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A Description of Higher Macrobenthic Infaunal Taxa of Mangrove Mud Flats at Khamir Port, Iran

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ABSTRACT

The diversity of mangrove macrobenthos assemblages at mudflat and mangrove ecosystems of Port Khamir, Iran were investigated for one year. During this period, we measured physicochemical properties of water temperature, salinity, pH, DO and the density and distribution of the macrobenthos. We sampled a total of 9 transects, at three different topographic levels (High tide,Mid tide and Low tide) along the intertidal zone at three stations. Assemblages at class level were compared. The five most diverse and abundant classes were Foraminifers (54%), Gastropods (23%), Polychaetes (10%), Bivalves (8%) & Crustaceans (5%), respectively. Overall densities were 1869 ± 424 ind.m^2 (26%) in spring, 2544 ± 383 ind.m^2 (36%) in summer, 1482 ± 323 ind.m^2 (21%) in autumn and 1207 ± 80 ind.m^2 (17%) in winter. Along the intertidal zone, the overall relative density of individuals at high, intermediate, and low topographic levels was 40, 30, and 30% respectively. Biodiversity indices were used to compare different classes: Gastropoda (Shannon-Weaver index: 0.33) and Foraminifera (Simpson index: 0.28) obtained the highest scores. With the exception of bivalves, filter feeders were associated with coarser sediments at higher intertidal levels, while deposit feeders were associated with finer sediments at lower levels. Salinity was the most important factor acting on community structure, while DO and pH had little influence.

Keywords: Macrobenthos, Biodiversity, Mangrove forest, Khamir Port, Persian Gulf.

INTRODUCTION

Mangroves are Euryhaline vascular plants living on sheltered tropical and subtropical coastlines throughout the world. These plants about 70 species included in 27 genera and 19 families [1] once covered about 200,000 km^2 in estuarine and marine ecosystems [2]. Mangrove ecosystems are highly endangered, and host unique intertidal organisms; due to their transitional nature, these systems are ecologically linked to terrestrial, fluvial and marine ecosystems [3].

Mangrove systems are based on detrital food webs, and the Macrobenthos typically occupies the second and third trophic levels. Macrobenthic productivity can be considered as an indicator of the overall system productivity and of water quality [4].

Abundance, richness and diversity of intertidal benthic assemblages are influenced by local environmental conditions, such as salinity, DO and sediment type [5]. Such assemblages are also impacted by human action, and can be efficiently used as Bioindicators in ecosystem management and pollution studies. In fact, changes of environmental conditions are paralleled by structural and compositional changes of both forest and mudflat assemblages [6-9]. Nonetheless, the relationships between the structure of faunal assemblages, historical land-use, environmental conditions, and mangrove species composition are scarcely such connections must be better investigated before faunal composition can be used as a reliable indicator of the success of mangrove rehabilitation or restoration schemes [10].

The area of Port Khamir,Iran is covered by approx. 1000 ha of mangroves. Mangrove macrobenthos, including species which live in mangrove ecosystems for at least part of their life cycle, includes representatives of multiple phyla, including Porifera, Mollusca, Arthropoda, Annelida, Nematoda, Sipunculoidea, Platyhelminthes, and Chordata [11]. Mangrove forests of Hormozgan province at Khamir Port are located in the northern part and considers among mangrove forest of the Persian Gulf center.

These forests, very similar Qeshm Island mangrove and are similar in many aspects to each other, seem have been cohesive communities due to natural condition have been aparted from each other by Khoran Creek.

Mangrove societies range from west of Bandar Abbas to Khamir Port sigle legs shrub, and then are changed in multi leg shrub and tree society form and at are massed in Khamir Port estuary and make desirable dense and low-dense forest that range to Sayeh khosh and Deghgan and then decease in dense rate, in a way that in long distance before Lengeh Port totally area break.

by carried out studies by satellite photos' and terrestrial observations , it was proved that more part of mangrove societies in Khamir Port, at corners of branched tributary of the main estuary, each of them have other branches, are wide.

The forest area in Khamir Port involved dense and semi dense societies which water organs penetrate into all of them and a part from each other.

Many parts dense and semi- dense forests, Quantitively and Qualitively are desirable and have enough density, spread over estuary of rivers which locate within the forest areas.

Provided maps on forest spread within Khamir Port and its suburb showed that the best forest communities situate in Mehran River and seasonal and continual estuary of the region, Regions which far from estuary. Mangrove forest in Khamir Port many parts of sparse areas is solid society of *Avicennia marina* species and another species in region was not found.

The principal aim of this study is to describe the seasonal variation in diversity and composition of the mangrove macrobenthos of the mudflats of Port Khamir, Iran.

MATHERIALS AND METHODS

Study area

Three stations (St.1-3) were periodically sampled nearby Port Khamir, along the coasts of southern Iran, in spring, summer, autumn and winter 2007 (Table 1). The prevalent grain size of the shore progressively changed from finer to coarser sediment towards the south, from St.1 to St.3. Each station was sampled at low, intermediate and high topographic levels. Per time of zones sampling, 3 transect were considered for every, the Length of each transect from high tide to low tide was 1000m an of each transect from each other was 500 m.

Table 1 The General features of the coastline

Station	Longitude	Latitude	Prevalent sediments
Station 1	26˚ 58' 67'' N	55˚ 37' 34'' E	mud
Station 2	26˚ 57' 69'' N	55˚ 36' 19'' E	mud - sand
Station 3	26˚ 57' 21'' N	55˚ 38' 61'' E	mud - rock

Macrobenthos samples, environmental conditions and sediment granulometry

Tidal predictions were recorded form the Internet. The prevalent granulometric composition of the shore progressively changed from finer to coarser sediments towards south, from Station 1 to Station 3. Sampling was conducted during high tide Form a boat: with three replicate Van veen Grab (0.25 m^2), depth about 10–15 cm samples at each intertidal level in each station. Each sediment sample was washed through a 500 µm sieve and put into sealed plastic bags, and Bengal Rose and Borax solution (1 g/L) were added to stain the animals. Finally, samples were preserved in 4% buffered formaldehyde.

DO, salinity, temperature and pH were recorded at each station.
Sediment grain size was analyzed by the wet-sieve method for fine silts and clays. macrobenthic samples were finally preserved and fixation in 70% Ethanol [12].The sediment samples were analyzed following [12] method. The sediment grain size was analyzed in subsamples kept at 70 ˚C for 24 hours. Twenty-five grams of the dried sediments were then transfer to Erlenmeyer inflowing, 250 cc of water and 10 cc of 7gr solution in Liter of Hexameta phosphate sodium solution was added to this solution, mixed for 15 minutes and left form 6 to 8 hours until sedimentation and then it was mixed again. The washed solution containing sediment was then passed through a sieve 63 µm.

The substance left in the sieve was transferred to Erlenmeyer and put in oven in 10 ˚C for 8 hours to dry completely and then was passed through the 2000, 1000 and 500 µm sieve and then the left sediment was exited and calculated the weight and the percentage of the presence of each sediment grain in samples. At each station dissolved oxygen, salinity, temperature and pH of water were recorded using portable Horiba U-10.

Statistical analysis

The Shannon-Weaver index, also known as 'Entropy', (1949) and the Simpson index, also known as 'dominance index' (1949) were calculated to compare the biodiversity of higher taxa (classes) among different sites and in different seasons.

Shannon-Weaver index: $H' = -\sum_{i=1}^{s}(Pi)(LnPi)$

Simpson Index: $\lambda = \sum_{i=1}^{s}(Pi)^2$

Shannon-Weaver index = H́; Simpson Index= λ; ratio of the number of each species to total of macrobenthos = Pi & the number of macrobenthic groups = s.

Mean index values were compared by using a One-Way ANOVA (SPSS 15.0; Minitab 14 Statistical Software). We also investigated the presence of significant correlations between macrobenthos density and physicochemical parameters (Excel 2003).

RESULTS

Twenty-seven species were found, representing five main classes of macrobenthic fauna: Bivalvia, Foraminifera, Gasteropoda, Malacostraca, and Polychaeta (Table 2). Sampling of sediment was carried out in way that transects tide level among low tide, high tide and mid tide regions was equal among stations.

The overall average densities were: Totally in each 3 sampling stations for Foraminifera in St.1 in abundance of 1212 ± 413 ind.m^2 equivalent to 60%,at St.2 in abundance of 760 ± 664 ind.m^2 equivalent to 48%,and St.3 in abundance of 872 ± 287 ind.m^2 equivalent to 51%, were respectively the maximum abundance and for Crustacean Class in St.1 in abundance of 60 ± 30 ind.m^2 equivalent to 3%,at St.2 in abundance of 108 ± 42 ind.m^2 equivalent to 7%,and St.3 in abundance of 111 ± 108 ind.m^2 equivalent to 7% respectively had the minimum of abundance.

Within each station, Foraminifera and Gastropoda, respectively, had the minimum and the maximum number of species per class while Foraminifera and Crustacean had the highest and lowest number of individuals, respectively (Figure 1). In this study, the dominant species were: *Orchestia platensis* and *Alpheus* sp. (29% and 13% of the whole malacostracan sample, respectively); *Cerithidea cingulata* and *Haminoea vitrea* (34% and 7% of the whole gastropod sample, respectively); *Sanguinolaria cumingiana* (46% of the whole bivalve sample); *Glycera* sp. and *Ophelia* sp. (68% and 5% of the whole polychaete sample, respectively); and *Cribrospiroloculina* sp., corresponding to 59% of the whole foraminiferan sample.

Signally we have in total 5327 ± 1739 ind.m^2 samples. Were collected 1869 ± 424 ind.m^2 equivalent to 26% in spring,2544 ± 383 ind.m^2 equivalent to 36% in summer,1482 ± 323 ind.m^2 equivalent to 21% in autumn and 1207 ± 380 ind.m^2 equivalent to 17% in winter.

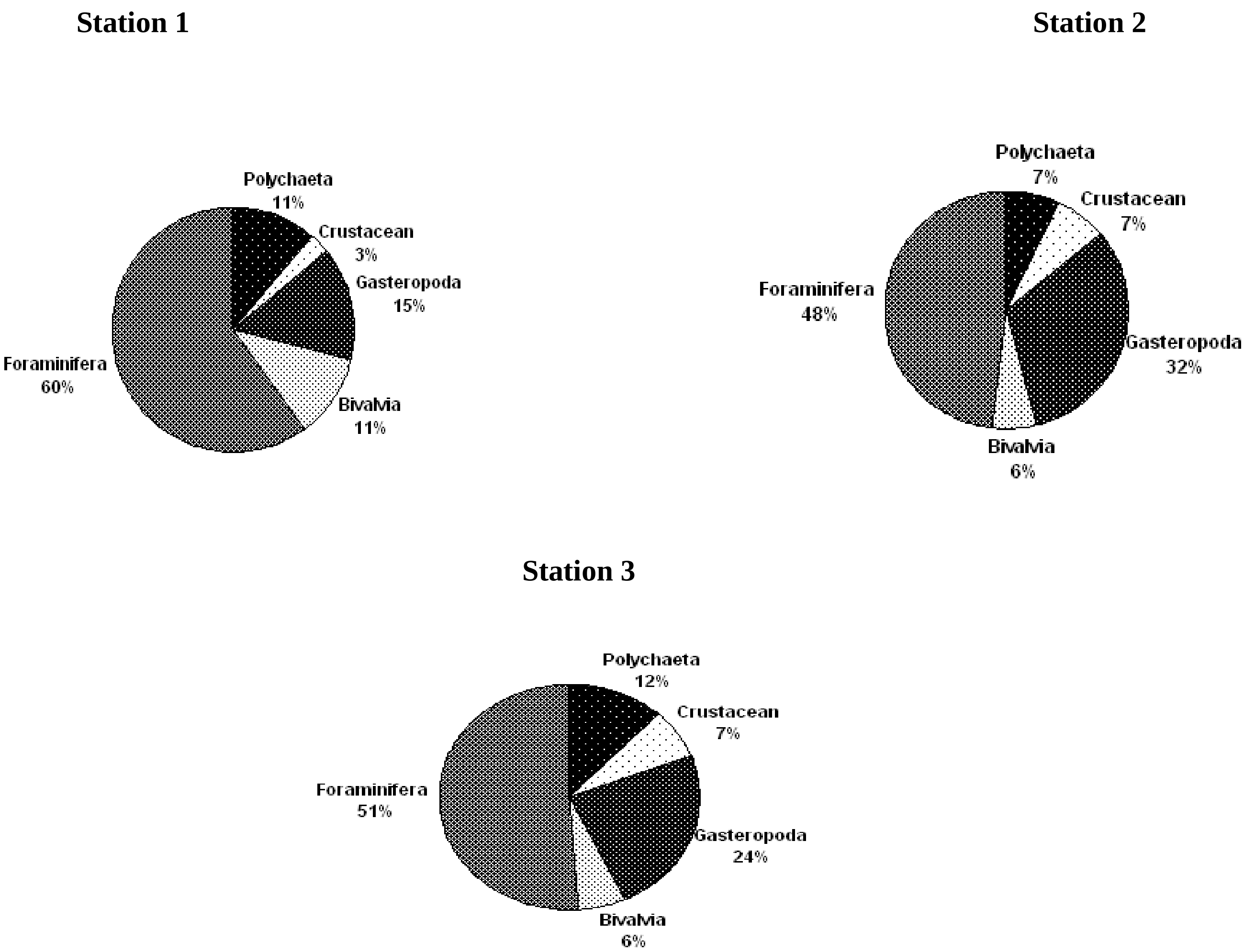

Figure 1 Relative abundance of different macrobenthic taxa at the sampled stations.

5 Class of macrobenthos were separated, accounted and identified that Foraminifera in abundance of 3792 ± 941 ind.m^2 equivalent to 54%, of Gasteropoda 1638 ± 407 ind.m^2 equivalent 23% , of Polychaete 716 ± 216 ind.m^2 equivalent to 10%, of Bivalvia 582 ± 295 ind.m^2 equivalent to 8%, and of Crustacean 372 ± 115 ind.m^2 equivalent to 5% of the whole of macrobenthos communities was calculated. In all stations, the highest overall densities were measured in summer in St.1 in abundance of 465 ± 587 ind.m^2 equivalent to 30%, St.2 in abundance of 296 ± 290 ind.m^2 equivalent to 47% and St.3 in abundance of 359 ± 456 ind.m^2 equivalent to 32% had the maximum density in total stations. Also it was observed that in winter in St.1 in abundance of 308 ± 276 ind.m^2 equivalent to 19%, St.2 in abundance of 158 ± 90 ind.m^2 equivalent to 12% and St.3 in abundance of 257 ± 208 ind.m^2 equivalent to 19% the minimum density of macrobenthos were calculated (Figure 2).

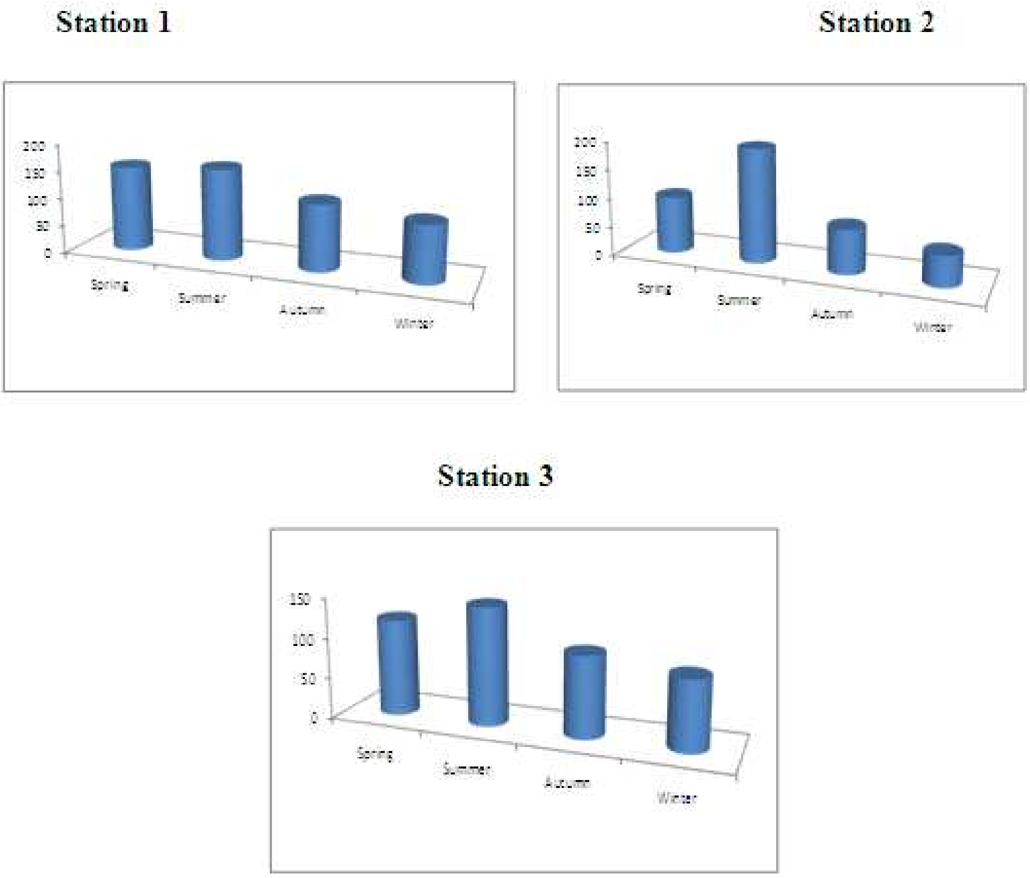

Figure 2 Average density of macrobenthic taxa different seasons (ind/m^2).

The density of macrobenthos in different shore-level areas indicated that in St.1 in high tide areas with abundance of 632 ± 1243 ind.m^2 had the maximum and in mid tide areas with abundance of 371 ± 278 ind.m^2 the minimum and in St.2 in mid tide areas with abundance of 586 ± 549 ind.m^2 had the maximum and in low tide areas with abundance of 298 ± 189 ind.m^2 the minimum and in St.3 in the high tide areas with abundance of 656 ± 1140 ind.m^2 The maximum and in mid tide area with abundance of 330 ± 187 ind.m^2 the minimum of density in separation of shore area (Figure 3).

In St.1 in all seasons Gastropods and Malacostracans respectively had the highest and the lowest abundance; while Foraminifera and Decapoda espectively had the highest and the lowest dominance. In St.2, Foraminifera (winter, autumn and spring) and Gastropods (summer) had the highest abundance; Malacostracans (spring and summer) and Polychaetes (autumn and winter) had the lowest abundance. In St.3, in all seasons Gastropods had the highest abundance; Polychaetes (summer) and Malacostracans (other seasons) had the lowest abundance. In this station Foraminifera are dominant in all seasons, while Polychaetes (summer) and Malacostracans (other seasons) present the lowest dominance.

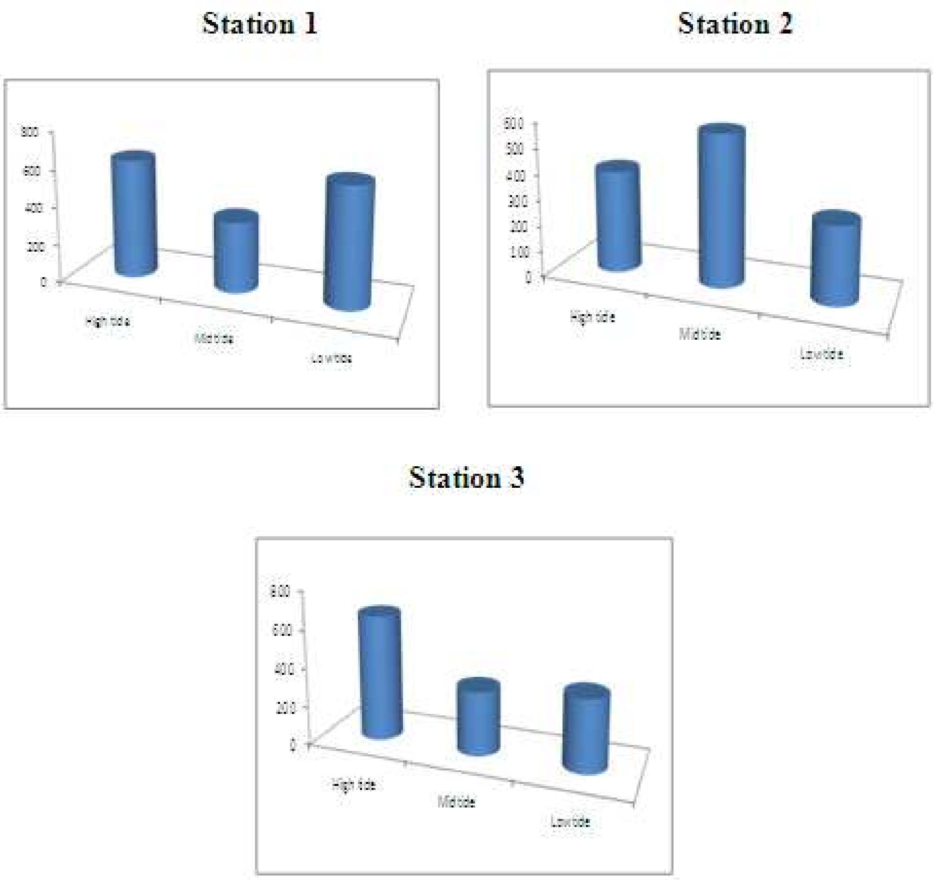

Figure 3 Average macrobenthos density (ind/m^2) along the intertidal zone.

Analysis of variance (ANOVA) shows no significant difference in Shannon index value between different sites ($p \geq 0.57$) as well as Simpson Index value ($p \geq 0.90$) (Table 3 and Fig 4).
Muudy and tiny size sediment are the features of estuary structure. The texture sediment is an important factor which plays a key role in distribution and dispersion of livings estuaries.For this reason, changing in sediment Grain size and sediment context causes revolution in other physiochemical characteristic of bed and in turn of it affects on fauna and flora structure. Among environmental parameters, we only found a significant linear positive correlation between Foraminifera density and salinity ($p < 0.05$; $r = 0.03$).

Sediment granulometric composition is reported in Table1. Grain size analysis among the stations showed that Sand , Silt and Clay in St.1 reached 15, 32 and 52 percent , in St.2 13,12 ,75 percent and in St.3 4, 23, 73 percent respectively.

The mean values of water physicochemical variables during the sampled span have been displayed (Table 3). No significant differences among stations were found ($p > 0.05$).

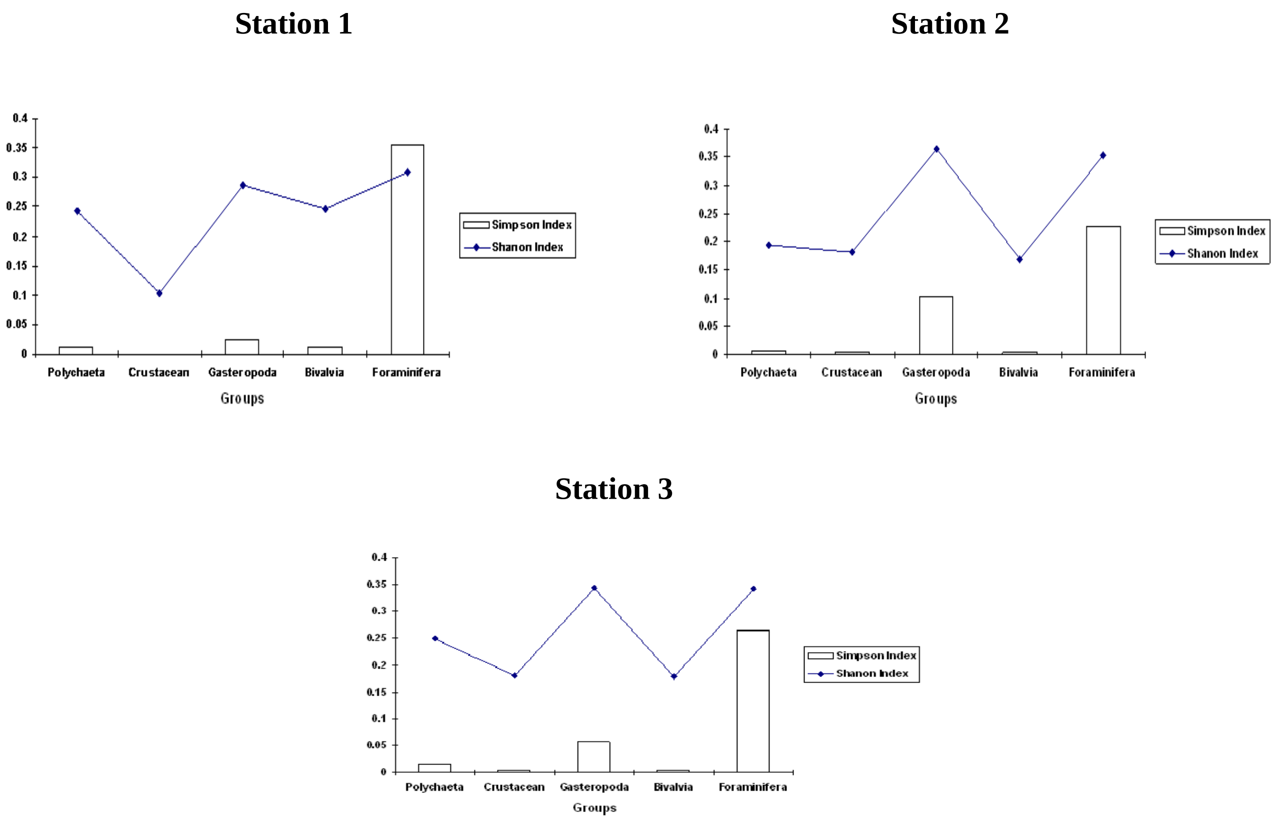

Figure 4 Indices of Shannon-Weaver (entropy) and Simpson (dominance) for different stations

Table 2 Species list and taxonomic classification adopted

Phylum	Class	Order	Family	Genus & Species
Annelida	Polychaeta	Sternaspida	Sternaspidae	*Sternaspis* sp.
		Eunicida	Lumbrineridae	*Lumbrineris* sp.
		Phyllodocida	Glyceridae	*Glycera* sp.
			Nephtyidae	*Nephtys* sp.
Crustacean	Malacostraca	Decapoda	Ocypodidae	*Uca sindensis*
				Paracleistostoma arabicum
			Alpheidae	*Alpheus* sp.
		Cumacea	Bodotriidae	*Cyclaspis picta*
		Amphipoda	Talitridae	*Orchestia platensis*
Mollusca	Gasteropoda	Neotaenioglossa	Potamididae	*Cerithidea cingulata*
			Truncatellidae	*Truncatella subcylindrica*
			Naticidae	*Natica vitelius*
			Eulimidae	*Niso venos*
			Tornidae	*Tornus* sp.
			Haminoeidae	*Haminoea vitrea*
		Neogastropoda	Buccinidae	*Babylonia spirata*
			Olividae	*Ancilla castanea*
			Columbellidae	*Anachis misera*
			Turridae	*Crassispira flavidula*
		Archaeogastropoda	Trochidae	*Umbonium* sp.
	Bivalvia	Veneroida	Psammobiidae	*Sanguinolaria cumingiana*
			Cardiidae	*Laevicardium papyraceum*
			Veneridae	*Marcia hian*
				Paphia gallus
Protozoa	Foraminifera	Miliolida	Haureinidae	*Triloculina* sp.
			Spiroloculinidae	*Cribrospiroloculina* sp.

Table 3 Kruskal Wallis Test for Shannon Index and Simpson Index different significance test between sites

Test Statistics[a,b]

	Shannon index
Chi-Square	1.333
df	1
Asymp. Sig.	0.248

a. Kruskal Wallis Test

b. Grouping Variable: Shannon index

Test Statistics[a,b]

	Simpson index
Chi-Square	4.083
df	1
Asymp. Sig.	0.043

a. Kruskal Wallis Test

b. Grouping Variable: Simpson index

DISCUSSION AND CONCLUSION

Macrobenthos composition and temporal changes

The observed changes in abundance and diversity of macrobenthos in Khamir Port can be related to the interactions with the environmental features. The distribution and abundance of all the livings species in nature can be the result of the interaction with different complex environmental factors, which considerably affect on the biology, ecology and physiology in aquatic livings [13]. Benthic communities also show different responses to environmental changes. for example in Phylum Crustacean for account of its own biological and Physiological features when tide happens make mid cavity full of water and of tide prevents it from evaporation by closing the mid cavity. Therefore, it resist to the dry and increases density and abundance in these regions [14].

The high abundance of *Capitella capitata* suggests that the pollution rate is high [15] and Increases the Polycheate density, which feeds organic matter, and aquatic birds that feed them are the signs of environmental pollution [16]. The most basic factor of distribution and dispersion of livings in tidal areas depend on tide in density. At tide ,there is an even state in all environmental factors such as , temperature and salinity and decrease risk of lacking dissolved oxygen and nutrients [17].

Salinity is one of environmental factor which cause stress in macrobenthos and affect their density. Salinity variance occurs in result of surface evaporation, tide, season changing and topography of zone. Salinity in different Larvae steps has different effects. Larva and its eggs in comparison with their parents is more vulnerable to salinity. The effect of salinity on density and dispersion of benthic fauna in some review of seashore water at Indian Ocean has been emphasized [18]. Our results showed that macrobenthos in the mangrove forest form very important faunal communities. The abundance of Foraminifera 3792 ± 941 ind.m^2 equivalent to 54%, of Mollusca 1110 ± 659 ind.m^2 equivalent to 31%, Annelida 716 ± 216 ind.m^2 equivalent to 10% and Crustacean 372 ± 115 ind.m^2 equivalent to 5% was calculated. In the study by Fujii [19] in the Humber estuary, the Polycheate, Crustacean and Molluscs were the most dominant of groups. In our study the density of macrobenthos varied from 308 ± 276 ind.m^2 in winter to 495 ± 647 ind.m^2 in summer at St.1 from 158 ± 90 ind.m^2 in winter to 591 ± 714 ind.m^2 in spring at St.2 and from 257 ± 208 ind.m^2 in winter to 439 ± 394 ind.m^2 in summer at St.3.

Overall, the density of macrobenthos was highest in the summer (7632 ind.m^2) and lowest in the winter (3632 ind.m^2). The density of macrobenthos in mangrove forest of Kenya between 6025 ind.m^2 and 265 ind.m^2 [20]. In a study of in water of Marmugoa Gulf in Goa, in the central part of the Western Coasts of Indian, the density of macrobenthos varied between 1107 ind.m^2 and 498 [21]. Seventeen macrobenthic taxa were identified along the mangrove from the Island of Santa Catarina, with maximum densities up to 7250 ind.m^2 [22]. Also in a survey of macrobenthos of two coastal lagoon in Ghana was conducted, the density of benthos was 31715 ind.m^2 [23]

Macrobenthos distribution in different shore-level areas

In each 3 stations it can be concluded that at the high tide area in abundance of 560 ± 1039 ind.m^2 equivalent 40% and of mid tide area 429 ± 272 ind.m^2 equivalent 30% and of low tide area 431 $\pm$ 296 ind.m^2 equivalent to 30% have calculated to themselves during total period of sampling. This indicates the most abundance among the stations of St.3 in high tide and the least abundance belongs to St.2 in low tide. From this matter we can conclude although high tide zone deal with different kinds of environmental stress more than low tide as an area that have more stability than high tide, it has more abundance.

The more abundance in high tide zone can be considered as result of Foraminifera high density, because this group of macrobenthos bear high temperature rate and make no change in it life procedure.

Grain size in high tide zone because of faster sedimentation Grain size Sand in ratio to Silt -Clay provide an adjusted environment to settle this macrobenthos group.

Comparison with other studies

Some other research has shown in Table 5. In our study, among the 5 identified Classes, totally 26 species were identified. Netto and Gallucci [24] in the studies that he carried out on macrobenthos communities in mangrove forest in Brazil coastline reported totally 17 species. In another study in Hong Kong the number of all identified macrobenthos was reported 46 species. On this account, the dispersion of this animals group is severely effect the habitat changes also climate change, this matter in review of correlation level of density and diversity indices and environmental variance in this research has been proved.

Crustacean

Class of Crustacean during this study with 3 Orders and 3 Species was studied that in the period of sampling in each 3 station had the maximum density. *Orchestia platensis* species equivalent 29% of total population of the Class of Crustacean as a dominant species and also *Alpheus* sp. Species equivalent 13% of the whole of this Class of macrobenthos of mangrove forest in Khamir Port were introduced with the minimum density.

Ghalandari in 2001 reported the *Balanus amphitrite* species in density of 93.95 % as compared with the whole population of Crustacean.

Mollusca

The study of Mollusca indicated they are part of 2 Classes of Gastropod and Bivalvia. Among the Gastropoda Class *Cerithidea cingulata* reached abundance of 853 $\pm$ 32 ind.m^2 (34%) as compared with the whole population of Gasteropoda Class as a dominant species *Haminoea vitrea* with 94 $\pm$ 10 ind.m^2 comprised 7% of the total of this Class of the macrobenthos of mangrove forest in Khamir Port were introduced.

Ghalandari in 2001 found *Planaxis sulcatus* at rocky shore of Tola region in Qeshm Island, in density of 89.53% as a dominant species of Gastropoda Class. In this review, Gastropod Class in 12 species has the maximum species. Of the obtained results form study of Tola region in Qeshm Island has allocated the maximum species to Gastropod Class in 17 species.

The Bivalvia Class in 1 Order and 4 species were identified that the *Sanguinolaria cumingiana* species in abundance of 372 ± 42 ind.m^2 equivalent to 46% of the total population of Bivalvia in all the stations was calculated as dominant species.

In another work, the Bivalvia *Maldane sarsi* with 3852 ± 432 ind.m^2 equivalent to 46% of the total population of the maximum of the Bivalvia [25]. In study of Lui *et al.*, [26]. in the mangrove forest of Hong Kong 11 species of Mollusca were reported but in reviewing of Mollusca in mangrove forests of Khamir Port were 16 species. In the review of macrobenthos communities in mangrove forests in Southern Brazil Bivalvia and Filter feeders were not reported.

Polychaetes

The density and dispersion of the Polychaete Class in total stations showed that *Glycera* sp. in total stations in abundance of 442 ± 137 ind.m^2 equivalent to 68% and the *Ophella* sp. Species in total stations in abundance of 38 ± 12 ind.m^2 equivalent to 5% of the whole population of Polychaete in all station respectively as a the most density and the maximum density were introduced. In the study of Sergio (2003), in a mangrove forest of Southern Brazil the Polychaetes and Oligochaetes represented up to 82% of the total macrobenthos. In the studies of Lui *et al*., [26] in Hong Kong, 11 Polychaete species were reported including 5 species also found in this study.

Foraminifera

Among the species of Foraminifera Class with 2 species were identified. That *Cribrospiroloculina* sp. Species in abundance of 1748 ± 852 ind.m^2 equivalent 59% as compared with the whole population of Foraminifera of all stations as a dominant species of this macrobenthos groups were calculated.

Diversity indices

The calculated Simpson and Shannon-Weaver indices in separation of stations indicate that at St.1 in all seasons Mollusca had the maximum of Shannon-Weaver index and Malacostraca had the minimum of one and about Simpson index in all season Foraminifera and Malacostraca respectively, had the maximum dominance and the minimum.

At St.2 in winter, autumn and spring for Foraminifera and in summer for Mollusca were calcuted the maximum Shannon-Weaver index and the minimum of this index for Malacostraca in spring and summer and for Polychaete in autumn and winter were calculated.

At St.3 in all seasons Mollusca the maximum Shannon-Weaver index and the minimum of this index for Polychaete in summer and for the rest of season for Malacostraca were calculated. The Simpson indexes in this station in all season for Foraminifera.

The maximum for Foraminifera and the maximum for Polychaete in summer and in the rest of seasons for Malacostraca were calculated.

Analysis of variance (ANOVA) for the indices of Shannon and Simpson between different season and sampling stations indicated no significant differences ($p < 0.05$). Variance analysis results of Shannon index showed that this index in all seasons in 5%error level has meaningful difference and about Simpson index it was found that this index in spring and autumn in %5 error levels has meaningful difference and comparing other seasons with each other in this index is meaningless difference.

Relationship of macrobenthos with environmental variables

Differences in benthos biomass in different areas can be related with different causes as the biological features of biological groups, structure of sea bottom. The nutrient abundance of this organisms and the role of feeding of fishes form animals. The main physicochemical features on environmental in carried out studies on macrobenthos communities of the Chabahar Gulf it was determined that in addition of the effect of organic materials in macrobenthos dispersion the other causes are involved as grain size. In this was that in sandy shore density and diversity the species of different animal of macrofauna dominantly were formed from mud and sandy bottoms, because the sand granules are a more appropriate environment for most of macrobenthos. This because there is a strong relation between the kind of sediment tissue and abundance of benthos fauna and among that the sandy shores have the high density of macrofauna. There is clear relation between kinds of sediments texture, density and abundance of benthic fauna and sand bottoms have high density of macrobenthos [27].

With regard to the sediment grain size, it was determined as we move towards the high tide region from low tide region the ratio Sand/Silt are increasing and in high tide region the number of Filter feeder like the Bivalvia and Foraminifera obviously need to mention that had the maximum density and in low tide region the density of this group was decreased. Also the number of Polychaete and Gastropoda increased. It is be concluded that if an area the sediment be larger the number of filter feeding macrobenthos is higher and in an area the sediment be smaller the number of deposit feeding macrobenthos will be dominant.

Also in this review by increasing temperature by increasing Phytoplankton productions and in result by increasing biological activities of macrobenthos as feeding, reproduction and then causes increasing the density and dispersion of them [9]. This matter confirmed that 10% population increasing of macrobenthos in summer in all stations during this period.

The calculated results of correlation coefficient between macrobenthos density and Environmental factors indicated that there was significant difference only between Foraminifera density and salinity ($p> 0.05$) ($r =+ 0.03$).

The results of correlation coefficient between macrobenthos density and environmental factors it can be concluded that among the mentioned parameters respectively salinity ($r =+ 0.22$), Temperature ($r =+0.15$), pH($r =+0.07$) and dissolved oxygen ($r=-0.1$) influence on macrobenthos communities.

Variances in water temperature one of the most important factors of aquatic reproduction for example, Annelids the member of species need to certain temperature rate to reproduce and increase water temperature can play a key role in releasing the gamete. Temperature is one of the physical factors which found in places with heat variances.

Distribution and diversity of livings shows the definite patterns. A state of steady happens in all environmental factors as salinity and temperature rate in tide condition and risk of lack of solved oxygen and food decreases [17].

Dissolved oxygen is one of environmental factors which affects dispersion and density of effective macrobenthos species and the muddy bottoms at tide. So, in sediment surface larger of muddy bottoms will face the problem of lacking oxygen. Lasting decrease in dissolved oxygen cause that the natural macrofauna will be extinct and Polycheate will be dominant in ecosystem.

Muddy bottoms shows less variance in relation to Salinity and it because of ting grain sediment that they keep the water in sediment which prevent from severe changes in Salinity.

pH is one of the physicochemical factors that have major effect on macrobenthos diversity. macrobenthos are unable to control their Physiological mechanism without pH stability. The dissolving of metal pollutant increases in pH < 8 and lead to increasing of aquatic death [28]. Ratio of CO_2 forms is another main works of pH in water. As a way that in there are more free forms of CO_2 in pH=4 and in pH=7 bicarbonate reach to maximum in ecosystem. Totally, increasing the free CO_2 in water and pH and salinity lead in increasing the toxicity effect of NH_4^+ on aquatic [28].

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