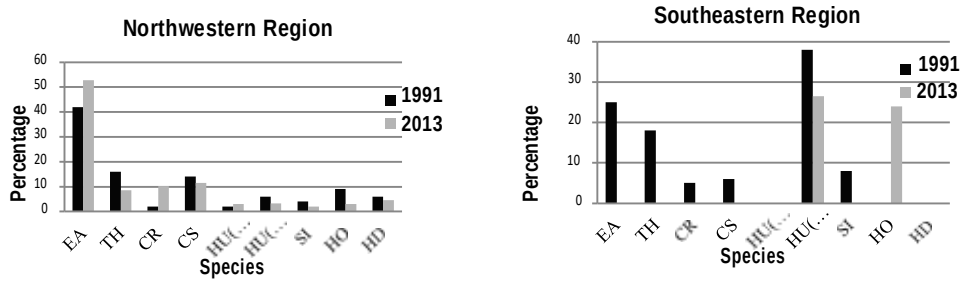

Figure 2. Bar charts for seagrass species distribution in Northwestern region and Southeastern region in 1991 and 2013. *Enhalus acroides* (EA), *Thalassia hemprichii* (TH), *Halodule uninervis* (HU), *Syringodium isoetifolium* (SI), *Cymodocea rotundata* (CR), *Cymodocea serrulata* (CS), *Halophila ovalis* (HO) and *Halophila decipiens* (HD).

Discussion and Conclusions

There have been recorded degradation of seagrass species distribution from 1991 to 2013 in both regions (Figure 2) but degradation of seagrass distribution in Southeastern region is greater than Northwestern region.

Highest seagrass diversity was recorded at Kalpitiya (1.619) where as zero diversity index value was recorded at Palavi since only one sea grass species has been recorded. The evenness for Kalpitiya (0.0529) and Kuringipitiya (0.605) were greater than the evenness for Paliwasalthurai (0.463), Kandakuda (0.502) and Puttalam (0.314). Six sites were homogeneous with respect to salinity, dissolved oxygen where as six sites were heterogeneous with respect to temperature, pH and conductivity. Some species which had been recorded by Jayasuriya, 1991 were not encountered in the study site Southwestern region. Zero diversity was recorded in Palavi which is composed of only *Halophila ovalis* within study site. It can be due to climatic conditions and area which was covered for the sampling during study period. Although Jayasuriya, 1991 stated that the distribution pattern of seagrasses can be influenced by the nature of the habitat and physicochemical parameters of the lagoon. Statistically significant relationship was found between water temperature and Shannon- Wiener diversity index values.

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