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PLANKTON DIVERSITY IN COASTAL WATERS NEAR KALU GANGA RIVER MOUTH; SRI LANKA

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ABSTRACT

The plankton community plays a significant role in the stability of coastal ecosystems. They serve as key players in marine food webs. The present study investigated the plankton diversity in coastal waters near Kalu Ganga river mouth. Six sampling locations were chosen randomly, three along the right side of the coastline (CR_1-CR_3) and three along the left-side (CL_1-CL_3) from the river mouth. Zooplankton and phytoplankton at each location were sampled from September 2020 to February 2021 using a 55µm plankton net in surface waters on a monthly basis. Plankton were morphologically identified to the nearest possible taxonomic level. The Shannon-Weiner diversity index (H) and Simpson's Index of Diversity (SID) were calculated to determine plankton diversity. The number of phytoplankton species found during the wet months (September-October) and dry months (January-February) were 62 and 68 respectively, while a similar number of zooplankton species (43) were recorded in both periods. Altogether, 81 phytoplankton species and 53 zooplankton species were identified during the research period. Bacillariophyta (72%) and Copepods (68%) were identified as the dominant phytoplankton and zooplankton groups respectively. Dinoflagellates including, Peridinium sp., Protoperidinium sp., Ceratium sp., Noctiluca sp., Gonyaulax sp., and Alexandrium sp., which are well-known to form harmful algal blooms (HABs) accounted for 17%. Chlorophyta and Cyanophyta were less dominated and found only during wet months at nearest sampling locations (CL_1 and CR_1) to river mouth. Rotifera (11%), foraminifera (9%), protozoa (10%) and ichthyoplanktons (<1%) were also reported. The H and SID values for plankton were recorded to be between 2.7 to 3.1 and 0.90 to 0.96 respectively. The both values were not significantly different ($p>0.05$) between wet months and dry months at each location. According to the H and SID values, the study area has a moderate-high level of plankton diversity. Further research should be conducted to determine the temporal and spatial variation of plankton diversity in the study area.

KEYWORDS: *Kalu Ganga river mouth, Coastal waters, Plankton diversity, Shannon-Wiener diversity index, Simpson Index of Diversity*

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1. INTRODUCTION

Plankton are aquatic organisms that are unable to swim against the currents of the water (Suthers et al., 2019). They play a critical role in marine life and in supporting fisheries (Batten et al., 2019). Plankton are classified according to their food requirements, size, habitat, and life cycle.

They are primarily classified as phytoplankton or zooplankton based on their dietary requirements. Prokaryotes that are capable of photosynthesis commonly referred to as phytoplankton contribute greatly to biomass and primary production in aquatic settings. These organisms are crucial for aquatic life because they serve as the basis of the food chain. The other significant component is zooplankton, which acts as primary consumers in energy transmission between phytoplankton and higher trophic levels (Imoobe and Adeyinka, 2009; Kusuma et al., 1988).

Biodiversity affects ecosystems' functioning and services (Duffy, 2009). Changes in the plankton community's structure directly affect the ecosystem's function (Gao et al., 2018; Yuan et al., 2014). The abundance of zooplankton and phytoplankton is determined by a wide array of abiotic factors (such as light availability, temperature, salinity, heavy metals, pH and nutrient concentrations) and biotic factors (predators, parasites) that jointly influence the structure of plankton communities (Harris and Vinobaba, 2012; Rocha et al.,1997). Plankton reacts at the slightest variation of surrounding ecosystems (Araujo et al.,2022). Therefore, plankton communities are frequently used as bioindicators to monitor ecological changes in aquatic ecosystems (Paul et al., 2016). They can be used as management tools to monitor the quality of the ecosystem by preventing algal blooms and identifying harmful contaminations from unknown sources. These variations are studied through ecological data and can be utilized by policymakers, such as in circumstances where the plankton population changes due to the rapid growth of harmful plankton species due to the surplus of nutrients in the water (Anderson et al., 2014).

Diversity indices are used to quantify the general characteristics of communities (Morris et al.,2014). The Shannon-Weiner Species Diversity Index (H) is one of the most applied diversity indices in aquatic communities which considers the species richness and evenness. The number of species present in a community is referred to as its species richness. Species evenness is a parameter which indicates relative abundance of given species among all the species in a community (DeJong,1975). This index gives a numerical assessment of the number of component groups and the relative abundance of these groups within the community (Cook,1976). The Simpson index of diversity (SID) is a dominance index because it gives more weight to common or dominant species. As developed by Simpson, the index ranges from 0 to 1, where 0 indicates the absence of diversity and 1 indicates maximum diversity (Guajardo, 1999).

According to Krakstad et al., (2018), in Sri Lankan waters, plankton dynamics from the central Indian Ocean are poorly known. In Sri Lanka, several studies have been carried out on the plankton diversity of coastal and brackish waters (Jayasiri et al., 2007; Jitlang et al., 2008; Wijetunge et al., 2015; Wimalasiri et al., 2021). Fernando (1980), has stated that the limnetic zooplankton of Sri Lanka is typical of tropical limnetic zooplankton in species composition. Warusawithana and Yatigammana (2019) reported 85 phytoplankton species and 38 zooplankton species in Kotmale reservoir while Silva (2007) has identified nearly 150 taxa of phytoplankton belonging to nine taxonomic groups from Sri Lankan inland water bodies. However, such studies in coastal waters near the river mouths of Sri Lanka are scanty. Environmental conditions in river mouth areas fluctuate widely, according to river water discharge and the effects of oceanic water intrusion (Sakami et al., 2003). These fluctuations can affect on the biological community. Land-based pollutants discharged into waterways finally end up at the coast with a risk of contamination. Therefore, identifying plankton diversity in coastal waters near river mouths can reveal important ecological data. The Kalu Ganga basin is Sri Lanka's second largest river basin, comprising 2766 km^2, and a substantial portion of its catchment is located in the country's greatest rainfall region. The river originates from the Adam's peak in the central hills at an altitude of 2250 m and falls in to the Indian ocean at Kalutara after flowing through Rathnapura and Kaluthara districts. The basin's average annual rainfall is approximately 4000mm, resulting in a yearly flow of 4000 million m^3. It accounts for the country's most significant amount of discharge to the sea (Ampitiyawatta and Guo, 2010; Panditharathne et al., 2019). Hettige et al., (2014) have studied the water quality status of Kalu Ganga coastal waters. Since the river flows through rapidly developing cities there's a possible risk of nutrient contamination. Therefore, it will be essential to examine the plankton population in the Kalu Ganga river mouth's coastal waters to determine the potential threat of algal blooms to coastal fisheries and recreational activities in the neighbouring beach park. With a focus on identifying the major zooplankton and phytoplankton taxa in the study area, the current study was conducted to evaluate the plankton assemblage in coastal water near the river mouth of the Kalu Ganga. The Shannon-Wiener diversity index (H) and Simpson's Index of Diversity (SID) for plankton were calculated to determine the impact of precipitation on the plankton population. That involved calculating the variation of H and SID between wet and dry months in the study area.

2. METHODOLOGY

2.1 Study site and sampling locations

The current study was carried out in the adjacent coastal water of Kalu Ganga river mouth. Sampling was carried out at six randomly selected and independent sampling locations, including three (CR1, CR2, CR3) along the river mouth's right-side coastline and three (CL1, CL2, CL3) along the river mouth's left-side coastline (Figure 2.1). Each sampling point's GPS coordinates were recorded using a handheld GPS (Garmin eTrex H Handheld GPS Navigator). Monthly sampling was carried out from September 2020 to February 2021. September and October of 2020 were considered as wet months while the January and February of 2021 were considered as dry months based on the average monthly rainfall (Meteo.gov.lk., 2021).

2.2 Sample collection and analysis of plankton composition

At each sampling location, 50L of surface water (0-1m) was filtered through a typical plankton net (HYDRO-BIOS, KIEL plankton net : 55 µm mesh size) to analyze phytoplankton and zooplankton. The samples were immediately transferred to labeled 100mL opaque plastic bottles and preserved with acidified Lugol's solution and 4% formalin. The plankton samples were kept for 24hours for the natural sedimentation. After removing the supernatant, known dense sample was vigorously shaken to ensure homogeneity. A Sedgewick-rafter counting chamber was used (Pyser-SGI, S52, glass cell) to enumerate the plankton.

Identification and enumeration of plankton was carried out under binocular compound light microscope (Optika, Italy, B-159) with the magnification of 40x (APHA,2017). Using standard plankton identification keys and guides, zooplankton and phytoplankton were identified to the lowest possible taxonomic level (Cupp, 1943; Dand et al.,2015; Faust and Gulledge, 2002; Newell and Newell,1963; Perry,2010; Razouls et al., 2021; Yamaguchi and Bell, 2007). Magnus Live USB 2.0 viewer of the Microscopic Image Projecting System was used to process the images (Magnus MIPS, India).

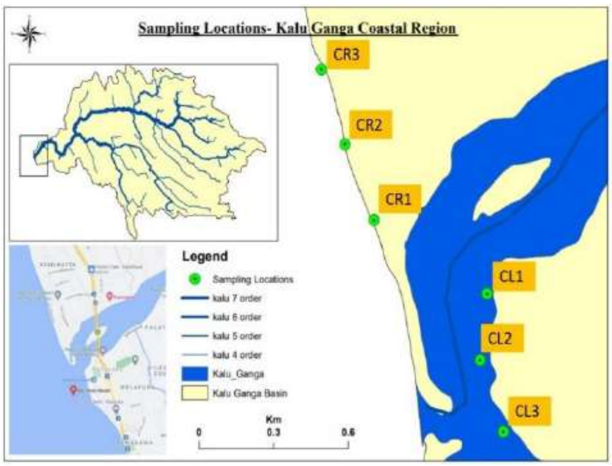

Figure 2.1- Sampling locations of Kalu Ganga river mouth coastal are

2.3 Calculation of Shannon-Wiener Diversity Index (H) and Evenness

The Shannon-Wiener diversity index was calculated to determine the plankton diversity. The following formula was used for the calculations (Gao et al., 2018; Pielou, 1966).

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

$$\text{Evenness} = \frac{H}{\ln(S)}$$

Where,

H = Shannon- Wiener diversity index

P_i = fraction of the entire population made up of species i

S = number of species encountered

Σ = sum from species 1 to species S

2.4 Calculation of Simpson's index of diversity (SID)

The Simpson index was calculated (Hossain et al., 2017; Simpson,1949) using the following equation.

$$SID = 1 - \frac{\Sigma\, n(n-1)}{N(N-1)}$$

Where,
D = Simpson's diversity index
n = number of individuals of each species
N = Total number of individuals of all species

2.5 Secondary data collection

Monthly total and average rainfall data of the Kalu Ganga catchment area for the study period was collected from the Meteorological Department, Sri Lanka. Digital maps of the study area were collected from Survey Department, Sri Lanka.

2.6 Map generation, Data analysis and Statistical Analysis

The study area's map generation was performed using Arc GIS 10.5 version. Statistical analysis was carried out using Minitab 17 statistical software package along with Microsoft Excel 2016 version. Paired T test was performed to determine the significance difference of H value and SID values separately, between wet months and dry months for zooplankton diversity and phytoplankton diversity. $p < 0.05$ was regarded as statistically significant. All the statistical tests were performed with a significance level of 95%.

3. RESULTS AND DISCUSSION

3.1 Plankton identification

The number of recorded phytoplankton species was 62 and 68 respectively during wet and dry months. A similar number of zooplankton species (43) was recorded during the wet months as well as during the dry months. A total of 81 phytoplankton and 53 zooplankton species were recorded during the study period. The identified phytoplankton groups were bacillariophyta (72%), dinophyta (17%), chlorophyta (7%) and cyanophyta (3.5%). As the major zooplankton groups, copepoda (68%), rotifera (11%), foraminifera (9%), protozoa (10%) and ichthyoplankton (<1%) were recorded (Table 3.1 and 3.2). In a similar manner, Perumal et al. (2009) identified Bacillariophyta as the main phytoplankton group and copepod as the dominating zooplankton group in Kaduviyar estuary, southeast coast of India, and the percentage contribution of each phytoplankton group was as follows: In the phytoplankton community, Bacillariophyta> Dinophyta> Cyanophyta> Chlorophyta predominate. Also mentioned is a similar descending arrangement of zooplankton groups. Bacillariophyta has been found as the main phytoplankton group in the southeast coast of India (Rajkumar et al., 2009) and northern Bay of Bengal (Prakash and Raman, 1992). Diatoms predominated the phytoplankton population, followed by dinoflagellates (Achary et al., 2014; Madhav and Kondalarao, 2004; and Yasmin et al., 2021). Microscopic photographs of some of the observed plankton are included in Figure 3.1(phytoplankton) and 3.2 (zooplankton).

Table 3.1: Recorded phytoplankton, their distribution and percentage of occurrence during the study period

Phytoplankton group	Phytoplankton sp.	No. of recorded species in the genus	Sampling location ID						No. of recorded species in the group	Percentage %
			CL1	CL2	CL3	CR1	CR2	CR3		
Bacillariophyta (Diatoms)	*Achnanthes* sp.	1	+				+		59	72
	Amphiprora sp.	1		+	+					
	Amphora sp.	1						+		
	Asterionellopsis sp.	1	+	+	+	+	+	+		
	Biddulphia sp.	2	+				+			
	Campylodiscus sp.	1	+							
	Cerataulina sp.	1		+	+	+	+	+		
	Chaetoceros sp.	4	+	+	+	+	+	+		
	Cocconeis sp.	1			+					
	Coscinodiscus sp.	1	+		+	+	+	+		
	Cyclotella sp.	1	+	+	+	+	+	+		
	Cylindrotheca sp.	1	+	+		+	+	+		
	Cymbella sp.	1				+		+		
	Detonula sp.	1		+			+			
	Diatoma sp.	1	+							
	Diploneis sp.	1	+	+			+	+		
	Ditylum sp.	2	+	+	+	+	+	+		
	Fragilaria sp.	1	+				+	+		
	Guinardia sp.	1								
	Gyrosigma sp.	2	+		+		+			
	Helocotheca sp.	1	+				+	+		
	Lauderia sp.	1	+	+		+		+		
	Leptocylindrus sp.	1			+	+	+			
	Lioloma sp.	1			+					
	Melosira sp.	1	+			+				
	Navicula sp.	3	+							
	Nitzchia sp.	5	+	+	+	+	+	+		
	Odontella sp.	1			+					
	Pinnularia sp.	1	+		+	+		+		
	Planktoniella sp.	1		+						
	Pleurosigma sp.	2	+	+	+	+	+			
	Proboscia sp.	2	+	+						
	Pseudonitzchia sp.	1	+	+	+	+	+	+		
	Rhizosolenia sp.	3	+					+		
	Skelotenema sp.	1	+	+	+	+	+	+		
	Streptotheca sp.	1	+		+		+			
	Synedra spp.	2	+	+		+		+		
	Tabellaria sp.	1			+		+			
	Thalassiothrix sp.	1	+	+		+				
	Thallasionema sp	1		+		+		+		
	Thallasiosira sp.	1	+			+				
	Tribonema sp.	1						+		
Dinophyta (Dinoflagellates)	*Alexandrium* sp. *	1		+					13	17
	Ceratium furca *	1	+	+	+	+	+	+		
	Ceratium fusus *	1		+	+	+	+			
	*Ceratium lineatum**	1	+		+		+	+		
	*Ceratium longipes**	1		+	+	+	+	+		
	Ceratium tripos *	1	+	+	+					
	*Dinophysis tripos**	1						+		
	Gonyaulax sp. *	1					+	+		
	Gymnodinium sp. *	1				+	+			
	*Noctiluca scintillans**	1	+			+	+			
	Peridinium sp. *	1	+	+						
	*Protoperidinium divergens**	1	+	+	+	+	+	+		
	*Pyrocystis noctiluca**	1	+	+		+		+		
Chlorophyta (Green algae)	*Ankistrodesmus* sp.	1	+						6	7
	Closterium sp.	3	+	+		+				
	Scenedesmus dimorphis	1	+							
	Scenedesmus quadricauda	1	+							
Cyanophyta (Blue green algae)	*Chroococcus* sp.	1	+			+			3	3.5
	Spirogyra sp.	1	+			+				
	Spirulina sp.	1	+							

+: Presence of species at each location
*: Dinoflagellates known to form algal blooms

Table 3.2: Recorded zooplankton, their distribution and percentage of occurrence during the study period

Zooplankton Group	Zooplankton	Nu. of recorded species	Sampling location ID						Nu. of recorded species	Percentage (%)
			CL1	CL2	CL3	CR1	CR2	CR3		
Copepoda	*Acartia* sp.	2	+		+		+	+	36	68
	Acartiella sp.	2						+		
	Acrocalanus sp.	1			+		+			
	Candacia sp.	1		+						
	Centropages sp.	2		+	+		+	+		
	Chiridius sp.	1			+					
	Clanopia sp.	1					+	+		
	Cyclops sp.	4		+	+		+	+		
	Dioithona sp.	1		+						
	Euchirella sp.	1	+				+	+		
	Heterorhabdus sp.	2				+	+			
	Isias sp.	1	+					+		
	Microstella sp.	1	+	+				+		
	Nauplius	4	+	+	+	+	+	+		
	Paracalanus sp.	4	+		+	+	+	+		
	Pontella sp.	1								
	Pseudodiptomus sp.	6		+		+				
	Rhincalanus sp.	1	+		+	+	+			
Rotifera	*Keratella* sp.	2	+			+			6	11
	Lecane sp.	2	+			+				
	Testudinella sp.	2	+			+		+		
Foraminifera	Foraminifera	5		+			+		5	9
Protozoa	Tintinnids	3		+	+	+	+		5	10
	Arcella sp.	2		+	+	+	+			
Ichthyoplankton	Fish eggs	1	+						1	<1
+: presence of species at each location										

The plankton diversity as well as the number of reported freshwater phytoplankton were increased towards the river mouth along the coastline. *Nitzchia* sp. was found at every sampling location as a tolerant phytoplankton species with highest abundance and highest species richness. The genus *Nitzchia* contains species found in clean water as well as in polluted water. *Nitzschia* sp. can be easily found in almost any water body in the world (Martin and Fernandez,2012). Ariyasinghe et al., (2016) has reported highest abundance of *Nitzchia* sp. in all salinity levels. Nauplius larvae are an important food source for fish and predatory invertebrates. The abundance of these species could be attributed to the abundant food supply, reproductive activity, and the ecosystem's favourable environmental conditions (Ramaiah and Nair, 1997). Their recorded highest abundance is essential information for the coastal fisheries of the area. However, most of the species found in the study area were marine. Since some of the bloom-forming dinoflagellates were reported it is important to analyze the nutrient content of the coastal waters in the study area.

3.2 Variation of plankton composition between wet months and dry months

During the wet months 48 Bacillariophyta species, 5 dinophyta species, 6 chlorophyta species and 3 cyanophyta species were recorded. But during the dry months, only bacillariophytes and dinoflagellates were reported in 56 and 12 respective number of species. During the wet months the number of recorded species of copepods, rotifers, foraminifera and protozoa were 31,6,2 and 4 respectively. During the dry months 35 copepod species, no rotifers, 5 foraminifera species, 2 protozoa species and 1 ichthyoplankton were reported (Figure 3.3 and 3.4).

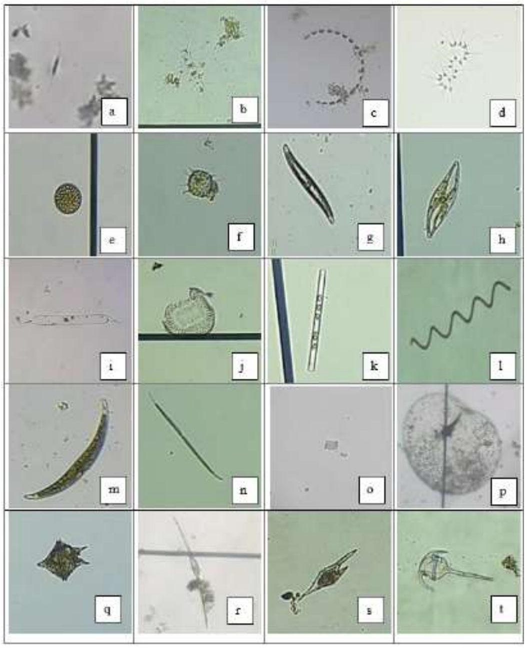

Figure 3.1: Some of the recorded phytoplankton: Bacillariophyta (a-k), Chlorophyta (l-o), Dinophyta (p-t)

Figure 3.2: Some of the recorded zooplanktons: Rotifera (a-c), Protozoa (d-g), Foraminifera (h-i), Copepoda (j-p)

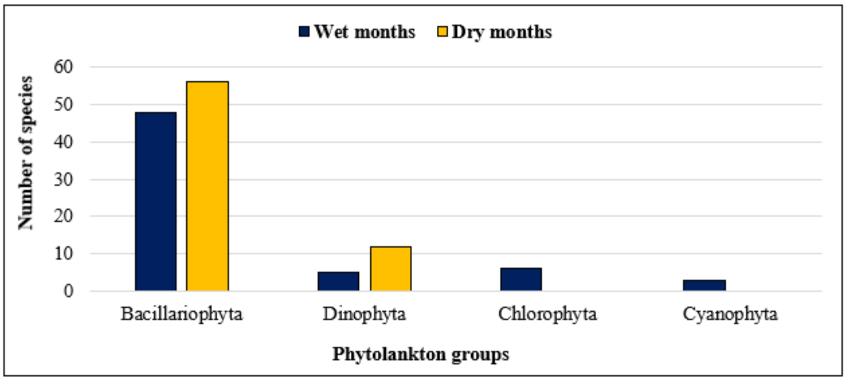

Figure 3.3: Variation of Phytoplankton composition

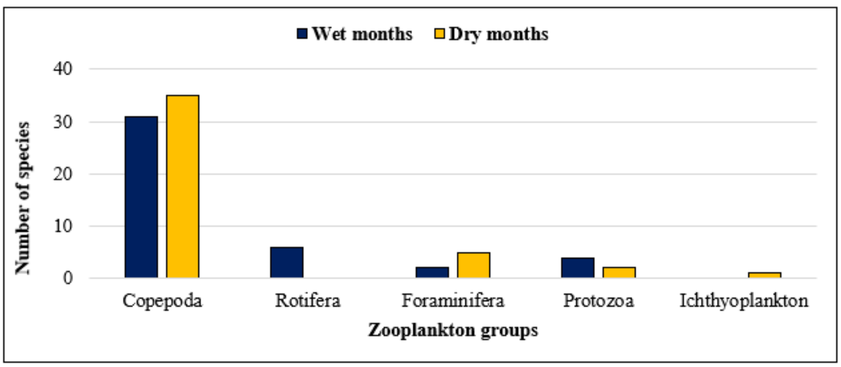

Figure 3.4: Variation of Zooplankton composition

Compared to the dry months, Kalu Ganga catchment area receives a high amount of rainfall during the wet months [The average monthly rainfall at Rathnapura station was reported as >575mm, >400mm, <200mm, <75mm respectively during September (2020), October (2020), January (2020) and February (2020)] (Meteo.gov.lk., 2021). Therefore, the volume of freshwater discharge through the river mouth into adjacent coastal waters is higher during wet months compared to the dry months. Salinity fluctuates in response to seasonal variation of freshwater inflow into adjacent areas from the rivers (Stoker et al., 1992).

Rathnayaka et al., (2013) has observed a saltwater intrusion in Kalu Ganga up to 11 km from the river mouth. Larson and Belovsky (2013) has stated salinity as a dominant factor which influence the diversity of phytoplankton communities in aquatic ecosystems. Therefore, the changes of salinity levels between wet months and dry months can influence the plankton diversity. Due to high amount of freshwater inflow into coastal areas can allow freshwater chlorophytes and cyanophytes to tolerate at the nearest sampling locations (CL1 and CR1) to the river mouth during wet months. The freshwater green algae *Closterium* sp. is sensitive to water quality (Wang et al., 2018). Low salinity levels can allow them to tolerate. Perumal et al. (2009) observed the presence of freshwater algae in the Kaduviyar estuary, located on the southeast coast of India, during the monsoon season when there is considerable rainfall and low salinity. Freshwater phytoplankton found in estuaries during the wet months can be used as an indicator of the presence of freshwater conditions. But due to the decreasing dilution effect of saltwater along the coastline from the river mouth, they tolerate only at the nearest sampling locations to the river mouth.

But less freshwater discharge during the dry months can increase the saltwater conditions at same locations (CL1 and CR1) making these freshwater species hard to survive at these locations. Harris and Vinobaba (2012) observed decrement of chlorophyta and cyanobacteria abundance with the increasing salinities. Freshwater phytoplankton do not survive at these higher salinities (Harris and Vinobaba., 2012). Therefore, they only present during the wet months. Also, the flow variations can change the nutrient levels, primary production and make changes in the ecosystem (Alexander et al., 1996).

3.3 Variation of Shannon-Wiener diversity index value between wet months and dry months

During the research period, H value was recorded between 2.7 to 3.1. In terms of zooplankton and phytoplankton diversity, the CR1 and CL1 locations reported the highest H value (H=3.1). There was no significant difference in H values between wet and dry months for phytoplankton (t= 0.00, p=1.00) and zooplankton (t=2.24, p=0.076). The Figure 3.5 and Figure 3.6 are regarding the variation of H value (±Standard deviation) between wet months and dry months respectively for phytoplankton and zooplankton.

3.4 Variation of Evenness between wet months and dry months

The calculated species evenness values during the research period for zooplankton and phytoplankton are displayed in Figure 3.7 separately. Although there were no significant differences in zooplankton species' evenness (t=1.31, p=0.247) between wet and dry months, a significant difference was recorded for the phytoplankton species evenness (t=6.97, p=0.001) between wet months and dry months. Species evenness was higher during the wet months compared to the dry months for phytoplankton.

3.5 Variation of Simpson's Index of Diversity (SID) values between wet months and dry months

SID value was recorded between 0.90 to 0.96 in the study area during the research period. The highest SID value (0.96) was reported at CL1 location. There was no significant difference in SID value for phytoplankton (t=2.10, p=0.09) and zooplankton (t=2.44, p=0.06) between wet and dry months. Figure 3.8 and Figure 3.9 are regarding the variation of SID value (±Standard deviation) between wet months and dry months, respectively, for phytoplankton and zooplankton.

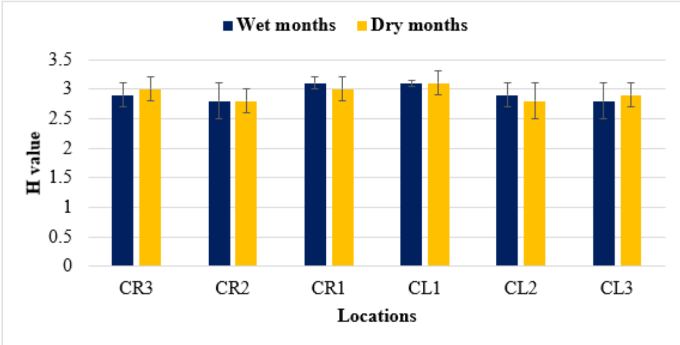

Figure 3.5: Variation H value for phytoplankton between wet months and dry months

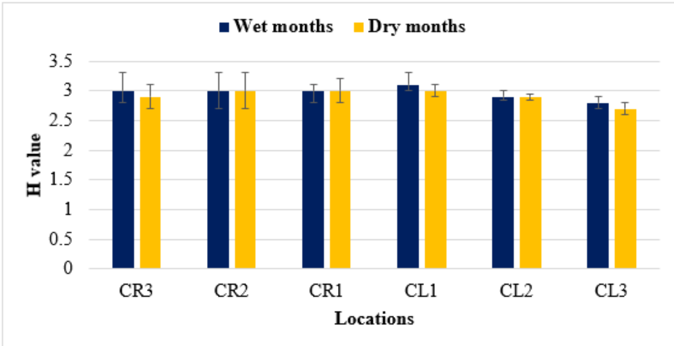

Figure 3.6- Variation H value for zooplankton between wet months and dry months

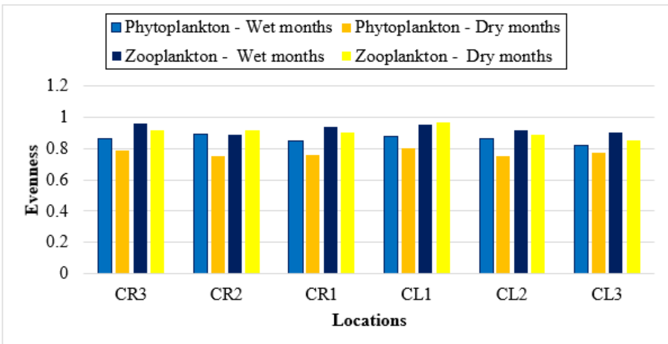

Figure 3.7- Variation of species evenness between wet months and dry months

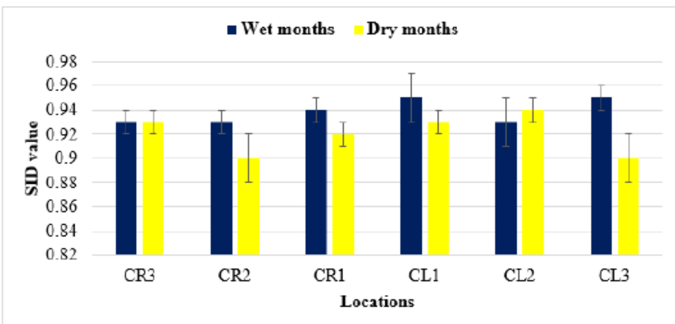

Figure 3.8- Variation of SID value for phytoplankton between wet months and dry months

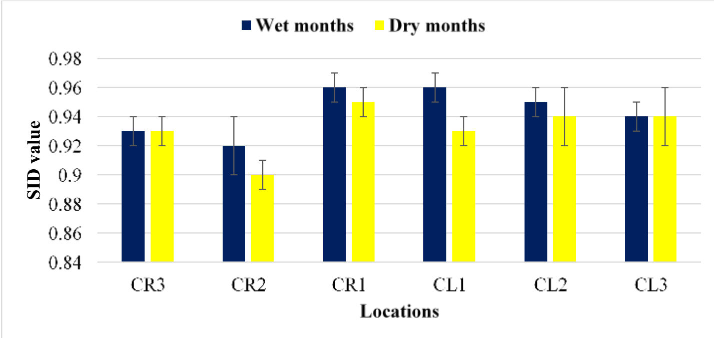

Figure 3.9- Variation of SID value for zooplankton between wet months and dry months

Shannon-Wiener index is strongly influenced by species richness as well as by rare species, while Simpson index gives more weight to evenness and common species. The effect of the sample size is generally negligible for both of them. According to the classification scheme for the Shannon-Wiener Diversity index as described in Fernando et al., (1998), the relative level for the zooplankton and phytoplankton diversity of the study area is moderate to high (H value range- 2.7-3.1). According to the classification system of Simpson's Index of Diversity in Guajardo (2015), study area can be classified as a high diversity area of plankton (SID value range - 0.90-0.96). The reported high evenness values can be contributed to the high SID values. In coastal areas near river mouths, nutrient-rich river water is mixed with coastal water (Romero et al.,2007). Therefore, it increases phytoplankton diversity. In aquatic environments, phytoplankton plays a significant role in supplying the dietary needs for filter-feeding zooplankton (Peltomaa, et al., 2017). With a sufficient food supply, zooplankton community becomes stable and diverse. The ability of freshwater plankton, brackish water plankton, and marine planktons to tolerate at nearest sampling locations to the river mouth (CL1 and CR1) can increase species richness towards the river mouth**.** Therefore, diversity increases towards the river mouth. Ariyasinghe et al., (2016) have reported greater species diversities at low salinities than at high salinities in Batticaloa lagoon, Sri Lanka.

Low salinity levels closer to the river mouth can attribute to this high diversity value at CL1 and CR1 locations. Interactions between marine and river water result in ecosystems with wide fluctuations in salinity and a variety of other physical, chemical, and biological water characteristics (Morris et al.,1995). Therefore, studying plankton community structure at these areas are crucial. This study's findings about the distribution and abundance of plankton would serve as a valuable tool for future ecological assessment and monitoring of the coastal ecosystems of Sri Lanka's River mouths.

4. CONCLUSION

Bacillariophyta was the dominant phytoplankton group while copepods were identified as the dominant zooplankton group during the study period. Although the number of recorded plankton species was almost similar in both periods, a variation of species composition was observed between wet months and dry months. The plankton diversity as well as the number of reported freshwater phytoplankton were increased towards the river mouth along the coastline. The highest species diversity was reported at the nearest sampling locations (CL1 and CR1) to the river mouth. Although the hazardous algal bloom conditions were not reported in the study area it can be concluded that there is a risk of bloom formation due to the presence of dinoflagellates which are well known for bloom formation. There was no significant difference in H and SID values between wet months and dry months. There is a moderate-high level of plankton diversity in the area. Future research is highly recommended regarding the spatial and temporal distribution of plankton community of the study area with long-term continuous assessments.

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