

Population Study of the Family Cerithiidae (Phylum: Mollusca) at Mangrol Coast, Gujarat, India

Rahul S. Gohel¹, Pandya Khushali M.² and P.C. Mankodi^{2*}

¹Department of Biology, Shree M. & N. Virani Science College, Rajkot, India

²Department of Zoology, Faculty of Science, The Maharaja Sayajirao University of Baroda, Vadodara, India
pcmankodi@yahoo.com

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Abstract

Mangrol coast is one of the most diverse coasts of Gujarat with varied substratum and habitat characteristics. It is located at 21°06' N and 70°05' E. The intertidal zone of this area has flat rocky substratum with large tide-pools, cracks, water pools, rough cups and burrows. Family Cerithiidae is one of the largest families of Gastropod, which exhibits stable population in the inter tidal environment. This Gastropod family has much abundance and even distribution pattern is spread all over upper intertidal zone. Fishermen use some of the members of this family as fishing baits. Standard quadrat sampling was done for two years to analyze population dynamics of family Cerithiidae. The result obtained is discussed as comparison of two years and overall population dynamics with biodiversity indices.

Keywords: Mangrol coast, Gastropods, Family Cerithiidae.

Introduction

Phylum Mollusca plays an important role in ecosystem function by source as food in their habitats¹. The marine phyla has 35,000 fossils species, and more than 1,00,000 recognized species². It is known as an important ecological group of invertebrates that belong to many lesser known creatures. Of all Mollusca class, Gastropoda is estimated to have more than 75,000 species, as most diverse class of phylum Mollusca in the marine habitat³. Diversity of Mollusca derived in different form by the structure, which is heterogeneous group of animals with different structural form such as slugs, mussels, octopus and snails⁴. Usually molluscan population is more enrich than other intertidal faunal populations. Amongst the molluscs, the gastropods are more distributed on the rocky substratum. This population dynamics and community variability among inter specific and vertical zonation pattern, which may also lead by physical condition⁵. Even though, large number of marine gastropods are suitable for human consumption⁶ knowledge for nutritive value and edibility in the member of family is still fragmentarily known. Scheibling⁷ concluded that population distribution was maximum during reproductive period whereas it is minimum or random aggregated during annual reproductive phase. Here therefore, we have recorded population structure of Cerithiidae molluscs.

Study area: Saurashtra coast is located in the south west of Gujarat and contributes nearly 985 km. of the total coast line of Gujarat. Mangrol coast is located in Junagadh district at the 21° 06' N latitude to 70° 05' E longitudes (Figure-1). It has vast rocky intertidal zone which provide good shelter to most molluscs and other marine fauna. Present study; therefore,

had been aimed to investigate the population structure and dynamics of the family Cerithiidae (Class Gastropoda). Habitat structure of the study area was characterized by flat rough rocks, very small to huge tide pools, micro to macro cups and crevices^{8,9,10}. The entire shore is physically affected by wave actions, although it is same like other rocky seashore, but wave action and water level responsible for the exposed of heat and sunlight to the intertidal fauna. Alteration of physical conditions, such as wave action, leads to the formation of different communities¹¹. Family Cerithiidae is a highly distributed family and an important biotic component in community structure, assemblage and intertidal ecology.

Materials and Methods

The present study was conducted at the Mangrol coast (Figure-1). The study site was visited monthly during low tide, so that the exposed lower intertidal zone could be explored. Approximately 1.4 km² of the entire intertidal area was covered in this study.

The entire intertidal belt is occupied by number of macro faunal species, amongst which Molluscs are one of the highly diversified group. Out of all the species of family Cerithiidae, which form the key species in this area, four species were recorded to be abundant at the Mangrol coast viz., *Cerithidium morus*, *C. cingulata*, *C. scabridum*, and *C. obelicus*. These four are found in the entire intertidal zone. For population dynamics and diversity assessment random quadrat method was adopted from upper to lower intertidal zone. The data acquired were subjected to various statistical analysis using PAST software and MS Excel.

Results and Discussion

Intertidal zone, of Mangrol coast, has diverse micro habitats and substratum characteristics, where the Cerithiid community structure, being a key species, and population study was carried out.

During the 1st year survey period, a total of 370 quadrates were laid, of them in 278 quadrates Cerithiids were found with 2861 individuals. An average of 30 quadrates was laid per month, out of which 23 exhibited the presence of Cerithiids. In these 23 quadrates, 238 individuals were observed (Table-1). Abundance is very important as a part of community dynamics and it is also

environmental biotic factor that is responsible to find the strength of the family in local environment. At Mangrol coast, the family abundance was observed to be very peculiar as compared to other species. Abundance of family Cerithiidae on this coast recorded in 1st year showed an average of 10.24 number of individuals per 0.25m². It was recorded to be highest during month of November and lowest during January, 19.00 and 4.46 respectively (Table-2, Figure-2). Density for the 1st year was 7.45 at an average with lowest in January, 2.32 and the highest in October, 10.98 (Table-2, Figure-3). Frequency recorded of the 1st year ranged from 0.47% in June to 0.86% September with an average of 0.74% (Table-2, Figure-4).

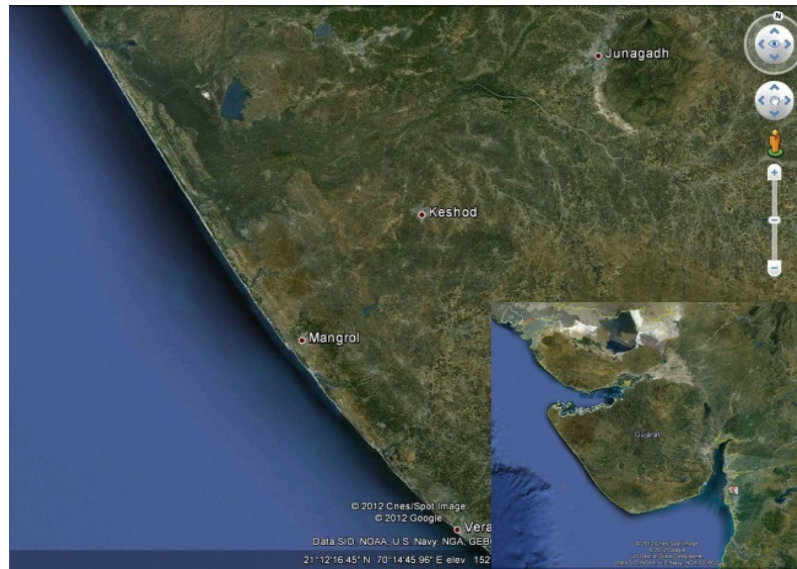


Figure-1
 Map of Mangrol study area

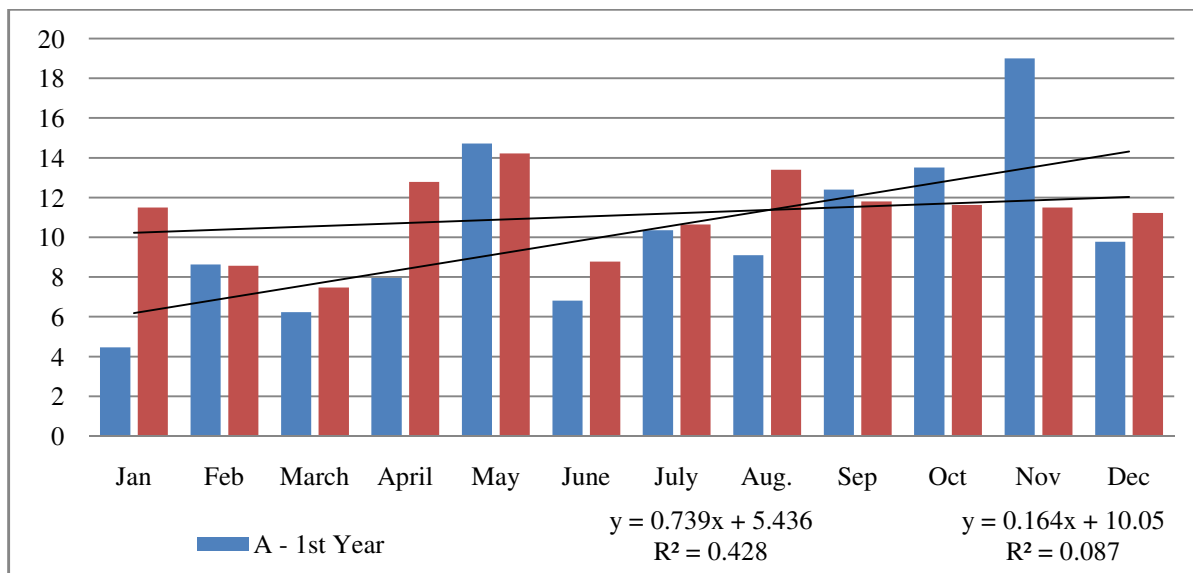


Figure-2
 Abundance of family Cerithiidae

Table-1
Yearly recorded data of family Cerithidae

Month	1 st Year			2 nd Year		
	Total no. of quadrates Studied	No. of quadrates in which family found	Total no. of individuals	Total no. of quadrates studied	No. of quadrates in which family found	Total no. of individuals
Jan	25	13	58	20	16	184
Feb	10	8	69	32	23	197
March	31	26	162	26	19	142
April	27	23	183	12	9	115
May	38	32	471	18	18	256
June	42	36	245	34	31	272
July	23	17	176	24	20	213
Aug.	36	29	264	26	18	241
Sep	32	15	186	34	26	307
Oct	48	39	527	25	13	151
Nov	26	14	266	19	12	138
Dec	32	26	254	22	13	146
Total	370	278	2861	292	218	2362
Average	30.83	23.17	238.42	24.33	18.17	196.83

Table-2
Frequency, Density and Abundance of family Cerithiidae

Month	1 st Year			2 nd Year		
	F (%)	D	A	F (%)	D	A
Jan	0.52	2.32	4.46	0.8	9.2	11.5
Feb	0.8	6.9	8.63	0.72	6.16	8.57
March	0.84	5.23	6.23	0.73	5.46	7.47
April	0.85	6.78	7.96	0.75	9.58	12.78
May	0.84	12.39	14.72	1	14.22	14.22
June	0.86	5.83	6.81	0.91	8	8.77
July	0.74	7.65	10.35	0.83	8.88	10.65
Aug.	0.81	7.33	9.1	0.69	9.27	13.39
Sep	0.47	5.81	12.4	0.76	9.03	11.81
Oct	0.81	10.98	13.51	0.52	6.04	11.62
Nov	0.54	10.23	19	0.63	7.26	11.5
Dec	0.81	7.94	9.77	0.59	6.64	11.23
Total	8.89	89.4	122.94	8.94	99.74	133.51
Average	0.74	7.45	10.24	0.75	8.31	11.13

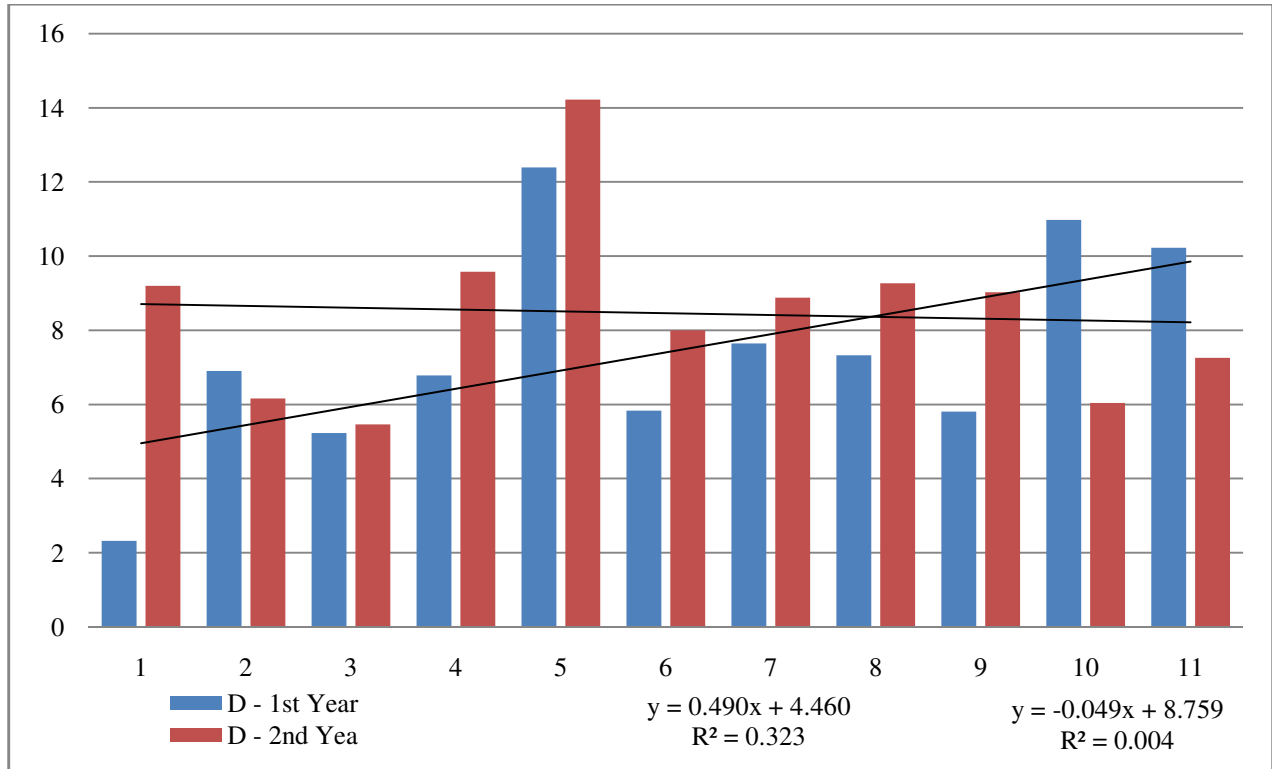


Figure-3
 Density of family Cerithidae

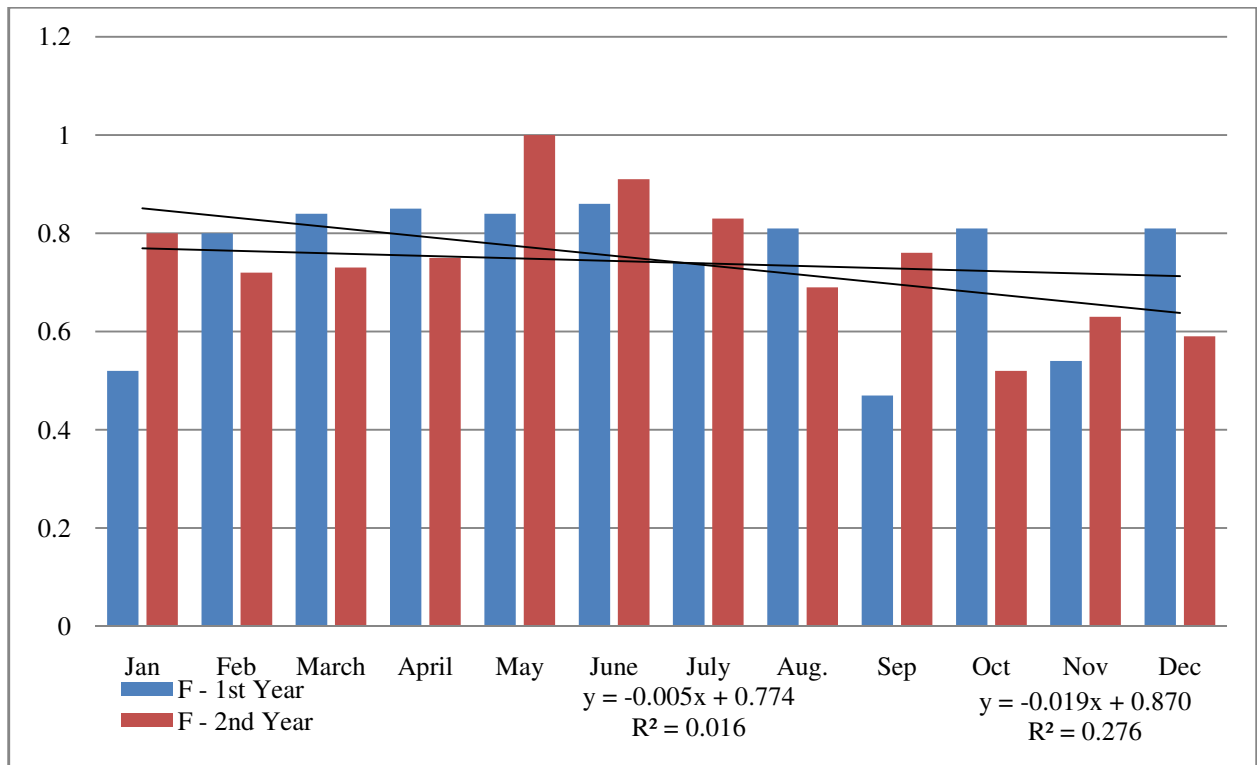


Figure-4
 Frequency (%) of family Cerithidae

Similarly, in the 2nd year, 292 quadrates were laid and surveyed. Out of which, 218 quadrates showed the occurrence the family Cerithiidae with a total of 2362 individuals. The total quadrates studied were approximately 24 per month out of which 18 exhibited the presence of this family with approximately 197 (Table-1). In 2nd year, average abundance was around 11, with lowest in March 7.47 and highest in May 14.22 (Table-4, Figure-2). Density recorded 8.31 an average with range between 5.46 in March to 14.22 in May (Table-2, Figure-3). Frequency was calculated an average of 0.75%, with lowest of 0.72% in February and highest of 1.00% in May (Table-2, Figure-4). Indices calculation of Shannon-winner indices H' was 2.33 in the 1st year and in the 2nd year 2.44. Evenness was found to be 0.85 and 0.95 respectively for the two years.

Discussion: At the study site average abundance difference between study years was found to be approximately 0.89. Lowest value was depicted in different month's viz., January in first year and March in the second year. The highest value was counted in November for the first year and May for the second year. Density was observed to be an average of 0.86. Density and Abundance being correlated to each other showed lowest values in January and March respectively. Frequency was found approximately similar in both years at an average difference of only 0.01%. Collectively, all three parameters were exhibiting lesser fluctuation except in month of May, October and November, during the entire study. The R^2 values for different parameters were negative and with less statistical significance for abundance 4.395, density 2.60 and frequency 2.65. Abundance in May reached at the peak for both years whereas in November of 1st year it exhibited sudden rise of up to 19.00. Density in both the years, were observed to have same fluctuation. Frequency in 1st year was observed to be constant from February to June.

Study shows that winter season is much suitable for the population of the Cerithiidae family. While as in summer, temperature might be effective on the community structure, which leads to more fluctuation in results. Also, wave-force causes frequent disturbance to the community present¹² and substratum is also one of the major active controlling factor for faunal distribution¹³. Thus, seasonal variation and local environment controls the population of the family Cerithiidae. The family distribution exhibited a wide range and it is one of the major macro fauna of the coast, such observations leads to consider this family as indicator family¹⁴. According to Patel¹⁵ this coast was observed to sustain maximum density of family Cerithiidae rather than any other Gastropods. Similar results were obtained during the present study also.

The results obtained positively supported and are depicted by abundance, frequency and density during this two year. Vaghela⁸ indicated that the Mangrol coast has less anthropogenic activity as compared to the surrounding harbors which is also indicative of a stable presence of the family Cerithiidae and better population of its representative species.

Conclusion

Mangrol coast at the south west of Gujarat state has long and broad rocky seashore with directly effective by environment and physico-chemical factors that are creating diverse conditions at habitat level as well as biodiversity level. The family Cerithiidae is one of the significant representatives with ecological structure and organism assemblage. At Mangrol coast abundance, density and frequency of population of family Cerithiidae fluctuated as seasonal changes. Even though mobility of the faunal component influence the distribution pattern the movement of the family Cerithiidae is less effective. Generally after monsoon and winter seasons, population increases while rest of season population shows decline. This leads to difference in the mean abundance, density and frequency.

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