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Study of Polychaete Seasonal Changes (Ecological Indices) in Basatyn Estuary Nay band Bay of Bushehr

Saideh Fazileh 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 was conducted to investigate Polychaete seasonal changes (Ecological Indices) available in sediments of Basatyn Estuary Nay band Bay of Bushehr. Sampling of this study was carried out for a year from summer (2010) to spring(2011) by a plot with dimensions of 25×25 cm in 3 stations(opening, middle and end of the estuary) for 3times. Next, sampling performed in order to determine sediments aggregation and measure the total amount of organic materials in each station. Hydrologic parameters such as temperature, salinity, PH and dissolved oxygen were measured by Horiba measurement device. Generally, in four sampled seasons the maximum number of the total identified polychaetes (1152 per square meter) was related to Capitellacapitata. Polychaete biological indices calculated in this study indicated that highest amount of Shannon index was related to spring in the opening estuary while its lowest amount can be seen in autumn in the end estuary. In addition, the highest and lowest amount of Simpson index was related to autumn in the end estuary and spring in the end estuary, respectively. Highest and lowest amount of Margalef index were related to winter in the end estuary and autumn in the end estuary, respectively.
Key words: Polychaetes, Basatyn Estuary, Nay band Bay, Mangrove Forests, Persian Gulf

1. INTRODUCTION

Macrobenthosare among importantcomponentsof marine eco systems spending at least a part of their life. These organisms are considered more than any otheraquatic organismsin theecologicalassessment ofaquaticecosystemsbecause of their special features. Macrobenthoshaveextremely high species richnessand react in different ways to theenvironmental factors. They are distinguished among other organisms due to diversity ofthe life cycle oftheseorganismsanda high range of tolerancerangein some species towardscontaminantsfound intheir habitats. Polychaetesarea group ofMacro benthos with highspecies richnessandhighdiversityinthe aquatic environment. They are also present in various kinds of beds andmarinehabitats. In addition, they have high amount of tolerance against harmful effects(both pollutionandnaturaldisturbances. Therefore,theseorganismsare widely used in biologicalmonitoringtests(Bio monitoring) [1, 2, 3, 4, 5, and 6].

Mangrovesforests inIran are considered as highest level of Mangroves in Southwest Asia. Location of these forests starts at most easternpartof Iran's Oman Sea in Goiter bay and ends in the west part of the Persian Gulf in Nay bandhabitat near Bushehr [7].

Coasts of BushehrNay band bay have prominentandimportantecologicaland biologicalfeaturesamong which are Haracommunities, presence ofseabirdsandhabitat values for breeding of aquatics in this region. These regions in addition to economical values have also aestheticandrecreationalfeatures. Despite great importanceof this regionin terms ofitsgeographicalsituation, it is open to a varietyof industrialwastewaters. Some Mangroves forests in Basatyn Estuary Nay band Bay of Bushehrarethreatened by plenty of industrialwastewaters due to effects of industrial region. A part of thesetrees are dried affectedvariouspollutions. In addition tothe pollution caused byindustrialarea, bridgeconstructiononopeningestuary is another reason for pollution in this habitat [8].

2. MATERIALS AND METHODS

Nay band Bay is located in 320 km of the southeastof Bushehr in a snooty form in landsof northerncoast of Persian Gulf. Itssouthern highlands are betweenthe latitude of 27° and 13 minutes to 27°and 52minutes. ThisBaywith an area of41.3square kilometers(equivalent to 41300hectare),7400meterswide of openings and coastal line with length of20.75km is classified as small coastal gulfs (bay).

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

Figure1.Geographic location of Basatyn Estuary

Table 1. Geographic location of sampling stations in Basatyn Estuary

Station	Location	Latitude	Longitude
Station 1	End estuary	E 52^{O}40$^{'}$ 48.54$^{''}$	N 27^{O}24$^{'}$ 40.19$^{''}$
Station 2	Middle estuary	E 52^{O}40$^{'}$ 11.33$^{''}$	N 27^{O}23$^{'}$ 57.15$^{''}$
Station 3	Opening estuary	E 52^{O}39$^{'}$ 38.20$^{''}$	N 27^{O}23$^{'}$ 41.67$^{''}$

As shown in table 1, for sampling, 3 stations in opening, middle and end of the estuary are considered.

Sampling was performed seasonally at thetime of fulltide for one year from summer (2010) to spring (2011) by quadrateswith dimensions of 25×25 cm(0. 0625m^2) andadepth of 20 cm. Ateachstation,samplingwas performed for 3 times with aminimum distance of3 meters.Physicochemicalparameters of water such astemperature,salinity, and dissolved oxygen andPH were measured in sampling stations bya watermeasurement device(Horiba U-10). Aftersampling, 500micron sieve was usedto separatesamples so that we first put sedimentsamplesonsieve and started towash it using the sea water with the same salinity. Washingcontinuesuntil quiteclearand transparent watercomes outfrom under part of the sieve. Next, samples available in the sieve were transferred intoplastic sealed containers and kept in4%formaldehyde(diluted with seawateras abuffer).Samples kept in the informal in, werewashedagain in thelaboratory and stained using bio color of Rose-Bengal 1g per liter specific for staining living organismsand organictissue.Obtained Benthossampleswereexamined usinga stereomicroscope and stained samples of Polychaeteswereisolated and kept in 70% ethanol alcohol. Then, some photosandslides were preparedusingavailableidentificationkeys and samplesidentified. Sieve serieswere used to determine theaggregationsize of sediments according to which sand, silt -clay particles wereisolated. In the next step, the material and aggregation of the bed was determined at eachstation [9]. A physicalmethod(electric furnace) was used to measure sediment'sorganic materials in the bedat a temperature of550 ° Cfor 8 hours[9].

3. RESULTS

Physicochemicalparameters:

Aggregationanalysis ofsedimentsindicated that in general amount of coarse and mediumsand was less than othercomponents of thesediment. Percent of silt-claywas reduced from end estuary to openingsestuary. Highest amount offines andhas been recordedat theopeningestuary. Range ofchanges in total organic materials was 6.1-8.3%,12.2-14.7%, 11.2-14.1%,8.1-9.3% for spring, summer, autumn and winter, respectively.

Highest average of TOM was measured in summer (14.4 ±0.3 %)at station1 (endestuary) and the lowest amount was related to spring (6.2 ±0.1 %)in the station3 (estuary openings). The highest averagetemperature was recorded in summeratstation 2(middle estuary)with an average of34.6 ±0.1°Canditslowest amount was in the winter at station 1(end estuary) with an average of17.63±0.23°C.

Highestsalinityaveragewas related tostation3(opening estuary)in the summer with an average ofpsu40.1±0.1 andthe lowestsalinity was related tostation2 (middle estuary) in the springwith an average ofpsu38.63±0.05.The highest average of DO is recorded atStation 1in winter(end estuary) with an average ofppm 8.04±0.03 and lowest average of DO is recorded atStation 1in summer(end estuary) with an average ofppm4.81±0.01.

PHrangein thesamplingstations of Basatyn Estuary was 8-8.45, 8.1-8.15, 8.1-8.25, 7.7-8.13 for spring, summer, autumn and winter, respectively.The highest average ofPHin thestation 2(middle estuary) was in spring (8.42 ±0.02) andthe leastamountofPH was in station3 (opening estuary) in thewinter with an average of7.76 ±0.05.

Polychaete species:

Results of seasonal sampling for a year from summer (2010) to spring (2011) in Basatyn EstuaryNay band Bay of Bushehr included identification ofninespeciesfromsixfamiliesofpolychaetesCategory that present in table 2.

Table2.Polychaetesidentified inBasatyn Estuary(2010-2011)

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.***

As shown in figure2, maximum number ofpolychaetes was in autumn (3488polychaetes per square meter)andthe lowestnumber was in winter (704 polychaetes per square meter).

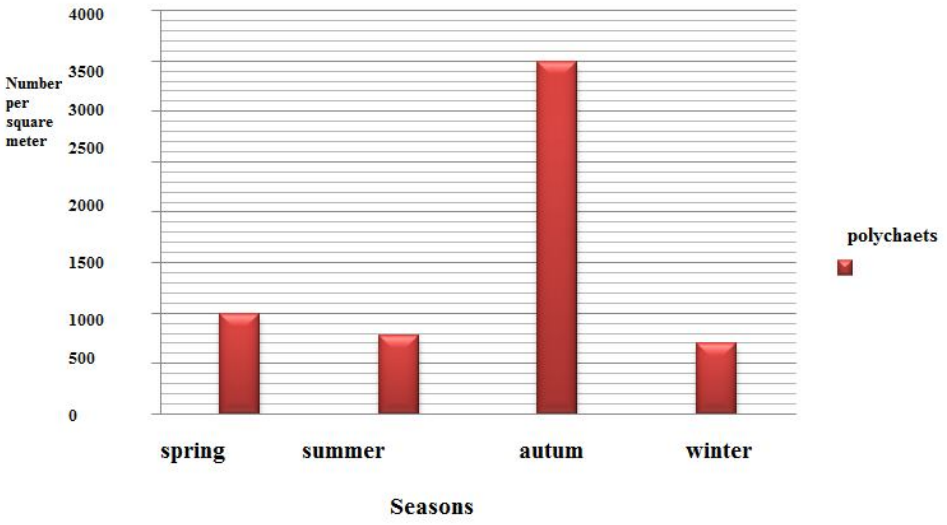

Figure2. Frequency of polychaetes in Basatyn Estuary(2010-2011)

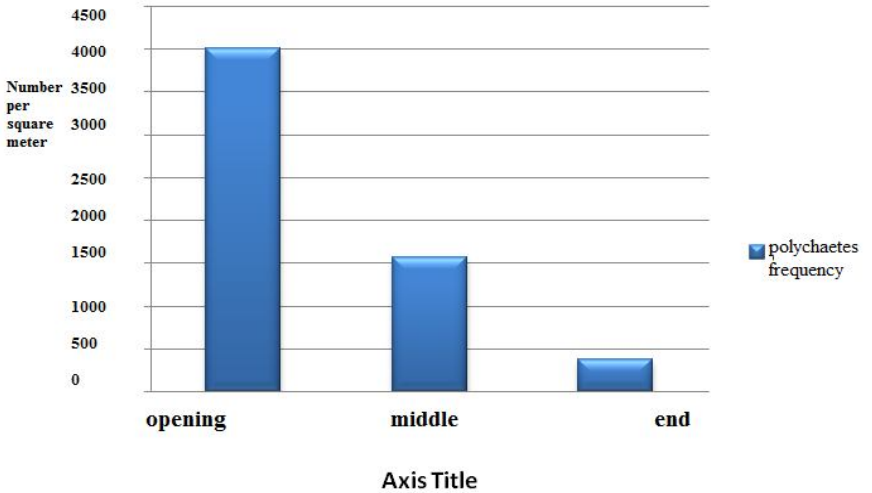

Figure3.Frequency of polychaetes in sampling stations of Basatyn Estuary

Generally, in four sampled seasons the maximum numberof the totalidentified polychaetes (1152 per square meter) was related toCapitellacapitata(figure4).

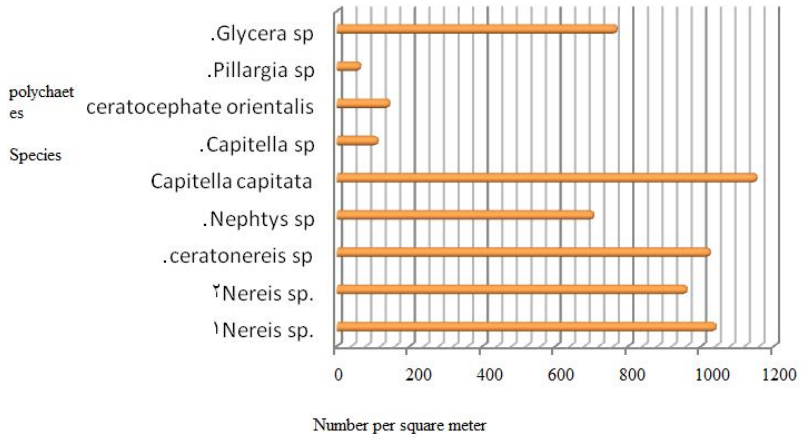

Figure4. Frequency of polychaetes species identified in Basatyn Estuary(2010-2011)

For assessmentof the ecological indices (seasonal changes), Shannon-Wiener, SimpsonsandMargalef indices were used. According to calculation of the amount of these indices, different seasons of a year were compared with sampling stations (table3).

Table3. Bioligicalindicators of polychaetesBasatyn Estuaryin 2010-2011

Season	Station	Shannon - Wiener index	Simpson index	Margalef index
Spring	Opening estuary	0.852	0.126	5.181
	middle estuary	0.735	0.153	6.149
	End estuary	0.678	0.067	10.281
Summer	Opening estuary	0.729	0.170	5.723
	middle estuary	0.681	0.170	6.373
	End estuary	0.678	0.067	10.281
Autumn	Opening estuary	0.818	0.162	3.657
	middle estuary	0.842	0.139	4.784
	End estuary	0.555	0.19	9.466
Winter	Opening estuary	0.771	0.16	5.654
	middle estuary	0.790	0.115	7.182
	End estuary	0.579	0.1	11.445

4. DISCUSSION

According toperformed studies, in thepolychaetesworms the individualsof species should characterizea certaintemperature for breeding. Therefore,increasing thewatertemperature is considered as an important factorin thereleasingof gametes. So it can be said that differencein thegamete-sheddingofa species in twodifferentenvironmentsmay be due to watertemperaturechanges not onlydue tolocaladaptation [10].

Conducted investigations show that average annual temperature of opening station is the highest temperature among sampling stations. Evaluation of figure2 indicates maximum number ofpolychaetes in this station that is considered as an important factor forreleasingof gametesand producing polychaetes larvae in large numbers that is considered as one of important factors of increasingpolychaetes in thethisregion.

A generalindexbyWelch,cited by Eksiri[11],was usedto findthe status ofthe study area. Accordingly, H value in areas without pollution is larger than 3, in pollutedareas is smaller than 1 and in medium polluted areas is 1 -3. According to thenumerical valueobtainedforShannonindex ofpolychaetesinallstationsandseasons that is less than 1(table3), it can said that the related area is polluted.

The highestnumerical valueof Simpson'sindex is related to station of endestuaryin the autumn. Numericalvalue ofHatthestation (0.555) indicated that this area was limited in terms of diversity and just a few of polychaetesareableintolivein thisenvironmentthatmade themselves compatiblewith the region. This is because of stressimposed on the environmentdue to roadconstruction in the opening estuaryandpollutionrelated toindustrialarea.

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