J. Appl. Environ. Biol. Sci., 2(7)348-357, 2012

ISSN 2090-4274
Journal of Applied Environmental and Biological Sciences
www.textroad.com

The Study of Seasonal Changes of Intertidal Macrobenthoses in Mangrove Forests of Basatin Estuary of Nay band Gulf

SaidehFazileh Hamzavi[1*], Ehsan Kamrani[1], Alireza Salarzadeh[2] and Ali Salarpouri[3]

1.Fisheries Ecology Department, University of Hormozgan, Bandar Abbas, Iran
2. Fisheries Biology Department, Islamic Azad University, Bandar Abbas Branch, Bandar Abbas, Iran
3. Research Institute of Persian Gulf and Oman Sea Ecology, Bandar Abbas, Iran

ABSTRACT

This study investigated seasonal changes of existing Macrobenthic in sediments of Bushehr Nay band Gulf Estuary Basatin and the sampling was done from summer 2010 to 2011. Samples were done by quadrate with measures of 25*25 cm in 3 stations with 3 replications. Then for determination of the sediments size and amount of total organic matter were sampled in each station. Also, this study was paid the measurement of environmental parameters (temperature, salinity, PH, and dissolved oxygen) by Horiba set. The results of this study showed that a total of 33 species Macro benthic belongs to 4 periods were identified which Gastropod species (11 species), Polychaeta (9 species),Crustaceans (7 species) and Bivalve (6species) respectively. Most of the abundance belong s to Paphiagalus of species of bivalve in the summer with 3096 in the square. The results of correlation test proved that between factors of physic-chemical of water and frequency of each group Macro benthic in error level at 50%, abundance of Macro benthic groups shows most correlations belongs to PH and showed that between abundance of polycheata and PH (r=0.971), between the frequency of bivalvia and PH (r= 0.969), between gastropods and PH (r =0.993) and the abundance of crustaceans and PH (0.998) was calculated.According to the results of biodiversity indicators showed that the highest average belongs to Shannon index related to the gastropods at the autumn at the estuary mouth station (0.961), Simpson index bivalve at summer in estuary mouth (0.584) and index of Margalef bivalve in the estuary of the station fall (16.61). Aggregation studies showed that most of the region deposits are snd – fine-silt-clay, so that the maximum amount of silt-clay in the estuary has been recorded (67.7%) and maximum fine sand that makes up the bulk of sediment at the mouth of the estuary is recorded (90.2%).
Keywords: macrobenthic, basatin estuary, Nay band Gulf, mangrove forests, Persian Gulf

1. INTRODUCTION

More than 70 percent of Earth s surface is formed by different aquatic ecosystems which their different relationships with each other play a vital role in global ecosystem [1]. Mangrove forests are scare, fructiferous, sensitive and fragile ecosystems that protect different groups of aquatic and land animals. These forests are rich ecosystems that ecologically have different fauna and flora. These ecosystems are suitable places for their reproduction, breeding, feeding and their rest [2].

In spite of the fact that the extent of world's Mangroves is not striking, but in recent decades, they have decreased greatly. Cutting the trees and the entrance of contamination to this ecosystem is direct effects of their decreasing [3].

The coasts of Nay band Gulf in Boushehr have important biological and ecological characteristics, which mangrove communities. The presence of aquatic birds and homeland values for aquatic s reproduction are among these characteristics and in addition to these economical values, these coasts have recreational and aesthetic values, but in spite of great importance of this area for its special geographical position, it is acceptor of different industrial infusions [3].

At Basatin estuary in Nay band Gulf, there are Mangrove forests which under the industrial effect of area, they are threatened by many industrial infusions. Affected by different contaminations, some parts of these trees become dry and consequently the homeland of many bottom livings have destroyed. In addition to contaminations, the creation of bridge on the estuary is a strong reason for high contamination in this area [3]. The role of aquatic invertebrate in energy transfer in aquatic ecosystems is of great importance and studying the Benthose communities is a suitable criterion for ecological assessing of aquatic ecosystem [4].

Because bottom living have a special life style and lacking the quick movements, they have great importance in biological environments studies and many of this creatures have been known as biological index [5].In attention to the great important role of population structure and biodiversity of macrobenthose in ecological recognition of a region. At this study the macrobenthose of mangrove forests of Basatin estuary in Nay band Gulf have been examined.

*Corresponding Author: S. FazilehHamzavi,Fisheries Ecology Department, University of Hormozgan, Bandar Abbas, Iran, Email: f.hamzavi89@gmail.com

2. MATERIALS AND METHODS

Region's position:

Nay band Gulf is located in 320 km south eastern of Boushehr which is as cape northern coasts of Persian Gulf. Its southern heights are located between 27 latitude and 13 minutes to 27 and 52 minutes and 52 longitude and 33 minutes to 52 and 51 minutes.

Table 1. Geographical position of sampling stations

Sampling station	Sampling station	Longitude	Latitude
Station 1	End of estuary	E " 48.54´ 40º 52	N" 40.1924º 27
Station 2	Middle of estuary	E " 11.33́ 40 º 52	N " 57.15´ 23 º 27
Station 3	opening estuary	E " 38.20´ 39 º52	N " 41.67´ 23 º 27

Figure 1. Geographical position of sampling stations

Sampling Method:

Sampling was done during 4 seasons of autumn, winter, summer and spring. The exact time of sampling was determined by using the website (www. Iranhydrograghy.ir). For complete covering of settlement, 3 stations in 3 area of opening estuary (meeting place of estuary and sea), the middle of estuary and the end of estuary was selected.

For studying the structure of macrobenthoses, 3 samples of sediment was taken by plat which had the profile of 25* 25 cm and 20 cm penetration depth for identifying the livings and 2 samples was taken for studying the granulation and the alloy of organic material. The samples related to measuring the alloy of organic materials was hold in plastic in icebox and after transferring to lab, they were hold in freezer at -20 ˚c [6].Physico – chemical factors of water which include temperature, PH, salinity and desolved oxygen (DO), were measured in sampling site by using the Horiba U – 10 apparatus.

Separation of Benthonic Samples:

After sampling, the sieve 500 micron was usual for separating of samples. In such a way that at first the sedimentary samples were spilt on sieve and they were washed by sea water with same salinity. Then the samples which were on sieve were moved to lidded plastic containers and they were kept in 4% formalin (diluted by seawater as a buffer). In laboratory, the samples in formalin were again washed and they were colored by bio color Bengal Rose 1 g/lit which is special for coloring the organic tissue and living beings. The benthonic samples were studied by using the steromicroscope and the colored benthonic samples were separated and kept in ethanol 70%.

Then some pictures and slides are took from them, and by using the available identifying keys, the samples were identified.

- Persian Gulf Mollusca atlas [7].
- Seashells of eastern Arabia, Guide ti shells [8].
- And other valid sites such as:
- www.Sealifebase.org
- www.marinesecies.org
- www.Zipcodezoo.com

Sediment granulating Analysis:

Sediment granulating is performed between 63 µm and 4mm by a set of sieve [9]. In first phase, 25 g of dried sediment is mixed with 250ml water and 10 ml sodium hexametaphoste solution $(NaPO3)_6$ and stirred for 10 – 15 m and it kept at this state for 8 hours. Then the solution is passed from 63 micron sieve and the resulted sediment wae dried in 70° oven for 24 h. ultimately the sediment was passed from the set of sieve and it was weighted.

The sediments are divided to 4 groups:
Coarse sand (> 500 µm)
Medium sand (250 – 500 µm)
Fine sand (125 – 250 µm)
Mud (< 125 µm).

Organic materials Analysis:

Glass container was selected with the weight of **C** and it was filled with sediment. The container was put in oven in 70°c for 24h. After cooling in lab medium, it was measured by digital scale with the precision 0.001 **a** weight. After that, the container which had sediment, was put in 550°c and after cooling in desiccators, it´s **B** weight was obtained.

The below equation was used for estimating the percent of total organic material [10].

TOM = A-B /A-C * 100

Data processing and Analyzing of results:

In this study, 3 important indexes that have been examined for biodiversities of macrobenthoses are as below.

Shannon index:

Shannon index represents the average of unreliability in estimating and predicting the connection of a selected individual accidentally to one of a sample groups that have the total number of S species and total number of N people. So, the greater total number of the individuals that from a sample species, and more same the frequency distribution between these species, the more degree of unreliability there is.Which its interpretation is the existence of more diversity.The value of this index zero when there is only one species in sample and its value is maximum when number of species is more and the individuals that from the species in the specimen are relatively equal [11]. For estimating the diversity of macrobenthoses in this study, Shannon index was used.

Shannon index (H´):

$$H' = -\sum_{i=1}^{s} PiLn(Pi)$$

Pi: frequency ratio of each specimen which is calculated as follow: $P_i = n_i/N$

Ni: number of total individuals belongs to its species.

N: number of total individuals of specimen.

S: total number of species.

Simpson index:

This index is varied between o to 1 and it represents that an individual that accidentally is taken out of a population, how much it is probable that it belongs to a species. If the probability of belonging of two individuals to a same species was high, the diversity of sampled community will be low. This index represents the predominance rate and as a result. Its value is decreased by increasing the diversity [11].

This index is calculated as below:

Simpson index (λ):

$$\lambda = 1 - \sum_{i=1}^{s} [\frac{ni\ (ni-1)}{N\ (N-1)}]$$

N is the total number of known individuals for S species in population.

Ni: the number of individuals its species.

Margalef index:

According to studying available sources, it could be said that one of effective and distinctive indices for describing the situation of benthic communities is margalef index, which is the comparison of total number of species in a community and it is shown by S letter. Because the rate of this index depends on the number of collected specimen and also to length of studying time, so its efficiency as an index for describing the different benthic communities is limited. So other indices are suggested to describe the diversities of benthoses population which are quite intendant of size and number of specimen. Theses indices are expressed based on the relationship between the total number of species (S) and total number of individuals that form the species (N) which naturally are increased by increasing the number of specimen [11].Species richness which is known as species accumulation, it means total existing species.

In this index, for calculating the species richness, we use the below formula:

$$R = \frac{S-1}{LnN}$$

R: species richness

S: number of species

N: number of individuals.

Studying the statistical relations:

One – way Enova variance analysis with Tukey HSD and LSD post tests have used for recognizing the difference between different areas and seasons in sampling stations .

The test of correlation coefficient was used for examining the rate of correlation between macrobenthoses accumulation with each other and with physic – chemical parameters of water in each station.

At this project, SPSS 16 program for calculating the simple variance analysis and correlation coefficient test, biodiversity ver.2 software for calculating the biodiversity indices, Excel 2007 for calculating the averages and standard deviations and planning the diagrams and Word 2007 for drawing the tables was used.

3. RESULTS

The samplings that were performed in Basatin estuary showed that generally the amounts of coarse and medium sands at all station were less than other sedimentary components, and silt – clay and fine sand are the major parts of sediments. The amount of silt – clay is increased from opening to end of estuary (figure 2).

Data comparing in different seasons show that between the amount of different granule such as silt – clay, fine sand, medium sand and coarse sand in different seasons, there is no significant variance ($p > 0.05$). But the comparison of different stations for percent of different granules, it shows the significant different between the stations ($P < 0.05$).

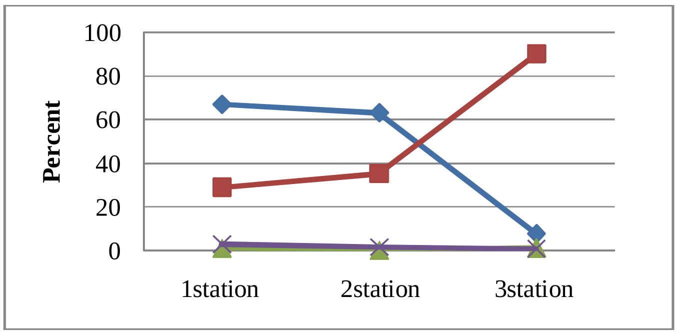

Figure 2. The diagram of percent of sedimentary components at sampling stations in Basatin estuary

The changing ranges of organic materials were 6.7 to 8.3 % in spring, 12.2 to 14.7 % in summer, 11.2 to 14.1 % in autumn and 8.1 to 9.3 % in winter. TOM percent between different seasons of year except autumn and summer showed a significant variation ($P < 0.05$). But there was no significant variation between the sampling stations ($P > 0.05$).

The highest average of temperature was recorded in summer at station 2 (middle of estuary) by 34.6 ± 0.1˚ c , and the lowest average was recorded in winter at station 1 by 17.63 ± 0.23˚ c. (The average temperature of water has shown in table 2).

Table2. Table of mean and standard devition of water temperature of Basatin estuary at different seasons of year

Water Specifications	Sampling Station	Spring	Summer	Autumn	Winter
Water temperature (Centigrade)	Station 1	0.25 ± 26.76	0.11 ±24.53	0.15 ± 22.26	0.23± 17.83
	Station 2	0.15 ±27.2	0.1 ±34.6	0.11 ± 23.06	0.26 ±19.5
	Station 3	0.1 ± 30	0.15 ±34.06	0.15 ±23.26	0.32 ±20.13

The highest average of salinity was for station 3 (opening of estuary) in summer with the average of 40.1 ± 0.1 psu , and the lowest salinity was for station 2 in spring with the average of 38.63 ± 0.05 psu. The mean of salinity at Basatin estuary in different seasons have given in table 3.

Table3. Means and standarddivition of water salinity (psu) of Basatin estuary at different seasons of year

Water Specifications	Sampling Station	Spring	Summer	Autumn	Winter
Water salinity (psu)	Station 1	0.05 ± 38.83	0.05 ± 40.04	0.05 ± 39.66	0.11 ± 39.46
	Station 2	0.05 ± 38.63	0.1 ±40	0.15 ± 39.13	0.15 ± 39.13
	Station 3	0.05 ± 39.03	0.1 ±40.1	0.1 ± 39.2	0.2 ± 39.2

The highest mean of recorded DO of Basatin estuary is winter at station 1 with the mean of 8.04 ± 0.03 ppm and the lowest amount of DO have recorded in summer at station 1 with the mean of 4.81 ± 0.01 ppm. The quantity of dissolved oxygen in water of Basatin estuary at different seasons of year is given in table 4.

Table4. Means and standard deviation of water DO (ppm) of Basatin estuary at different seasons of year

Water Specifications	Sampling Station	Spring	Summer	Autumn	Winter
DOWater (ppm)	Station 1	0.04 ± 6.45	0.01 ±4.81	0.05 ± 7.76	0.03 ± 8.04
	Station 2	0.02 ± 6.31	0.01 ± 5.11	0.05 ± 6.86	0.03 ± 7.92
	Station 3	0.04 ±6.04	0.01 ±5.01	0.02 ± 7.32	0.03 ± 8.03

The range of PH at sampling stations of Basatin estuary was 8 to 8.45 in spring, 8.1 to 8.15 in summer, 8.1 to 8.25 in autumn and 7.7 to 8.13 in winter. The highest mean of PH at station 2 was 8.42 ± 0.02 in spring and lowest rate of PH was 7.76 ±0.05 at winter for station 3. PH mean of Basatin estuary in different seasons of year is given in table 5.

Table5. Mean and standard deviation of PH basatin estuary of different seasons of year

Water Specifications	Sampling Station	Spring	Summer	Autumn	Winter
pHwater	Station 1	0.01 ±8.36	0.02 ± 8.13	0.005 ± 8.15	0.06 ± 8.07
	Station 2	0.02 ± 8.42	0.01 ±8.11	0.01 ± 8.11	0.06 ± 8.07
	Station 3	0.02 ± 8.02	0.005 ± 8.14	0.02 ±8.22	0.05 ±7.76

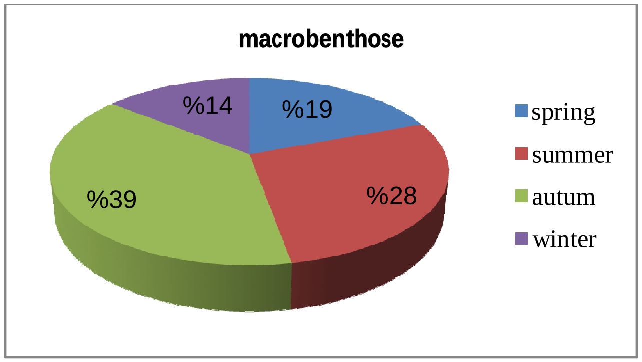

Figure 3. Abundance diagram of macrbenthos species in Basatin bay at sampling seasons

Macrobenthic groups:

In seasonal sampling of Basatin estuary of Nay band Gulf, 33 genuses of 23 families in 4 classes of bivalves, crustacean, polycheata and gastropods has been identified (table 6).

Table6. Lists of identified macrobenthic species in Basatin estuary along the sampling seasons

Class	Order or Subclass	Family	Species or Genus
Polycheata	Phyllodocidae	Nereidae	***Nereis sp.1***
			Nereis sp.2
			Ceratonereis sp.
		Nephtydae	***Nephtys sp.***
	Capitellida	Capitellidae	***Capitellacapitata***
			Capitella sp.
	Phyllodocidae	Cirratulidae	***Ceratocephateorientalis***
		Pillargidae	***Pillargia sp.***
		Glyceridae	***Glycera sp.***
Bivalvia	Euheterodontaincertae sides	Veneridae	***Paphiagalus***
		Tellinidae	***Tellinawalace***
			Tellinacapsoids
		Mytillidae	***Mytillus sp.***
	Veneroida	Lucinidae	***Cadakiatigerina***
		Psammobiidae	***Soletellinadiphos***
Gastropoda	Neotaenioglossa	Nassaridae	***Nassariusdeshayessina***
			Nassariuscastus
		Potamidae	***Cerithideasingulata***
		Ceritidae	***Clypeomerousbifasciatus***
		Columbellidae	***Mitrellamisera***
		Planaxidae	***Planaxissulcatus***
	Vetigastropoda	Cylichnidae	***Aceteocinainvoluta***
		Atydae	***Atys sp.***
		Trochidae	***Trochus sp.***
	Systellommatophora	Onchidiidae	***Phasionellasolida***
Malacostraca			***Onchidiumperonii***
	Decapoda	Ocypodidae	***Ucasidensis***
			Ocypoda sp.1
			Ocypoda sp.2
			Macrophthalmuspectinipes
		Menippidae	***Epixanthusfrontalis***
	Euphausicea		
	Amphipoda		

The abundance of total identified species at summer, autumn, includes 5456, 7536, 2896, 3776 in square meter respectively, which have allocated 28%, 38%, 15% and 19% of total species respectively.

The studying of the abundance of macrobenthoses showed that at summer generally 5456 figure in square meter macrobenthos was collected which 54% have been related to bivalvia, 20% to gastropods, 14% to polycheata and 12% to crustacean.In autumn from 7536 collected macrobenthoses, 46% have been related to polycheata, 27% related to gastropod and, 15% to crustacean and 12% to bivalvia.

In winter, from 2896 collected macrobenthoses, 27% have been related to gastropods, 25% to crustacean, 24% to polycheata, and 24% to bivalvia.In spring, from 3776 collected macrobenthoses, 32%have been related to crustacean, 26% to polycheata, 22% to bivalvia and 20% to gastropods.

Sampling showed that in spring the highest number of polycheata is related to species of *Capitellacapitata*,*Ceratocephateorientalis with* 208 individual in $m^{2.}$ In summer the highest number was related to genus Glycera sp. With 160 individuals in m^2, in autumn the highest number was related to genus Nereis sp.1 with 704 individual , in winter the highest number was related to *Capitellacapitata*with 192 individual (Figure 4).

In all sampled seasons, the highest number of all identified polycheata has been related to *Capitellacapitata*with 1152 individual in m^2.

The highest number of bivalvia have been related to spring with 2944 individual in m^2 and the lowest number has been related to winter with 688 individual. In spring, the highest number was related to species of *Paphiagalus* with 432 individuals. In summer, the highest number was related to species of *Paphiagalus* with 2096 individuals in m^2. In autumn, the highest number was related to species of *Paphiagalus* with 352 individuals and in winter, the highest number was related to species of *Paphiagalus* with 384 individuals in m^2 (figure 5). In all four seasons, the highest number has been related to *Paphiagalus* with 3264 individuals in m^2.

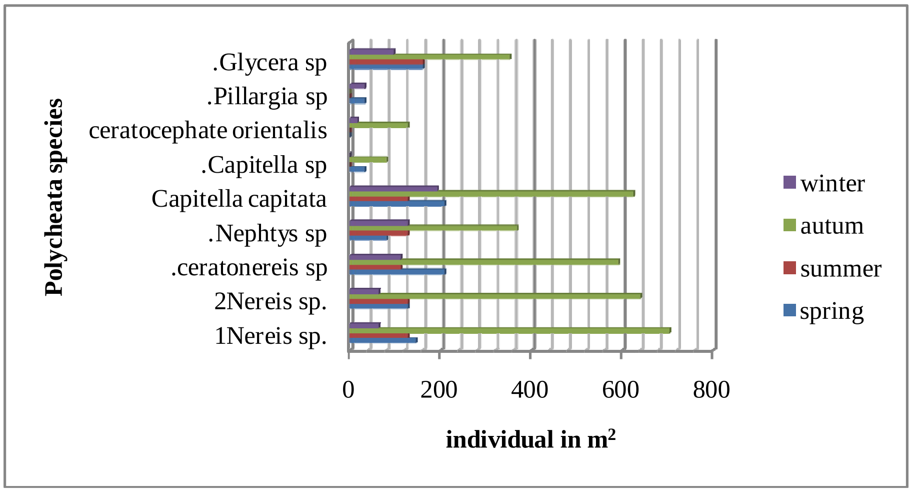

Figure 4. The diagram of comparing the abundance of polycheata species at different seasons of year

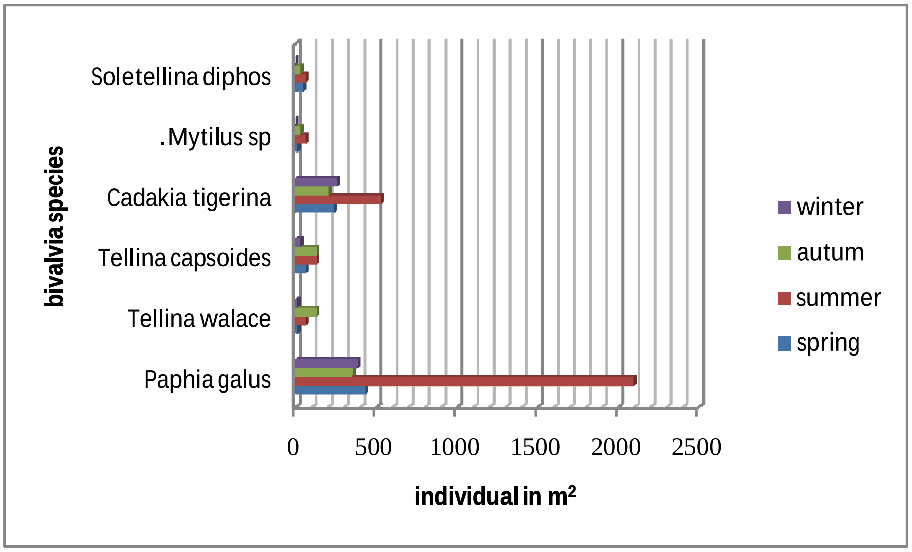

Figure 5. The diagram of comparing the abundance of bivalvia species in different seasons of year

The highest number of gastropods has been related to autumn with 2064 individuals and the lowest number has been related to spring with 768 individuals in m^2. In spring, the highest number was related to the *Cerithideasingulata* with 240 individuals in m^2. In summer, the highest number has been related to *Nassariusdeshayasiana* with 416 individuals in m^2.In autumn, the highest number has been related to *Cerithideasingulata*and *Nassariusdeshayasiana* with 432 individuals in m^2 and in winter, the highest number has been related to *Cerithideasingulata* with 240 individuals in m^2 (Figure 6).In all four seasons, the highest number has been related to *Nassariusdeshayasiana* with 1280 individuals in m^2.

The highest number of identified crustacean has been related to spring with 1200 individuals in m^2 and the lowest number has been related to summer with 624 individuals in m^2. In spring the highest number has been related to *Ocypoda sp.1* genus with 336 individuals in m^2. In summer, the highest number has been related to *Ocypoda sp.1* genus with 192 individuals in m^2. In autumn, the highest number has been related to *Ocypoda sp.1* with 288 individuals and in winter, the highest number has been related to *Ocypoda sp.1* genus with 192 individuals in m^2 (figure 7). In all four seasons, the highest number has been related to *Ocypoda sp.1* genus with 192 individuals in m^2.

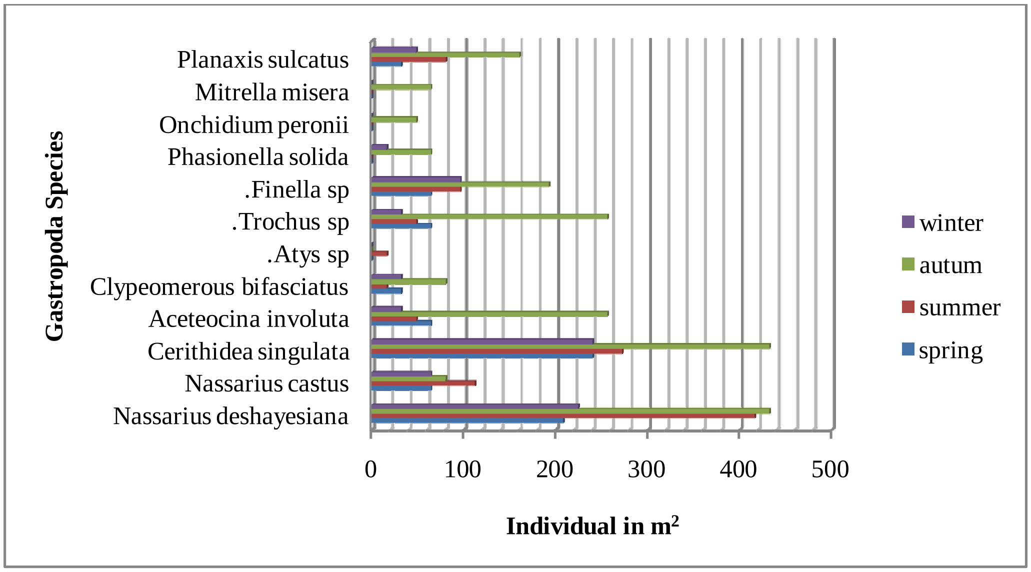

Figure 6. The diagram of comparing the abundance of gastropods species at different seasons of year

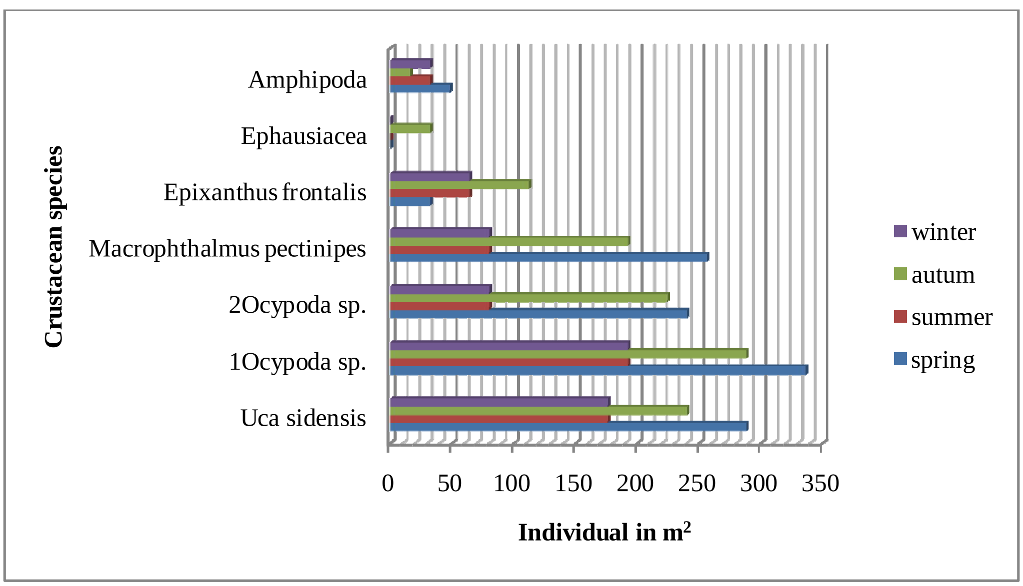

Figure 7. The diagram of comparing the abundance of crustacean's species at different seasons of year

Ecological indices:

For examining the ecological indices, Shannon index and simpson and margalef indices were used, which by calculating the value of these indices, the comparison between different season of year and sampling stations was done.The lowest value of Shannon index was calculated in summer with 1.09, and the highest value was for autumn with 1.25. Also, the lowest value of simpson index was obtained in autumn with 0.056 and the highest value was for summer with 0.13. The lowest value of margalef index was obtained in autumn with 14.46 and the highest value was for winter with 18.83.

For gastropods class among the sampling stations, the highest and lowest value of Shannon index,simpson and margalef indices, was calculated respectively (0.961-0.47), (0.343 – 0.105) and (13.016 – 6.137).In bivalvia class, the highest and lowest value of Shannon index, simpson and margalef indices, was calculated respectively (0.711– 0.276), (0.584 – 0.211) and (16.61– 2.28).

In polycheata class, the highest and lowest valueof Shannon index, simpson and margalef indices, was calculated respectively (0.852-0.555), (0.19–0.067) and (11.445–3.657).And in crustacean class,the highest and lowest value of Shannon index, simpson and margalef indices, was calculated respectively (0.716 – 0.509), (0.305– 0.143) and (5.386–4.062).

Correlation test between macrobenthic classes and physical parameters:

Correlation between macro benthic classes and physical parameters of Basatin estuary was calculated in 0.05 error rate and the results of this test have been given in table 7.

Table7. Correlation between macro benthic classes and physical parameters of Basatin estuary

	Temperature	salinity	PH	oxygen	TOM	silt	pilycheata	bivalvia	gastropod	crustacean
Person Correlation**Temperature**	1									
Sig. (2-Tailed)										
N	36									
Person Correlation**Salinity**	0.492**	1								
Sig. (2-Tailed)	0.002									
N	36	36								
Person Correlation**Ph**	0.244	-0.253	1							
Sig. (2-Tailed)	0.152	0.137								
N	36	36	41							
Person Correlation**Oxygen**	– 0.983**	-0.467**	-0.287	1						
Sig. (2-Tailed)	0.000	0.004	0.089							
N	36	36	36	36						
Person Correlation**TOM**	0.349*	0.775**	0.010	-0.349*	1					
Sig. (2-Tailed)	0.037	0.000	0.954	0.037						
N	36	36	36	36	36					
Person Correlation**Silt**	-0.098	-0.04	0.414*	0.029	0.231	1				
Sig. (2-Tailed)	0.568	0.983	0.012	0.867	0.179					
N	36	36	36	36	36	36				
Person Correlation**Polycheata**	-0.117	-0.166	0.972**	0.138	0.063	-0.540**	1			
Sig. (2-Tailed)	0.497	0.334	0.000	0.423	0.716	0.001				
N	36	36	41	36	36	36	41			
Person Correlation**Bivalvia**	0.425**	0.396*	0.969**	-0.424*	0.184	-0.571**	0.949**	1		
Sig. (2-Tailed)	0.010	0.017	0.000	0.010	0.282	0.000	0.000			
N	36	36	41	36	36	36	41	41		
Person Correlation**Gastropod**	-0.035	0.008	0.993**	0.014	0.263	-0.443**	0.998**	0.972**	1	
Sig. (2-Tailed)	0.841	0.961	0.000	0.935	0.121	0.007	0.000	0.000		
N	36	36	37	36	36	36	37	37	37	
Person Correlation**Crustcean**	-0.089	-0.526**	0.998**	0.070	-0.383*	-0.269	0.979**	0.965**	0.994**	1
Sig. (2-Tailed)	0.607	0.001	0.000	0.684	0.021	0.113	0.000	0.000	0.000	
N	36	36	37	36	36	36	37	37	37	37

4. DISCUSSION

The existing macrobenthoses in sea sediments have effective role in ecosystem processes such as food cycle, pollutant metabolism and secondary production. Accumulation and abundance of macrobenthoses have direct relationship with the amount of dissolved oxygen and accessibility to food resource. Also the biomass of macrobenthoses has direct relationship with the type of seedbed.

The number of identified species in this study was 33 species at same studies by Keshavrz [12] in Bandar khamir, 32 species and by Kamalifar [13] in Boushehr 44 species have been identified.

Generally, the difference at variance mangrove settlements depends on geographical length , mangrove species, estuary morphology and presence or absence of freshwater at region and other variables that could be the result of specific environmental and ecological forms of each settlement [14].

In this study, the polycheate with 30% and bivalvia with 27%, are the dominant taxons in Basatin estuary. Kamalifar [13] at studying on Bardestan estuary reported the bivalvia with abundance of 47.5% as the dominant taxon.In many studies, polycheata are the dominant macronenthoses in mangrove forests, such as [12, 15]. At above studies, the sampling was limited to mangrove trees areas.

The obtained results represent the time and place changes in dispersion,abundance, number and species composition of macrofauna at basatinestuary.This variation is not unusual in tidal area of mangrove forests [15].Karami [5]has found the similar results in tidal areas of Zohreh River. He suggested that the decreasing the macrobenthic variation in summer is the result of DO decreasing, and increasing of temperature and salinity in this season.

Sarvankumar et al [16] studied the mangrove forests of Kachch – Gujarat in India , have suggested that accumulation and high diversity of macrofauna in winter is due to lower temperature and the stability of environmental factors like salinity. They also concluded that the low diversity of species in summer is due to the decreasing of gametogenesis and reproduction, declining of dissolved oxygen and increasing H_2S in sediments.

At last, it can be said that, there was time and place changes of some environmental factor between the stations and different seasons.The composition of macrofaunic communities was varied in different seasons and stations. Environmental characteristics like temperature, DO, TOM and granulation play vital role in dispersion, diversity and species composition of macrofaunic communities.

In studies of eksiri et al [17], it has been suggested that the regions which lacking of pollution , have H' larger than 3, the polluted regions have H' smaller than 1 and the regions with medium pollution have H' equal to 1 to 3. At this study, with attention to obtained results of bio indices (the mean of Shannon - viner 1.18, simpson 0.08 and margalef 17.75) and because of threats such as neighboring to industrial centers and specially the creation of road on the opening of estuary, it can be said that Basatin estuary is at average limitation from ecological view , in drying of some parts of mangrove forests.

RECOMMENDATION

- Performing same studies about abundance and diversity of macrobenthoses communities in other estuaries of Nay band Gulf and comparing them.
- Simultaneous study of area for the velum of remained heavy metals in sediments and abundance and diversity of existing benthoses for determining the effect of heavy metals on abundance and diversity of benthoses.
- Because the Nay band Gulf is located in neighboring to huge industrial centers like Pars – e – jonoobi , it is suggested that it is necessary to protect of this beautiful ecosystem and planning for industrial development and creating the industries near ecosystem is related to studying the side effects of biological environment.
- Studying the mayofauna, bactries, algae, phytoplanktons, zooplanktons and so on for identifying this ecosystem.
- Necessary education to inhabitants for decreasing excess exploitations and the destruction of mangrove ecology.

REFERENCES

1. Shishecheian, F. 1994. Preliminary review of the Macrobenthic communities between tidal coast of Oman (Chabahar). MSc thesis. Tehran shomal Azad University.
2. Danehkar, A. 1996. Iranian mangrove forests. Quarterly Environment. 8 (2), p.110.
3. Davari, A. 2009. Review the remaining heavy metals in sediments of oil pollution in the mangrove forests of mangrove habitat and body in Bushehr. MSc thesis. Tehran University.
4. Tabatabaei, T., Amiri, F., and Pazira, A. 2009. Monitoring the community structure and diversity as indicators of pollution in estuaries Moses and Ghannam want macrobenthoses . Iranian fisheries magazine. 3 (4), p. 13.
5. Karami, K. 2004. Macrobenthic community structure in subtidal zone of Zuhreh river mouth. MSc thesis. Khoramshahr marine science and technology university. Department of marine biology.
6. Delman, O., Demirak, A. and Blaci, A., 2006. Determination of heavy metals (Cd, Pb) and trace elements (Cu, Zn) in sediments and fish of the southeast ern Aegean Sea (Turkey) by atomic absorption spectrometry. Food chemistry, 65: pp.157– 162.
7. Hosseinzadeh, H., Daghoghi, B., Rameshi, H. 2001. Atlas of the Persian Gulf mollusks. Iranian fisheries research organization (I.F.R.O).
8. Emerson, W. K. and Jacobson, M. K. 1974. Guide to shells. ALFRE A.Knopf. P. 482.

9. Eleftheiou, A. and Alasdair, M. I. 2005. Methods for the study of marine benthos. Third edition, Blackwell Science.
10. Holme, N. A., McIntyre, A. D., 1984. Methods for the study of marine benthos. IBP Handbook. V. 16. Second edition. Oxford, U. K.
11. Krebs, C. J., 1989. Ecological Methodology, Harper and Row Publishers, New York.
12. Keshavarz, M. 2008. Investigation of benthic communities of Khamir port mangrove forest. MSc thesis. Bandar-Abbas University. Department of marine biology.
13. Kamalifar, R., Vazirizadeh, A., Nabavi, M.B., Safahieh, A.R. Ronagh, M.T. and Fakhri, A. 2009. Investigation of macrobenthic communities in mangrove ecosystem of Bardestan estuary, in Bushehr province. International conference of the Persian Gulf. Islamic Azad University, Bushehr branch.
14. Kathiresan, K. and Binghamnd, B. L., 2001. Biology of mangroves and mangrove ecosystems. Advanced in Marine Biology, 40, pp. 81-251.
15. Chapman, M. G. 2006. Relationship between spatial Patterns of benthic Assemblages in a mangrove forest using different levels of taxonomic resolution. Marine Ecology Progress Series, No.162, pp. 71 – 78.
16. Saravnakumar, A., SeshSerebiah, J., Thivakaran, G.A., Rajkumar, M. 2007. Benthic Macrofaunal Assemblage in the Arid Zone Mangroves of Gulf of Kachchh – Gujarat. Journal of Ocean University of China, 6 (3), pp. 303 – 309.
17. Eksiri, F., Emadi, H., Nabavi, M.P., Vosoughi. G. 2004. Investigation of polychaeta assemblage diversity in Laft and Khamir ports. Research and study on animals and aquatic organisms. 5, 70-84.