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Polychaete Study in Northeastern Mediterranean Coast of Egypt

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Abstract: Within the frame work, organized by the National Institute of Oceanography and Fisheries, Alexandria, Egypt. 15 quantitative samples collected by using Van Veen grab from the soft bottom, depth ranging from 12m to 106 m and distributed over two seasons (spring and summer, 2008) were collected during two trips to the Northeastern coast of the Egyptian Mediterranean waters, from El Tina Bay, Balteem, Abokhashaba and Gamasa. The analysis of samples resulted 108 Polychaete species belonging to 25 families and 61 genera. More than 50 species were considered new for Egyptian Mediterranean waters. Data were analyzed with univariate techniques (Diversity, Richness and Eveness or Equitabilty). Results showed that, species richness and abundance were lower in the deeper samples and higher in spring than in summer season. The feeding guild classification was examined. Also the relation between different depths and feeding guild were reported. A total of nine main feeding categories were identified. There were more significant associations between feeding guild and depth. Also the analysis revealed the dominance of surface deposit feeding with slightly fewer Omnivores and micro herbivores. This work, indicating that the polychaetes of the study area are quite diverse and poorly in number of individuals and great number of newly recorded species was reported.

Key words: Polychaetes • Northeastern Coast of Egypt • Univariate analysis • Biodiversity • Feeding Guild

INTRODUCTION

Polychaetes occur in almost all benthic marine and estuarine sediments [1] and are often the dominant component of the macrobenthos both in terms of number of species and individuals [2, 3]. Polychaetes also acciunted for most of the diversity and abundance of the infauna communities at the sandy site, but were less numerically important at the muddy site [4].

Polychaetes research in the Mediterranean started at the beginning of 19th century with the works of Savigny and Phillip. Until now, the Med. Sea hosts an estimate of 1037 polychaete species, account for 10% of the total world polychaetes [5]. Polychaetes research in the Eastern Med. largely focused on the family Serpulidae and the phenomenon of Lessepsian migration [6], while polychaetes investigations in the Egyptian Med. coast were concentrated on Alexandria region and Northwestern coast of Egypt. The first study has been done on the collections made by Steuer in 1933 and published by Fauvel [7], then polychaetes were identified by Selim [8] from the Eastern Harbour Alexandria, followed by other studies by Selim and Abd ElNaby [9,10] and other publications by the same authors.

Polychaetes in both soft and hard bottom of the Northeastern coast of Egypt were not studied before, therefore seasonal trips organized by National Institute of Oceanography and Fisheries, Alexandria branch were done to study this new area to fill this gap. This researches will helpe also to re-valuate taxonomy as a central discipline for the study of biodiversity [11].

Polychaetes are often classified according to their diverse feeding guilds. They play a major role in the functioning of benthic communities in terms of recycling and reworking of benthic sediments bioturbating sediments and in the burial of organic matter. Some species form dense tubiculous colonies which can radically change recruitment patterns of other infaunal organisms. Polychaetes, by their burrowing and feeding activity, may considerably enhance various sedimentary processes [3].

Many areas in Egypt were not studied before, therefore, this paper amis to investigate about the polychaetes in the Northeeastern coast of Egypt in relation to their feeding catigory.

MATERIAL AND METHODS

Sediment samples were collected by Van Veen grab from the northeastern coastal waters of Egypt; from El Tina Bay, Balteem, Abokhashaba and Gamasa (Fig.1).

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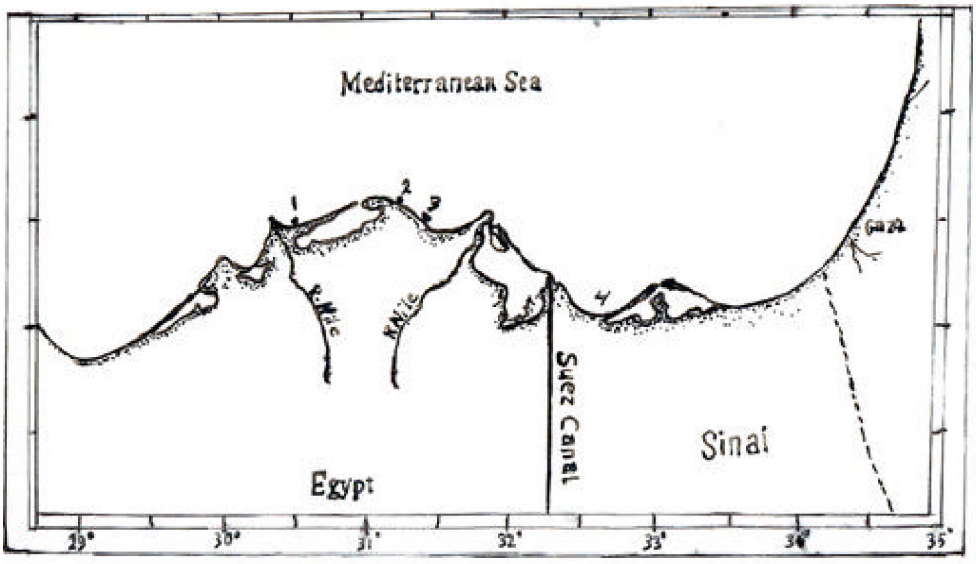

Fig. 1: Map of north Egypt showing the locatios of sampling sites. 1= Abokhashaba, 2= Balteem, 3= Gamasa and 4= El Tina Bay

Within two seasons Spring and Summer 2008. This study is part of a programme concerning studying the the Mediterranean coast of Egypt, the trips were carried out on board the R/V " Salsabeel". Sediment samples were washed and sieved through 0.5 mm sieve, then sorted by using stereo microsope. The extracted polychaete species were fixed in 10% formaldehyde- sea water solution. Each was identified as possible to species level; univariate techniques (Diversity, Richness and Eveness or Equitabilty), these were calculated on the basis of the Shannon Wiener [12], Margalefs's equation [13] and Pielou [14] repectivily. The feeding guild classification was reported according to the classification of [15].

RESULTS

A total of 1986 individuals of polychaetes belonging to 108 taxa, 61 genera within 25 families, from the total samples were collected which representing one of the most dominant groups. More than 57 species were considered new records to Mediterranean Egyptian waters (Table 1).

The most common families were Maldanidae, Paraonidae, Spionidae and Lumbrineridae both in terms of abundance and species richness. Maldanidae was the most diversified family, comprising 12 species followed by Spionidae 11 species, Capitillidae and Paraonidae, both have 10 species. Also, Cirratulidae and Nephtyidae were represented by 7 species. Some new families were recorded for the first time in the Egyptian waters such as Onuphidae, Owenidae, Pilargidae, Pectinaridae and Flabelligeridae. They were represented by low number of species in such study area. About 53 species appeared once a time once in each site and not repeated again such as *Aricidea wassi, Prionospio (prionospio) steenstrupi* and *Aricidea (Acmira) lopezi.* Some species were constant throughout the period of study,while others were transient in one or more stations.

Lumbrineris inflata, L latreilli and Arcidea wassi showed a high diversity and they were the most abundant species which made this genus dominant, their abundance may indicate a high reproductive potential of such species throughout the year.

Polychaetes were represented by small numbers of species in most sites and their numerical density was markedly low. Clear differences in species richness of polychaetes were reported among the sampled sites. Number (15), El Tina Bay (with depth 30 m) was the most diversified site (38 species), followed by number 6 (depth 34 m), with 23 species and the diversity index values ranged from 0.637 to 3.545 (Fig. 3, Table 2).

Richness fluctuated widly between 0.346 to 6.286. the variation is (Fig. 5, Table 2) approximately similar to that of diversity index, except it slight decrease in site (3, 8 and 10). Values of equitability fall within the range of 0.619-0.676 and showed a narrow variations (Fig. 4, Table 2).

Table 1: Distribution of Polychaetes in Different Stations with the Period of Study and their Feeding Guild

		Summer 2008												Spring 2008		
		Abu Khashaba			Gamasa			Baltim			Tina Bay			Tina Bay		
Family/Species	Feeding Guild	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1- Family Ampharetidae Malmgren, 1866																
**Melinna palmate* Grube, 1870	CM														5	
**Melinna cristata* (Sars, 1851)	CM														7	
Melinna monoceroides Fauvel, 1936	CM															
2- Family Arnicolidae Johnston, 1835																
Branchiomaldane vincenti Langerhans, 1881	CM													12		
Arenicola marina Saint- Joseph, 1894.	CM							7								
3- Family Capitillidae Grube, 1862																**18**
**Pulliella armata* Fauvel, 1929	SDF															12
Heteromastus filiformis (Claparede, 1864)	SDF															6
**Capitella jonesi*	SDF															12
**Notomastus lineatus* Claparede, 1868	SDF				12										6	6
**Noenotomastus bioculatus*	SDF				24											12
**Notomastus profundus* Eisig, 1887	SDF														12	
**Notomastus latericeus* Sars, 1851	SDF														18	
**Pseudoleiocapitella fauveli* Day, 1955	SDF		12			3										
Capitella giardi Mesnil,1897	SDF				6	9	6									
**Leiocapitellides analis* Hartmann-Scroder, 1960.	SDF															
4- Family Cirratulida Ryckholdt, 1851																
Cirriformia tentculata (Montagu, 1808)	SDF													30		
Cirriformia filigera (Delle Chiaje, 1825)	SDF													18		12
Chaetozone setosa Malmgren, 1867	SDF		12													
Caulleriella bioculatus keferstein, 1862	SDF				42											
Monticellina dorsobranchialis kirkegaard,1959	SDF	6														
Cirratulus chrysoderma Clapare`de, 1870	SDF				6											
Tharx killariensis Southern,1914	SDF		5													
5- Family Eunicidae																
**Eunice* sp.	C		6													
**Marphysa Bellii* (Audouin & Milne-Edwards, 1833	C															12
6-Family Flabelligeridae																
Piromis roberti	SDF		7													
7- Family Glyceraidae Grube, 1850																
**Glycera sphyrabrancha* Schmarda, 1861	CM															6
**Glycera tesselata* Grube, 1863	CM														12	6
Glycera unicornis Savigny in Lamarck, 1818	CM														18	
Glycera convolute Keferstein,1862	CM		18													
8- Family: Lumbrineridae (Schmarda, 1861)																
Lumbrineris inflata (Moore, 1911)	OM						42							42		18
Lumbrineris coccinea	OM						6	24								
Lumbrineris latreilli (Audouin&Milne-Edwards, 1833)	OM					24	12	30					5		6	6
Lumbrineris impatiens (Claparede, 1868)	OM					30						12	13			
9- Family Magelonidae Cunningham and Ramage, 1888																
**Magelona papillicornis* Muller, 1858	SDF							18								24
**Magelona capensis* Day, 1961	SDF							12						12		
**Magelona rosea* Moore,1907	SDF	6														

Table 1: Continued

10- Family Maldanidae Malmgren, 1867																
**Euclymene santanderensis* (Rioja, 1917)	SDF															12
**Praxillella affinis* (M. Sars in G.O. Sars, 1871)	SDF														24	
**Praxillella lophoseta* (Orlandi, 1898)	SDF														6	6
**Johnstonia clymenoides* Quatrefages 1865	SDF												6			
**Micromaldane ornithochaeta* Mesnil, 1897	SDF											6			6	
**Axiothella constricta* Clapare`de 1868	SDF														12	6
**Clymenura clypeata* (Saint Joseph,1894)	SDF													6		
Euclymene lombricoides (Quatrefages, 1866)	SDF	6								24						6
**Euclymene oerstedii* (Claparede, 1863)	SDF								18							
**Lumbriclymene minor* Ardwidsson, 1906	SDF															6
Euclymene capensis	SDF		6													
Maldane sarsi Mlmgren, 1865.	SDF						12								6	6
11- Family Nephtyidae Grube, 1850																
Nephtys picta	C	6														
Nephtys caeca (Fabricius, 1870)	C		12				6				6	7				4
**Nephtys agilis* (Langerhans,1879)	C															12
**Nephtys capensis*	C											11				8
Nephtys simoni Perkins, 1980	C				6											
Aglaophamus rubella Michaelsen,1897	C				24											
Aglaophamus paucilamellata	C						12									12
12- Family Nereididae																
Perinereis Arete tenuuisetis	C	6														
Ceratocephale sp.	C							5								
13- Family Onuphidae																
Onuphis eremite Audouin and Milne- Edwards,1833	CM						4									
Hyalinoecia tubicola O.F.Muller,1776	CM															
14- Family Opheliidae																
*Armandia cirrhosa (Filippi,1861)	SDF			6												12
Travisia forbesii Johnston, 1840	SDF						7									
15- Family Orbiniidae Hartman, 1942																
Scoloplos (Leodamas) rubra (Webster, 1879)	C				6											
Leitoscoloplos fragilis	C	6														
16- Family Owenidae Rioja, 1917																
Myriowenia sp	C														6	
17- Family Paraonidae Cerruti, 1909																
Aricidea cerrutii Laubier, 1966	SDF		19				13								12	12
Aricidea (Acmira) lopezi Berkeley and *Berkeley, 1956*	SDF			12				6	8	6						12
Aricidea wassi Pettibone, 1965	SDF	14	6				6		10	12					6	6
Aricidea simplex Day, 1963	SDF									6	12	6	6			
Aricidea succica Eliason,1920	SDF	10	5			6							24			
Levinsemia gracilis Tauber, 1879	SDF	6		6		6										
Aricidea claudiae Laubier, 1967	SDF		7		12		20									
Aricidea belgicae Fauvel,1936	SDF	18			6		10									
Levinsemia reduta Hartman,1965	SDF	13			6			6								
Aricidea (Acmira) catherinae Laubier, 1966	SDF															
18-pectinaridae Quatrefages, 1866																
**Pectinaria (Lagis) koreni* Malmgren, 1865	DF															12
**Pectinaria (amphictene) auricoma* (O.F. Muller, 1776)	DF	11														6

Table 1: Continued

19- Family Phyllodocidae Orsted, 1843															
Eulalia sp	C			6											
Eteone lacteal Clapare`de, 1868.	C		6							6					
20-Family pilargidae															
Sigambra tentaculata Treadwell, 1941	C		1	2		2	6		3						
Ancistrosyllis groenlandica Mc Intosh, 1879	C					6									
21- Family Sabellidae (Malmgren, 1867)															
**Chone minor*	FF													6	
**Chone Filicaudata* Southern, 1914	FF		21											6	12
**Potamilla stichophthalmos* Grube, 1863	FF													12	12
Chone usticensis Giangrande, Licciano and Castriota, 2006	FF												6		
Jasmeneira caudate Langerhans, 1880	FF												12		
Euchone southerni Banse, 1970	FF											18		12	
22- Family Serpulidae Johnston, 1865															
Hydroides elegans (Haswell, 1883)	FF		7												6
23- Family Spionidae Grube, 1850															
**Prionospio saldanha* Day, 1961	SDF													6	
Prionospio (Aquilaspio) aucklandica (Augener, 1923)	SDF						22								12
Prionospio (Prionospio) steenstrupi Malmgren, 1867	SDF			10		6		5		9			6		2
**Spiophanes missionensis* Hartman, 1941	SDF											12			7
Spiophanes kroeyeri Grube, 1860	SDF											6			6
Scolelepis carunculata Blake and Kudenov, 1978	SDF														8
Prionospio (Prionospio) heterobranchia Moore, 1907.	SDF														
Prionospio Minuspio cirrifera Wire`n, 1883.	SDF		15					13							
Prionospio (Prionospio) dubia Maciolek, 1985	SDF		13												
Prionospio multibranchiata Berkeley, 1926	SDF		19												7
Aproprionospio pygmaea Hartman, 1961.	SDF						12								
24- Family Syllidae Grube, 1850															
**Typosyllis rosea* (Langerhans, 1879)	Cm							6							
Brania arminii	hem							6							
Grubeosyllis tenucirrata (Claparede, 1864)	hem		3					18							
**Sphaerosyllis thomasi*	hem							14							
**Pionosyllis weismanni* Langerhans, 1879	Cm							12							
Parapionosyllis labronica Cognetti, 1965.	hem							10							
***25- Family Terebellidae* Malmgren, 1867**															
**Terebellides stroemi* Sars, 1835	SFF					6									
Parathelepus collaris Southern, 1914.	SFF							12							
Lanice conchilega Pallas, 1766.	SFF							18							
Pista cristata O.F. Muller,1776	SFF							12							

SDF=Surface deposite Feeder, CM=Macro Carnivores, cm= micro Carnivores, C= Carnivores,
OM= Omnivores, hem= micro herbivores, SFF= surface filter feeder.
•*= New recorded species in the present study

Table 2: Showing Diversity, Species richness and Evenness or Equitabilityin different sites

	Summer 2008												Spring 2008		
	Abu Khashaba			Gamasa			Baltim			Tina Bay			Tina Bay		
Family / Species	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Diversity index	2.897	2.668	1.040	2.420	1.983	3.026	1.983	1.277	1.427	0.637	1.992	1.427	1.965	2.925	3.545
Evenness or Equitability (E)	0.670	0.667	0.656	0.619	0.625	0.660	0.625	0.639	0.615	0.637	0.664	0.615	0.620	0.666	0.676
Species richness (SR)	3.614	3.044	0.629	2.714	1.689	4.077	1.689	0.803	1.003	0.346	1.607	1.003	1.610	3.761	6.286

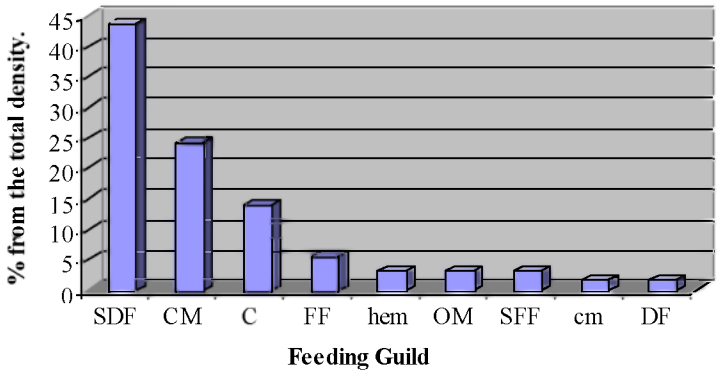

Fig. 2: Percentage of polychaetes in relation to their feeding guild

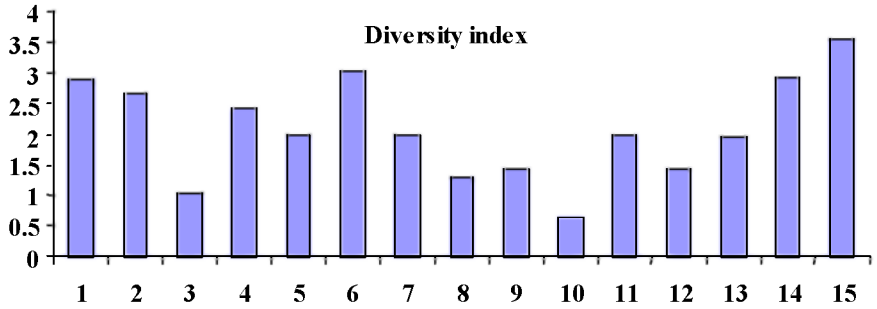

Fig. 3: Diversity Index (H`) of the investigated stations during Spring and Summer 2008

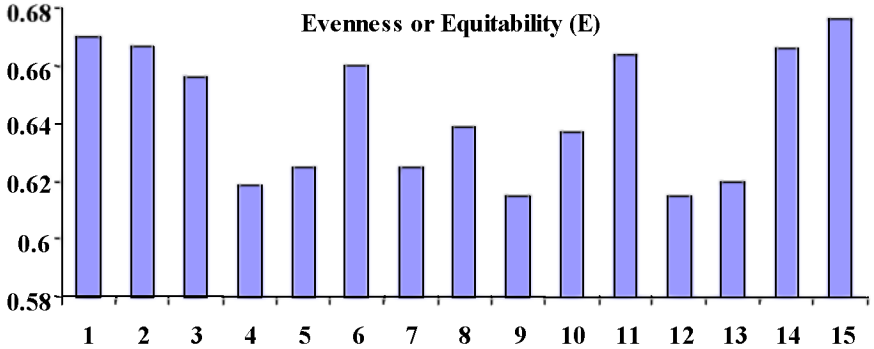

Fig. 4: Evenness or Equitability (E) of the investigated stations during Spring and Summer 2008

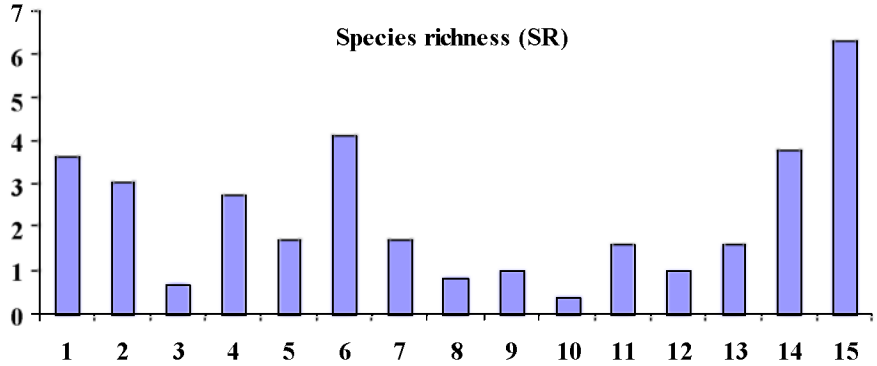

Fig. 5. Species richness (SR) of the investigated stations during Spring and Summer 2008

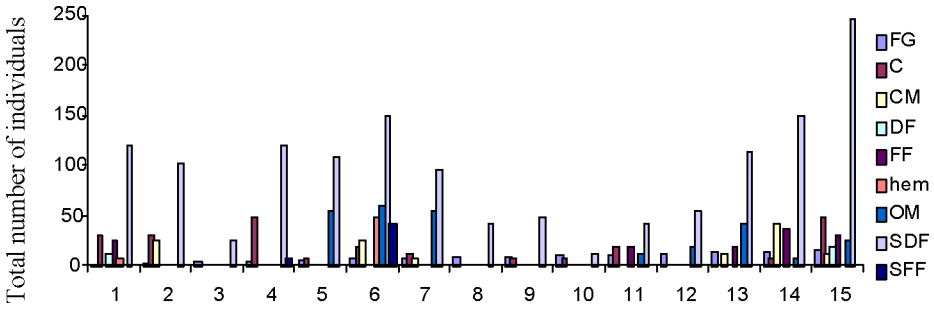

Fig. 6: Stations of the study area with different depths in relation with feeding guild. St. 1=30.5 m, St. 2= 20 m, St. 3= 13.7 m, St. 4= 34m, St. 5= 23.o m, St.6= 13.7 m, St. 7= 31.6 m, St. 8= 20.5 m, St. 9= 12.1m, St. 10= 33 m, St. 11= 24.2 m, St. 12= 13 m, St. 13= 106 m, St. 14= 54 m, St. 15= 30 m

The percentage of the number of individuals belonging to the different types of feeding is shown in Fig. (2). A review of feeding strategies of species identified in table (1) reveals that the subtidal polychaetes in the study area are dominantly surface deposit feeders with high values of the total denisity more than 40% of the total density and Macro Carnivores, while micro carnivores and deposite feeders by less percentage 1.56% from the total polychaetes. The abundance of the feeding type was positively correlated with sites of low depth (Fig. 6).

DISCUSSION

The present study revealed low biodiversity of benthic polychaetee where only 108 polychaete species were recorded from the study area, This may be attributed to the increased stress in the Mediterranean region [16], which make short or long-term changes as mentioned by Simboura and Zenetos [17].

Despite of the large recorded number of polychaete families (25 families), family Capitillidae, Maldnidae, Paraonidae and Spionidae were the most diversified families due to incresing number of its representatives during the present study. Also, they were considered the most abundant families in Mediterranean which agrees with the results of Muniz and Pires [18] in Southeastern Brazil. Giangrande *et al.* [19] who noticed that increasing abundance and domination of species with small biomasis indicator of habitat subjected to water pollution stress.

Inspite of, low biodiversity of the polychaetes over the whole area of the study, El Tina Bay was considered with the highest abundance and diversified community (59 species), while Balteem comparatively was low diversified 12 species. It seems to be due to that the first one are semicircular area with less physical disturbance, that agrees with the opinion of Cosentino and Giacobbe [20], that physical disturbance includes a wide typology of natural processes which impact on the benthic environment and may determine a rapied sediment movement and re-suspension, especially in sub-tidal sedimentary environments. Also these observations are supported by those of Giangrande *et at.*, [19] who found that protected area influenced by the positive impact may show no high variation in species number, but the highest denisty value. The same authors supposed that changes in abundance more than changes in diversity could be an indicator of the effect of protection. The quantitative cycles of polychaetes reported, showed different patterns at the sampled sites. 53 species appeared once a time and not appeared in any site again and few species were responsible for the bulk of numerical abundance such as: *Aricidea wassi, A. lopezi, Lumbrineris laterilli, L. inflata* and *Caulleriella bioculatus.* The recruitment of polychaete population depend on the wide variations in physico-chemical factors that play an important role in determining this recruitment of population. More than 57 species also were recorded for the first time in the Egyptian Med. waters, that may be due to these areas were not studied before.

Since polychaetes are often the numerically dominant macrobenthos group and show diverse modes of feeding, they have been shown to be good indicators of species richness and and community patterns in benthic invertebrate assemblages [19].

The major descriptors (density, species richness and diversity) showed that the highest density, richness and diversity were recorded in spring season while the lowest recorded were in summer season, this agrees with

Gambi *et al.* [21], that the existence of low richness and diversity values during summer was registered in the Mediterranean polychaete.

Most of polychaete fauna corresponded to sedentary forms typical of soft bottoms with low biodiversity and decreased in number by depth which agrees with the results of Brito *et al.* [22] and Quijon and Snelgrove [5], who mentioned that polychaetes were at least three times more abundant and two times more diverse in sandy than in muddy sediments also agrees with Gage *et al.* [23], who mentioned that there is strong pattern of declining biomass and faunal abundance with increaseing depth. Most of the species are burrowing species, such as Maldanidae and pectenaridae and poring type such as spionidae which burrowing into sediment both for protection or searching for food and others actively swallow mud and deposited particulate matter [24, 25]. The most polychaete species were recorded were sessile form, these results are supported by the openion of Maurer and Leathem [26], who mentioned that sessility is generally associated with less dynamic, more stable sedimentary conditions encountered in deeper water.

Some significant relationships between feeding guild and depth. Provisional attempts at defining feeding strategies among benthic polychaetes were made by Fauchald and Jumars [15]. According to them, surface deposit feeder were represented by 43.75% of total number of individuals, followed by Macro Carnivores 24.22%, the less percentage were the micro carnivores and deposit feeding type. Hutchings [3] mentioned that polychaetes are classified according to their diverse feeding guild. Spionids are found distributed throughout a wide rang of depths which agrees with the result of Fauchald and Jumers [15].

In the present study, El Tina Bay was the most diversified site, samples collected in station number 13 (106 m depth) had smaller number of individuals than other stations of El Tina Bay (number14 and 15), this site located in waters deeper than 100 m depth, yielded fine, soupy muds with a consistency of "black yogurt" and were essentially devoid of macroinvertebrates and less polychaete numbers, This agrees with the result reported by Dean [27], who recorded six stations with more than 100 m depth were devoid of macroinvertebrates, belived to be due to the result of low oxygen concentratios and the deeper stations in Golfo Dulce reflects the low current velocities which act to restrict oxygen renewal in stagnant bodies of water. In the present study, such results nearly agree with the findings obtained in El Tina Bay. Also his review of feeding strategies of the identified species reveals that the subtidal polychaetes in Golof Dulce are predominantly surface deposit feeders or carnivores, also agrees with the new result in the northeastern coast of Egypt.

From the present study, it was concluded that biodiversity of polychaetes in the Northeastern coast of Egypt was poor. Species number and total number of individuals were very low and surface deposit fedeers were the engineering species. Also Atlas cruise indicates that there is still much more work to be done in order to characterize the benthic fauna of Mediterranean and Red Sea coasts of Egypt.

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