SPATIALITY AND SPECIES DIVERSITY OF THE CRITICAL SEAGRASS POPULATION IN THE CURVIER BASIN OF JAFFNA LAGOON AT COHERENT MANDAITHEEVU COASTLINE

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Introduction

Seagrasses are true vascular plants closely resembling terrestrial grasses and belonging to Monocotyledonous of Angiosperms. They are fairly distinguishable from seaweeds with the help of discrete morphological entities they possess; leaves, stems and roots (rhizomes). The submerged lifecycle of seagrasses is adapted to submarine pollination. Seagrasses commonly occur in habitats extending from intertidal to completely subtidal situations and have higher salinity tolerance. Seagrass meadows are relatively extensive in shallow calm waters with the substratum consisting sand, mud and dead corals. Marine angiosperms are devoid in coasts having heavy wave action and water currents. Distribution of species is determined by the factors such as local topography, substrate type, stability, tidal exposure, water clarity and salinity.

The vitality of seagrasses broadens the role to act as a food source in detrital- based food chain. Endangered species such as Dugong and Green turtle are depending on the seagrass meadows for grazing. It provides refuge space for pelagic and reef fishes. Major role in enrichment fish stock is played by serving as a nursery ground for crabs and shrimp. Jaffna lagoon is having a higher potential with the higher production in Blue Swimming Crabs and *Holothuria scraba* when compared with other districts due to the distinct sea grass ecosystem it retained. Present study is carried out to identify co-existing species with respect to their substrate and emphasize the critical condition of the seagrass meadow due to the anthropogenic impacts.

Methodology

The study was conducted in the coastal area of Mandaitheevu, located at southern margining edge of the curvier basin of Jaffna lagoon. The total area of Jaffna lagoon is extended up to 412 km^2 with a mean depth not exceeding 4 m. Sampling site was selected with concern to the high and low abundance of seagrasses in our cursory observations over the coastline. Selected site was demarcated in to perpendicular 60 m long seaward transects in 15 m intervals. Transects were delineated by 15 m from the high tide mark and arbitrarily considered as distinguish spatial strata. Stratified metal Quadrate (1 m X 1 m by 10 cm X 10 cm) was defined as the sampling unit and deployed in strata along each transect. Samples were collected by skin diving and flushed in the water until the debris and sediments were removed. The collected samples were sorted by species and analysed by determining a shoot as a sample unit. The number of individuals (shoots) was enumerated in each transect with respect to the stratum and species it belongs to. Species were identified with reference to their leaf tip characters under microscope, which is a rapid and easy method used by Lanyon (1986) to identify confusing species to the naked observation. The features concerned for study are leaf

margins, serration, veins and lignifications patterns in cells. The biological indices were used to assess the status of the biodiversity. The calculated indices were Dominance (*D*), Simpson index (1-*D*) for, Shannon diversity index (*H*) and Menhinick's richness index (*M*). Comparison of the Shannon diversities in two strata or transect was done by using a specified *t*-test. Kruskal-Wallis test was performed in Minitab 17 for the comparison of abundance.

Results and Discussion

Current study area at Mandaitheevu had the potential to favour the presence and abundance of seagrasses and the site is isolated from undulation of waves. The literature information about the seagrass species in the northern region is scanty. Seagrass species identified in the current study fell into two families; Family Potamogetonaceae and Family Hydrocharitacea. The five documented seagrass species were *Enhalus acroides*, *Thalassia hemprichii*, *Thalassodendran ciliatum*, *Halophilla ovalis* and *Halodule pinifolia*. There are no species endemic to Sri Lanka. *Halodule pinifolia* is newly reported in Jaffna and it has already been reported in the country's seagrass profile. *Thalassodendran ciliatum* which is abundant near the Pamban island in India, was present at the Mandaitheevu study site in significant amount (p= 0.023). It was earlier suspected to be present in Sri Lankan waters by means of carried by water current and may get dispersed.

Seagrass meadows at the study site possess both loose and dense cover of seagrasses. Observational studies reveal that the seagrasses are stratified and formed clustered abundance. Results of the Kruskal-wallis test for the abundance implies that strata were significantly different from each other (P= 0.02528). Stratum 1 (0-15 m) of the all transects were abundant with *H. pinifolia* and *H. ovalis* and except transect 1 the stratum 4 is only with *E. acroides* having the higher dominance (1.0000). Species composition of the stratum 2 varies with the transect. All 5 species were observed in the stratum 2 of transect 4, where the Simpson evenness (0.7222) and Shannon diversity index (1.398) are comparatively higher from the rest.

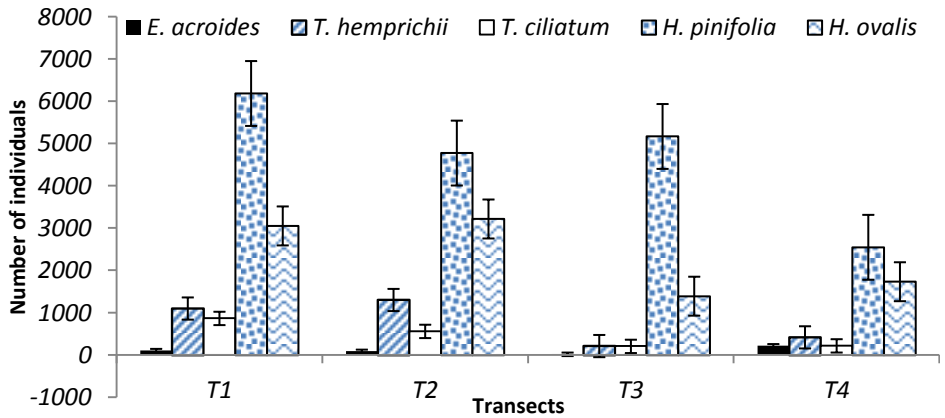

Figure 1. Species composition of seagrasses in different transects at Mandaitheevu sampling site.

Comparison of Shannon index values across transects indicated that stratum 2 occupies the highest score in all transects. *T. ciliatum* and *T. hemprichii* species often found in the stratum 2 and 3 irrespective to the transect they belongs to. Consolidate occurrence of seagrasses such as Stratum 2 shows confined pattern, the *T. hemprichii* and *T. ciliatum* covers the centre of the colony while the *H. pinifolia* and *H. ovalis* together making a margining population by demarking the edges, which may be due to some allelopathic effect. The stratum 4 is dominant by *E. acroides* and deviod with others species due to canopy effect. It is the best growing species in the deeper area (De silva & Amarasinghe, 2007).

Menhinick's richness is considerably high in stratum 4 of transect 3. The outcome of the study indicates that, the abundance of the seagrasses is confined and stratified. The contrary respond is due to the canopy effect of the higher grasses, light penetration with respect to the depth and intensified colony formation. The results emphasize that the substrate characters have marginal effect on the spatial distribution of the seagrasses and species richness. Cursory observation along the transect 3 coast reveals that huge amount of fragmented leaves (blades) of *E. acroides*, *T. hemprichii* and *T. ciliatum* were collected as debris in the shore due to the boat the fleet over. At the transect 4 *T. hemprichii* and *T. ciliatum* were purposefully removed to set the Sirahu valai". Seagrass ecosystem is inevitably indispensable to ensure the prevailing productivity of the lagoon and adjacent Palk Strait fishing. Due to the current post war context the vigorous economic development in Jaffna simultaneously expanded the scale and dimension of both Blue Swimming Crab and Seacucumber fishery. Over exploitation in the seagrass meadows made it to become vulnerable. Removal of seagrasses for the seaweed culture, trial culture practices and for "Sirrahu valai", "Parri koodu" (crab trap) and hoop nets are significantly noteworthy causes for degradation. Dried seagrasses were utilized as the organic composite manure for agriculture. Seagrass is not only an ecosystem but it adds economic, cultural and social lucrative value to the fishermen.

Conclusions and Recommendations

The present study documents new seagrass species both *H. pinifolia* and *T. ciliatum* in Jaffna lagoon. Observational outcome emphasis the degradation of seagrasses due to extended anthropogenic effects. Mandaitheevu contributes and constitute a higher composition of crabs and Seacucumber in seafood production of Jaffna peninsula. Directly or indirectly the entire fishery depends on the seagrass ecosystem so it should be conserved with an ecosystem based management for a sustainable fishery. Future studies should be based on the abundance and productivity of seagrasses with respect to the physico-chemical parameters.

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