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Comparative Report on the Algal Diversity of Dickwella, Sri Lanka at the Start of South-West Monsoon in 2015 and 2017

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Abstract: This research was carried out at Dickwella algal bed to investigate the percentage abundance of algae diversity at the start of South-West monsoon in June 2015 and 2017. Three line transects such as TR 1, TR 2 and TR 3 that were parallel to the shore were positioned along the algal bed. A quadrat (0.5 m × 0.5 m) was placed at forty five (n = 45) sampling locations at 0.5 m intervals along each transect and the algal species within the quadrat were identified and the abundance of each species was recorded. Altogether 17 algal species were recorded in 135 quadrat samples. Species identification was made *in-situ,* and later confirmed by standard algal identification keys. Shannon Wiener diversity index (H') and Simpson's diversity index (D') with respect to each transect were calculated separately. In 2015, the H' for TR 1, TR 2 and TR 3 were 2.0, 2.27 and 2.32, while 0.78, 0.86 and 0.87 were recorded respectively for D'. The H' in 2017 for TR 1, TR2 and TR3 were 1.60, 1.63 and 1.04, while, 0.72, 0.71 and 0.43 were recorded for D', respectively. *Sargassum* sp. contributed the highest species percentage (23% in 2015) and (55.21% in 2017), while, the lowest percentage (1.47%) was contributed by *Chaetomorpha antennina* in 2015 and *Halimeda discoidea* (0.01%) in 2017. It was evidenced that *Sargassum* sp. dominates the Dickwella algal bed by out-competing other algal species.

Keywords: algae, Dickwella, diversity, *Sargassum* sp., Sri Lanka

Introduction

Algae can be considered as biologically and ecologically significant group in the marine environment. Algae make an important participation in primary production of the ocean and provide habitat for near shore benthic communities. There are numerous factors that can influence the distribution of species such as wave action, light intensity, salinity, tidal range and shore topography (Darghalkar and Kavlekar, 2004). Species diversity declines with increasing height of

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sea level in intertidal zones due to the harsh conditions (Williams and Smith, 2007).

Algal biomass and composition are controlled by the existence or absence of grazers on algae. Mollusks, crustaceans, sea urchins and fish are the major groups which feed on algae. Many of these grazers are species selective hence, influencing the relative species abundance. Previous studies stated that, under high grazing pressure, only the most resistant species avoid consumption and under low grazing pressure a competitive dominant which would normally be controlled through grazing occupies all available space. Therefore, the species diversity is maximized under moderate grazing levels (Williams and Smith, 2007).

Marine algae grow along Sri Lankan coastline mainly in rocky shore areas. Rich algae beds can be seen along southern coastline, where Dickwella, Batheegama algae bed is the one of the famous place in that region. Major objectives of this study were to compose a species inventory of algae in Dickwella algal bed and to compare the percentage abundance of each species during the start of South-West Monsoon in 2015 and 2017.

Materials and Methods

Study area

The Data were collected in June 2015 and 2017 from Dickwella, Batheegama algal bed located in Southern Province of Sri Lanka (5° 57'35".8N and 80° 41'06".9E).

Data Collection

The site survey was done using three transects (135 sampling sites). Forty five sampling sites were selected at 0.5 m intervals along the algae bed for each transect. Direct counts of species were made using a quadrat (0.5 m × 0.5 m).

Data Analysis

Algae species were listed as they were seen in the field and data were taken as percentage abundance on each quadrat. Species identification was *in situ*, and later confirmed using various identification books such as Abc taxa (Coppejans *et al*., 2009).

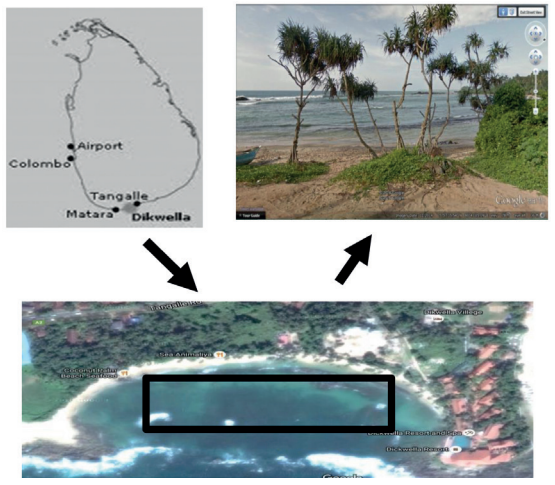

Figure 1: Map of the study area (Source- Google map)

Figure 2: Aerial view of study area

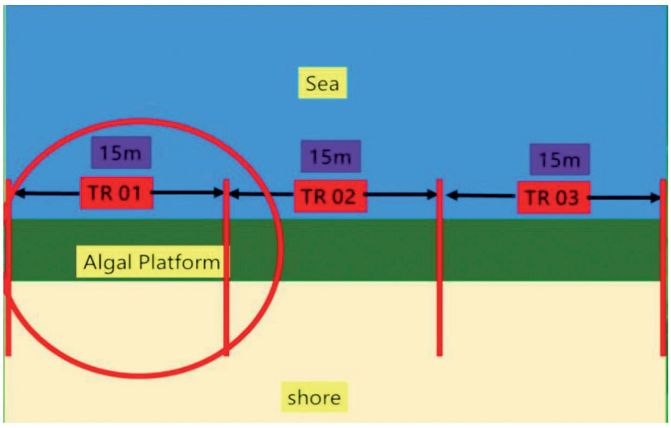

Figure 3: Sketch of the sampling sites

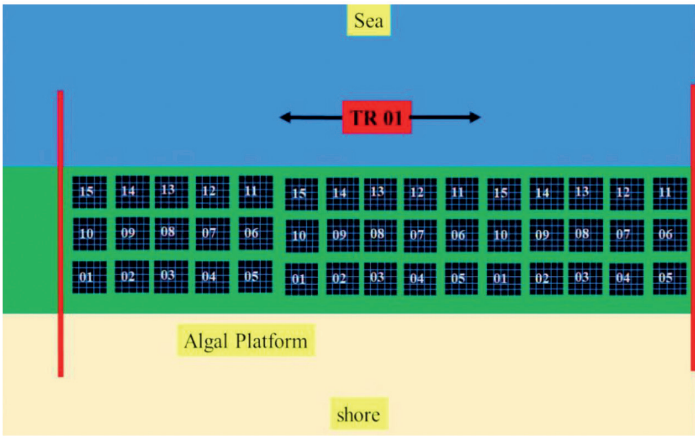

Figure 4: Sketch of one transect

Shannon Wiener diversity index and Simpson's diversity index were used to estimate the species diversity.

Shannon Wiener diversity index

$$H = -\sum_{i=1}^{s} p_i \, lnp_i$$

Where, *pi*= Number of individuals of species, *i*= Total number of samples, *s* = Number of species or species richness

Simpson's diversity index

$$D = \sum(n/N)^2$$

Where, *n* = the total number of organisms of a particular species, *N* = the total number of organisms of all species

Evenness

$E=H/H_{max}$

Where, *H* = Shannon Wiener diversity index, H_{max} = Maximum diversity possible

Table 1: Comparison of percentage abundance in 2015 and 2017

Species	Average species abundance	
	in 2015	in 2017
Ulva fasciata	9.37	0.06
Ulva lactuca	3.70	0.05
Chaetomorpha antennina	1.47	0.51
Valoniopsis pachynema	9.73	2.29
Caulerpa rasemosa	1.53	4.18
Caulerpa sertularioides	7.00	1.85
Halimeda opuntia	2.80	0.25
Halimeda discoidea	0.00	0.01
Sargassum crassifolium	9.10	16.39
Sargassum sp.	23.00	55.21
Gelidium	1.60	8.23
Gelidiopsis variabilis	11.60	1.18
Gracilaria corticata	2.13	0.33
Hypnea pannosa	2.70	0.19
Chnoospora minima	3.00	0.00
Laurencia natalensis	2.87	0.00
Crustose coralline algae	8.40	1.85
Reef crust	0.00	7.42
Total	100	100

Results and Discussion

Dickwella algal bed provides a suitable coastal habitat for the different types of algae species. A total of 17 species were recorded during this study period. The *Sargassum* sp. and *Sargassum crassifolium* were found to be dominant on the algal bed in both years as illustrated by the table 1.

In 2015, highest species percentage was displayed by *Sargassum* sp. (23%) and lowest percentage was indicated by *Chaetomorpha antennina* (1.47%). In 2017, highest species percentage was displayed by *Sargassum* sp. (55.21%) and lowest percentage was displayed by *Halimeda discoidea* (0.01%). Percentage abundance of *Sargassum* sp., *Sargassum crassifolium*, *Caulerpa rasemosa*, and Gelidium were comparatively higher in 2017 than 2015. While, the percentage abundance of *Ulva* spp., *Valoniopsis pachynema*, *Caulerpa sertularioides*, *Gelidiopsis variabilis* and *Chnoospora minima* were dropped down dramatically from 2015 to 2017. This may due to the fluctuations in the ecological and environmental conditions in intertidal zone due to erosion, sedimentation and marine water pollution. There are numerous reasons that can influence the distribution of species such as wave action, light intensity, salinity, tidal range and shore topography (Darghalkar and Kavlekar, 2004). Sea urchins and grazing gastropods were seen throughout the bed. However, it was observed that these grazers do not control mature *Sargassum* sp. Grazers prefer to eat filamentous and sheet-like epiphytes and facilitate the growth conditions of algae by decreasing shading epiphytes on algae and increasing nutrients by releasing In 2015, highest value for Shannon Wiener Diversity Index, evenness and Simpson's Diversity Index were displayed by TR 3. However in 2017, highest Shannon-Weiner Diversity Index and evenness were exhibited by TR 2, while, highest value for Simpson's

Table 2: Shannon Wiener Diversity Index and Species Evenness and Simpson's Diversity Index of TR 1, TR 2 and TR 3 in 2015

	TR 1	TR 2	TR 3
Shannon-Wiener Diversity Index	2.00	2.27	2.32
Evenness	0.8	0.9	1.0
Simpson's Diversity Index	0.78	0.86	0.87

Table 3: Shannon Wiener Diversity Index, Species Evenness and Simpson's Diversity Index of TR 1, TR 2 and TR 3 in 2017

	TR 1	TR 2	TR 3
Shannon-Wiener Diversity Index	1.60	1.63	1.04
Evenness	0.56	0.58	0.37
Simpson's Diversity Index	0.72	0.71	0.43

Diversity Index was exposed by TR 1 (Table 2 and 3).

Sargassum sp. mainly dominated on the rocky substrate, whereas, in water margins and crevices along the landward side of the rock were dominated by *Caulerpa* sp. The most abundant algae species found in the study site were mainly *Sargassum* sp. and *Sargassum crassifolium*.

The South-West monsoon period (June–September) is a period with widespread drifting of algae species. *Sargassum* sp. could have the ability to thrive during these hard conditions compared to other species.

Conclusion

In both years, Dikwella, Batheegama algal bed was dominated by *Sargassum* sp. by outcompeting other species and lowest percentage was displayed by *Chaetomorpha antennina* in 2015 and *Halimeda discoidea* in 2107. However, the resource availability and competition between species may change depending on the seasons (Wernberg *et al*., 2001). Therefore this study is being continued to get the proper understanding of the variation of algal diversity of Dikwella algal bed according to season-wise.

Recommendations and Suggestions

Polymerase chain reaction (PCR) method (Barcording) should be incorporated to minimize the errors with species identification. Algal farming is a growing industry in Sri Lanka as food source, cosmetic, alternative fuel etc. Therefore, these kinds of studies are much needed to identify the suitable algae species that can be easily grown in Sri Lanka.

References

Coppejans, E., Leliaert, F., Dargent, O., Gunasekara, R. and Clerck, O. D. 2009. Sri Lankan Seaweeds Methodologies and field guide to the dominant species, Abc taxa, volume 06.

Darghalkar, V.K. and Kavlekar, D. 2004. Seaweeds- A field Manual. NIO Manual 1: 1- 36.

Giannotti, A.L. and McGlathery, K.J. 2001. Consumption of *Ulva lactuca* (Chlorophyta) by the omnivorous mud snail *Ilyanassa obsoleta*. Journal of Phycology, 37:1–7.

Wernberg, T., Thomsen, M.S., Stæhr, P.A. and Pedersen, M.F. 2001. Comparative phenology of *Sargassum muticum* and Halidrys siliquosa (Phaeophyceae: Fucales) in Limfjorden, Denmark. Botanica Mariana, 44:31–39.

Williams, S.L. and Smith, J.E. 2007. A Global review of the Distribution, Taxonomy and Impacts of Introduced Seaweeds. Annual Review of Ecology, Evolution and Systematics. 38:327–359.