Pakistan J. Zool., vol. 58(5), pp 2137-2145, 2026 DOI: https://dx.doi.org/10.17582/journal.pjz/20240622140045

Macrobenthic Polychaetes Community Structure and Diversity in Tidal Mudflats of Korangi Creek, Karachi

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ABSTRACT

This study focuses on the structure of the polychaete community inhabiting tidal mudflats in Korangi Creek, Karachi. We collected polychaetes over a year, from January to December 2017, and found 2,797 individuals from 12 families and 14 taxa. Of these, the eight most abundant species were *Polydora ciliata*, *Capitella giardi*, *Diopatra neapolitana*, *Ceratonereis marmorata*, *Sigambra* sp., *Glycera alba*, *Levinsenia* sp., and *Tylonereis bogoyawlenskyi*, which together accounted for 90.85% of the total polychaete population. Notably, *Sigambra* sp. and *Levinsenia* sp. were identified as new findings in Pakistan. The polychaete population was found to be lowest (556 individuals) during the southwest monsoon (SWM) and highest (863 individuals) during the northeast monsoon (NEM). Hierarchical cluster analysis revealed that the SWM polychaete assemblage formed a distinct group with 64.77% similarity. Furthermore, the pre-monsoon (PRM) period exhibited higher diversity (H′ = 2.33), species richness (M = 1.88), and evenness (J = 0.91) compared to the SWM season, which had lower values (H′ = 1.71, M = 1.58, J =0.71). The study also found that significantly more individuals (F = 10.001, p = 0.0003) were in the low-intertidal zone than in the mid and high zones. The K-dominance curves showed that the post-monsoon (PTM) and PRM seasons had higher diversity and evenness than the SWM and NEM seasons. Polychaetes' low density and diversity during the SWM season can be attributed to the rough seas and heavy rainfall during the summer monsoon. Overall, this study's findings provide valuable insights into the structure and diversity of the polychaete community in tidal mudflats, which can be used for further research and conservation efforts.

Article Information
Received 22 June 2024
Revised 25 October 2025
Accepted 08 November 2025
Available online 13 April 2026 (early access)
Published 30 July 2026

Authors' Contribution
FI: Conceptualization, collection, sorting, writing the initial draft. SK: Supervision. JM: Software, reviewing, and editing.

Key words
Polychaetes, Diversity, Distribution, Abundance, Karachi

INTRODUCTION

Polychaete worms are a highly diverse and ecologically significant macrobenthic organism group commonly found in intertidal zones. These organisms are crucial in nutrient recycling, sediment oxygenation, and energy transfer facilitation within the marine food web. While primarily sedentary, residing in sediments or attaching to hard substrates, their larvae can be transported long-distance. This, in combination with their effective environmental condition indicator capabilities, renders them a valuable group for ecological research (Giangrande *et al*., 2005; Samikkannu *et al*., 2018). Specific polychaete species have also demonstrated resilience in polluted habitats contaminated with oil, municipal, and industrial wastes, serving as important pollution indicators. The research conducted by Martin and Barros (2022), Levin (2000), Sivada *et al*. (2010), Mendez *et al*. (1998), and Dean (2008) provide valuable insights into the ecological significance of polychaete worms.

Numerous studies have been carried out on polychaetes in Pakistan, primarily focusing on taxonomic classification. Mustaquim (1997) compiled a checklist of 109 species, while Kazmi and Naushaba (2013) listed 159 polychaete species in their later checklist. Subsequently, several authors (Arshad *et al*., 2019; Khan *et al*., 2019; Moazzam and Moazzam, 2019; Aslam *et al*., 2020; Khatoon *et al*., 2020, 2022; Ali *et al*., 2023) have described an additional 13 species from Pakistani waters, bringing the total number of known species to 172.

Few attempts have been made to describe the polychaete assemblages in Pakistan's coastal waters. Arshad *et al*. (2019) described the seasonal distribution of polychaetes from two sandy beaches, Hawksbay and Sandspit, in Karachi. They found the highest abundance of polychaetes during the NE monsoon season. Another

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0030-9923/2026/0005-2137 $ 9.00/0

study by Uzair *et al*. (2022) focused on the effects of the summer monsoon on polychaete assemblages in three mangrove swamps, Sandspit, Port Qasim, and Ketibunder, in the Karachi area. They observed a reduced abundance of polychaetes in the summer monsoon season, which they attributed to heavy rainfall, resulting in reduced salinity. Korangi Creek is a tidal creek that forms a part of the mangrove ecosystem of the northernmost Indus Delta. It is situated on the Eastern and Western sides of the Korangi Fish Harbour and has a salinity level as high as the open sea. The creek houses moderate to thick mangrove forests primarily composed of a single species, *Avicenna marina* (Forssk). Korangi Creek receives domestic sewage from the fishing villages and industrial effluents from the Korangi Industrial Area (KIA), most of which is untreated. The Malir River, a seasonal river that passes through Karachi metropolitan city and drains into Korangi Creek, floods with water during the rainy season (July and August), emptying huge amounts of municipal and industrial wastes (Khan *et al*., 2019). Studies estimate that the Malir River discharges approximately 650 million litres per day of untreated wastewater into the sea (Khan *et al*., 2007; Tariq *et al*., 2016). The discharges from the nearby Landhi cattle colony, which houses several thousand buffalo, pollute the creek water (Meynell, 1995; Alamgir *et al*., 2018).

Our study aims to comprehensively understand the species composition, distribution, and diversity of macrobenthic polychaetes in this unique habitat. We aim to test the hypothesis that polychaetes in the tidal mudflats do not differ between low, mid, and high tide zones. Our research aims to contribute to the existing knowledge on intertidal zone ecology and biodiversity and ultimately aid in conserving this important ecosystem.

MATERIALS AND METHODS

Study site

The study site is located on the coast of Korangi Creek near the new Korangi Fish Harbour and salt works in Karachi, Pakistan, at coordinates 24°48'42" N; 67°12'11.5" E (Fig. 1). A semidiurnal tide with diurnal inequality characterizes the shore, and the average tidal range is about 2.3 m. The area is calm and protected from the strong currents and waves of the open sea, and the shore is gently sloping, exposing wide intertidal mudflats with some sandy patches during low tides. Grey mangroves are present near the low water mark. This area is often visited by shorebirds that feed on molluscs, worms, and other creatures, especially during low tides.

Sample collection

From January to December 2017, we gathered polychaetes during low tides using a quadrate (0.25 m^2) and excavating mud up to a depth of around 10 cm. We collected samples in triplicate from the high-, mid-, and low-intertidal zones. On-site, we sieved the collected sediment through a 1mm mesh and preserved the material retained on the sieve in 8% formalin. In the laboratory, under a stereomicroscope, we sorted out the polychaetes. We used Lactophenol to clear the worms and their parapodia if required, and sometimes, we used methylene blue and rose Bengal stains to differentiate the head appendages, especially in small-sized and pale worms.

Fig. 1. The map shows the location of the study site, which is represented by a red dot and is situated at Korangi Creek in Karachi.

Seawater's temperature, salinity, pH, and dissolved oxygen (DO) were recorded monthly during sample collection. Temperature was measured using a mercury thermometer, salinity with a hand-held refractometer (Atago, S-Mill-E), pH with a Hanna pH meter (H18424), and DO with a DO meter (H19146).

Statistical analysis

The data underwent univariate analysis using Margalef's index (M), Shannon-Weiner index (H′), and Pielou's index (J). Bivariate analysis was done using one-way ANOVA, multivariate analysis with hierarchical cluster (Bray-Curtis similarity), and graphical analysis with k-dominance using statistical software such as PRIMER, version 7, and PAST4.03.

RESULTS

Physical parameters

Seawater temperature ranged from 27.3 ± 1.5 to 29.7 ± 1.5 ^{0}C, averaging 28.4 ± 1.7, whereas salinity varied from 34.7 ± 0.6 to 37.3 ± 1.0 ‰, with an average of 36.5 ± 1.0 for the studied period. Dissolved oxygen (DO) and pH varied from 7.1 ± 0.3 to 8.9 ± 1.5 mg/L and 7.5 ± 0.3 to 7.9 ± 0.3, respectively. The average for the studied period was 7.9 ± 0.8 mg/L for DO and 7.8 ± 0.3 for pH (Table I).

Species composition

As many as 2,797 individuals from 12 families and 14 species were found during the study period (Table II). The eight most common and abundant species were *Polydora ciliata* (19.31%) in the family Spionidae, *Capitella giardi* (16.09%) in the family Capitellidae, *Diopatra neapolitana* (13.8%) in the family Onuphidae, *Ceratonereis marmorata* (12.73%) in the family Nereididae, *Sigambra* sp. (8.69%) in the family Pilargidae, *Glycera alba* (7.11%) in the family Glyceridae, *Levinsenia* sp. (6.97%) in the family Paraonidae, and *Tylonereis bogoyawlenskyi* (6.15%) in the family Nereididae, which together made up 90.85% of the total polychaetes encountered (Table III). The three least abundant species were *Branchiomma cingulatum* (0.18%) in the family Sabellidae, *Eulalia varidis* (0.25%) in the family Phyllodocidae, and *Schistomeringos japonica* (0.32%) in the family Dorvellidae. The presence of *B. cingulatum* and *E. viridis* seems accidental, as they are typically found in intertidal and subtidal rocks (Aziz, 1938; Ishaq and Mustaquim, 1996).

Table I. Seawater temperature (T °C), salinity (S ‰), dissolved oxygen (DO ppm), and pH recorded from Korangi Creek during different seasons in 2017.

Season	T	S	DO	pH
Pre-monsoon	28.3 ± 1.5	36.3 ± 0.6	7.2 ± 0.2	7.8 ± 0.1
SW monsoon	29.7 ± 1.5	34.7 ± 1.0	7.1 ± 0.3	7.5 ± 0.3
Post-monsoon	28.9 ± 0.6	37.3 ± 1.0	8.1 ± 0.5	7.9 ± 0.2
NE monsoon	27.3 ± 1.5	37.0 ± 1.7	8.9 ± 1.5	7.9 ± 0.3
Whole Year	28.4 ± 1.7	36.5 ± 1.0	7.9 ± 0.8	7.8 ± 0.3

Table II. List of polychaete species and their abundance (individuals/2.25 m^2, sum of nine samples) in Korangi Creek each month from January to December 2017.

Family	Species	Months, 2017												Total
		J	F	M	A	M	J	J	A	S	O	N	D	
Capitellidae	*Capitella giardi*	152	13	79	0	7	0	2	3	20	35	14	125	450
Cirratulidae	*Timarele anchylochaeta*	0	0	3	2	17	1	2	0	2	8	0	0	35
Dorvilleidae	*Schistomeringos japonica*	0	0	5	0	1	0	0	0	1	2	0	0	9
Glyceridae	*Glycera alba*	9	33	26	10	15	7	5	13	15	21	35	10	199
Nereididae	*Ceratonereis marmorata*	20	28	11	21	26	97	12	25	26	38	24	28	356
	Tylonereis bogoyawlenskyi	8	16	25	13	19	7	3	0	19	29	23	10	172
Onuphidae	*Diopatra neapolitana*	1	18	14	14	37	79	75	52	28	45	21	2	386
Paraonidae	*Allia alisdairi*	8	11	7	14	0	0	1	0	2	0	101	7	151
	Levinsenia* sp	22	12	11	18	4	20	0	4	40	22	15	27	195
Phyllodocidae	*Eulalia viridis*	0	2	0	0	0	0	0	0	0	0	5	0	7
Pilargidae	*Sigambra** sp.	6	10	16	0	36	46	18	38	43	8	15	7	243
Sabellidae	*Branchiomma cingulatum*	1	0	3	0	0	0	0	0	0	0	0	1	5
Spionidae	*Polydora ciliata*	108	69	70	27	14	17	5	10	10	57	55	98	540
Syllidae	*Syllis variegata*	0	1	8	0	21	14	0	0	0	4	1	0	49
	Total	335	213	278	119	197	288	123	145	206	269	309	315	2797

Table III. Seasonal abundance of polychaetes in Korangi Creek and cumulative percentage during different monsoon seasons: Pre-monsoon (PRM), southwest monsoon (SWM), post-monsoon (PTM), and northeast monsoon (NEM).

S. No.	Species	Seasons				Total	%	Cumulative %
		PRM	SWM	PTM	NEM			
1	*Polydora ciliata*	111	32	122	275	540	19.31	19.31
2	*Capitella giardi*	86	5	69	290	450	16.09	35.40
3	*Diopatra neapolitana*	65	206	94	21	386	13.80	49.20
4	*Ceratonereis marmorata*	58	134	88	76	356	12.73	61.92
5	*Sigambra** sp.	52	102	66	23	243	8.69	70.61
6	*Glycera alba*	51	25	71	52	199	7.11	77.73
7	*Levinsenia** sp	33	24	77	61	195	6.97	84.70
8	*Tylonereis bogoyawlenskyi*	57	10	71	34	172	6.15	90.85
9	*Allia alisdairi*	21	1	103	26	151	5.40	96.25
10	*Syllis variegata*	29	14	5	1	49	1.75	98.00
11	*Timarele anchylochaeta*	22	3	10	0	35	1.25	99.25
12	*Schistomeringos japonica*	6	0	3	0	9	0.32	99.57
13	*Eulalia viridis*	0	0	5	2	7	0.25	99.82
14	*Branchiomma cingulatum*	3	0	0	2	5	0.18	100.00
Total		594	556	784	863	2797		

Throughout the study, four species, *G. alba*, *C. marmorata*, *D. neapolitana*, and *P. ciliata*, were consistently observed across all seasons. On the other hand, *C. giardi*, *T. bogoyawlenskyi*, *Levinsenia* sp., and *Sigambra* sp. were found to be present in 11 months. Additionally, *E. viridis*, *B. cingulatum*, and *S. japonica* were only observed in the study's 2, 3, and 4 months, respectively (Table II).

The taxa *Sigambra* sp. (Family Pilargidae) and *Levinsenia* sp. (Family Paraonidae) have been newly identified in Pakistan. They were found in moderate numbers throughout the study period. Pilargidae has not been previously recorded in Pakistan, so this is the first report of the family in the country.

Seasonal distribution

Table III shows the distribution of polychaetes in four different seasons: Pre-monsoon (PRM) from March to May, southwest monsoon (SWM) from June to August, post-monsoon (PTM) from September to November, and northeast monsoon (NEM) from December to February. The lowest number of species (11) and individuals (556) were found during the SWM. The most species (13) were found in PRM and PTM, followed by NEM (12). The highest number of individuals (863) was found in the NEM, followed by PTM (784) and PRM (594).

The abundance of the two most common species, *P. ciliata* and *C. giardi*, was highest during the NEM and lowest during the SWM. In contrast, the next most common species, *D. neapolitana* and *Sigambra* sp. were most abundant during the SWM and least abundant during the NEM. *A. alisdairi*, *Levinsenia* sp., *Glycera alba*, and *T. bogoyawlenskyi* were found in the highest number in the PTM and the lowest number in the SWM. The difference in the average number of individuals across the four seasons was not statistically significant, as determined by one-way ANOVA ($F = 0.387$, $df = 3$, $p = 0.763$).

Cluster analysis

A comparison of polychaete abundance across different months and seasons was conducted using a hierarchical cluster analysis with the Bray-Curtis similarity measure. The resulting Figure 2 shows the analysis separated the polychaete assemblage into two distinct groups with 60.07% similarity when analyzed monthly. Group I included the summer months (May to September), while Group II included the remaining seven months (October to April). January and December (winter months) had the highest similarity at 95.3%. When the clustering was done season-wise, the dendrogram showed that the SWM, or summer monsoon, formed a separate group with 64.77% similarity (Fig. 3A). The two most similar seasons, with a similarity of 85.08%, were PRM and PTM.

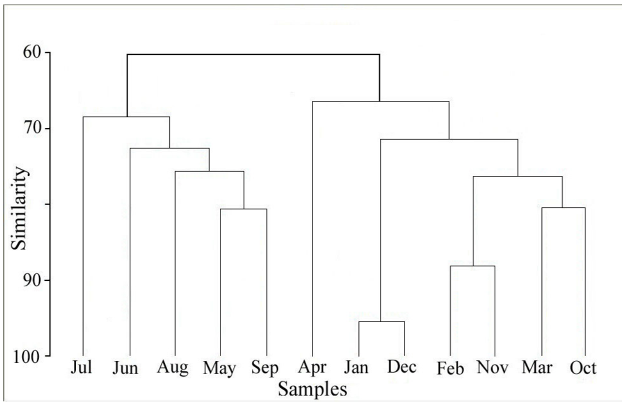

Fig. 2. A dendrogram showing monthly hierarchical clustering (Bray-Curtis similarity) of macrobenthic polychaetes collected from Korangi Creek.

Species diversity

Table IV presents the diversity indices values for each season and the entire study period. The Shannon diversity (H′) values ranged from 1.71 in SWM to 2.33 in PRM seasons. Margalef's species richness (M) values varied from 1.58 in the SWM to 1.88 in the PRM. Pielou's evenness (J) values varied from 0.71 in the SWM to 0.91 in the PRM. Generally, the PRM and PTM seasons exhibited the highest diversity (H′), evenness (J), and species richness (M), while the SWM and NEM seasons showed the lowest values. Overall diversity was recorded as low, with H′ = 2.23.

K-dominance curve

The k-dominance curve is created by plotting the cumulative dominance percentage on the y-axis and species rank on the x-axis using a logarithmic scale for the four seasons (Fig. 4A). The curves for the PTM and PRM seasons are situated on the lower part of the graph, indicating high diversity and evenness. They are close to each other and intersect at the upper end. Both curves steadily rise due to the presence of more species. As the cumulative dominance percentage increases, the curves extend horizontally until they reach 100% cumulative dominance. On the other hand, the curves for the SWM and NEM seasons occupy the upper part of the graph, indicating low diversity and low evenness. They also run close to each other and intersect at the lower end. The k-dominance curves conform with the trend observed in diversity indices (Table V).

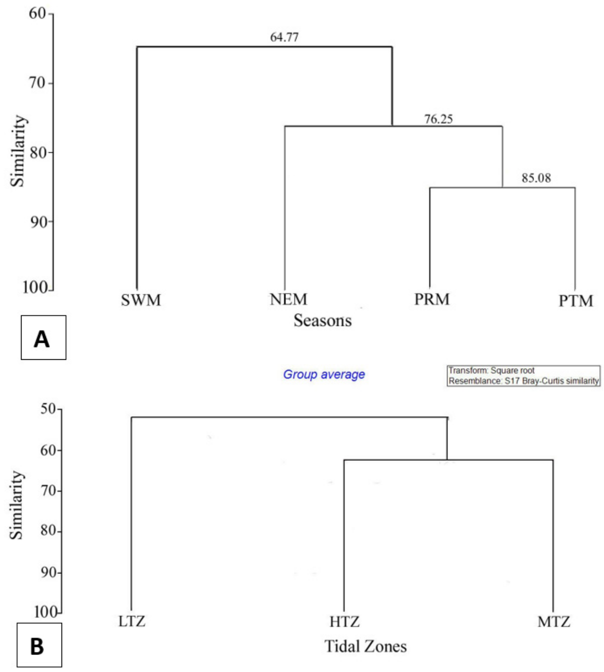

Fig. 3. Dendrogram depicting hierarchical clustering of macrobenthic polychaetes based on season-wise data (A) and Vertical zones include low tide zone (LTZ), mid tide zone (MTZ), and high tide zone (HTZ) (B) using Bray-Curtis similarity. Seasons include SWM (Southwest or summer monsoon), NEM (Northeast or winter monsoon), PRM (Pre-southwest monsoon), and PTM (Post-southwest monsoon).

Table IV. Diversity indices of polychaetes during different seasons- pre-monsoon (PRM), southwest monsoon (SWM), post-monsoon (PTM), and northeast monsoon (NEM) and in different tidal zones–high tide zone (HTZ), mid tide zone (MTZ), and low tide zone (LTZ).

	Seasons				Tidal zones			Overall
	PRM	SWM	PTM	NEM	HTZ	MTZ	LTZ	
No. of species (S)	13	11	13	12	6	12	14	14
No. of individuals (N)	594	556	784	863	386	426	1985	2797
Margalef's index (M)	1.88	1.58	1.80	1.63	0.84	1.82	1.71	1.64
Shannon-Weiner index (H′)	2.33	1.71	2.28	1.76	1.26	2.16	2.27	2.23
Pielou's index (J)	0.91	0.71	0.89	0.72	0.70	0.86	0.87	0.85

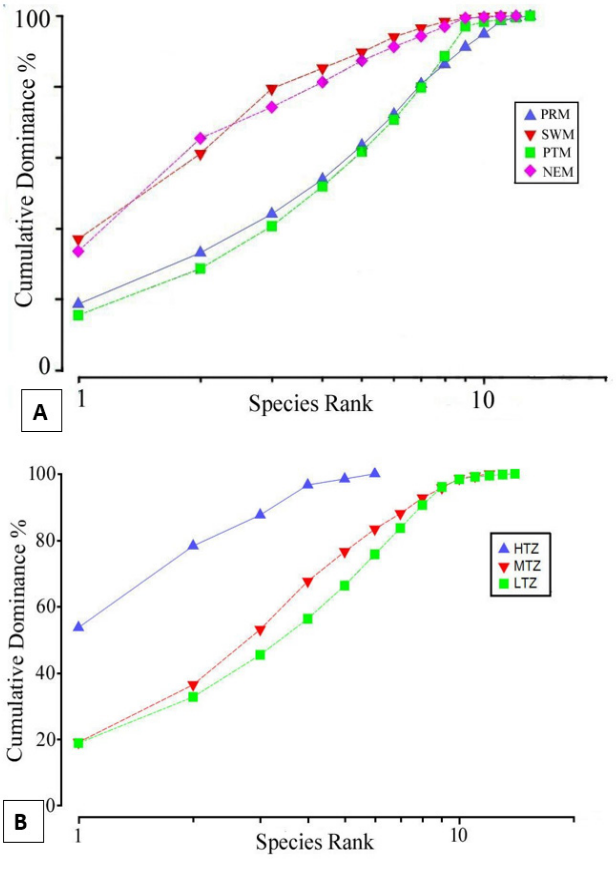

Fig. 4. K-Dominance curves for each season (A), and three tidal zones. PRM, pre-monsoon; SWM, south west monsoon; PTM, post-monsoon and NEM, north east monsoon. HTZ, high tide zone; MTZ, mid tide zone and LTZ, low tide zone.

Vertical distribution

Table V presents the quantitative data regarding the presence of polychaetes in the sediment samples obtained from the high-, mid-, and low-intertidal zones throughout the study. The results indicate that the high-intertidal zone exhibited the lowest abundance regarding species and individual count, whereas the low-intertidal zone showed the highest abundance. The one-way ANOVA analysis showed a significant variation in polychaete abundance among different intertidal zones ($F= 10.001$, $df= 2$, $p= 0.0003$). This rejects the null hypothesis that there is no difference in diversity among the three intertidal zones. Further post hoc (Tukey) testing revealed no significant difference between high- and mid-intertidal assemblages ($p = 0.9947$), but there were significant differences between high- and low-intertidal ($p = 0.00099$) and mid- and low-intertidal assemblages ($p = 0.00131$).

Table V. Vertical distribution of polychaetes in Korangi Creek's mudflats - high tide zone (HTZ), mid tide zone (MTZ), and low tide zone (LTZ).

Species	HTZ	MTZ	LTZ	Total
Polydora ciliata	207	81	252	540
Capitella giardia	6	71	373	450
Diopatra neapolitana	36	74	276	386
Ceratonereis marmorata	95	62	199	356
*Sigambra** sp.	7	20	216	243
Glycera alba	0	12	187	199
*Levinsenia** sp	0	38	157	195
Tylonereis bogoyawlenskyi	35	29	108	172
Allia alisdairi	0	13	138	151
Syllis variegata	0	3	46	49
Timarele anchylochaeta	0	20	15	35
Schistomeringos japonica	0	3	6	9
Eulalia viridis	0	0	7	7
Branchiomma cingulatum	0	0	5	5
Total	386	426	1985	2797

Cluster analysis

A hierarchical cluster analysis was conducted to compare the abundance of polychaete in different tidal zones (Fig. 4B). The Bray-Curtis similarity measure was used to conduct the analysis. The analysis revealed that the low tide zone formed a separate group with a 52.24% similarity. The high and mid-tide zones were found to be the most similar, with a similarity of 62.89%.

Species diversity

Table IV presents the diversity indices values for each tidal zone. The Shannon diversity (H′) values ranged from 1.26 in the HTZ to 2.27 in the LTZ. Margalef's species richness (M) values varied from 0.84 in the HTZ to 1.82 in the MTZ. Pielou's evenness (J) values varied from 0.70 in the HTZ to 0.87 in the LTZ. Generally, diversity (H′) and evenness increased steadily from HTZ to LTZ.

K-dominance curve

The k-dominance curve is a graph that displays the cumulative dominance percentage on the y-axis and species rank on the x-axis, using a logarithmic scale for the three tidal zones (Fig. 3B). The LTZ curve is located at the bottom of the graph, indicating high diversity and evenness. The curve gradually rises as more species are present, and as the cumulative dominance percentage increases, the curve extends horizontally until it reaches 100% cumulative dominance. Conversely, the HTZ curve is located at the top of the graph, indicating low diversity and evenness. The MTZ curve is situated in the middle of the graph, showing intermediate diversity and evenness values. The k-dominance curves match the trend observed in diversity indices (Table IV).

DISCUSSION

When a benthic community is exposed to adverse environmental conditions, it is expected to undergo significant changes in community structure, such as diversity, abundance, dominance, and biomass. Since polychaetes play a crucial role in the benthic community, any alterations in community structure would also be evident in the polychaete community. Studies on pollution monitoring conducted in various locations have observed a notable decline in species diversity in polluted areas (Guerra-Garcia and Garcia-Gomez, 2004). One notable aspect of this decrease in diversity is the increased dominance of a few species of polychaetes.

Polychaetes are a diverse group of marine worms often used to assess the environmental quality of aquatic habitats. Capitellids, spionids, dorvilleids, and nereidids are considered positive indicators of pollution or stressful environments due to their tolerance for environmental stressors (Bailey-Brock *et al*., 2002; Belan, 2003; Dix *et al*., 2005; Rivero *et al*., 2005). On the other hand, terebellids, lumberinerids, and maldanids are sensitive to pollution and are referred to as negative indicators (Belan, 2003; Olsgard *et al*., 2003). The absence of negative indicator species in an ecosystem may suggest that the environment is contaminated and unsuitable for their survival.

According to the present study's findings, the prevailing polychaete species in the studied area were Spionidae (*Polydora ciliata*) and Capitellidae (*Capitella giardi*), followed by Nereididae (*Tylonereis bogoyawlenskyi* and *Ceratonereis marmorata*) and Onuphidae (*Diopatra neapolitana*). These results suggest that the studied area is experiencing environmental stress caused by pollution. Notably, none of the negative indicator species, including lumberinerids, terebellids, and maldanids, were found in the collected samples. Penha-Lopes *et al*. (2013) conducted a study to assess the impact of sewage pollution on polychaete diversity and community structure. The study revealed that Nereididae (*Perinereis vancaurica* and *Dendronereides zululandica*) and Capitellidae (*Mediomastus* sp.) were the most tolerant polychaetes to sewage pollution. The authors attributed the shift in polychaete species composition to the increased organic pollution from human activities. The high organic matter content in domestic sewage provided an abundant food source for opportunistic polychaete species, leading to a decline in the diversity of other polychaete species.

The present study's results indicate that polychaetes are most abundant during the PRM and PTM seasons, followed by the NEM season. During SWM, when there is relatively lower salinity due to rainfall and freshwater discharges from the Lyari River and runoffs, the polychaete density is lower compared to other seasons. This finding aligns with Uzair *et al*. (2022) study, which also reported lower polychaete density during SWM from three mangrove swamps in Karachi. Unfavorable environmental conditions due to the development of cyclonic conditions and monsoonal rain in the Arabian Sea are not conducive for macrobenthic polychaetes to thrive in the intertidal zone.

The abundance and diversity of macrobenthos in the intertidal zone depend on various physical and biological factors. Organisms in the high tide zone are exposed to air longer, making it hotter and drier than the low tide zone. The mid-tide zone is underwater and exposed for an equal amount of time. The low-tide zone is covered longer, making it more suitable for organisms to thrive, resulting in greater biodiversity than the rest of the zones (Dalman *et al*., 2023). Our findings show that there were more species and individuals in the low-tide zone compared to the mid and high-tide zones, with a significant difference. The present study's findings could serve as valuable baseline data for any forthcoming polychaete abundance and diversity assessment.

DECLARATIONS

Acknowledgments

This study is part of the Ph.D. research conducted by the first author, who received a junior research fellowship from the Centre of Excellence in Marine Biology at the University of Karachi. We gratefully acknowledge this support.

Funding

The study received no external funding.

Ethical statement

The collec-tion and study of macro-benthic polychaetes from mud flats of Ko-rangi creek were con-ducted in compliance with guide-lines set by the Pakistan Environ-mental Pro-tection Agency (PEPA). Sample was carried out with mini-mal disturb-ance to the marine eco-system, and necessary permits were obtained from rele-vant authorities.

Generative AI and AI-assisted technology statement

The authors declare that no genrative AI was used in the creation of this manuscript.

Statement of conflict of interest

The authors have declared no conflict of interest.

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