UTTAR PRADESH JOURNAL OF ZOOLOGY

42(2): 72-82, 2021
ISSN: 0256-971X (P)

DIVERSITY, DISTRIBUTION AND ABUNDANCE OF ESTUARINE SHRIMPS AND CRABS IN KADALUNDI, KERALA, SOUTH INDIA

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AUTHOR'S CONTRIBUTION

The sole author designed, analysed, interpreted and prepared the manuscript.

Article Information

Editor(s):
(1) Rakpong Petkam, Khon Kaen University, Thailand.
Reviewers:
(1) Devi Valeriani,SE., Universitas Bangka Belitung, Indonesia.
(2) Prosenjit Pramanick, Techno India University, India.

Received: 12 December 2020
Accepted: 17 February 2021
Published: 01 March 2021

Short Research Article

ABSTRACT

Diversity, distribution and abundance of estuarine shrimps and cabs in Kadalundi, Kerala were studied from July, 2016 to June 2017. The atmospheric temperature and water temperature reported high during summer and minimum during winter. Water is less acidic during summer and nearly neutral during rainy season. The level of dissolved O_2 was less during monsoon season and slightly high during winter. The dissolved CO_2 was reported high in rainy season and minimum in summer season. The level of salinity was reported high during summer season and little less during monsoon season. 6 species belonging to 2 families were studied from the 3 selected stations. The families are Penaeidae and Portunidae, each family contribute 3 species. *Fenneropenaeus indicus, Macrobrachium rosenbergii* and *Penaeus monodon fabricis* was reported from Penaeidae. *Portunus reticulates Scylla olivacea and Scylla tranquebarica* was reported from Portunidae.

Keywords: Physico-chemical parameters; arthropods; species richness; species evenness; shannon-wiener index; Kadalundi river.

1. INTRODUCTION

The rivers and estuaries are generally considered as one of the most productive aquatic systems and the nutrient supply from fresh water inputs is important in sustaining their high rates of primary production. Biodiversity is most essential for stabilization of all ecosystems, protection of overall environmental quality for understanding intrinsic worth of all species live on the earth. [1]. The diversity, distribution, and conservation of South America's freshwater crab and shrimp fauna; the crayfish (Parastacidae) and anomuran freshwater crabs (Aeglidae) are treated elsewhere in this volume [2]. India plays one of the world's mega ichthyofaunal biodiversity and stand in the ninth position in terms of freshwater mega biodiversity [3]. Among Arthropoda, crustaea constitute a major class. The crustacean fisheries could be grouped under prawns, lobsters and crabs. The prawns are the most important accounting for

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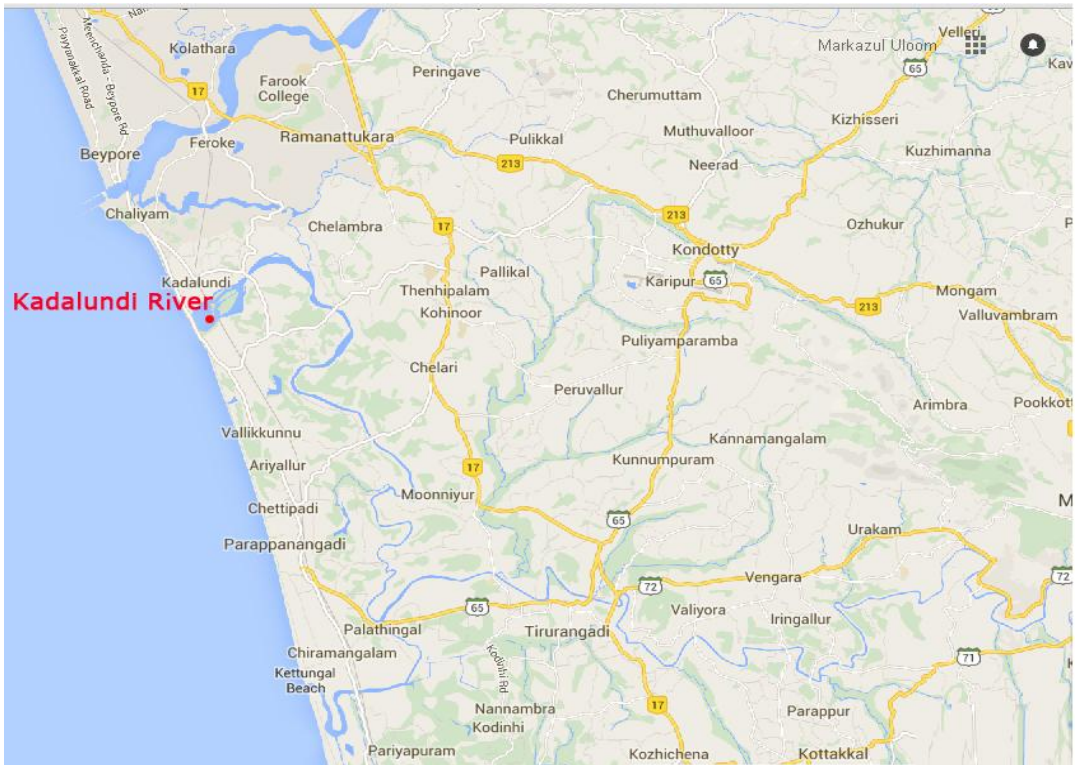

Fig. 1. Route map of Kadalundi River

about 98% of the marine crustaceans landed. Freshwater ecosystem are still pristine and well preserved, many decapod species are increasingly impacted by different anthropogenic threats [4]. The giant freshwater prawn *Macrobrachium rosenbergii* is also caught in good quantities from the different backwaters of Kerala. Trawl nets and boat seines are the main gear employed in the fishing from sea. The stake nets, fixed dip nets and cast nets are used in the backwaters [5]. Kerala has large inland water resources and this accommodates a good assemblage of crustaceans (prawns, shrimps, crabs and crustacean zooplanktons). Shrimps and Prawns are predominating among them [6]. Crabs are generally trapped in 'dip nets' using baits. In shallow waters and creek, 'seine nets' are employed. Hooked iron rod is also used for extracting the crabs from crevices [5].

2. MATERIALS AND METHODS

The areas selected for the study were three different stations of Kadalundi river estuary, borderline of Malappuram and Kozhikkode district of Kerala. The stations are Heros Nagar (Station-A), Palakkal (Station-B) and Keezhayil (Station-C). It is located on the Western side of the Northern Kerala, in Kozhikode and Malappuram districts on the river mouth of Kadalundipuzha spreading in the estuary. Kadalundi river situated in Eastern side of Malappuram district and flowing westward nearly 130 Kms. It extends in Kadalundi of Kozhikode Taluk of Kozhikode District and Vallikunnu of Thirurangadi Taluk of Malappuram District. Temperature was measured by using thermometer; pH was measured by digital pH pen. The dissolved oxygen was estimated by Winkler's method. Dissolved carbon dioxide and salinity was estimated by titration method. Prawns are collected by net as well as purchased from fishermen and were cleaned and arranged out species, then 31 placedthem into 4-10% formalin; preserved species were identifying by standard keys provided [7]. For crab collection the drop lining method was used with the help of fisherman. The size of net is varied to 1.5 inches or larger. For crab collections tie a piece of bait (chicken waste) securely at the end of the net. Drop of bait in to the water holding securely onto stick. Wait for the tug of the crab eating chicken waste. Heavy rain also helps in the collecting of some deep-burrowing crabs [8].

3. RESULTS AND DISCUSSION

The atmospheric temperature and water temperature vary in summer and winter season in three stations. The atmospheric temperature and water temperature reported high during summer and minimum during winter. Water is less acidic during summer and nearly neutral during rainy season. The level of dissolved O_2 was less during monsoon season and slightly high

during winter. The dissolved CO_2 was reported high in rainy season and minimum in summer season. The level of salinity was reported high during summer season and little less during monsoon season. The Sub-lethal concentrations of pollutants do not produce immediate consequences for the populations, but do affect growth, metabolism and reproduction [9]. The physicochemical parameters are not showing much variation in three stations, so the mean value graph of three stations kept in the result. 6 species belonging to 2 families were studied from the 3 selected stations. The families are Penaeidae and Portunidae, each family contribute 3 species. *Fenneropenaeus indicus, Macrobrachium rosenbergii* and *Penaeus monodon fabricis* was reported from Penaeidae. *Portunus reticulates, Scylla olivacea and Scylla tranquebarica* was reported from Portunidae. Among Penaeidae, Macrobrachium rosenbergii was reported maximum in 3 stations. Similar finding was also reported by [10]. Kerala has strong estuarine water resources and this accommodates a good assemblage of crustaceans (prawns, shrimps, crabs and crustacean zooplanktons) and Shrimps and Prawns are predominating among them [10]. The study, "Information Utilisation and Extension Needs Assessment in Shrimp Farming in Tamil Nadu, [11], was conducted, with the objective of examining the socio- personal profile of shrimp farmers in coastal districts of Tamil Nadu and its influence on the diffusion and adoption of technology at farm level, and training. *Penaeus monodon fabricis* was reported minimum in station-A and *Fenneropenaeus indicus* was reported minimum in station-B and station-C. *Macrobrachium rosenbergii* was reported maximum in station-B (672) followed by station-C (669) and station-A (598). *Fenneropenaeus indicus* was reported maximum in station-A (164) followed by station-B (75) and station-C (4). *Penaeus monodon fabricis* was reported maximum in station-B (203) followed by station-C (189) and station-A (159). Among Portunidae, *Portunus reticulates* was reported maximum in station-A and Scylla *tranquebarica* was reported maximum in station-B and station-C. *Scylla olivacea* was 53 reported minimum in station-A and *Portunus reticulates* was reported minimum in station-B and station-C. *Portunus reticulates* was reported maximum in station-A (46) followed by station-B (6) and station-C (0). *Scylla olivacea* was reported only in station-A (20). *Scylla tranquebarica* was reported maximum in station-C (55) followed by station-B (40). *Scylla tranquebarica* was reported maximum in station-C (46) followed by station-B (28) and station-A (20). Total population density of station-A, B and C was 1001, 1005 and 930 respectively. The maximum number of species was reported in three stations in the month of September and minimum species was reported in March, this findings also almost similar with the findings of [12]. The maximum number of Species was reported in station-A (127) and minimum number of species was reported in station-A (43). The maximum number of species was reported in station-B (133) and minimum number of species was reported in station-B (47). The maximum number of species was reported in station-C (134) and minimum number of species was reported in station-C (41). Maximum species richness was reported in station-A (1.791) in the month of February. The minimum species richness was reported in station-A (0.693) in the months of July, August, September and October. The maximum species richness was reported in station-B (1.791) in the month February. The minimum species was reported in station-B (0.693) in the months of July, August, September, October, November and June. The maximum species richness was reported in station-C (1.386) in the months of February, April and May. The minimum species was reported in station-C (0.693) in the month of July, August, November and June. Maximum species evenness was reported in station-A (0.89) in the months of February and March. The minimum species evenness was reported in station-A (0.25) in the months of July and August. The maximum number of species evenness was reported in station-B (0.87) in the month of May. The minimum species evenness was reported in station-B (0.33) in the month of July. The maximum of species evenness was reported in station-C (0.82) in the months of February and March. The minimum species evenness was reported in station-C (0.14) in the month of August. Maximum Shannon-Wiener index was reported in station-A (1.59) in the month of February. The minimum Shannon-Wiener index was reported in station-A (0.17) in the months of July and August. The maximum Shannon-Wiener index was reported in station-B (1.41) in the month of February. The minimum Shannon-Wiener index was reported in station-B (0.23) in the month of July. The maximum Shannon-Wiener index was reported in station-C (1.14) in the month of February. The minimum Shannon-Wiener index was reported in station-C (0.10) in the month of August. Among arthropods, crustacean constitutes a major class. The crustacean fisheries could be grouped under prawns, lobsters and crabs. The prawns are the most important accounting for about 98% of the estuarine crustaceans landed.

4. IMPLICATIONS

My results highlight that variety of Shrimps and crabs present in estuarine area of Kadalundi. Most species found associated to the mangrove forest. Therefore, prioritizing the conservation and management of mangrove ecosystem and associated area with higher diversity and abundances of fish will benefit a larger number of native species.

Monthly variations of Arthropods in different stations of Kadalundi River from July, 2016 to June 2017

Table 1. Station-A

Arthropods	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	Jun.	Total	Abundance
PENAEIDAE														
Fenneropenaeus indicus	0	0	0	0	0	32	26	18	14	24	38	12	164	16.383
Macrobrachium rosenbergii	52	92	121	102	84	51	34	14	0	0	0	48	598	59.740
Penaeus monodon fabricis	0	4	6	10	16	12	13	18	16	24	32	8	159	15.884
PORTUNIDAE														
Portunus reticulates	0	0	0	0	4	8	14	11	6	3	0	0	46	4.595
Scylla olivacea	0	0	0	0	0	0	0	2	3	5	4	0	14	1.398
Scylla tranquebarica	2	0	0	0	0	2	2	3	4	5	2	0	20	1.998
Total Population Density	54	96	127	112	104	105	89	66	43	61	76	68	1001	

Table 2. Station-B

Arthropods	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	Jun.	Total	Abundance
PENAEIDAE														
Fenneropenaeus indicus	0	0	0	0	0	10	13	11	12	14	15	0	75	7.462
Macrobrachium rosenbergii	64	96	122	106	93	64	42	31	0	0	0	54	672	66.865
Penaeus monodon fabricis	4	8	11	12	14	18	20	21	23	36	22	14	203	20.199
PORTUNIDAE														
Portunus reticulates	0	0	0	0	0	0	0	2	2	2	0	0	6	0.597
Scylla olivacea	0	0	0	0	0	0	0	2	4	8	7	0	21	2.089
Scylla tranquebarica	0	0	0	0	0	2	3	5	6	8	4	0	28	2.786
Total Population Density	68	104	133	118	107	94	78	72	47	68	48	68	1005	

Table 3. Station-C

Arthropods	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	Jun.	Total	Abundance
PENAEIDAE														
Fenneropenaeus indicus	0	0	0	0	0	0	0	0	0	2	2	0	4	0.430
Macrobrachium rosenbergii	64	98	128	112	93	62	36	20	0	0	0	56	669	71.935
Penaeus monodon fabricis	0	2	3	12	18	20	22	20	26	38	28	0	189	20.322
PORTUNIDAE														
Portunus reticulates	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Scylla olivacea	0	0	0	0	0	0	0	2	6	8	6	0	22	2.365
Scylla tranquebarica	2	0	3	2	0	3	5	6	9	8	6	2	46	4.946
Total Population Density	66	100	134	126	111	85	63	48	41	56	42	58	930	

Monthly variations of Shannon and Wiener diversity index of Arthropods in different stations of Kadalundi River from July, 2016 to June 2017

Table 4. Station-A

Months	Species Richness (H_{max})	Species Evenness (E)	Shannon-Wiener Index (H^1)
Jul.	0.693	0.25	0.17
Aug.	0.693	0.25	0.17
Sep.	0.693	0.29	0.20
Oct.	0.693	0.43	0.30
Nov.	1.098	0.53	0.58
Dec.	1.609	0.76	1.23
Jan.	1.609	0.86	1.38
Feb.	1.791	0.89	1.59
Mar.	1.609	0.89	1.43
Apr.	1.609	0.80	1.29
May	1.386	0.70	0.97
Jun.	1.098	0.73	0.80

Table 5. Station-B

Months	Species Richness (H_{max})	Species Evenness (E)	Shannon-Wiener Index (H^I)
Jul.	0.693	0.33	0.23
Aug.	0.693	0.39	0.27
Sep.	0.693	0.39	0.27
Oct.	0.693	0.48	0.33
Nov.	0.693	0.56	0.39
Dec.	1.386	0.66	0.91
Jan.	1.386	0.80	1.11
Feb.	1.791	0.79	1.41
Mar.	1.609	0.82	1.32
Apr.	1.609	0.79	1.27
May	1.386	0.87	1.20
Jun.	0.693	0.75	0.52

Table 6. Station-C

Months	Species Richness (H_{max})	Species Evenness (E)	Shannon-Wiener Index (H^I)
Jul.	0.693	0.20	0.14
Aug.	0.693	0.14	0.10
Sep.	1.098	0.18	0.20
Oct.	1.098	0.38	0.42
Nov.	0.693	0.62	0.43
Dec.	1.098	0.64	0.70
Jan.	1.098	0.81	0.89
Feb.	1.386	0.82	1.14
Mar.	1.098	0.82	0.90
Apr.	1.386	0.69	0.96
May	1.386	0.70	0.98
Jun.	0.693	0.20	0.14

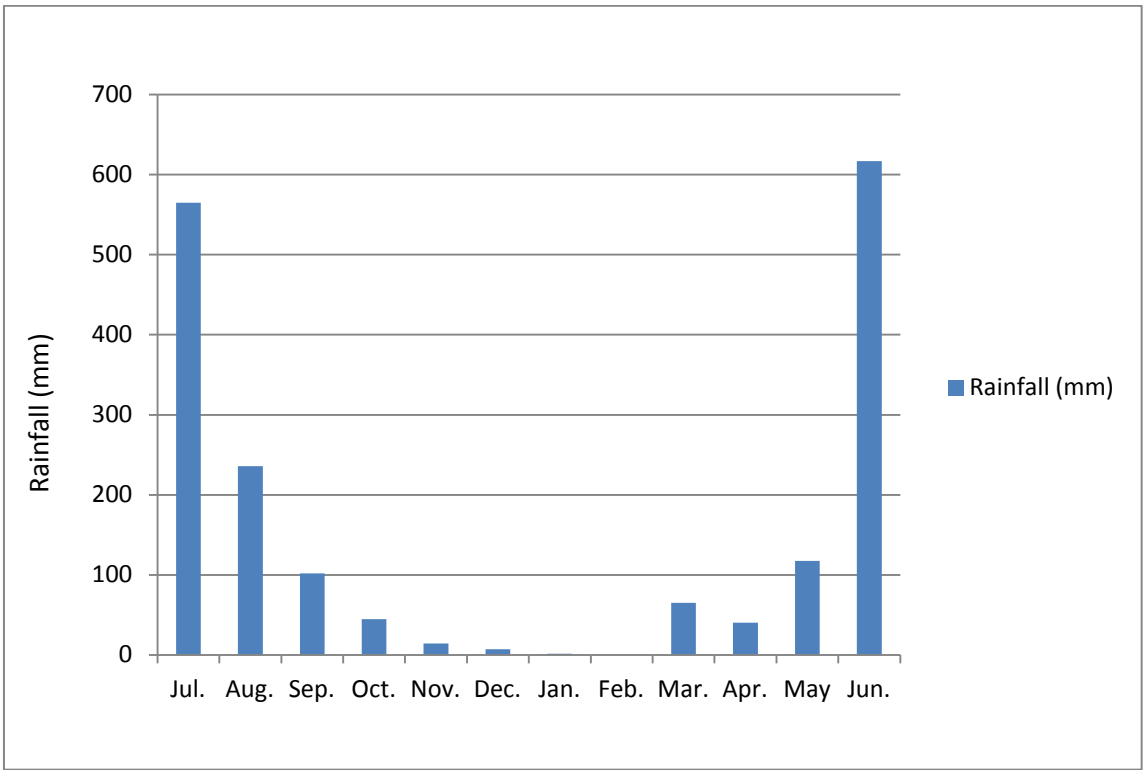

Fig. 2. Average rainfall recorded during 2016-17 in the study area

Monthly variations of atmospheric temperature (^{O}C) in different stations of Kadalundi River from July, 2016 to June, 2017

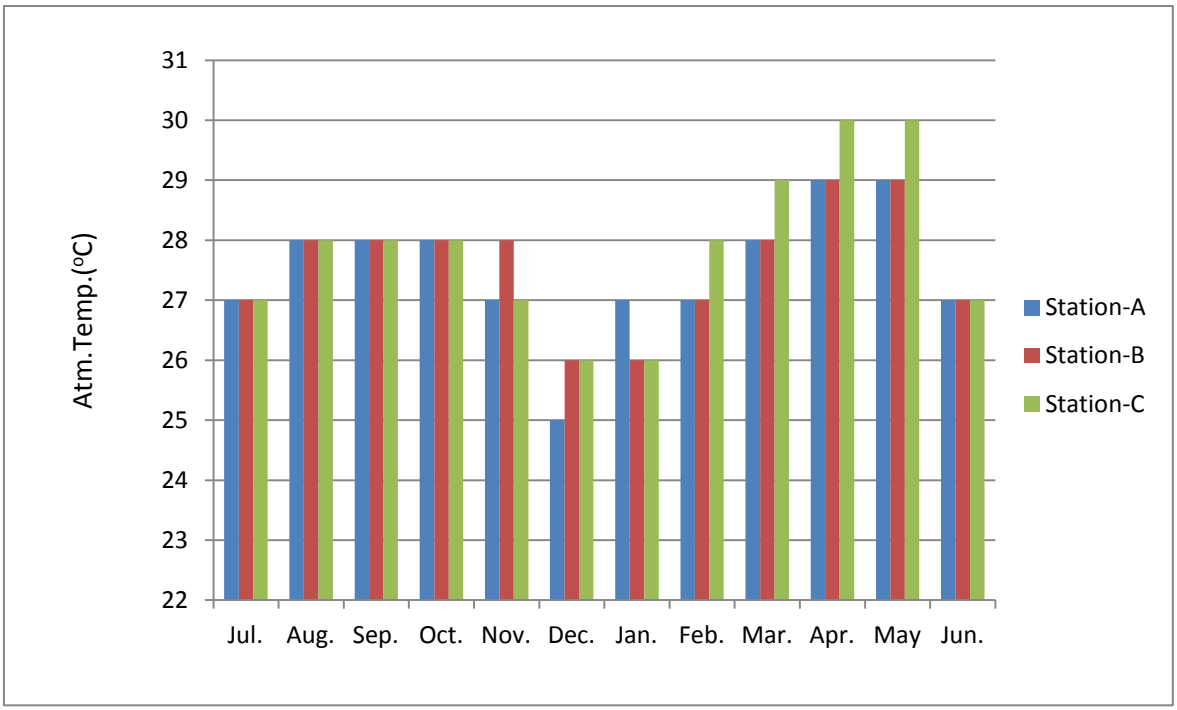

Fig. 3 Atmospheric temperature (^{O}C)

Monthly variations of water temperature (^{O}C) in different stations of Kadalundi River from July, 2016 to June, 2017

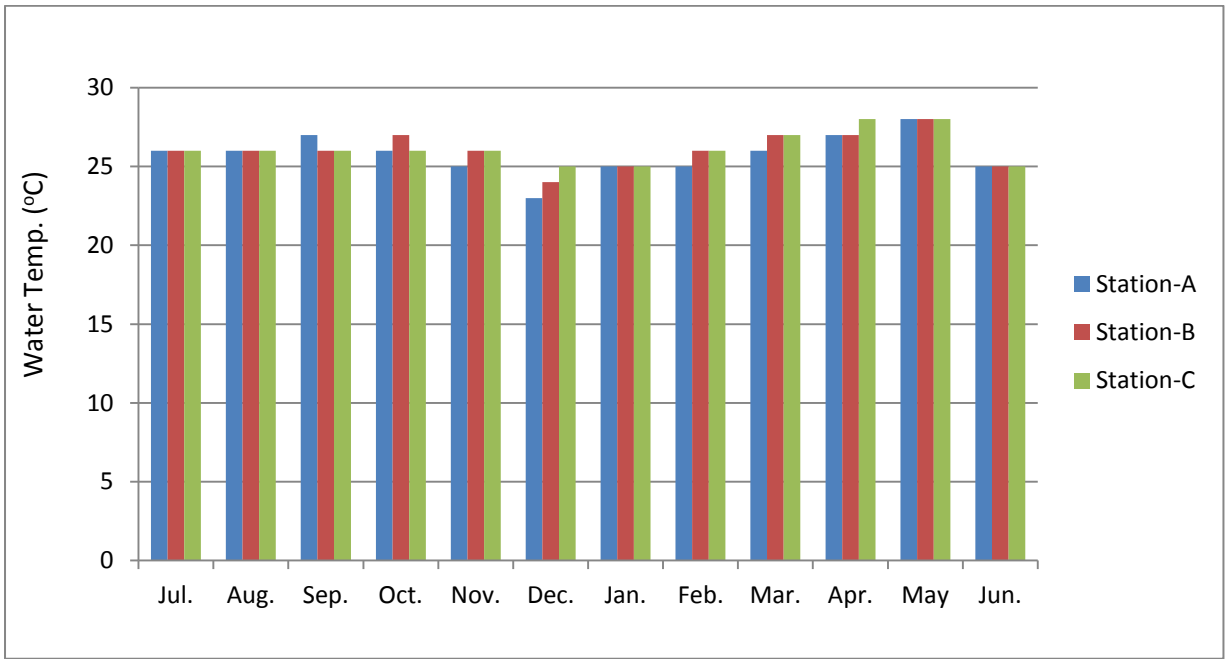

Fig. 4. Water temperature (^{O}C)

Monthly variations of pH in different stations of Kadalundi River from July, 2016 to June, 2017

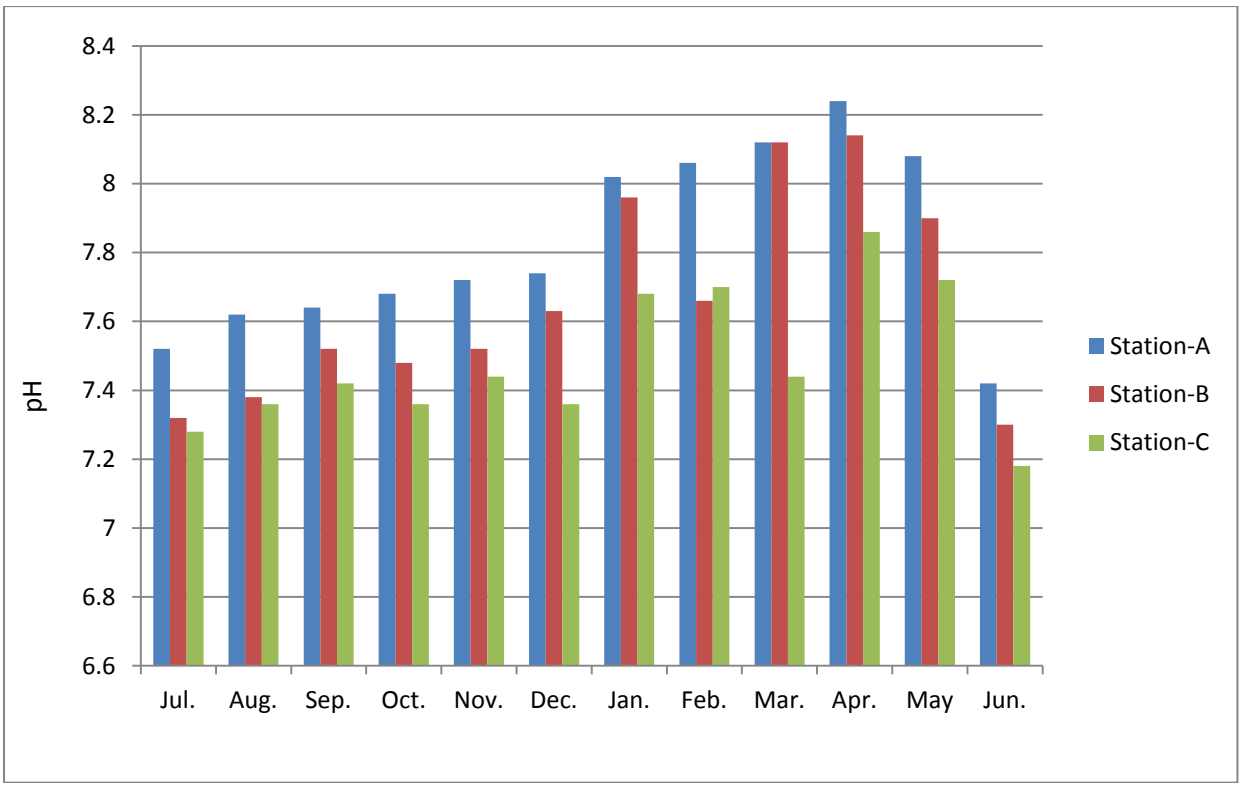

Fig. 5 pH

Monthly variations of Dissolved oxygen (mg/l) in different stations of Kadalundi River from July, 2016 to June, 2017

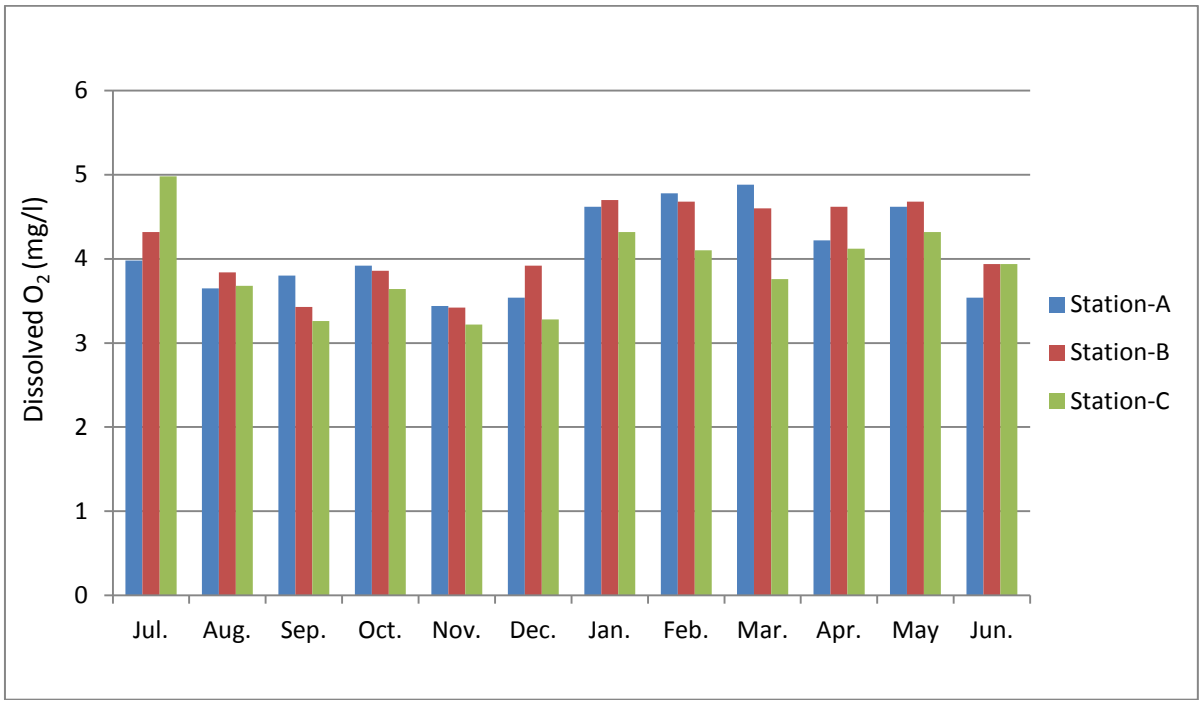

Fig. 6. Dissolved oxygen (mg/l)

Monthly variations of Dissolved CO_2 (mg/l) in different stations of Kadalundi River from July, 2016 to June, 2017

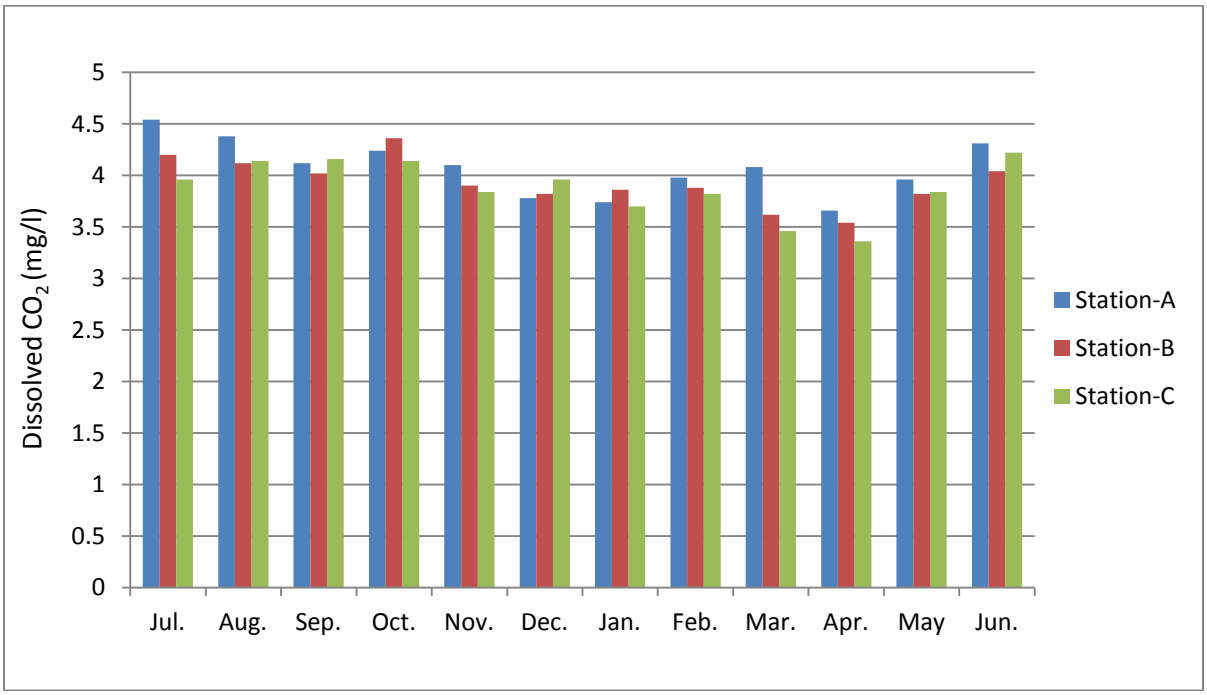

Fig. 7. Dissolved CO_2 (mg/l)

Monthly variations of Salinity (ppt) in different stations of Kadalundi River from July, 2016 to June, 2017

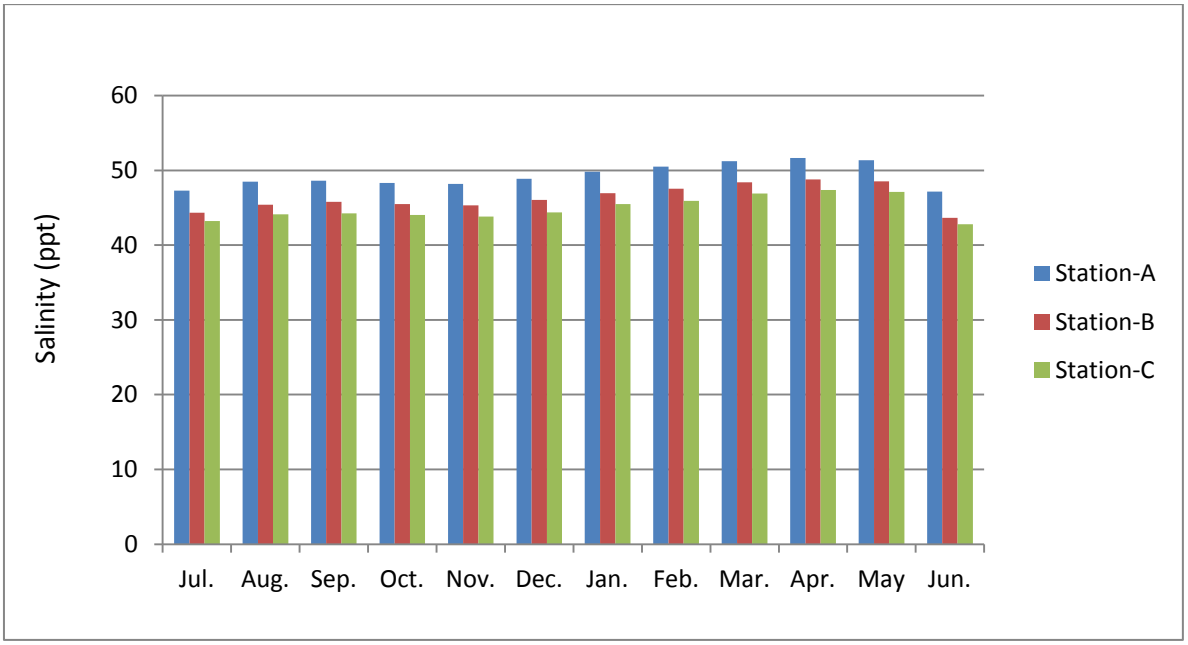

Fig. 8. Salinity (ppt)

Fenneropenaeus indicus ***Macrobrachium rosenbergii***

Penaeus monodon fabricis ***Portunus reticulates***

Scylla olivacea ***Scylla tranquebarica***

Fig. 9. Aquatic Arthropods of Kadalundi-Vallikkunnu Community Reserve

4. CONCLUSION

The atmospheric temperature and water temperature vary in summer and winter season. The atmospheric temperature and water temperature showed high during summer and minimum during winter. Water is more alkaline during summer and nearly neutral during rainy season. The level of dissolved oxygen was less during monsoon season and slightly high during winter. The dissolved carbon dioxide was found to be maximum in rainy season and minimum in summer season. The level of salinity was reported high during summer season and little less during monsoon season. The salinity level decreased during monsoon is due to the mixing of river water with rain water. The maximum arthropod was reported in summer season and minimum reported in monsoon season.

COMPETING INTERESTS

Author has declared that no competing interests exist.

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