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A Review on the Macro Benthic communities in Abu Qir Bay, Mediterranean Sea, Egypt

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Received 22st November 2011, Accepted 20th December 2011

Abstracts

The bottom macro benthic communities inhabiting Abu Qir Bay according to the different biotope and habitat classifications indicate that the inshore western coast of the bay is heavily polluted with industrial wastes and sewage effluents through El-Tabia Pumping Station. Certain bottom invertebrates appear to be tolerant to such pollution or even their growth may be promoted by the diluted effluents. Polychaetes were the highly abundant (40%) than the amphipods (16%) and bivalves (17%) at the sampling sites along the study area in Abu Qir Bay. The maximum abundance of benthos was recorded at El Tabia Pumping Station (21.5%, 10869 ind. /m^2), Abu Qir head (19.7%, 9981 ind. /m^2), at inside bay offshore area (15.7%, 7448 ind. /m^2), Electrical Power Station (6.4%, 3243 ind. /m^2), and Boughaz Maadyia (5.6%, 2840 ind./m^2). The benthic fauna was more sensitive to the impact of pollution than the algal flora. Therefore, the lowest counts were recorded at the inshore stations adjacent to sewage effluents and Industrial wastes and the fauna there was restricted to scattered specimens of the Molluscs *Modiolus barbatus, Mactra coralina, Mactra gluana,* and *Corbula gibba*. At the offshore, the bottom fauna remained low but they tended to increase. Sea grass was represented by only one species *Zostera marina* and the macro algae represented by 3 main classes Chlorophyta 8 species, Phaeophyta 8 species and Rhodophyta 7 species and one genus. The benthic flora was, in general, more rich along the western coast of Abu Qir Bay, in the area adjacent to the outfall of El-Tabia Pumping Station. On the other hand, the offshore harbored much lower standing crop of algae. This may be attributed to the sheltered conditions of the coast. The green algae *Caulerpa prolifera* and *Codium elongatum* were the only ones that flourished well along the western coast of Abu Qir Bay in areas subjected to sewage effluents and industrial wastes.

Key wards: Macro benthos, bioindicator, biodiversity, polychaetes, bivalves, algal cover, sea grass, pollutants wastes.

1. Introduction

Abu Qir Bay is a semicircular shallow basin with a shore line ca 50 km long and has an area of ca 360 km^2. It lies between 30°4`- 30°21`E and 31°16`-31°30`N (Figure 1), at 35 km to the east of Alexandria city between Abu Qir Peninsula (west) and the Rosetta branch of the River Nile (east). The depth of water is about 16 m with an average depth of about 10 m. The nature of bottom is composed mainly of smooth in the most parts but at the western part there is an extension surface ridge namely Nelson Island. Inside Abu Qir Bay the bottom nature is gradually varied from sandy in the western part to sandy and muddy sand in the central part and then to almost purely muddy in the eastern part of the bay and in is muddy around the mouth of the Rosetta Branch of the Nile River.

The amount of freshwater discharged into the bay is estimated as 2130×106 m^3/y (Abdel-Moati, 2001). The bay receives various types of continental discharges through three openings, namely; El-Tabia Pumping Station, the out let of Lake Edku (Boughaz El-Maadyia) and the Rosetta mouth of Nile River. Along the coast of Abu Qir Bay there are 22 different factories representing four major categories of industry namely; food processing and canning, paper industry, fertilizers industry and textiles manufacturing. The wastes of these industries pumped to the sea through El-Tabia Pumping station; this station is located in the southern part of Abu Qir Bay, nearly in the mid way between the city of Abu Qir and Boughaz El-Maadyia. It pumps out an average amount of 1.5 to 2 million cubic meter of polluted water per day. In addition, brackish water is drained to the station from a vast cultivated land area of the northeastern part of the Delta. These factors affect the physical, chemical and biological characteristics of the bay waters. Also, a natural gas field (NGF) was discovered in 1970`s at latitude 31°21`7``N and longitude 30°18`40``E at the inshore region between Rosetta and Maadyia opening. Abu Qir Bay was considered one of the most profitable fishing areas

before it was assumed polluted by the disposal of sewage and industrial effluents.

In early studies in 1982 Samaan and El Komi (1994) indicated that the distribution of benthos in Abu Qir is affected by the degree of pollution as well as the prevailing hydrological conditions. The green algae *Caulerpa prolifera* and *Codium elongatum* appeared as the most common species in the polluted area they are regarded to be tolerant to pollution. The macro algae at the off shores were less frequent but included members of chlorophytes, phaeophytes and rhodophytes as well as the phanerogame *Zostera marina*. The bottom animals appeared more sensitive to pollution than the algal flora. Thus, their lowest counts were recorded at the inshore stations and the fauna was mainly represented by the molluscs *Mactra glauca, Tellina radiata, Neverita josephinia.* The area of the lake-sea (Maadyia) connection was generally poor in benthos due to the wide fluctuations of the water chlorosity. The offshore harbored more diversified fauna including polychaetes, molluscs and crustaceans. During 1995 the spatial distribution pattern of bottom fauna in Abu Qir Bay was studied by El Komi (1997) in relation to the prevailing environmental condition in this area. He reported that density of bottom macro-organisms polychaetes and molluscans was relatively high in the eastward to El Maadyia opening and in front to El Tabia Pumping Station that are received a considerable amount from waste industrial and land drainage. Mollusca *Mactra corollina, Venerupis rhomboides, Tellina pianola* and *Loripes lucinilis* yielded 343 org. /m^2. Distribution variation of benthos assemblages in the bay shows a high density and diversity in the inshore stations for certain species resistant for pollution such as bivalves *(Mactra, Venerupis, Tellina, Donax, and Loripes),* gastropod *(Neveritia)* and polychaete (*Prionospis).* The area investigated is considered to have less eutrophic effect since the discharged pollutants is diluted through the open sea by the water circulation in the bay.

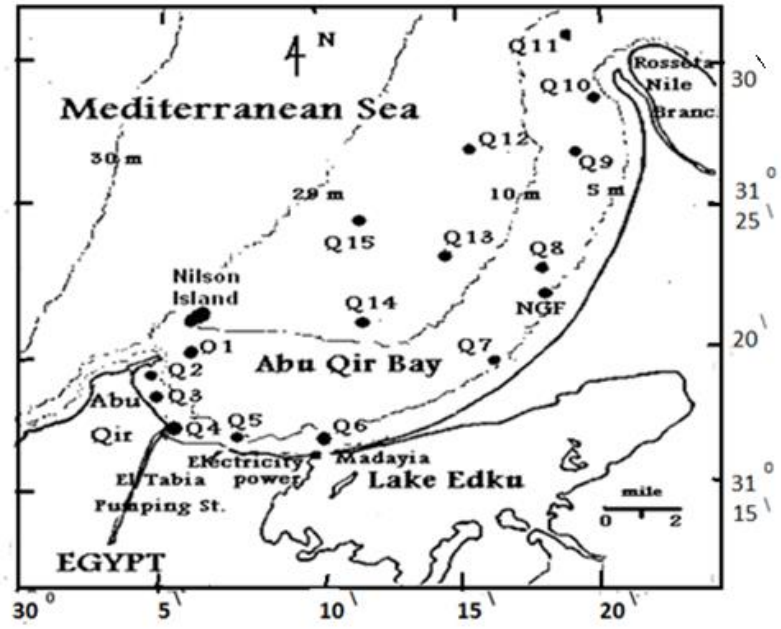

Figure 1. The location of sampling sites in Abu Qir Bay

Area of studies

1. Sampling sites during 1982 (Samaan and El Komi, 1994).

Eight stations were selected as in the western sector of Abu Qir Bay. Sampling of benthos was carried out by using a metallic dredge.

- Stations 1, 8 and 7 lie at the off shore these situated near to the western coast.
- The other 5 stations are located at a distance of about one km apart from the shore line and represent the: inshore stations.
- Station 6 locates nearby to Boughaz El-Maadyia (lake-sea connection).
- Station 5 occupies the area affected by the influx of urea Fertilizer Factory.
- Station 4 is situated in front of El-Tabia outfall.
- Stations 3 and 2 are located north to El-Tabia station.
- The latter one is rocky in nature and lies away of pollution.

2. Sampling sites during 1995 (El Komi, 1997).

Sampling of benthos was carried out from 25 stations by using a grab sampler. These sampling sites stations (No.1 to No.25) covered the inside area of Abu Qir Bay and outside the bay.

3. Sampling sites during 1999, 2000 (EIMP, 2000 and 2001)

Benthos and sediments samples were collected from four stations inside Abu Qir Bay Me20 and Me21 (at Head of Abu Qir), Me22 (at El Tabia Pumping Station), Me24 (at Maadyia Opening) and Me29 (at Rosetta Nile River Branch).

4. Sampling sites during 1999

The fishing operation was carried out by the fishing boat is a stem trawler of 22 m length and 5 m wide with a speed about 10 knots. The fishing gear was Italian trawl net. Four transects were selected the depth of fish trawling at the selected transacts varied from about 10 m to 20 m. The fish trawling operation was taken at the 1st sector (trans. 9 & 11), 2nd sector (trans. 7 & 13).

5. Sampling sites during 2000

Benthos and sediments samples were collected from four stations inside Abu Qir Bay S1 (at Head of Abu Qir), S2 (at El Tabia Pumping Station), S3 (at Maadyia Opening) and S4 at the eastern sector inshore and S5 inside offshore of the bay.

Laboratory studies and Statistical analysis of benthos.

In the laboratory taxonomic study of the macro benthos assemblages was conducted. The sample was washed thoroughly and sorted to their main constituents. Each group was identified to the species or the genus levels, counted and weighed.

Quantitative analysis of the macro benthos communities was carried out; in order to estimate the density and abundance of each species as the number of organisms per meter square and the corresponding biomass of their main groups were expressed as the wet weight in gram per m^2.

The following descriptive measurements were computed at each site:

1- S is the species number per sample

2- A is the abundance of individuals and it is expressed as number of ind. / m^2

3- The species diversity was calculated, using logarithms to the base `e` in the calculations, as the Shannon-Weaver (1949) index $H` = - \sum Pi \log_e Pi$ where Pi = proportional of a sample of individuals belonging to species i

4- Species richness as Margalef (1958)`s index J = (S - 1) / loge N where N = the number of individuals in a sample and S = the number of species in a sample.

5- Evenness was calculated as Pielou (1966)`s index E = H` / Hmax = H` / loge S where S = the number of species in a sample

Nature of Bottom:

According to the type of bottom sediments it can divided into the following areas : a) in front El Tabia Pumping Station, which is covered with sludgy materials, a mixture of agriculture drainage and industrial wastes (Mousa 1973), with a depth 2 - 5 m except station 1. 2) Area *B*, stations *6* - 14, located eastward of El Maadyia opening, it is mud sandy predominantly covered with mud originated from Lake Edku (Mousa, 1973), with a depth of 8.4 m in average. a) inside the bay located westward of Abu Qir Bay, the bottom sediment of this area is mainly coarse sandy with a larger depth ranged from 31 to 82 m. and c) area located in the inner of Abu Qir Bay, it is also mud sandy in the stations near ELTabia Pumping Station and Boughaz El Maadyia, with a depth 17 -19 m.

Physio-chemical parameters

The average of sea water temperature ranged from a minimal 16°C in winter to a maximal 29°C in summer season. Transparency of sea water is high along the west region of Abu Qir Bay reached 21 meters at high depth water. At low depth the turbidity is very low due to increasing of suspended material originated from different sources of pollution along inshore off Abu Qir Bay.

pH value of sea water near bottom is less variable in most stations but it dropped to 8 in front El Tabia and a maximal 8.35 was recorded in the eastern sector of Abu Qir (Abd Eziz *et al.* 2001). Oxygen content in bottom samples decreased greatly to 1.43, 3.08 and 2.97 mg O2/1 in stations adjacent to El Tabia, respectively, due to the huge influx of waste product in these areas. In the most stations dissolved oxygen content fluctuated among 4.01 to 6.1 mg O2/1. Salinity of sea water in bottom samples has a narrow change that it ranged from a minimal value 34.4 ‰ in station 10 and a maximal value 40.49 ‰ in site outside bay. However, the salinity ranged around 39 ‰ in most stations. In front the El Tabia Pumping Station the total nitrogen content in bottom samples showed the largest values that created from the industrial waste materials and drainage waters. It reached to maximum 150.9 ug at N/l in station near Rosetta mouth due to increase of particulate nitrogen. The level of nitrogen content reached 48.34 ug at N/l in average. A considerable increase in total nitrogen was recorded near the output which attributed to the increase of the source of water drainage. Total dissolved nitrogen showed high level in bottom samples at stations in front Edku opening (Maadyia) reaching 102.5 and 59.2 ug at N/L. The level of TDN ranged from 4.2 (station 12) to 35.2 ug at N/l (station 9).

Dissolved organic nitrogen content in Abu Qir water has a wide fluctuation that ranged from maximal values 91.4 and 58.2 ug at N/l in bottom samples taken from station 6 and 7. The rest values ranged from *5.5* to 32.9 ug at N/l with 21.51 ug at N/l average (Abd Eziz *et al.* 2001).

3. Results

Species composition of benthos structure

This study reviewed the benthic structure and their distribution in Abu Qir Bay. A total of 124 taxa were identified as listed in Table (1). These include 50700 individuals in 17 benthic groups namely; free living Nematoda, Anthozoa, Bryozoa, Hydroids, Oligochaeta, Polychaeta, Decapoda, Ogyrididae, Isopoda, Cumacea, Anisopoda, Amphipoda, Pantopoda, Gastropoda, Bivalvia, Echinodermata and Ascidians. The list of taxa and their occurrence in the sampling sites are shown in Table (2). These groups belong to five main higher taxonomic levels namely; phylum Nematoda, order Anthozoa, phylum Bryozoa, order Hydroida, class Oligochaeta, class Polychaeta, class Crustacea (Decapoda, Ogyrididae Isopoda, Cumacea, Anisopoda, Amphipoda, Pantopoda), phylum Mollusca (Gastropoda, Bivalvia), phylum Echinodermata (Echinoidea, Ophiuroidea) and class Ascidiacea.

Table 1. List of benthos species recorded in Abu Qir Bay.

Nematoda:	*Glycera convoluta*	**Pantopoda:**
Enoplus sp.	*Polydora ciliate*	*Nymphon gracile*
Anthozoa :	*Polydora caeca*	**Gastropoda :**
Actinia equine	*Fabricia* sp.	*Murex trunculus*
Bryozoa	*Clymene lumbricornis*	*Neverita josephinia*
Actea truncate	*Clymene collaris*	*Nataccurius sterus-muscarum*
Bowerbanhia gracilis	*Thelepus triseriales*	*Nassarius mutabilis*
Scrupocillaria scruposa	*Pomatoceros triqueter*	*Aplysia depilans*
Bugula neritina	*Prottula tubularia*	*Hinia limata*
Hydroids	*Hydroides elegans*	**Bivalvia :**
Obelia geniculata	*Serpula concharium*	*Anadara corbuloides*
Oligochaeta	*Sabella fabricii*	*Anadara diluvii*
Polychaeta:	*Sabella pavonina*	*Macoma cumana*
Owenia fusiformis	*Paraonis* sp.	*Tellina planata*
Eunice vittata	**Decapoda**	*Tellina pluchella*
Thuryx sp.	*Processa edulis*	*Azorinus chamasolen*
Raphidnilus sp.	*Liocarcinus vrnalis*	*Lutaria angustior*
Ampharete gruberi	*Penaeus* sp.	*Lutaria magna*
Arenicola marina	*Neptunus* sp.	*Nucula nuculus*
Stemaspia sp.	*Portunus* sp.	*Nuculana pella*
Aricia latreillii	*Maia sp.*	*Barbetia barbata*
Scolaricia typica	*Leander sp.*	*Loripes lucinalis*
Cirratulus chrysoderema	**Ogyrididae:**	*Ruditapes decussatus*
Cirriformia sp.	**Isopoda:**	*Donax venustus*
Cirriformia filigera	*Sphaeroma serratum*	*Corbula gibba*
Prionospio auklandica	**Cumacea:**	*Modiolus barbatus*
Prionospio cirrifera	*Bodotria scorpiodes*	*Modiolus adriaticus*
Diopatra neapolitana	*Pseudocuma lngicornis*	*Solen marginatus*
Magelona papillonereis	**Anisopoda:**	*Thracia papyracea*
Onuphis eremita	*Jphinoe serrata*	*Mactra corallina*
Lumbriconereis latreilli	*Aspeudes laterillei*	*Mactra glauca*
Eunice vittata	*Tanais cavolinii*	*Tellina radiata*
Nereis falsa	**Amphipoda:**	*Ensis ensis*
Nereis diversicolor	*Corophium sextoni*	*Venerupis aurea*
Heteronereis sp.	*Elasmopus rapax*	*Venerupis pullastra*
Nephtys hombergii	*Elasmopus pectinicrus*	*Venerupis rhomboides*
Armandia polyophthalma	*Echinogammarus foxi*	**Echnodermata:**
Chaetozone setosa	*Podocerus variegatus*	*Ophiura lyrifera*
Capitila capitata	*Gammrus locusta*	*Asteropecten sp.*
Daybranchus caducus	*Stenothoe gallensis*	*Amphiura chlayet*
Nephtys hombergii	*Erichthonius barasiliensis*	*Bissopris lyrifera*
Mediomastus cirripis	*Hyale provesti*	**Ascidians:**
Hyalinoecia sp.	*Maera inaequipes*	*Ascidia nigra*
Polyodontes maxillosus	*Caprella liparotensis*	*Botryllus schlosseri*
Phyllodoce mucosa	*Caprella equilibera*	*Botrylloides leachi*
Glycera rouxii		*Polyclinium aurantium*

Table 2. Distribution of the density of macro benthos groups at the different sites in Abu Qir Bay, Mediterranean Sea, Egypt.

Groups/stations	**Q1**	**Q2**	**Q3**	**Q4**	**Q5**	**Q6**	**Q7**	**Q8**	**Q9**
Nematoda	269	84	42	1884	0	0	42	0	0
Anthozoa	0	0	0	103	0	0	0	0	0
Bryozoa	157	250	0	0	0	0	0	0	0
Hydroida	1211	0	0	0	0	0	0	0	0
Oligochaeta	0	588	84	0	0	0	294	0	0
Polychaeta	3547	990	1458	4474	3020	945	1548	294	252
Decapoda	100	120	30	0	0	30	0	42	0
Ogyrididae	67	0	0	0	0	0	0	0	0
Isopoda	50	0	0	0	0	0	0	0	0
Cumacea	20	0	0	42	0	230	0	0	0
Anisopoda	67	42	0	0	0	135	169	0	0
Amphipoda	2636	0	0	2497	13	154	0	0	0
Pantopoda	0	0	42	0	0	0	0	0	0
Gastropoda	1320	0	0	60	133	20	126	84	0
Bivalvia	417	336	42	1809	77	1327	538	882	294
Echnodermata	0	0	0	0	0	0	0	0	0
Ascidians	120	1110	90	0	0	0	0	0	0
Total no.ind./m2	9981	3520	1788	10869	3243	2840	2717	1302	546
%	19.7%	6.9%	3.5%	21.5%	6.4%	5.6%	5.4%	2.6%	1.1%
Groups/stations	**Q10**	**Q11**	**Q12**	**Q13**	**Q14**	**Q15**	**Average**	**Percentage**	
Nematoda	42	0	0	1211	42	168	252	7.5%	
Anthozoa	0	0	0	0	0	42	10	0.3%	
Bryozoa	0	42	0	0	84	84	41	1.2%	
Hydroids	0	0	0	0	0	30	83	2.4%	
Oligochaeta	42	42	0	0	42	0	73	2.2%	
Polychaeta	252	647	608	1220	609	510	1358	40.2%	
Decapoda	0	52	0	84	102	30	39	1.2%	
Ogyrididae	0	0	0	0	0	0	4	0.1%	
Isopoda	0	0	0	0	0	0	3	0.1%	
Cumacea	0	0	0	538	0	0	55	1.6%	
Anisopoda	0	0	0	842	0	0	84	2.5%	
Amphipoda	0	0	441	2140	0	84	531	15.7%	
Pantopoda	0	0	0	0	0	0	3	0.1%	
Gastropoda	0	0	0	67	90	180	139	4.1%	
Bivalvia	0	883	0	1279	924	0	587	17.4%	
Echnodermata	0	0	126	67	174	30	26	0.8%	
Ascidians	0	0	0	0	0	0	88	2.6%	
Total no.ind./m2	336	1666	1175	7448	2067	1158	3380	100%	
%	0.7%	3.3%	2.3%	14.7%	4.1%	2.3%			

Species number (S)

The structure of species number of benthos groups involved 124 high taxa at the different sites emphasized that Polychaeta were the most common comprising 38.7% of the total number of species, Bivalvia (21%), Amphipoda (9.7%), Decapoda (5.0%), Gastropoda (4.8%), and the other groups ranging between 0.8% to 3.0% of the total number of species.

Data analysis showed that the highest number of species was found at the following shallow sites 5m depth (Table 3); Abu Qir head (Q1) 45 species, El Tapia Pumping Station 38 species (Q4), and Boughaz Maadyia 33 species (Q6). The number of species was less frequent at inside sites with relatively deep water 10m; 28 species (Q13), 18 species (Q14) and 18 species (Q15). At the area impacted by NGF (Q7 and Q8) the species number was 19 and 18 species. It was the least in species numbers at sites located adjacent to Rosetta mouth of Nile branch involved Q9, Q10, Q11 and Q12 ranging 9-11 species.

Table 3. Basic description variables for benthos samplings at the different sites in Abu Qir Bay.

	Depth		No. Species	Abundance	Sp.Richness	Pielou`s Evenness	Shannon
				no.ind./m2	d=(S-1)/logN	J`=H`/logS	H`(loge)
Abu Qir Head	10m	Q1	45	9982	4.78	0.77	2.92
Abu Qir Harbour	5m	Q2	23	3562	2.69	0.75	2.34
Abu Qir Harbour	5m	Q3	16	1789	2.00	0.74	2.06
El-Tabia Pump.St.	5m	Q4	38	10870	3.98	0.75	2.73
Elect. Power plant	5m	Q5	17	3243	1.98	0.41	1.17
Boughaz Maadyia	5m	Q6	33	2841	4.02	0.89	3.13
NGF	6m	Q7	20	2718	2.40	0.92	2.75
NGF	5m	Q8	19	1302	2.51	0.94	2.76
Eastern Inshore area	6m	Q9	11	546	1.59	0.98	2.35
Rashid Area	7m	Q10	8	336	1.20	1.00	2.08
Rashid Area	5m	Q11	9	1667	1.08	0.70	1.54
Offshore Inside bay	10m	Q12	9	1175	1.13	0.86	1.89
Offshore Inside bay	12m	Q13	28	7448	3.03	0.86	2.86
Offshore Inside bay	12m	Q14	18	2067	2.23	0.73	2.12
Offshore Inside bay	17m	Q15	18	1158	2.41	0.95	2.75

Abundance (A) of benthos

Polychaetes were the highly abundant (40%) than the amphipods (16%) and bivalves (17%) within higher taxonomic levels at the sampling sites along the study area in Abu Qir Bay, Mediterranean Sea as shown in Table (3) and illustrated in Figure 2. Those groups contributed 73% of the total abundance of recorded macro benthos which can be arranged in the following sequence: polychaetes (40%) > bivalves (17.4%) > amphipods (16.3%) > nematodes (7.5%) and gastropods (4.1%). The other groups yielded lesser than 3% of the total number of individuals. The numerical density of the previous main groups yielded respectively 1358, 587, 531, 252, and 139 ind. /m^2. The total average abundance of macro benthos attained 3380 ind. /m^2.

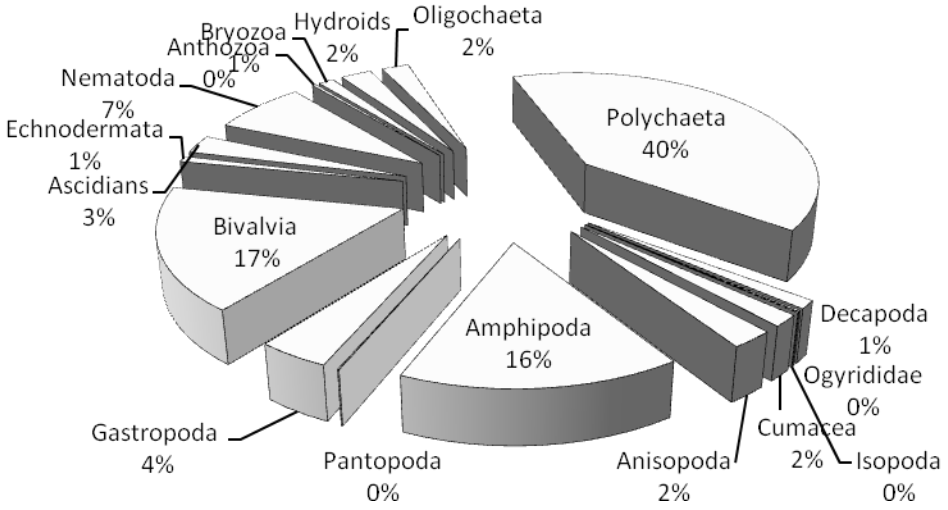

Figure 2. Showing the percentage density of benthic group's composition recorded in the study area in Abu Qir Bay

Biomass (B) of benthos

Bivalvia species have the largest biomass among the bulk of benthos collected at the different sites. The biomass was minimal for nematodes, oligochaetes, polychaetes, anisopods, and amphipods

Regional patterns and species composition of benthos

Regional variations in the species number, abundance and biomass of benthic fauna were generally varied. As shown in Figure 3 and Table (2) the maximum abundance of benthos was recorded at Q4 Tabia Pumping Station (21.5%, 10869 ind. /m^2), Q1

Abu Qir head (19.7%, 9981 ind. /m^2), Q13 inside bay offshore area (14.7%, 7448 ind. /m^2), Q5 Electrical Power Station (6.4%, 3243 ind. /m^2), and Q6 Boughaz Maadyia (5.6%, 2840 ind. /m^2).

Polychaeta community were represented by 42 species and 6 genera and were more frequent, nearly, at all sites and dominated by *Owenia fusiformi, Prionospio aucklandica, Lumbriconeries latreilli, Fabricia* sp., *Hydroides elegances* and *Sabella fabricii.* However, they formed 5% to 19.4% of the total abundance of polychaetes community. Their total number of individuals counted were 945 to 4472 ind. /m^2 at stations Q1 to Q7 reaching high percentages at Q1 (15.3%), Q4 (23.7%), and Q5 (10.7%) of the total polychaetes.

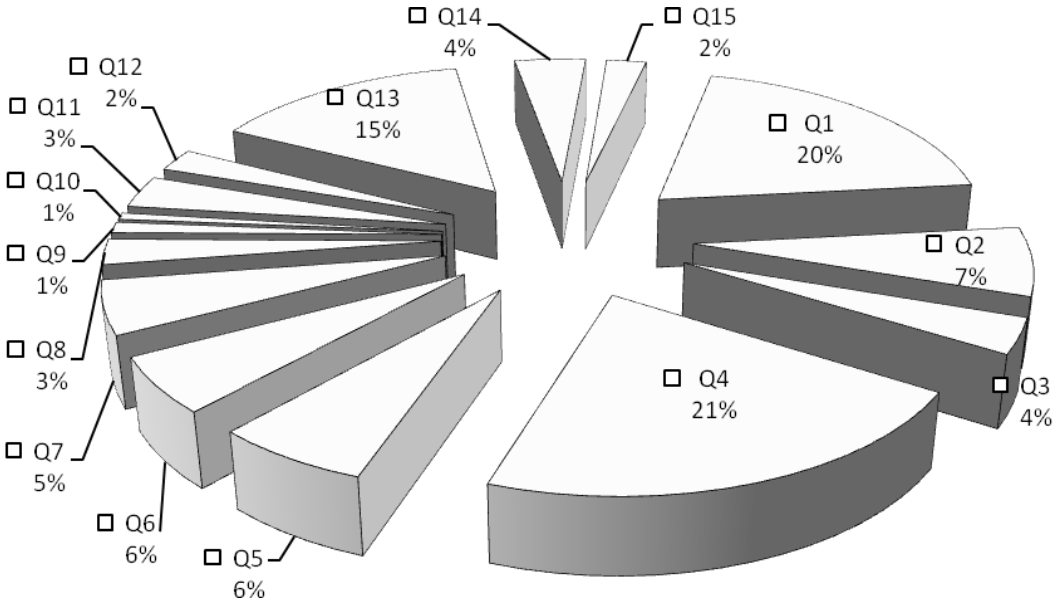

Figure 3. Showing the percentage abundance of benthic communities at different sites of study in Abu Qir Bay

Bivalves community were represented by 26 species.They were ,relatively, more frequent at most sites and predominated by four species namely; *Modiolus barbatus, Mactra corallina, Mactra gluaca* and *Macoma cumana*. On the other hand, they were more common at inshore stations Q4 (Tabia Pumping Station), Q6 (Boughaz Maadyia), and Q13 (of shore inside the bay) counting 1809 (20.5%), 1327 (15%) and 1279 (14.5%) ind. /m^2. Their numbers were encountered by 135 to 750 ind. /m^2.

Amphipoda community were represented by 12 species comprised mainly *Elasmopus rapax*, *Elasmopus pectenicurus*, and *Erichthonius barasiliensis* in particular at station Q1 2636 ind./m^2 (30%), Q4 2497 ind./m^2 and at Q13 2140 ind./m^2 (24.3%). Their total number of individuals is counted by 143 to 1893 ind. /m^2.

Gastropoda were represented by 6 species which relatively high and predominated by *Neverita josephinia* and *Hinia limata*. They were more frequent at Q1, Q5, Q7 and Q15. The 1st species predominated at sites Q1, Q5, Q7, Q8, Q14, and Q15 are counted by 60 to 150 ind. /m^2. The 2nd species was more common and found in great numbers at site Q1 (1170 ind. /m^2), at Q14 (90 ind. /m^2) and at Q15 (180 ind. /m^2).

Changes in Benthic Community Structure

Species diversity, Evenness, Richness, and Simpson index

The values of species diversity (H`), evenness (E), and richness of species (J) are shown in detailed in Figure 4 and Table (3). The species diiversity index had the highest values at Q1, Q4, Q6 and Q13 (2.73 – 3.13). The low species diversity was estimated at stations Q9, Q10, Q11, and Q12 which were primarily attributed to the uneven distribution of individuals among the species.

Pielou`s evenness index (E) showed highest values of 0.41 only at Q5 and the lowest eveness was found at Q10 the value was 1. At the rest stations values of eveness were relatively low which is attributed to a greater variation among faunal dominance.

The values of Margalef`s species richness (J) were maximal at sites Q1, Q4, Q6 and Q13 which reached respectively 4.78, 3.98, 4.02 and 3.03 The least values were recorded at Q5 Electrical power station and eatern inshore stations Q7 – Q12.

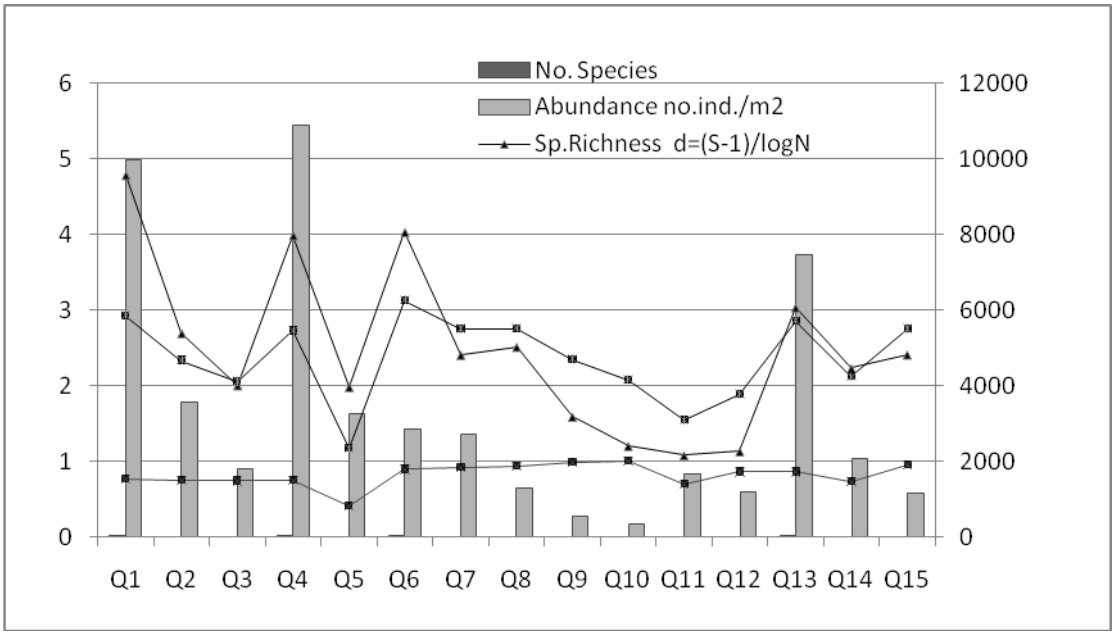

Figure 4. Basic description variables for benthos samplings at the different sites in Abu Qir Bay, Mediterranean Sea, Egypt,

Abundance-Sites Clustering

Dendograms based on Euclidean distances for clustering of 15 numerical density variables of all benthos collected at the different sites is shown in Figure 5, A. The relatively high similarity is noticed between the group Q8, Q9 and one class. The other groups of stations showed low similarity less than 40%. Figure 5 (A) indicates the clustering analysis of the benthic groups based on their abundance at the different sites. It can be distinguished into 3 classes of maximum similarity group reached 80%. The 2nd class includes Q8. The 3rd class included Q13 and Q6.

Groups Clustering

On the other hand, the similarity between the distributions of benthic groups showed high similarity (Figure 5, B) in 4 classes. The 1st class was maximal for reaching Isopoda and Ogyrididae equal 96%, the 2nd class included 2 subclasses Anisopoda-Cumacea and Bivalvia-Polychaeta with similarity 65% and the 3rd class included Decapoda and Bryozoa with similarity 67% and 4th class contains Amphipoda and Nematode had similarity 60%.

Abundance of trawling bottoms in Abu Qir Bay

The species composition of the trash fish catch, at the different catching transects, included a total of 19 species and 5 genera as listed in Table (4). The general structure of the constituent of bottom mobile fauna is composed mainly from Stomatopoda *Oratosquilla massavensis;* Brachyura *Liocarcinus vernalis;* Gastropoda *Murex brandaris, Trunculoriopsis trunculus;* Bivalvia *Anadara diluvii* and Asteroidea *Astropecten auranitiacus*. Stomatopoda (*Oratosquilla massavensis* and *Squilla mantis*) and Brachyura *(Liocarcinus vernalis)* are highly concentrated among the bulk of trash fish. Their density yielded 47% and 34% and their corresponding biomass reaching 49.4% and 35.5% of the total bulk of the trash fish respectively. Natantia (*Trachypanaeus* sp.), Asteroidea *(Astropecten auranitiacus),* Gastropoda *(Murex brandaris, Trunculoriopsis trunculus)* and Bivalvia *(Anadara diluvii)* were less frequent, which represents 1% to 2% of the total biomass and 0.01% and 4% of the total density of the bottom mobile macro fauna among the trash fish catch. The total crustacean's abundance was maximal yielding 808 kg/km/hr (86%) and gastropods attained low density 8.3% (Table 5). On the other hand, the corresponding biomass of crustacean's species reached 95.7% of the total wet weight and for gastropods reached 2.44% as shown in Table (5). The largely dominated marine invertebrates were *Oratosquilla massavensis, Liocarcinus vernalis* and *Anadara diluvii.* These species are characteristic of muddy sand area of the continental shelf. Other species like *Murex brandaris, Trunculoriopsis trunculus* and *Astropecten auranitiacus*. The general structural of bottom mobile fauna distribution at the various transects. At inside and outside the bay Stomatopoda groups were numerically the most dominant macro invertebrates as revealed in Figure 6 and 7 yielding respectively 335 and 549 ind./km/hr. Where, Brachyura were encountered by 328 ind./km/hr and inside bay collection and 319 ind./km/hr at out bay stations.

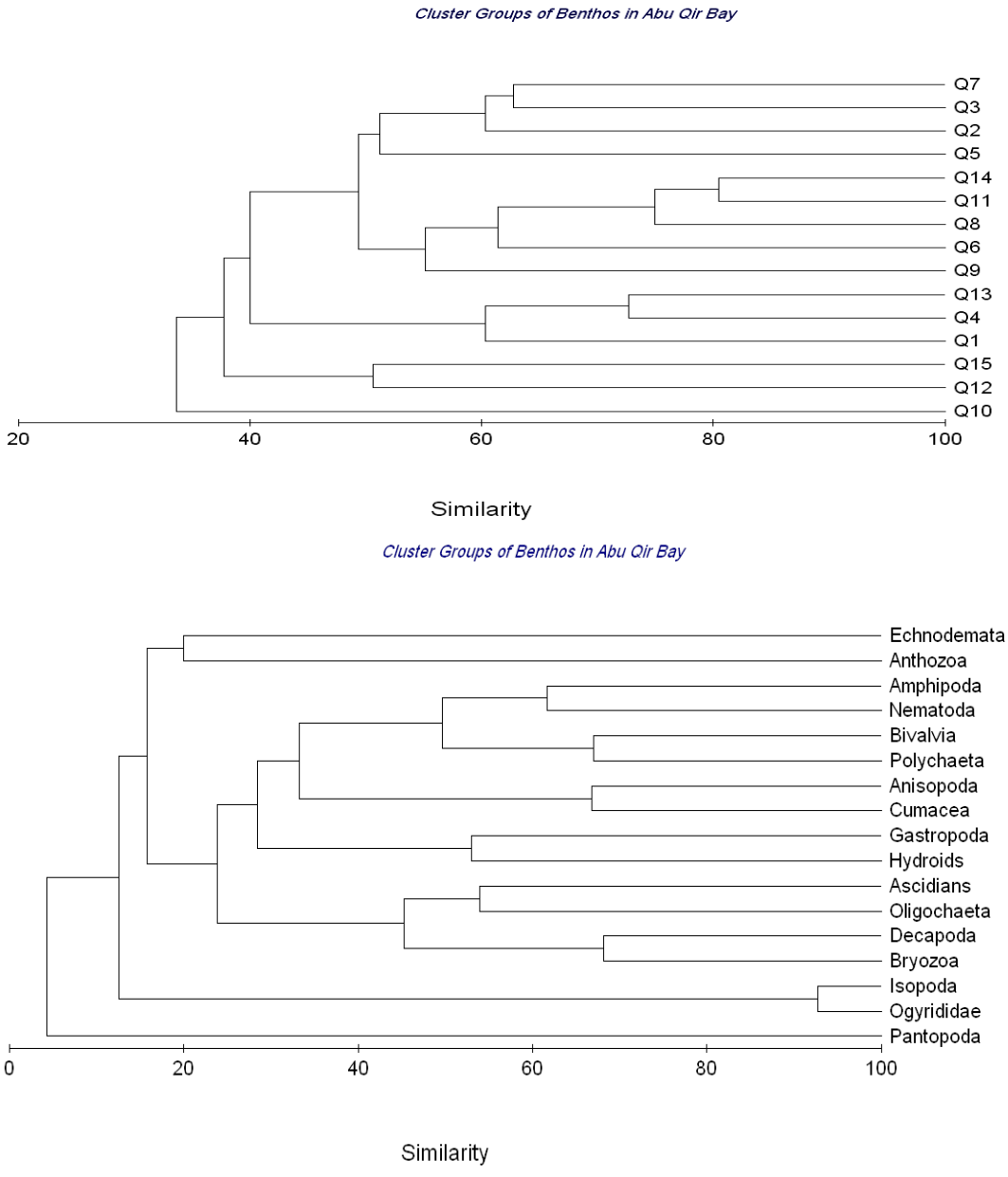

Figure 5. Dendograms based on Euclidean distances for clustering of 124 taxa (A) and 17 numerical density variables of benthos groups (B) collected at the different sites in Abu Qir Bay.

On the other hand, the corresponding biomass of Stomatopoda species showed a pronounced increase that sustained 16.7 kg/km/hr at inside bay trawling and 28.1 kg/km/hr in outside bay trawling. Whereas, the biomass of Brachyuran species attained maximal of 7.8 kg/km/hr and 9.9 kg/km/hr in outside and inside bay respectively. Other bottom mobile fauna were less dense among the bulk of the trash fish catches where molluscs Muricidae *Murex brandaris* weighted 2.5 and 0.26 kg/km/hr in outside and inside bay respectively.

The biomass of Echinoderms Asteriodea *Astropecten aurantiacus* was represented by only 0.23 and 0.47 kg/km/hr in outside and inside bay respectively. In general, the distribution patterns of the bottom mobile macro invertebrates among the trash fish catch was denser at in the bulk of trawling collection in Abu Qir Bay which yielding 93% of the total biomass. Concerning the numerical number of individuals, the large values were estimated by 86% of the total number of macro fauna in the trash fish catch.

Table 4: Distribution of marine invertebrates collected by trawling fishing net at Alexandria coastal area (no. ind./km/hr).

Species	Species	Out side	Inside	Average	%
Hydroidea		1.3	11.5	6.4	0.7%
Bryozoa	*Aetea sp.*	2.0	0.0	1.0	0.1%
Crustacea					
Stomatopoda	*Squilla mantis*	10	35	22.5	2.4%
	Oratosquilla massavensis	549	335	442.3	47.0%
Brachyura	*Liocarcinus vernalis*	319	328	323.1	34.4%
	Calappa granulata	0.0	0.8	0.4	0.0%
	Medorippe lanata	0.0	2.5	1.3	0.1%
	Goneplax sp.	0.0	0.5	0.3	0.0%
Natantia	*Trachypenaeus sp.*	4.3	1.0	2.6	0.3%
Anomura	*Dardanus arrosor*	0.0	2.5	1.3	0.1%
Cirripedia	*Balanus trigonus*	3.5	25.3	14.4	1.5%
Gastropoda					
Aporrhaidae	*Aporrhais pespelecani*	0.3	1.8	1.0	0.1%
Muricidae	*Murex brandaris*	3.3	73.0	38.1	4.1%
	Trunculariopsis trunculus	6.8	67.0	36.9	3.9%
Cassididae	*Phalium saburon*	1.5	0.0	0.8	0.1%
Doliidae	*Tonna galea*	0.5	0.0	0.3	0.0%
Naticoidea	*Neverita josephinia*	1.0	0.0	0.5	0.1%
	Naticarius stercus-muscarum	0.0	0.5	0.3	0.0%
Bivalvia					
Arcidae	*Anadara diluvii*	12.3	3.3	7.8	0.8%
Cephalopoda				0.0	0.0%
Sepiidae	*Sepia sp.*	0.5	3.5	2.0	0.2%
Echinodermata					
Asteroidae	*Astropecten aurantiacus*	14.0	31.0	22.5	2.4%
	Echinaster sepositus	0.3	0.5	0.4	0.0%
Ascidiacea	*Ciona intestinalis*	0.3	0.0	0.1	0.0%
	Botrylloides sp.	0.8	29.0	14.9	1.6%
	Total no. ind./km/hr	931	951	941	100%
	%	49%	51%		

Table 5: Distribution of marine groups of invertebrates collected by trawling Fishing net in Abu Qir Bay.

Groups	Out side	Inside	Average	%
Hydroidea	1.3	11.5	6.4	0.7%
Bryozoa	2.0	0.0	1.0	0.1%
Crustacea	886	730	808	86.0%
Gastropoda	13.3	142.3	77.8	8.3%
Bivalvia	12.3	3.3	7.8	0.8%
Echinodermata	14.3	31.5	22.9	2.4%
Ascidiacea	1	29	15	1.6%
Total no. ind. /km /hr	930.1	947.6	939	100%
%	50%	50%		

Table 6: Distribution of marine groups of invertebrates collected by trawling Fishing net in Abu Qir Bay

Groups	out side	inside	Average	%
Hydroidea	0.01	0.01	0.005	0.01%
Bryozoa	0.0	0.01	0.005	0.01%
Crustacea	38.8	24.5	31.65	92.90%
Gastropoda	2.5	0.26	1.38	4.05%
Bivalvia	0.13	0.79	0.46	1.35%
Cephalopoda	0.37	0.01	0.19	0.56%
Echinodermata	0.48	0.24	0.36	1.06%
Ascidiacea	0,02	0.02	0.01	0.03%
Total kg/km/hr	42.29	25.84	34.07	100%
%	62.1%	37.9%		

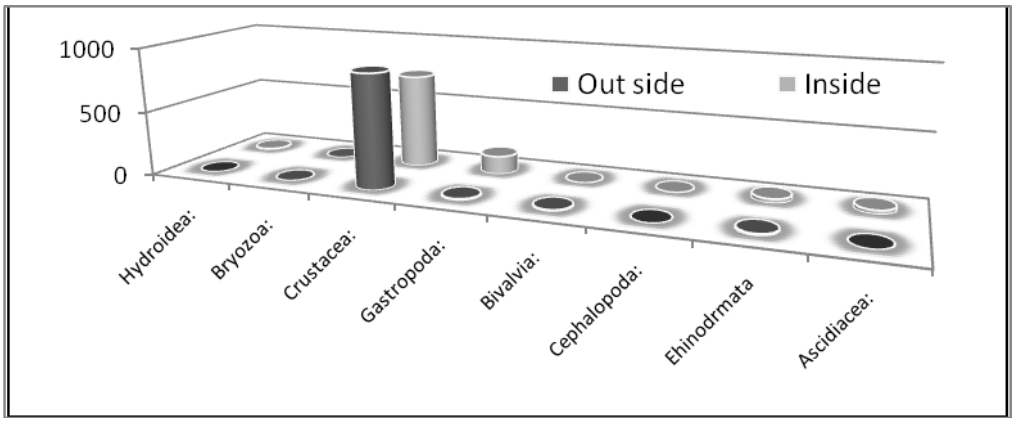

Figure 6. Distribution of main groups of invertebrates collected by trawling Fishing net at Alexandria coastal area (no. ind./km/hr).

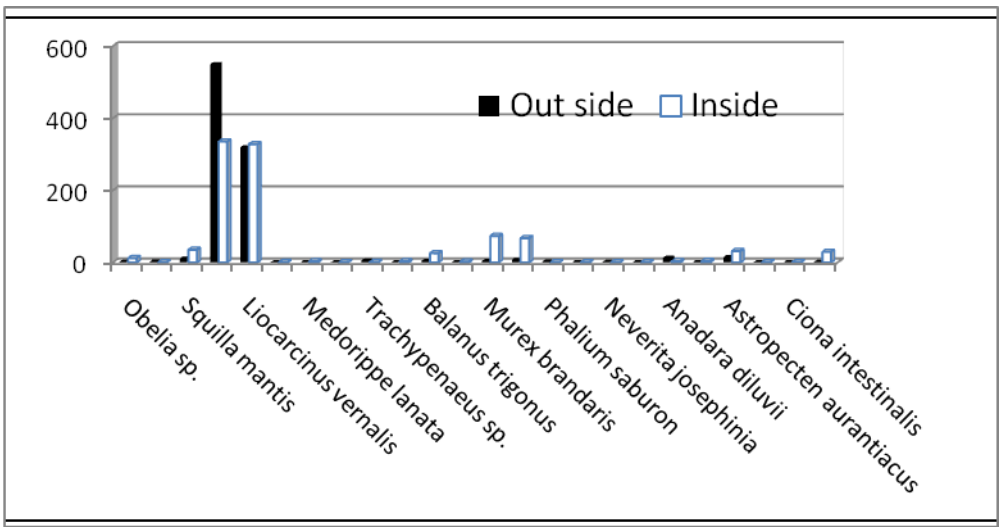

Figure 7. Distribution of marine invertebrates collected by trawling fishing net at Alexandria coastal area (no. ind./km/hr).

Macro Benthos Flora in Abu Qir Bay

The sediment bottom samples were collected from Abu Qir Bay by using grab sampler Van Veen at 15 inshore and offshore sites covering different habitat area. The inshore shallow stations 5m depth lies nearby to Boughaz El-Maadyia (lake-sea connection), El Tabia Pumping Station, Electrical Power Station, the eastern inshore area to the Rosetta Nile branch and some sites located inside the bay representing non impact areas with relatively deep water 10-17 m depth.

Species composition of macrophytes

Species composition of Sea Grasses

Sea grasses were represented by only one species *Zostera marina.*

Species composition of Macro algae

Macro algae were represented by 3 main classes Chlorophyta 8 species, Pheophyta 8 species and Rhodophyta 7species and one genus as listed in Table (7).

Table 7. List of species recorded in Abu Qir Bay

Floweing plants- Sea grasses	**Phaeophyta - Brown algae**	**Rhodophyta - Red algae**
Family, Potamogetonaceae	*Cystoseira barbata*	*Corallina elongata*
Zostera marina	*Dictyota dichotoma*	*Jania rubens*
Phylum, Thallophyta	*Taonia atomaria*	*Gelidium latifolium*
Chlorophyta - Green algae	*Sargassum vulgare*	*Nemalion helminthoides*
Ulva rigida	*Fucus virsoides*	*Pterocladia capillacea*
Caulerpa prolofera	*Gracilaria confevoides*	*Phyllophora nervosa*
Cladophra prolifera	*Ceramium rubrum*	*Corallina officinalis*
Halimeda tuna	*Padina pavonica*	*Peyssonelis sp.*
Codium tomentosum		
Codium elongatum		
Enteromorpha prolifera		
Enteromorpha		

intestinalis		

Regional distribution macrophytes

Regional distribution of Sea Grasses

The flowering plant sea grasses *Zostera marina* was also high at station Q3 (40 gm), Q1 (76 gm) and one gram at Q15 as shown in Figure 8. On the other hand, sea grass *Zostera marina* appeared more frequent at station Q1.

Regional distribution of Macro algae

The benthic flora was, in general, more rich along the western coast of Abu Qir Bay, in the area adjacent to the outfall of El-Tabia Pumping Station. On the other hand, the offshore harbored much lower standing crop of algae. This may be attributed to the sheltered conditions of the coast.

The coastal stations comprised most stations which lie near to the Urea Fertilizer Factory and in front of El-Tabia Pumping Station Q4, the algal flora was relatively rich and it consisted mostly of the chlorophyte *Caulerpa prolifera* which reached 61.5 and 78.5 gm fresh wt./m^2 at stations Q5 and Q4 respectively. The brown algae were poorly represented by *Cystoseira barbata* represented by one gram/m^2.

Algal cover was very rare nearby to Boughaz El-Maadyia (station Q6) due to the wide fluctuations of the water chlorosity resulting from the outflow of the slightly brackish water of Lake Edku as shown in Figure 8 and Table (8).

The offshore stations Q1–Q5 sustained high quantity of algae which amounted, respectively, 51.4, 85.8, 63.5, 96.9 and 67.1 gm fresh wt./m^2 and it consisted mostly of *Zostera marina* and both *Caulerpa prolifera* and *Cladophora prolifera* ranged from 3.3 to 26.1 gm fresh wt./m^2. Other infrequent algae comprised *Codiurn tomentosum* and *Cystoseira barbata. Zostera marina* appeared frequently there.

While marine algae on bottom of offshore sites Q13, Q14 and Q15 showed a poor cover and the biomass of algae decreased to be from 18.6 to 24.1 gm fresh wt./m^2 .The recorded species comprised *Caulerpa prolifera, Codium tomentosum, Cystoseira barbata, Sargassum vulgare, Fucus virsoides* and *Gracilaria confervoides,* while *Zostera marina* was scarcely noticed at station Q15.

The community was mostly represented by *Pterocladia capillaceo, Caulerpa prolifera* and *Enteromorpha intestinalis*. The algal biomass amounted 5.6, 9.0, 1.2, and 64.3 gm fresh wt. /m^2 at stations Q5, Q3 and Q2 respectively indicating a gradual increase away from pollution.

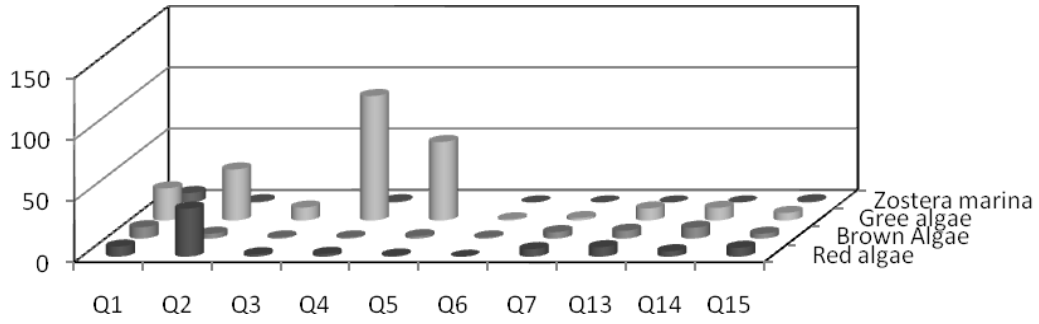

Figure 8. Distribution of sea grass and macro algae density at the different sites in Abu Qir Bay

Table 8. Distribution of sea grass and macro algae density at the different sites In Abu Qir Bay

	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q13	Q14	Q15		%
Zostera marina	7.6	1.0		1.0		0.0	0.0	0.0	0.0	1.0	0.7	2.6%
Green algae	26.2	41.6	10.5	101.6	64.1	1.0	2.0	9.9	10.3	6.2	18.2	67.5%
Brown Algae	9.3	4.0	1.0	1.0	2.0	1.0	5.3	6.4	8.9	4.0	2.9	10.6%
Red algae	8.3	39.2	2.0	2.3	1.0	0.0	6.2	7.8	4.5	7.3	5.2	19.4%
Total weigh//m2	51.4	85.8	13.5	105.9	67.1	2.0	13.5	24.1	23.7	18.5	27.0	100%
	12.7%	21.2%	3.3%	26.1%	16.6%	0.5%	3.3%	5.9%	5.9%	4.6%		

4. Discussion

Most of the previous quantitative estimations of macro algae in relation to pollution dealt with the effect of nutrients associated with the coastal sewage discharge on eutrophication of the algal population or on individual species (Tewari, 1972, Waite and Mitehell, 1972 and Rueness, 1973). The first ecological study in the eastern Mediterranean concerning the effect, of the different pollutants on the species composition, standing crop biomass and diversity of the algal community was carried out by Basson *et al.* (1976) along the coast of Lebanon.

Results of the present investigation indicate that the green algae *Caulerpa prolifera* and *Codium elongatum* were the only ones that flourished well along the western coast of Abu Qir Bay in areas subjected to sewage effluents and industrial wastes. Borowitzka (1972) illustrated that Phaeophyta and to a less extent, Rhodophyta are sensitive to pollution, whereas Chlorophyta particularly *Enteromorpha prolifera, Enteromorpha intestinalis* and *Ulva rigida* thrive in sewage polluted waters. On the other hand, the rocky area of Q1 which lies away of pollution harbored a rich algal community consisting mainly of *Pterocladia capillacea* and to a less extent *Caulerpa prolifera* and *Enterornorpha intestinalis.* The inshore station Q6 surrounding the opening of Lake Edku (Boughaz El- Maadyia) was practically devoid algal flora as a result of the wide fluctuations of water chlorosity produced by influx of the water rather than due to pollution.

The offshore stations were, in general, poor in algal cover while they were frequently inhabited by the phanerogame *Zostera marina.* This is attributed to its sandy nature and consequently its instability toward water currents. The benthic fauna was more sensitive to the impact of pollution than the algal flora. Thus, their lowest counts were recorded at the inshore stations adjacent to sewage effluents and Industrial wastes and the fauna there was restricted to scattered specimens of the molluscs *Modiolus barbatus, Mactra coralina, Mactra glauca,* and *Corbula gibba.*

The total counts of benthos increased considerably north to El-Tabia at station Q4 indicating the increased of eutrophication level where some benthic invertebrates could be flourished and predominated in this habitat as well as many polychaetes species and nematodes. The polychaetes, *Owenia fusiformi, Pronospio aucklandica, Lumbriconeries latreilli, Fabricia* sp., *Hydroides eleganes,* and *Sabella fabric* were recorded in these areas in considerable numbers and it is regarded as the most common species insensitive to pollution. The bottom fauna recorded at the Boughaz region (Q6) was generally high due to the wide fluctuation of water chlorosity and it consisted mainly of the euryhaline polychaetes species and nematodes could tolerate this wide fluctuation in chlorosity and level of eutrophication due to extensive out fall of Edku water through Maadyia opening.

At the offshore, the bottom fauna remained low but they tended to increase at station Q13. The benthic community at Q13 comprised mainly of amphipods and polychaetes. The lower values of bottom animals recorded at the stations adjacent to Rosetta Nile Branch namely; Q9–Q12 may be attributed to the water quality and the dilution water that reached the area from River Nile Branch. Also, the areas around the area of LNGF (Liquefied Natural Gas Field) reflect direct effect on biodiversity of macro benthic species which a pronounced decrease in biological indexes values in Q7&Q8. Results of the present investigation indicate that the western coast of Abu Qir Bay is heavily polluted with industrial wastes and sewage- effluents. Certain bottom invertebrates appear to be tolerant to such pollution or even their growth may be promoted by the diluted effluents. Also some nematodes, polychaetes, molluscs, amphipods, decapods, bryozoans and oligochaetes were found to resist such pollution.

A significant correlation was shown between density of bottom fauna and the different physio-chemical parameters of sea water off Abu Qir Bay (R square, significant 95 %). The density of benthos was much significant to depth, transparency and the total nitrogen content of sea water with a correlation coefficient 0.94 and 0.97. But they reveal a weak correlation (0.2) to the biomass. The correlation of density and biomass of bottom fauna show a relatively moderate relation (0.5 -0.7) to pH and oxygen values. On the other hand, the total dissolved nitrogen and dissolved organic nitrogen did not indicate any significant correlation to the density and biomass of bottom fauna in the bay. Therefore, the total nitrogen content in sea water is a main chemical factor affecting on the density and biomass of macro benthos in this area.

The general picture of the distribution of macro benthos assemblages in Abu Qir Bay shows a relatively high diversity in species composition and intensity in particular at the offshore stations. This area is subjected to less eutrophic effect because the industrial wastes diluted through the circulation of sea water and current system in the bay and exchange with the open sea water. The lowest value of species diversity was recorded at El Tabia and Boughaz Areas which representing the highest eutrophication region.

The area subjected to an increase in pollutant inputs reflected a great amount of biomass in contrast to the stations with low eutrophicatuion influences showing higher diversity values. Mousa (1981) reported that the water circulation in Abu Qir Bay is clockwise direction in the eastern region and anti-

clockwise in the western region. Therefore, the point of connection of the two types of water circulation forming a north western current. As mentioned by Samaan and Mikhail (1990) and El-Sherif and Gharib (1994) the distribution of phytoplankton in Abu Qir Bay is affected by the existence of a water mass layer due to the discharge of the influx of industrial wastes and drain waters through El Tabia Pumping Station and El Maadyia Opening. This will be directly influencing on the occurrence of the secondary marine life as zooplankton and bottom fauna. According to El-Sherif and Mikhail (2003) the phytoplankton community was mainly represented by diatoms (100 species) while dinoflagellates (25 species) were scarcely recorded. The average standing crop of phytoplankton by number during spring (March) was $87.77x10^3$ cells L^{-1}, increased to $482.84x10^3$ cells L^{-1} in summer (June) and $518.03x10^3$ cells L^{-1} during autumn (November). Chlorophyll (*a*) as an index of the phytoplankton biomass without specific attention paid for the temporal and spatial variability of the numerical phytoplankton standing crop, community structure, species composition and biomass. Its values indicated high primary production in the area all year round, with wide temporal variation (monthly average measurements of 2.06-52.64µg L^{-1}) and three distinguished peaks in April, September and March. The zooplankton standing crop in Abu Qir Bay indicated a highly productive area with an average of $60.474x10^3$ ind.m^{-3} (Zakaria, 2007). This community was affected significantly by waste water from El Tabia Pumping Station and the freshwater from Edku Lake through El-Maadyia outlet. The south western part of Abu Qir Bay attained an average zooplankton density of 43.454×10^3 ind.m^{-3} Protozoa contributed about 51.19% of the total zooplankton community with an average of 30.96x103 ind.$m^{-3.}$

References

Abdel Aziz, N.E.M.; Fahmy, M.A. and Dorgham, M.M.: 2001, Hydrography, nutrient levels and plankton abundance in Abu-Qir Bay, Egypt. *Mediterranean Marine Sci*ence, 2(2): 13-17.

Abdel-Moati, M.A.R.: 2001, Long-term impact of landbased activities on the coastal waters of Alexandria, Egypt. *Proceedings of the Fifth International Conference on the Mediterranean Coastal Environment*, MEDCOAST 01, E. Ozhan (Editor), Tunisia, Vol. 23-27, pp: 463-474.

Basson, P.W.; Hardy, J.T. and Lakkis, V.: 1976, Ecology of marine rnacroalgae in relation to pollution along the coast of Lebanon. *Symposium on the: Eastern Mediterranean sea*. IBP/PM-UNESCO (Malta 11-15 September, 1973; 307-324.

Borowitzka, M.A.: 1972, Intertidal algal species diversity and the effect of pollution. *Australian Journal of Marine and Fresh water Research*, 23: 73-84.

El Komi, M.M.: 1997, Ecological Studies on Macrobenthos Distribution in Abu Qir Bay, Egypt. *Proceeding of the 7th Conference on Environmental Protection Is A Must*, 20-22, May, 1997, Alexandria, Egypt, 341-352.

El Komi, M.M.: 2000, In EIMP, 2000. Final Report on Sediments, Biota and Benthos Data from Coastal Areas of the Gulf of Suez and Mediterranean Sea during 1999, 59 pp.

El Komi, M.M.: 2001, In EIMP, 2001. Final Report on Sediments, Biota and Benthos Data from Coastal Areas of the Gulf of Suez and Mediterranean Sea during 2000, 85 pp.

El-Komi, M.M. and Beltagy, A.I.: 1997, Distribution of macrobenthos assemblages in the north coast of Egypt. *Bulletin of National Institute of Oceanography and Fisheries, ARE,* 23: 267-293.

El Sherif, Z.M. and Gharib, M..: 1994, Phytoplankton Production and Composition in Abu Qir Bay, (Egypt). *Proceeding of the conference Environmental Protection Is A Must*, 10-12 May, 1994: 291-306.

El-Sherif, M.Z. and Mikhail, S.K.: 2003, Phytoplankton dynamics in the southwestern part of Abu-Qir Bay, Egypt. *Egyptian Journal of Aquatic Biology and Fish*eries, 7(1): 219-239.

Mousa, A.A.: 1973, "Study of the bottom sediments of Abu Qir Bay". M.Sc. Thesis, Faculty of Science, Alexandria University, Egypt, 120 pp.

Mousa, A.A..: 1981, Sediment Studies in Abu Qir Bay. In: Investigation of the level and effects of pollutants in saline lakes and littoral marine environment (Abu Qir Bay and Lake Edku). Report of Alexandria Institute of Oceanography and Fisheries, 211 pp.

Rueness, J.: 1973, Pollution effects on littoral algal communities In the Inner Oslofjoid, with special reference to *Ascopliyllwn* nodosiurn. Ilelolander wiss. *Meeresunters*: 24: 446-454.

Samaan A.A. and El Komi, M.M.: 1994, Effect of Pollution on the Distribution Benthos along Western Sector of Abu Qir Bay (Egypt). *The Bulletin of the High Institute of Public Health*, Alexandria, Egypt, 24(2):339-353.

Samaan, A.A. and Mikhail, S.K.: 1990, Distribution of phytoplankton in Abu-Qir Bay (Egypt). *Bulletin of Institute of Oceanography and Fisheries,* ARE, 16(1): 65-73.

Shannon, G.E. and Weaver, W.: 1949, The Mathematical Theory of Communication. University of Illinois Press, Urban 125 pp.

Tewarl, A., (1972): The effect of sewage pollution on *Enteromotpha prolifera* var. *tubulasa* growing under natural habitat. *Batonica Marina*, 15(3): 67.

Walte, T. and Mitchell, R.: 1972, The effect of nutrient fertilization on the benthic alga *Ulva lactuca. Batonica Marina*; 15(3): 151-156.

Zakaria, H. Y.: 2007, On the distribution of zooplankton assemblages in Abu Qir Bay, Alexandria, Egypt. *Egyptian Journal of Aquatic Research*, 33 (1):238-256.

بحث مرجعى على المجتمعات القاعية االكبيرة في خليج أبو قير، البحر المتوسط، مصر

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– المعهد القومى لعلوم البحار والمصايد الإسكندرية

تشير النتائج بمنطقة الدراسة بأن مجتمعات الأحياء القاعية الحيوانية والنباتية والتي تسكن الرواسب القاعية بخليج أبو قير وفقا للموائل المختلفة من التجمعات الأحيائية والتصنيفات المختلفة للموئل بأن الساحل الغربي للخليج الساحلية ملوثة بشكل كبير من النفايات الصناعية ونفايات مياه المجارى من خلال مصرف محطة الطابية. يشير البحث المرجعى بأن اللافقاريات الأحياء القاعية تتحمل مثل هذا التلوث، أو حتي يمكن أن يتحمل نموها تأثير النفايات السائلة المخففة. توضح النتائج المنشورة التى أجريت بخليج أبى قير بأنها تتكون أساساً من طائفة عديدة .الأشواك بدرجة عالية قدرت بـ 40٪ ومن رتبة مزدوجة الارجل من طائفة القشريات حيث قدرت بـ 16٪ ومن طائفة ذوات الصدفتين بـــ 17٪ . أوضحت الدراسات التى أجريت بمناطق الدراسة والتى جمعت بأخذ العينات الرسوبية من خليج أبى قير حيث تم فحصها و تقديرالتنوع النوعى والكمى خلال فترات الدراسات حيث تشير بأن الوفرة من الكائنات القاعية أكثر كثافة بمنطقة القريبة من منطقة مضخة محطة الطابية حيث قدرت بـنسبة ٢١.٥٪ من المجموع الكلى للأحياء القاعية و قدرت الكثافة العددية بـ 10869 كائن / متر مربع ومنطقة رأس أبى قير حيث قدرت بنسبة ١٩.٧٪ وكثافة عددية ٩٩٨١ كائن للمتر المربع والمنطقة الداخلية المقابلة لشاطئ أبى قير قدرت الكثافة العددية بـ ٧٤٤٨ وبنسبة ١٥.٧% والمنطقة المقابلة لمحطة توليد الطاقة الكهربائية حيث قدرت الكثافة العددية للاحياء القاعية بـــ3243 كائن للمتر المربع وبنسبة ٦.٤% ومنطقة التى تقع بالقرب من بوغاز المعدية بالخليج حيث تم تقدير الكثافة العددية للأحياء القاعية بمتوسط ٢٨٤٠ كائن للمتر للمربع وبنسبة ٥.٦% . أوضحت النتائج المختلفة بمنطقة خليج أبى قير بأن بعض الكائنات الحيوانية والنباتات من الطحالب القاعية أكثر حساسية لتأثير التلوث والتى سجلت أدنى كثافة في المناطق الساحلية المتاخمة لنفايات مياه الصرف الصحى والنفايات الصناعية مكونة أساساً من شعبة الرخويات من أنواع *Mactra coralina, Modiolus barbatus, Mactra glauca, Corbicula gibba,*
أشارت النتائج بمناطق الساحلية المقابلة الشاطئية بأن التكون القاعى أقل نسبياً. من ناحية أخرى وجدت بان المنطقة متمثلة فى نوع Zostera marina و ثلاثة طوائف من الطحالب البحرى منها ٨ أنواع من الطحالب الخضراء وثمانية أنواع من الطحالب البنية و ٧ أنواع وجنس واحد من الطحالب الحمراء . وبشكل عام أشارت النتائج بأن شارت النباتات القاعية، الأكثر كثافةً على طول الساحل الغربي لخليج أبى قير، في المنطقة المحاذية للمصبات من محطة الطابية ومن ناحية أخرى المناطق الساحلية المقابلة الشاطئية تتواجد الطحالب بكثرة ويعزى هذا إلى الظروف المحمية حيث تتواجد الطحالب من نوعى , *Caulerpa prolifera* و *Codium elongatum* الأكثر تواجداً حيث تتعرض لتركيزات عالية نسبياً من المتلوثات من الصرف الصحى والصناعى.