

ORIGINAL ARTICLE

Seasonal Variation of Intertidal Mangrove area Crustaceans of Shirgaon, Ratnagiri, Maharashtra

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ABSTRACT

This study highlights the seasonal variation in crustaceans of intertidal mangrove area of Shirgaon, Ratnagiri, Maharashtra. All crustaceans sampling was carried out by stratified random sampling method during the lowest low tide of each month. A total of eleven macro-faunal species of crustaceans such as Metopograpsus messor, Uca annulipes, Uca marionis, Sesarma sp. I, Sesarma sp. II, Thalamitta crenata, Myomenippe hardwickii, Etisus laevimanus, Balanus amphitrite, Alpheus sp. and Pagurus sp. were recorded. The abundance of crustaceans during pre-monsoon (3.6017 no m⁻²), monsoon (2.7359 no m⁻²) and post-monsoon (3.8961 no m⁻²) was recorded among which B. amphitrite and M. messor were recorded consistently in all seasons while Sesarma sp. I, U. annulipes, T. crenata and Alpheus sp. were recorded sporadically during all the three season. The U. annulipes and Pagurus sp. were recorded only during the monsoon season. The Sesarma sp. II was recorded only during the monsoon while the crab E. laevimanus and M. hardwickii were recorded during the late pre-monsoon season. Monthly variation in-situ parameter such as atmospheric temperature, intertidal water temperature, sediment temperature, dissolved oxygen of intertidal water, intertidal water pH, sediment pH and intertidal water salinity were recorded during the study period.

Key words: Mangrove area, Crustaceans, Intertidal, Diversity, Transect, Quadrate.

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INTRODUCTION

Mangroves are unique inter-tidal ecosystem of tropics and sub-tropics which support genetically diverse groups of aquatic and terrestrial organisms. The mangrove ecosystem has great ecological and economic significance in coastal protection, enrichment of water quality and in production of fishery resources. The mangroves exist under very hostile and inhospitable conditions and can tolerate higher salinity, tidal extremes, high wind velocity, high temperature and muddy anaerobic soil [1]. Seasonal variations in environmental parameter have direct impact on the qualitative and quantitative distribution of benthic crustaceans of intertidal mangrove area. Crustaceans in mangrove area are valuable due to their immense ecological significance. The feeding activities of detritivore crustaceans help in the degradation of organic matter, especially mangrove litters and decaying woods. They also influence the functioning of mangrove ecosystems as burrowers since their repeated burrowing and reburrowing activities enhance the soil aeration, mixing of different soil profiles, nutrient cycling, maintaining of fluidity etc [2]. The qualitative and quantitative information on the bivalve abundance of the mangrove area of Shirgaon is scanty. The main objective of present study is to investigate the seasonal variation in species composition and abundance of crustaceans in the intertidal mangrove area of Shirgaon, Ratnagiri, Maharashtra.

MATERIALS AND METHODS

Ratnagiri is a coastal district of Maharashtra state along the west coast of India. Shirgaon mangrove area (Lat. 17°01'50.29"N, Long.73°17'03.09" E) is of nearly about two kilometer stretch and is located along Shirgaon estuary at the western side of Ratnagiri. All samples were collected during the lowest low tide of each month when maximum intertidal exposure prevailed. Sampling was carried out using stratified random sampling method by fixing transects from lowest low tide to highest high tide mark perpendicular to the shoreline. Total of seven transect lines were fixed for the sampling so as to cover whole area intertidal region of the exposed mangrove habitat. In each transect, three quadrates, each with 0.0625 m² area were selected with a distance of seven meters between two successive quadrates and

sediment samples up to a depth of 0.1 m were collected and removed from sampling grid with the help of spade and collected in the sampling bags [3]. After sieving the sediment samples through 1 mm size sieve, the macro-faunal samples (> 1mm) were preserved in five per-cent formalin solution for further identification. All the macro-faunal crustaceans were studied quantitatively and qualitatively to record their monthly and seasonal variation. Sample were collected during the period from February 2012 to January 2103.

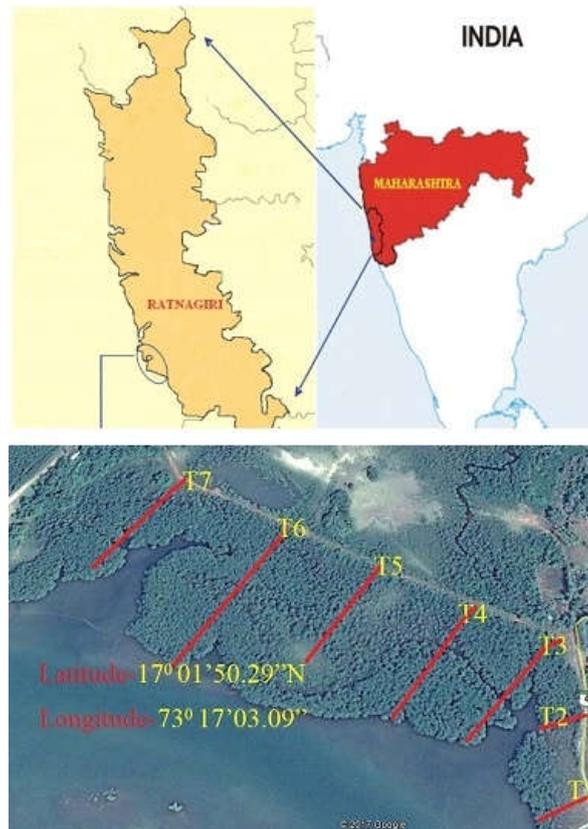


Fig. 1. Sampling site

RESULT AND DISCUSSION

Occurrence and abundance of crustaceans

During the field observation of twelve month period, a total of eleven macro-faunal species of crustaceans, such *Metopograpsus messor*, *Uca annulipes*, *Uca marionis*, *Sesarma sp. I*, *Sesarma sp. II*, *Thalamitta crenata*, *Myomenippe hardwickii*, *Etisus laevimanus*, *Balanus amphitrite*, *Alpheus sp.* and *Pagurus sp.* were recorded. A total density of crustaceans during pre-monsoon (3.6017 no m²), monsoon (2.7359 no m²) and post-monsoon (3.8961 no m²) was recorded among which barnacle, *B. amphitrite* was abundantly recorded in all the months and found at low tide mark along mangrove habitat. The maximum density of *B. amphitrite* was recorded during the post-monsoon season (37.3333 nom²) while it was found to be minimum during monsoon season (21.1428 nom²).



Fig. 2. *Metopograpsus messor*



Fig. 3. *Uca annulipes*



Fig. 4. *Uca marionis*



Fig. 5. *Sesarma sp. I* (UF)

Fig. 6. *Sesarma sp. II* (UF)

Fig. 7. *Thalamitta crenata*



Fig. 8. *Myomennipe hardwickii*

Fig. 9. *Etisus laevimanus*

Fig. 10. *Balanus amphitrite*



Fig. 11. *Alpheus sp.*

Fig. 12. *Pagurus sp.*

Similarly dominant abundance of the barnacle, *Balanus sp.* was observed in the intertidal mangrove habitat of Goa [4] and Mahul creek of Mumbai [5]. The crab, *M. messor* was also abundant throughout the study period and found in high tide level along the mangrove swamps. The maximum abundance of *M. messor* was recorded during April (13.7142 no m²) while it was minimum during November (2.2857 no m²). *M. messor* also dominantly abundant and found in high tide level along the mangrove swamps of Cochin [6] and southeast coast of India [7]. During the present study, *U. annulipes* was sporadically distributed throughout the study period, while the *U. marionis* was recorded only during monsoon season. The maximum abundance of *U. annulipes* was recorded during the monsoon season (1.5238 no m²) while it was minimum during the post-monsoon (0.7619 no m²). The maximum abundance of *U. marionis* was recorded during the June (2.2857 no m²) while it was found to be minimum during September (1.5238 no m²). Fiddler crabs are unique features of mangrove area. Similarly dominant abundance of crab, *U. annulipes* was observed in the intertidal mangrove area of Cochin [6], Versova [8], and Uran, Navi Mumbai [9]. During the present study the genus, *Sesarma sp.* was shown to have discontinuous distribution. The *Sesarma sp. I* was observed during February to July and then in November while *Sesarma sp. II* was recorded only once in July. The maximum abundance of *Sesarma sp. I* was recorded during the pre-monsoon season (3.4285 no m²) while it was minimum during post-monsoon season (0.1904 no m²). *Sesarma sp.* also dominantly abundant along mangroves of Pichavaram [10] and Mahul creek, Mumbai [5]. Sondarpandian observed *T. crenata* in Pichavaram mangroves [11] while Bandekar rarely observed *T. crenata* along Karwar mangrove environment [12]. During the present investigation, *T. crenata* was sporadically distributed throughout the season with maximum density was recorded in post-monsoon (0.7619 no m²) and minimum in pre-monsoon (0.1904 no m²). In the present investigation, the hermit crab, *Pagurus sp.* were recorded only once in the month of July (0.7619 no m²) while the *Alpheus sp.* recorded in all three seasons at low tide water mark. Nandi and Choudhuri recorded *Alpheus sp.* along Sundarban mangrove environment [13]. Sunilkumar recorded *Alpheus sp.* during the pre-monsoon season at mangrove swamps of Cochin area [6].

Diversity indices

Diversity indices were used to know the macro-faunal richness and species diversity of that area. According to Bakus (2007), the Shannon Wiener index varied from 0 (no diversity) to 5 (maximum diversity). The Simpson index varied from 0 (no diversity) to 1 (maximum diversity). The Evenness index varied from 0 (no evenness) to 1 (greatest evenness) and Dominance index varied from 0 to 1 (greatest dominance) [14]. During the present investigation, the diversity indices like Shannon Wiener index varied from minimum (0.7429) during the post-monsoon period and maximum (1.379) during the pre-monsoon

period. The Simpson index (S) was maximum (0.5166) during the pre-monsoon period and minimum (0.2573) during the post-monsoon period.

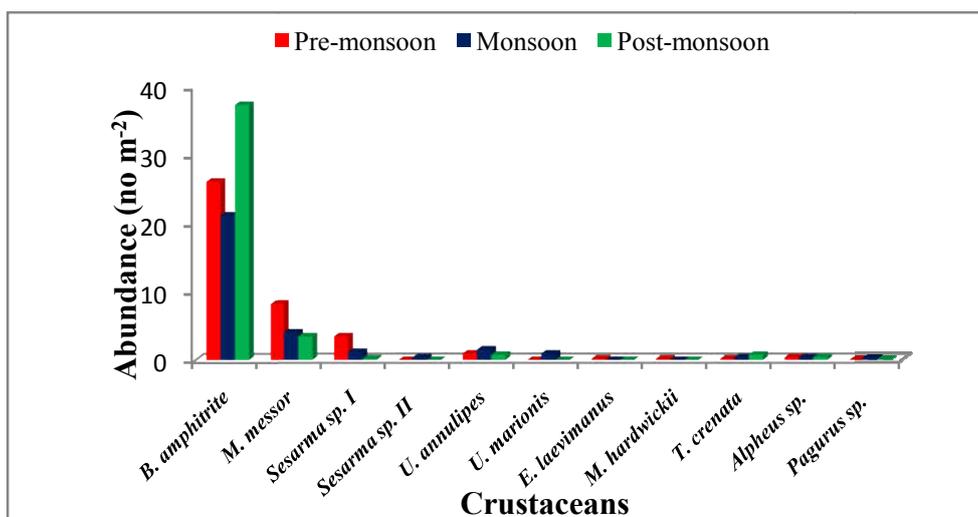


Figure. 13. Season-wise distribution of crustacean (nom⁻²) along Shirgaon mangrove area.

The evenness index recorded maximum during the pre-monsoon period (0.6444) and minimum during the post-monsoon period (0.4036). The dominance index was maximum during the post-monsoon period (0.5963) and the minimum during the pre-monsoon period (0.3561). The changes in diversity indices may be due to the dynamic fluctuation in the environmental parameters and seasonal spawning of invertebrates. The present study therefore revealed that the crustacean macro-fauna in Shirgaon mangrove area, moderately diversified with moderately high evenness exist.

Table 1. Season-wise biodiversity indices for the crustaceans of mangrove area of Shirgaon

Indices	Pre-monsoon	Monsoon	Post-monsoon
<i>H'</i> (Shannon index)	1.379	1.36065	0.7429
<i>S</i> (Simpson index)	0.5166	0.4753	0.2573
<i>J'</i> (Evenness index)	0.6444	0.6225	0.4036
<i>D</i> (Dominance index)	0.3561	0.3775	0.5963

Environmental parameter

Season wise variation in environmental parameters: during pre-monsoon (February-May), monsoon (June-September) and post-monsoon (October-January) was recorded. Atmospheric temperature value were recorded maximum (30.13 °C) during pre-monsoon season and minimum (27. °C) during monsoon period. The maximum water temperature was recorded in the month of March (30°C) and the minimum in the month of July (24°C). During the pre-monsoon period maximum (29.25 °C) sediment temperature was found while minimum (26.75 °C) during the monsoon period. The maximum value of dissolved oxygen was recorded during the monsoon season (4.3mg^l⁻¹) and minimum (3.2 mg^l⁻¹) during the pre-monsoon period. The maximum and minimum salinity values of water were recorded during the pre-monsoon (33.38 psu) and the monsoon (29.25psu) seasons respectively. The maximum and minimum values of intertidal water pH was recorded during the post-monsoon (7.95) period and in the monsoon period (7.45) respectively. During the pre-monsoon period, pH of sediment ranged between 7.5 and 8.3 whereas in the monsoon period, it ranged between 6.8 and 8.1. While studying the ecology of Shirgaon mangroves it was observed that the maximum organic carbon in the month of November (2.52 %) and the minimum in the month of August (1.47 %) and also the Organic carbon was positive correlated with abundance of crustacean (r = 0.698, p < 0.05). This may be attributed due to the crustaceans feed on the organic detritus. The correlation analysis of the parameters like atmospheric, intertidal water and intertidal sediment temperatures and intertidal water salinity did not show any significant correlation with mangrove crustaceans, which suggest that all these mangrove crustaceans are well adapted to seasonal fluctuation in environmental conditions.

Table 2. Correlation coefficient among environmental parameters and crustaceans of mangrove area of Shirgaon

	Atm temp °C	Water temp °C	Sediment temp °C	DO of Water (mg l ⁻¹)	pH of water	pH of sediment	Salinity (psu)	Organic carbon (%)	Crustaceans (no/m ²)
Atm temp °C	1								
Water temp °C	.982**	1							
Sediment temp °C	.965**	.955**	1						
DO of Water (mg l ⁻¹)	-.392	-.408	-.331	1					
pH of water	.431	.476	.339	-.737**	1				
pH of sediment	.324	.311	.138	-.270	.617*	1			
Salinity (psu)	.548	.563	.563	-.657*	.714**	.321	1		
Organic carbon (%)	.156	.182	.112	-.216	.148	.108	.256	1	
Crustaceans (no/m ²)	-.003	.005	-.059	-.175	.358	.279	.452	.698*	1

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