

DIVERSITY AND DISTRIBUTION OF MACROBENTHOS AND FISHES IN ABU QIR BAY, EGYPT

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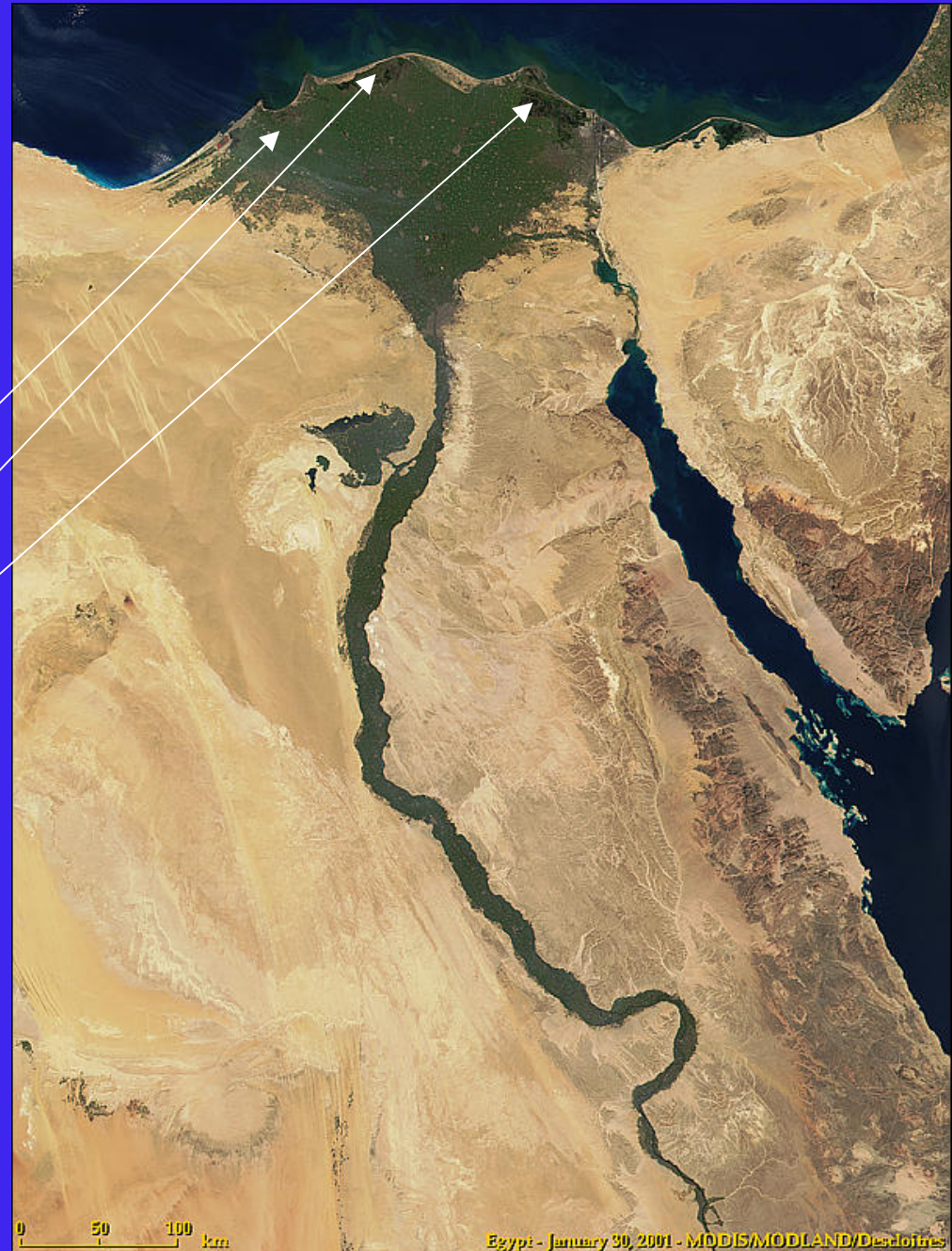
The Mediterranean coastal region of Egypt extends for about 1000 km, from Salloum (west border) to Rafah (east border). The northern coast of the Nile delta close to the Mediterranean sea is characterized by three shallow lakes;

Edku (in the west)

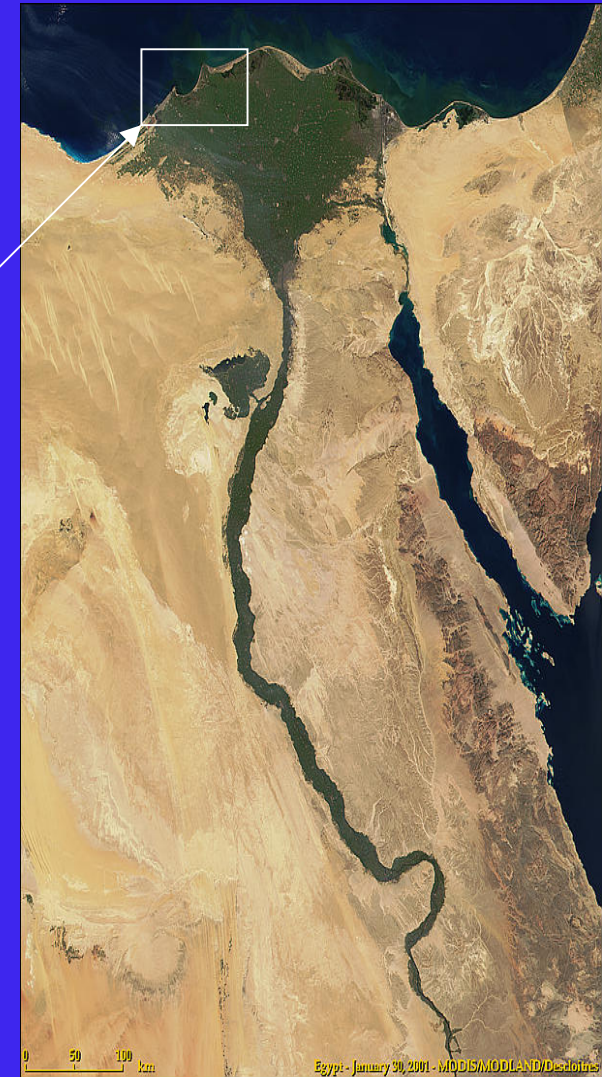
Burullus (in the middle)

Manzala (in the east)

These lakes receive most of the drainage water from the Nile delta land.



Study area



Prospects for development



- 1-High biodiversity of fisheries, migratory birds and marine resources**
- 2-High biodiversity of palm and Orchard trees**
- 3-Residential development adjacent to highly populated Alexandria City and economic centers close to the recently established International road**
- 4-Textile industry, fertilizers and Natural gas plants**

Main Problems and threats to the area

- **Pollution:**

- a. **Rosetta branch of the River Nile**



**b. Lake Edku Water discharge
via Maadia outlet**



c. El-Tabia Pumping Station



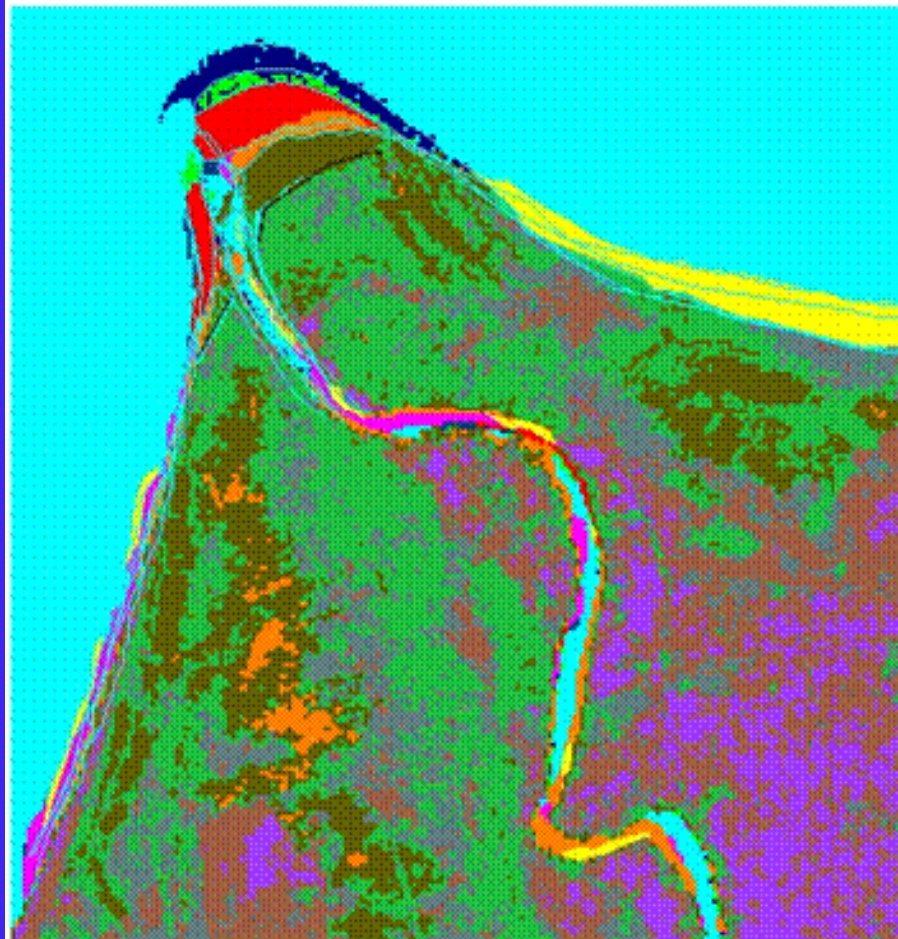
2. Erosion

Multi-temporal Images of Rosetta Promontory

Erosion and Accretion Patterns of Rosetta Promontory



I.G.S.R., Alexandria University



- Sea Water
- Erosion between 72-7
- Erosion between 76-7
- Erosion between 77-7
- erosion between 78-8
- Erosion between 83-8
- Erosion between 85-9
- Accretion areas
- Sea Walls

Effects of problems on flora and fauna in the area:

- **The loss of habitat**
- **Changes in existing habitat**
- **Change on water quality of the bay**

Sampling sites

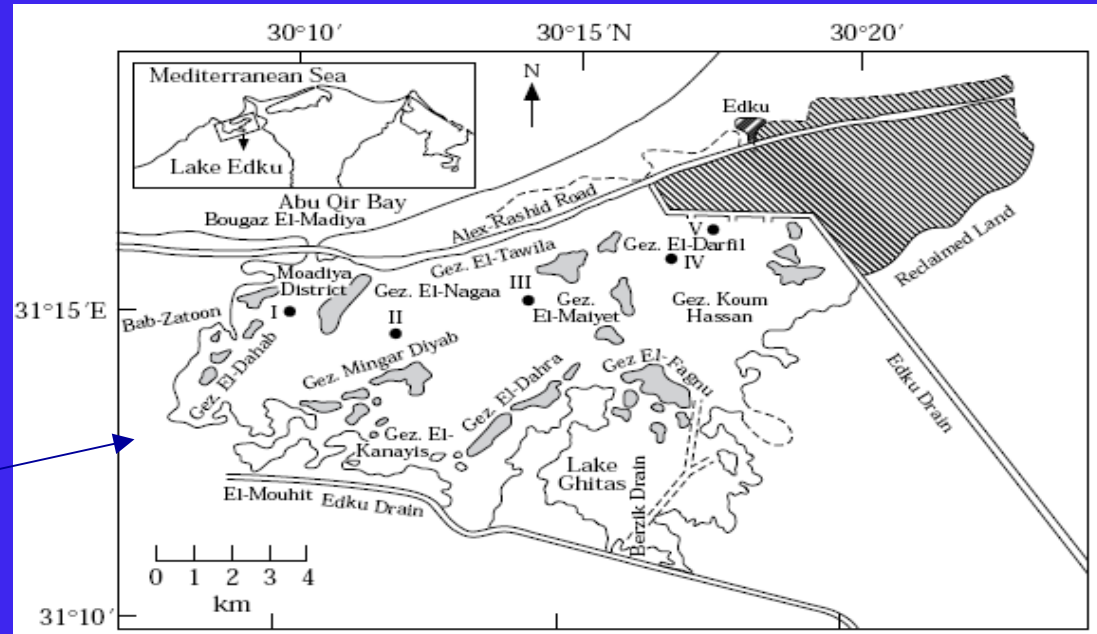
1-Abu Qir



It lies near Abu Qir city. The area receives a substantial load of industrial, agricultural and domestic pollution. Bottom of the site is sandy black mud with bad odor.



2-Lake Edku



This coastal lagoon is a basin for agricultural drains and domestic wastes. It covers an area of 126 km² with a mean depth of 1 m. Bottom is muddy with organic detritus and slightly vegetation around the boarder.



3-Edku Sea Coast



Represent the Edku coastal area at the Abu Qir Bay near Edku city. This area characterized by extended sandy beach and dense fisheries activities.



4-Rosetta



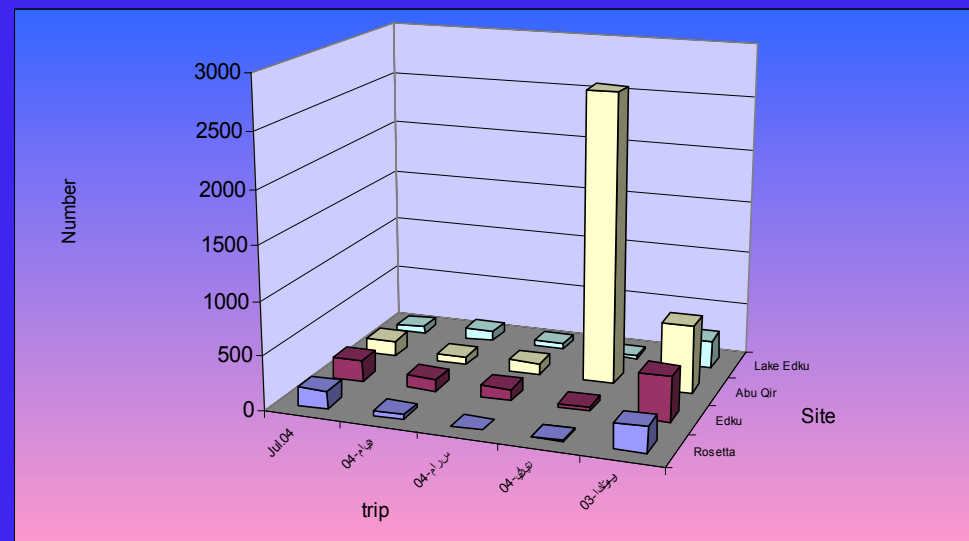
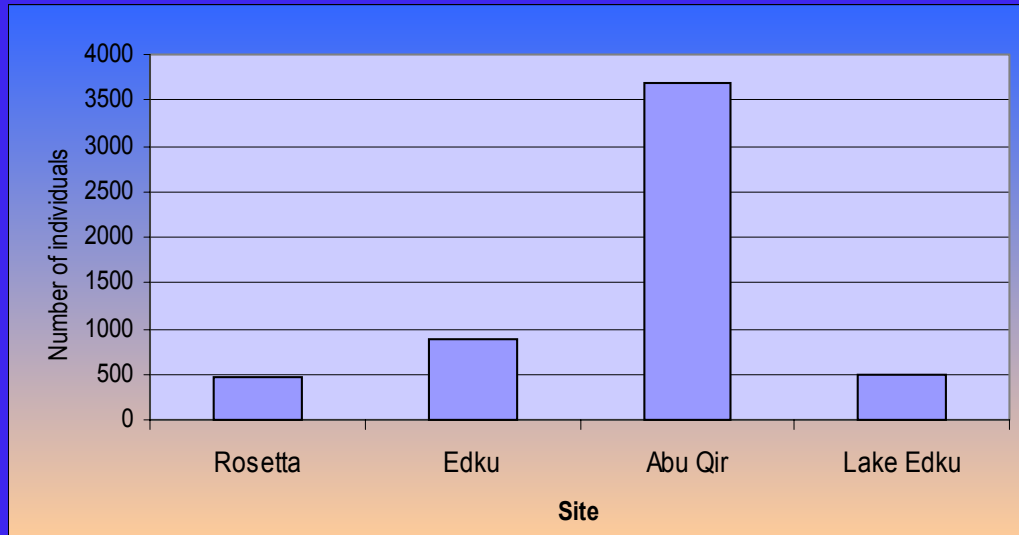
The sampling site situated near the mouth of Nile River to the Mediterranean Sea. It is characterized by the presence of rocky sides and muddy bottom



RESULTS

A) Fish

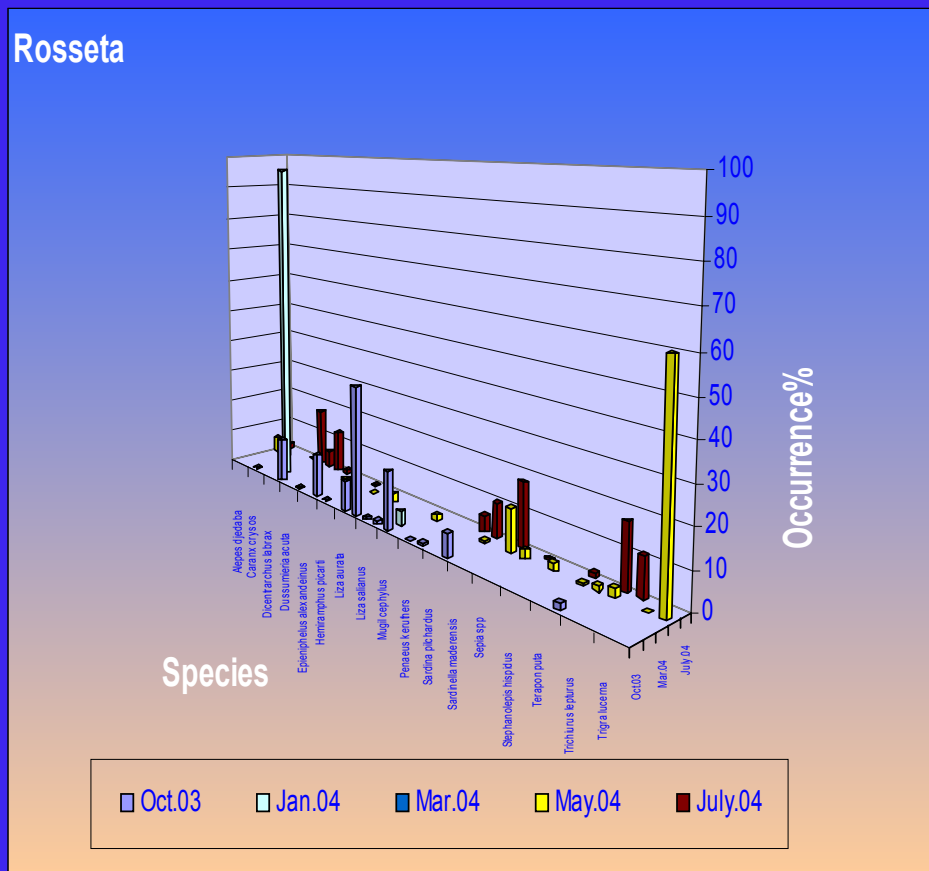
Distribution of total number of fishes in investigated area



Temporal variations of occurrence % of different fish species in sampling sites

Rosetta

31 species recorded

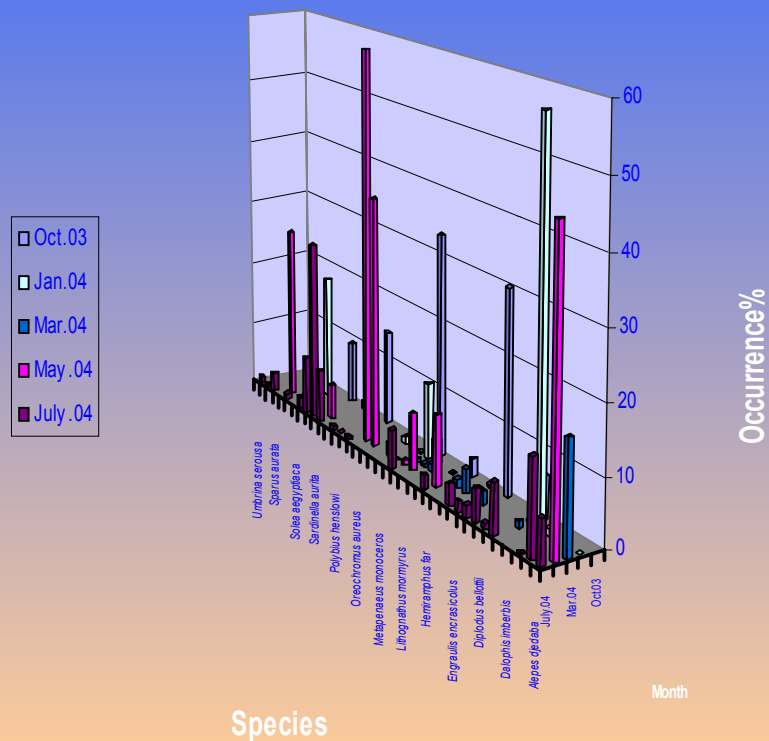


Species	Oct.03	Jan.04	Mar.04	May.04	July.04
<i>Alepes djedaba</i>				11.36	0.61
<i>Argyrosomus regius</i>				2.27	
<i>Caranx crysos</i>	0.85				
<i>Citharus linguatula</i>					0.61
<i>Dicentrarchus labrax</i>		91.67			3.03
<i>Dicentrarchus punctata</i>	0.43			18.18	0.61
<i>Dussumieria acuta</i>					23.64
<i>Engraulis encrasicolus</i>	1.28				12.12
<i>Epinephelus alexandrinus</i>				2.27	
<i>Gobius niger</i>	48.72				
<i>Hemiramphus picarti</i>	1.28				1.21
<i>Lithognathus mormyrus</i>				2.27	
<i>Liza aurata</i>	1.71				
<i>Liza ramada</i>	8.97			6.82	
<i>Liza salianus</i>	0.43				
<i>Metapenaeus monoceros</i>	10.68				
<i>Mugil cephalus</i>	0.43	8.33			
<i>Oreochromis aureus</i>				2.27	
<i>Penaeus keruthers</i>	0.85				
<i>Penaeus keruthers</i>	2.14				
<i>Sardina pilchardus</i>					28.48
<i>Sardinella aurita</i>	19.66			4.55	15.15
<i>Sardinella maderensis</i>					1.21
<i>Scomberomorus commerson</i>				6.82	0.61
<i>Sepia spp</i>				2.27	
<i>Solea aegyptiaca</i>					0.61
<i>Stephanolepis hispidus</i>				2.27	
<i>Synodus saurus</i>					
<i>Terapon puta</i>				2.27	1.82
<i>Tilapia zilli</i>	2.56			13.64	
<i>Trichiurus lepturus</i>				6.82	6.67
<i>Trichiurus ovatus</i>					3.64
<i>Trigra lucerna</i>				2.27	
<i>Umbrina serousa</i>				13.64	

Edku Coast

34 species recorded

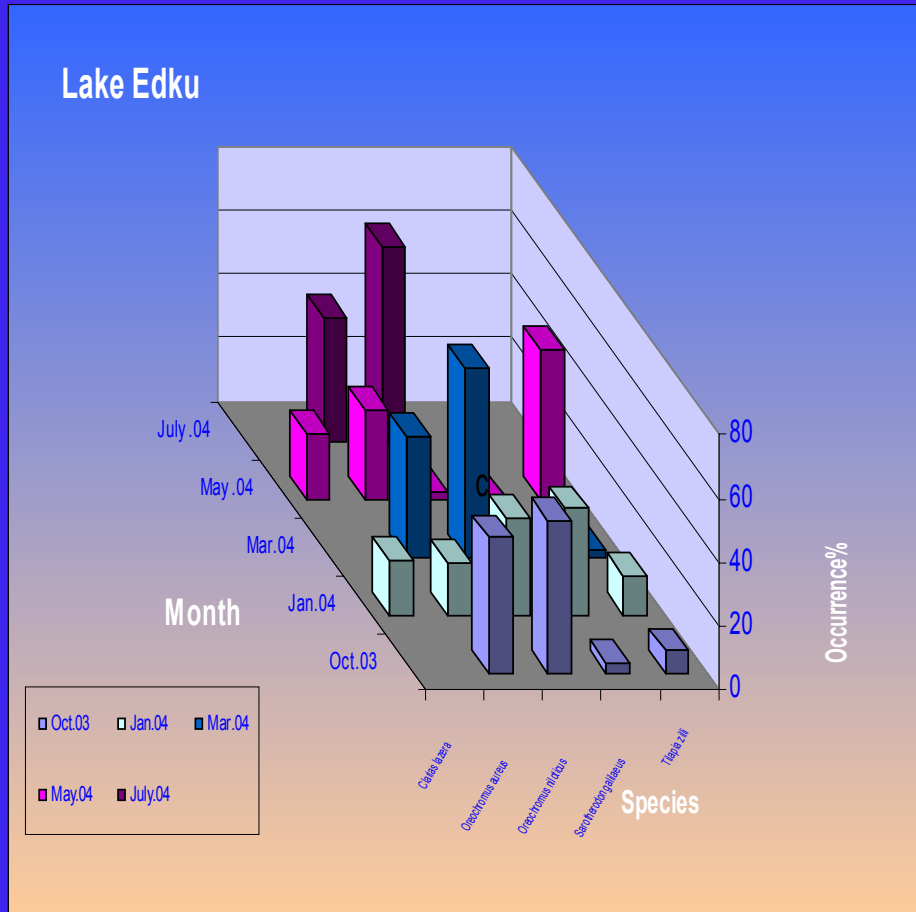
Edku Coast



Species	Oct.03	Jan.04	Mar.04	May.04	July.04
<i>Alepes djedaba</i>		2.50	14.70	38.60	6.90
<i>Argyrosomus regius</i>					7.39
<i>Boops boops</i>					0.49
<i>Dalophis imberbis</i>		2.50			
<i>Dicentrarchus labrax</i>		22.50			
<i>Dicentrarchus punctata</i>	3.32	7.50	0.92		4.93
<i>Diplodus bellottii</i>					0.49
<i>Diplodus cervinus</i>					0.49
<i>Diplodus vulgaris</i>					2.46
<i>Engraulis encrasicolus</i>	80.57		19.30		16.26
<i>Epieniphelus alexandinus</i>					0.49
<i>Gobius niger</i>	0.47	5.00	6.42		
<i>Hemiramphus far</i>			5.50		
<i>Hemiramphus picarti</i>	2.61			29.82	10.34
<i>Liocarcirus vernalis</i>		5.00			
<i>Lithognathus mormyrus</i>			4.59		
<i>Liza aurata</i>		5.00	0.92	7.02	
<i>Liza ramada</i>	2.37	7.50	0.92	0.88	0.99
<i>Metapenaeus monoceros</i>	0.24	7.50		0.88	
<i>Mugil cephalus</i>		2.50		0.88	
<i>Oratosquilla Massavensis</i>		5.00			
<i>Oreochromis aureus</i>				20.34	
<i>Oreochromis niloticus</i>				76.27	
<i>Penaeus stebengi</i>					1.48
<i>Polybius henslowi</i>	4.03		7.34		3.45
<i>Pomatomus saltatrix</i>					0.99
<i>Portunus pelagicus</i>	0.24				
<i>Sardinella aurita</i>	1.66		32.10	18.42	17.24
<i>Scomberomorus commerson</i>					16.26
<i>Siganus rivulatus</i>	2.84				2.96
<i>Solea aegyptiaca</i>					1.97
<i>Solea vulgaris</i>		27.50	6.42	1.75	
<i>Sparisoma cretense</i>					0.49
<i>Sparus aurata</i>				1.75	
<i>Tilapia zilli</i>	0.24				3.39
<i>Trachy penaeus</i>	1.42		0.92		2.96
<i>Umbrina serousa</i>					0.49

Lake Edku

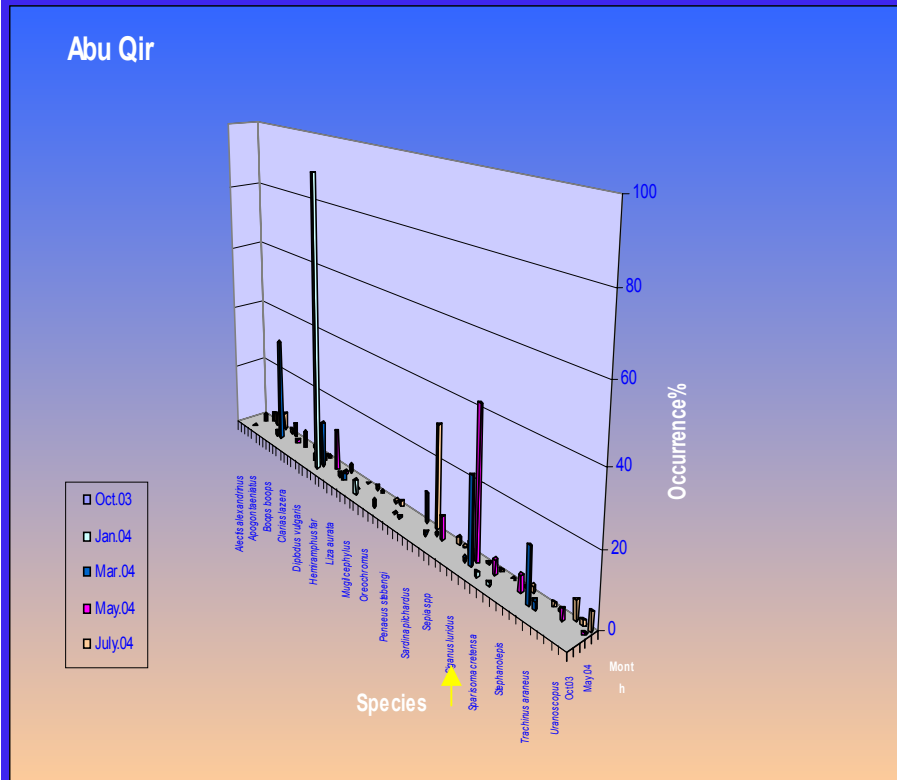
5 species recorded



Species	Oct.03	Jan.04	Mar.04	May.04	July.04
Species	No%	no	no	no	no
→ <i>Oreochromis aureus</i>	45.88	16.67	20.34	38.04	72.41
→ <i>Oreochromis niloticus</i>	43.53	30.10	76.27	3.26	27.59
<i>Sarotherodon galilaeus</i>	3.92	20.83		1.09	
→ <i>Tilapia zilli</i>	6.67	29.17	3.39	55.43	

Abu Qir

60 species recorded

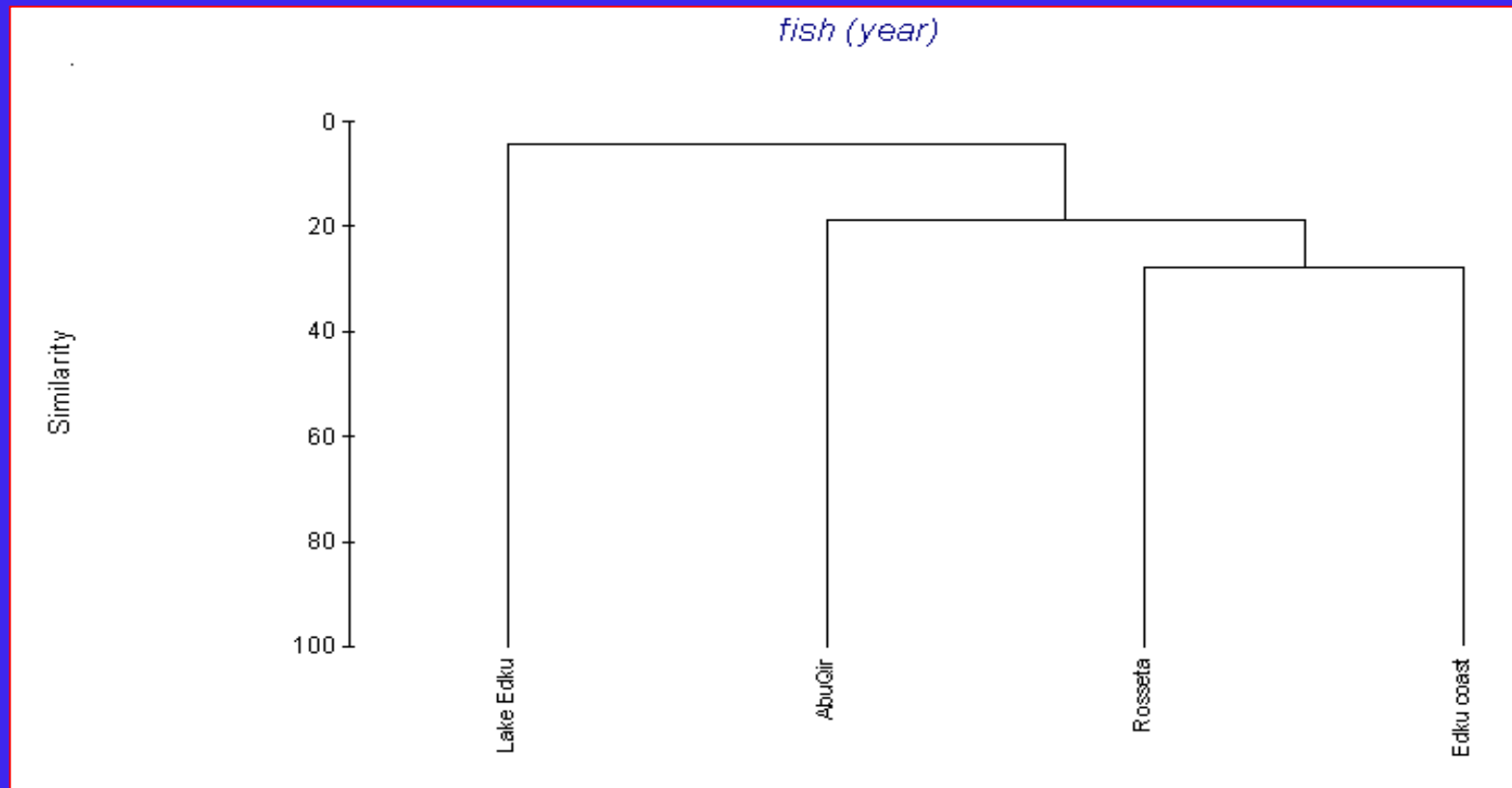


Species	Oct.03	Jan.04	Mar.04	May.04	July.04
<i>Alectis alexandrinus</i>	0.31				
<i>Alepes diedaba</i>	0.16				
<i>Anguilla anguilla</i>		47.92		2.63	
<i>Apogon imberbis</i>					8.90
<i>Apogon taeniatus</i>	0.31				7.53
<i>Argyrosomus regius</i>					
<i>Arisoma balearicum</i>					10.96
<i>Atherinomorus</i>			4.72		
<i>Boops boops</i>	0.47		22.64		2.05
<i>Bothus podas</i>					10.27
<i>Caranx crysos</i>					
<i>Citharus linguatula</i>	0.16			1.32	
<i>Clarias lazera</i>					
<i>Chromis chromis</i>				1.32	
<i>Coris julis</i>					1.37
<i>Dicentrarchus punctata</i>	7.54				
<i>Diplodus vulgaris</i>					4.11
<i>Engraulis encrasicolus</i>	36.42		6.60	47.37	2.74
<i>Epinephelus</i>				1.32	0.68
<i>Gobius niger</i>	17.43	51.60	28.30		
<i>Hemiramphus far</i>	2.98				
<i>Hemiramphus picarti</i>				1.32	
<i>Liocarcirus vernalis</i>	2.98				
<i>Lithognathus mormyrus</i>	0.16		1.89	1.32	1.37
<i>Liza aurata</i>	1.26		0.94		
<i>Liza ramada</i>	0.63				
<i>Liza salianus</i>					
<i>Metapenaeus</i>			1.89		1.37
<i>Mugil cephalus</i>	0.16	0.07			
<i>Mullus barbatus</i>					1.37
<i>Mullus surmulatus</i>					2.05
<i>Oratosquilla</i>	0.78				
<i>Oreochromis niloticus</i>		0.29			
<i>Pagellus erythrinus</i>					2.74
<i>Pagrus pagrus</i>					3.42
<i>Penaeus semiculcatus</i>			0.94		
<i>Penaeus stebengi</i>			0.94		
<i>Polybius henslowi</i>	0.31				
<i>Portunus pelagicus</i>	12.24				
<i>Raja radula</i>					0.68
<i>Sardina pilchardus</i>	2.51				
<i>Sardinella aurita</i>	0.78		0.94		13.01
<i>Scomber japonicus</i>				2.63	
<i>Scorpaena porcus</i>				2.63	
<i>Sepia spp</i>	0.16				
<i>Serranus cabrilla</i>					2.05
<i>Serranus hepatus</i>					1.37
<i>Serranus scrib</i>					4.11
<i>Siganus luridus</i>			0.94	5.26	
<i>Siganus rivulatus</i>	3.30		11.32	22.37	
<i>Solea aegyptiaca</i>					0.68
<i>Solea vulgaris</i>		0.07			
<i>Sparisoma cretense</i>				1.32	1.37
<i>Sparus aurata</i>	0.16	0.04			
<i>Spicara smaris</i>					0.68
<i>Squilla mantis</i>	0.31				
<i>Stephanolepis hispidus</i>	4.40			5.26	0.68
<i>Synodus saurus</i>					1.37
<i>Terapon puta</i>	3.92		16.04	1.32	
<i>Tilapia zilli</i>	0.16		1.89		
<i>Trachinus araneus</i>					0.68
<i>Trachurus trachurus</i>					0.68
<i>Trachinus radiatus</i>				1.32	
<i>Upeneus asymmetricus</i>					5.48
<i>Uranoscopus scaber</i>					0.68
<i>Xyrichtys novacula</i>				1.32	4.79

Statistical analysis fish samples collected from Abu Qir Bay during the period from October 2003 to July 2004.

	S (NO. of species)	N (Individuals)	D (Richness)	J (Evenness)	H' (Diversity)
Rosetta	47	401	7.676	0.7333	2.823
Edku Coast	69	1704	9.139	0.4052	1.715
Abu Qir	92	499	14.65	0.7716	3.489
Lake Edku	19	510	2.887	0.9007	2.652

Cluster analysis of fish species between sampling sites



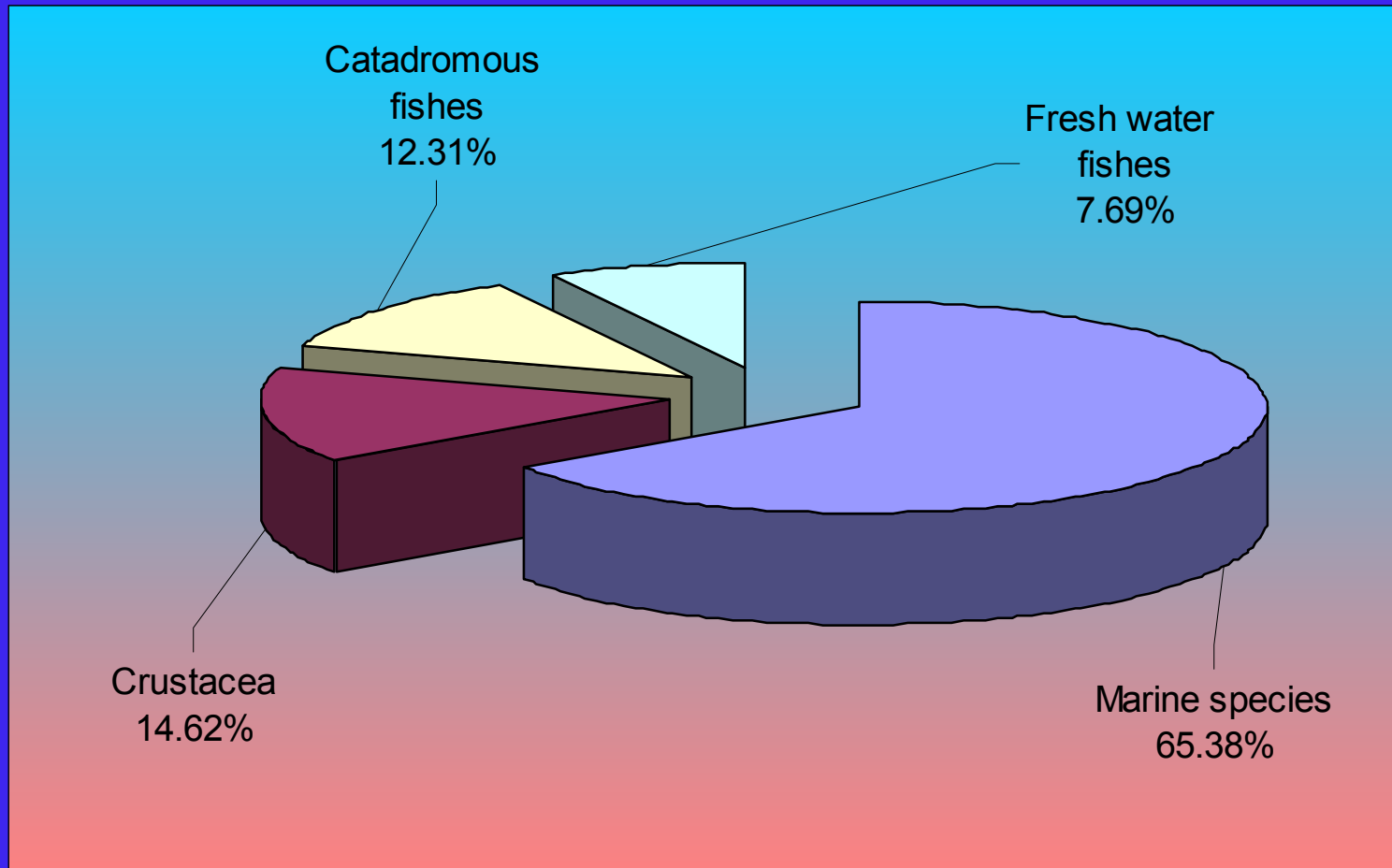
Abundance of Fish species in different sampling sites

84 species were identified

	Abu Qir	Edku Lake	Edku Coast	Rosetta
Marine species 59 species				
<i>Alectis alexandrinus</i>	*			
<i>Alepes djedaba</i>	*		*	*
<i>Apogon imberbis</i>	*			
<i>Apogon taeniatus</i>	*			
<i>Argyrosomus regius</i>			*	
<i>Arisoma balearicum</i>	*			
<i>Atherinomorus lacunosus</i>	*			
<i>Boops boops</i>	*		*	
<i>Bothus podas</i>	*			
<i>Chromis chromis</i>	*			
<i>Citharus linguatula</i>	*			*
<i>Caranx crysos</i>			*	*
<i>Coris julis</i>				
<i>Dalophis imberbis</i>			*	
<i>Diplodus bellottii</i>			*	
<i>Diplodus cervinus</i>			*	
<i>Diplodus vulgaris</i>			*	
<i>Dussumieria acuta</i>				*
<i>Engraulis encrasicolus</i>	*		*	*
<i>Epiplatys alexandrinus</i>	*		*	*
<i>Gobius niger</i>	*		*	*
<i>Hemiramphus far</i>	*		*	
<i>Hemiramphus picarti</i>	*		*	*
<i>Lithognathus mormyrus</i>	*		*	*
<i>Mullus barbatus</i>	*			
<i>Mullus surmulatus</i>	*			
<i>Pagellus erythrinus</i>	*			
<i>Pagrus pagrus</i>	*			
<i>Parablennius incognitus</i>			*	
<i>Pomatomus saltatrix</i>			*	
<i>Raja radula</i>	*			
<i>Sardina pilchardus</i>	*			*
<i>Sardinella aurita</i>	*		*	*
<i>Sardinella maderensis</i>				*
<i>Scomber japonicus</i>	*			
<i>Scomberomorus commerson</i>			*	*
<i>Scorpaena picta</i>	*			
<i>Scorpaena porcus</i>	*			
<i>Serranus cabrilla</i>	*			
<i>Serranus hepatus</i>	*			
<i>Serranus scrib</i>	*			
<i>Siganus luridus</i>	*			
<i>Siganus rivulatus</i>	*		*	

<i>Solea aegyptiaca</i>	*		*	*
<i>Sparisoma cretense</i>	*		*	
<i>Spicara smaris</i>	*			
<i>Stephanolepis hispidus</i>	*			*
<i>Synodus saurus</i>	*			
<i>Terapon puta</i>	*			*
<i>Trachinus araneus</i>	*			
<i>Trachinus ruidatus</i>	*			
<i>Trachurus trachurus</i>	*			
<i>Trichiurus lepturus</i>			*	*
<i>Trichiurus ovatus</i>				*
<i>Trigra lucerna</i>				*
<i>Umbrina serousa</i>			*	
<i>Upeneus asymmetricus</i>	*			
<i>Uranoscopus scaber</i>	*			
<i>Xyrichtys novacula</i>	*			
Catadromous fishes 8 species				
<i>Anguilla anguilla</i>	*			
<i>Dicentrarchus labrax</i>			*	*
<i>Dicentrarchus punctata</i>	*		*	*
<i>Liza aurata</i>	*		*	*
<i>Liza ramada</i>	*		*	*
<i>Liza salianus</i>				*
<i>Mugil cephalus</i>	*			*
<i>Sparus aurata</i>	*			
Crustacea 12 species				
<i>Liocarcinus vernalis</i>	*		*	
<i>Metapenaeus monoceros</i>	*		*	*
<i>Oratosquilla massavensis</i>	*		*	
<i>Penaeus keruthers</i>				*
<i>Penaeus keruthers</i>				*
<i>Penaeus semiculcatus</i>	*			
<i>Penaeus stebengi</i>	*		*	
<i>Polybius henslowi</i>	*		*	
<i>Portunus pelagicus</i>	*		*	
<i>Sepia spp</i>	*			*
<i>Squilla mantus</i>	*			
<i>Trachypenaeus spp</i>			*	
Fresh water fishes 5 species				
<i>Oreochromis aureus</i>		*		*
<i>Oreochromis niloticus</i>	*	*		
<i>Sarotherodon galilaeus</i>		*		
<i>Tilapia zilli</i>	*	*	*	*
<i>Clarias lazera</i>		*		

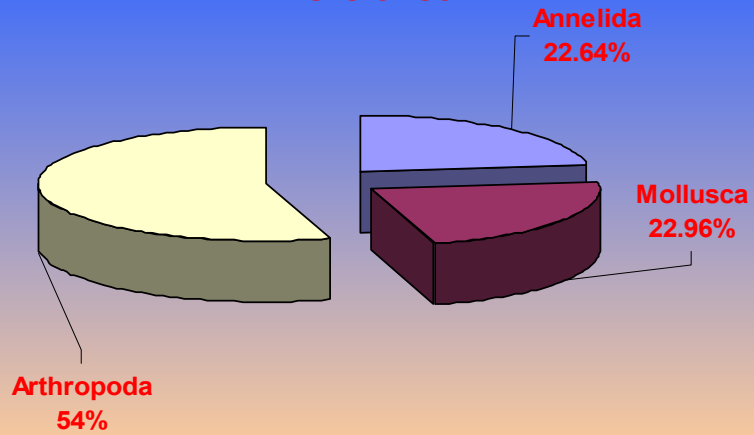
Percentage of fish species number in sampling area



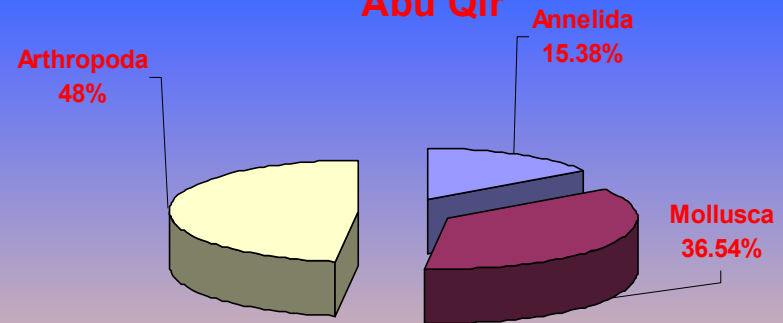
Macrobenthos

Quantitative Community composition

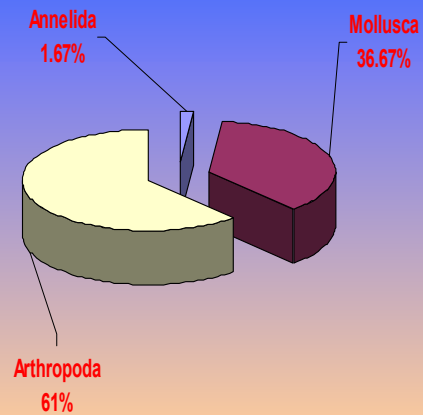
Whole area



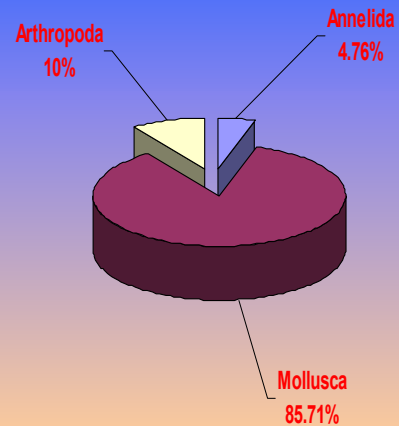
Abu Qir



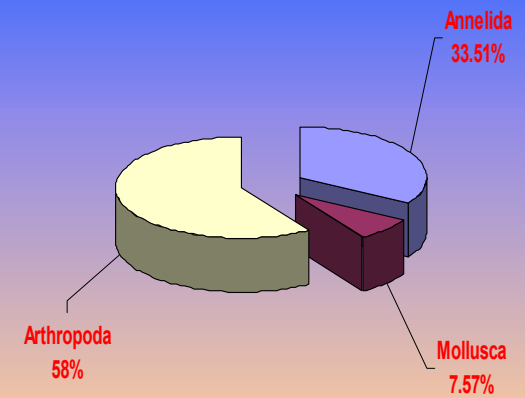
Lake Edku



Edku

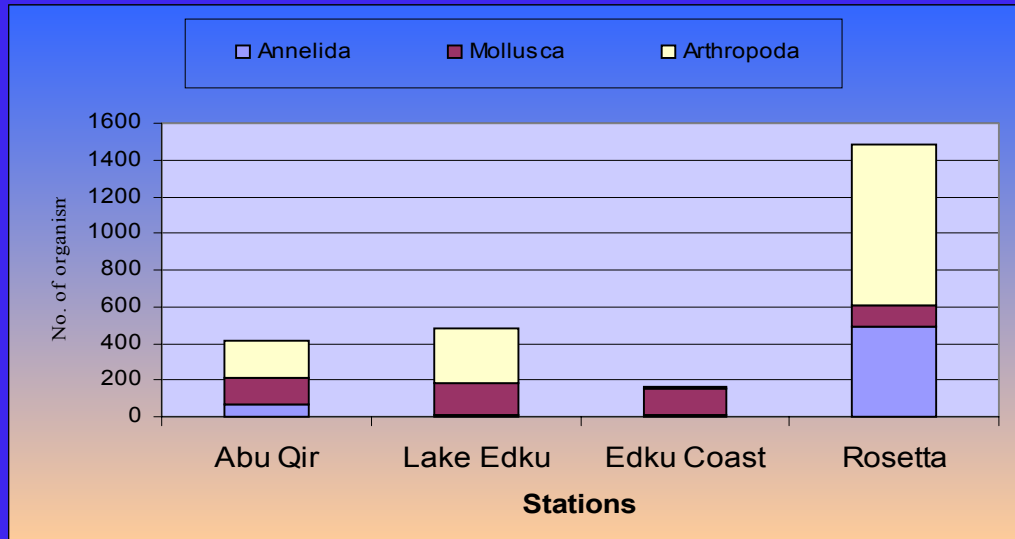


Rosetta

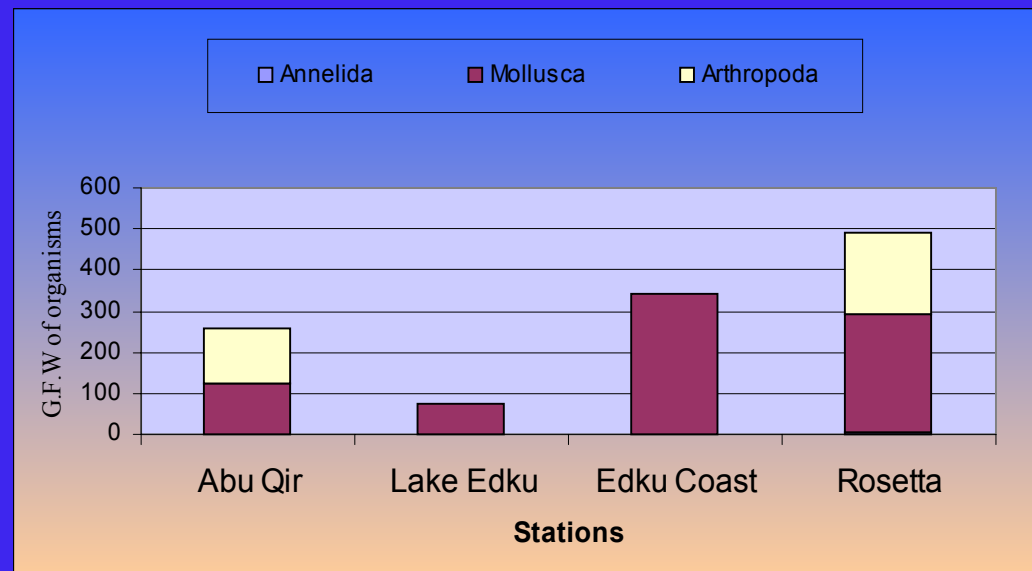


Spatial distribution

1) Number/m²



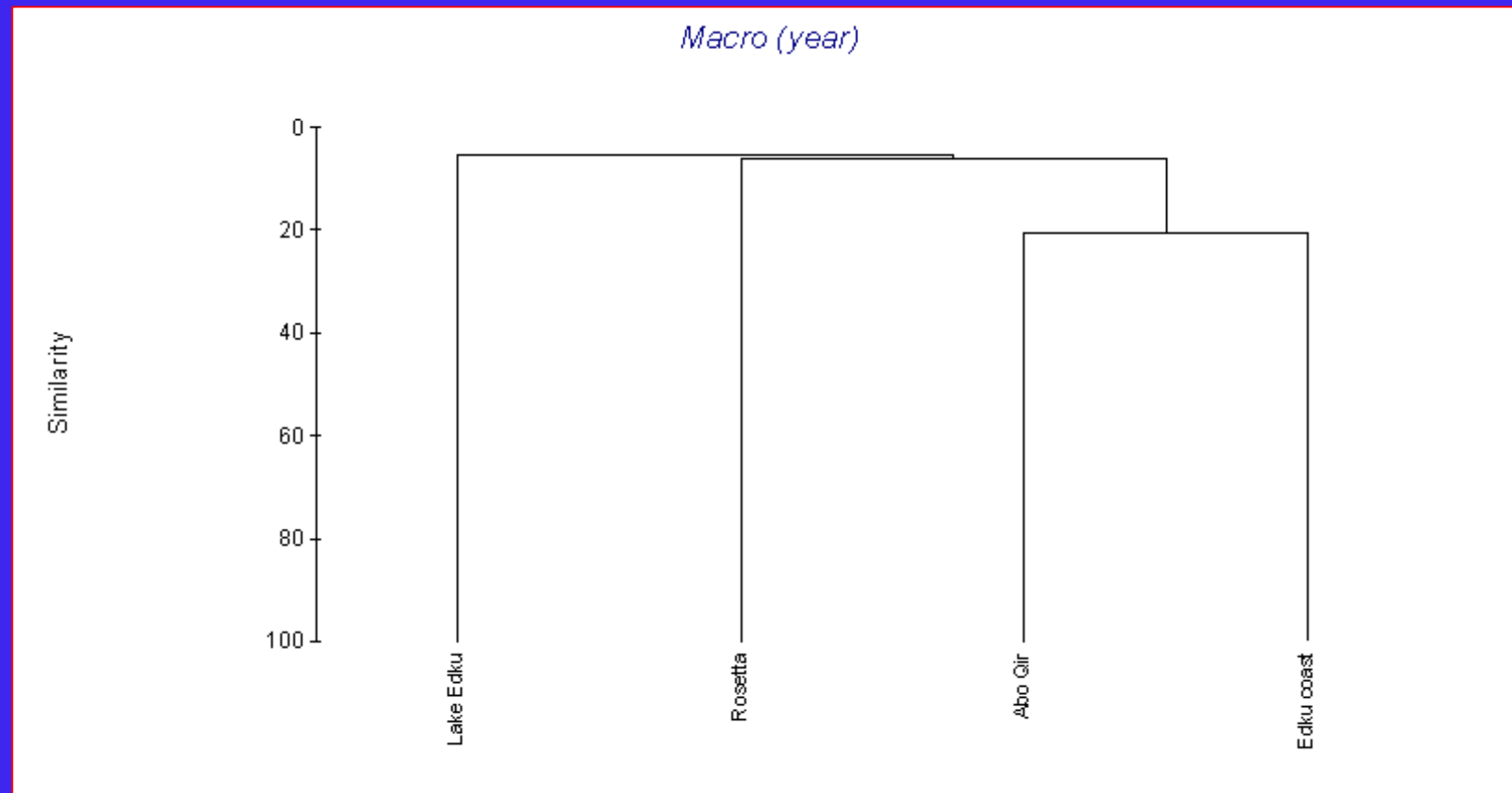
2) Weight/m²



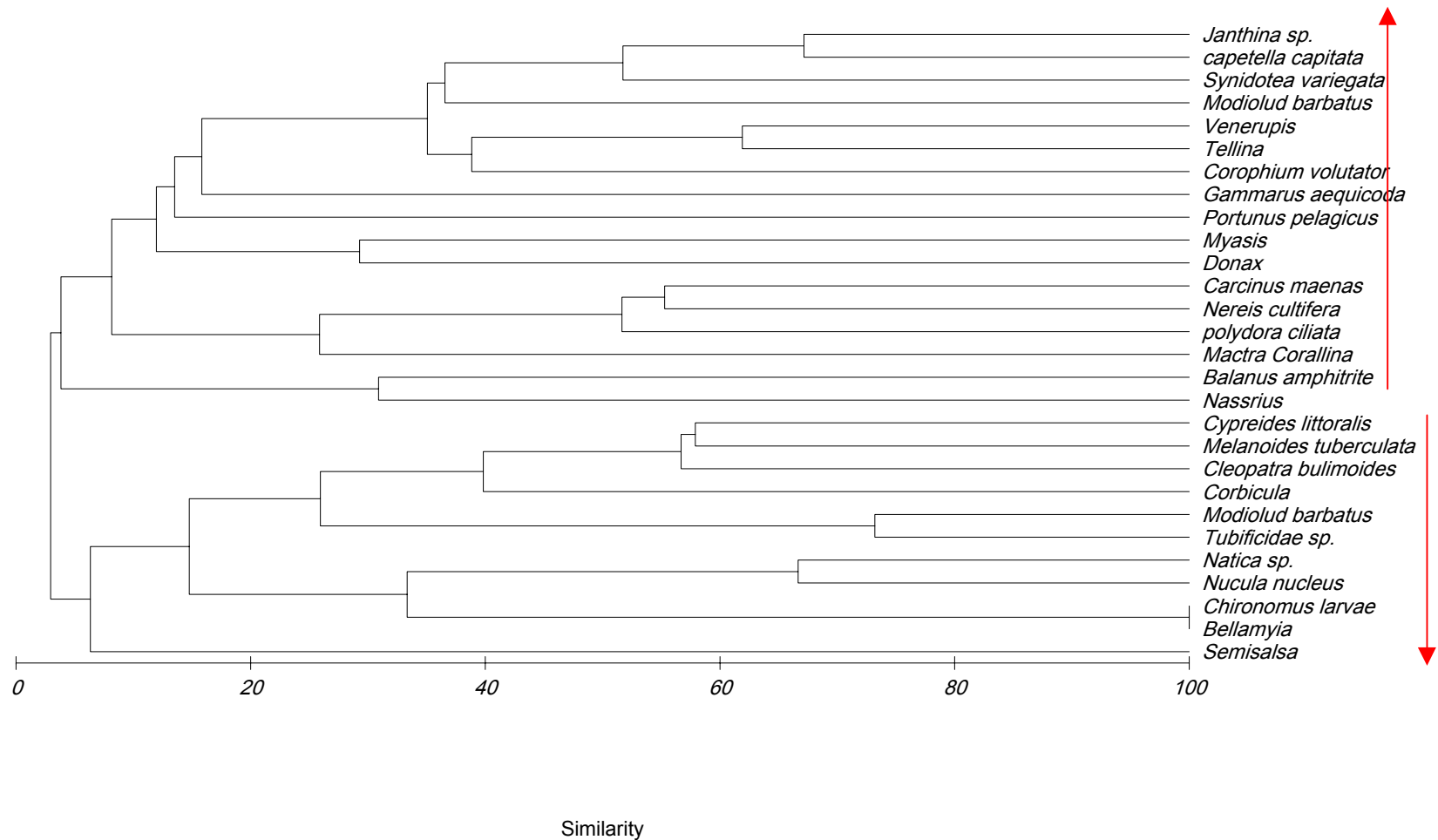
Statistical data analysis of macrobenthic community

	S (NO. of species)	N (Individual)	D (Richness)	J (Evenness)	H' (Diversity)
Rosetta	38	2814	4.659	0.7622	2.773
Lake Edku	39	2228	4.929	0.8081	2.961
Edku Coast	17	3761	1.944	0.5765	1.633
Abu Qir	29	4605	3.32	0.704	2.371

Cluster analysis of macrobenthic community between sampling sites



Cluster analysis on macrobenthic species in the whole study area

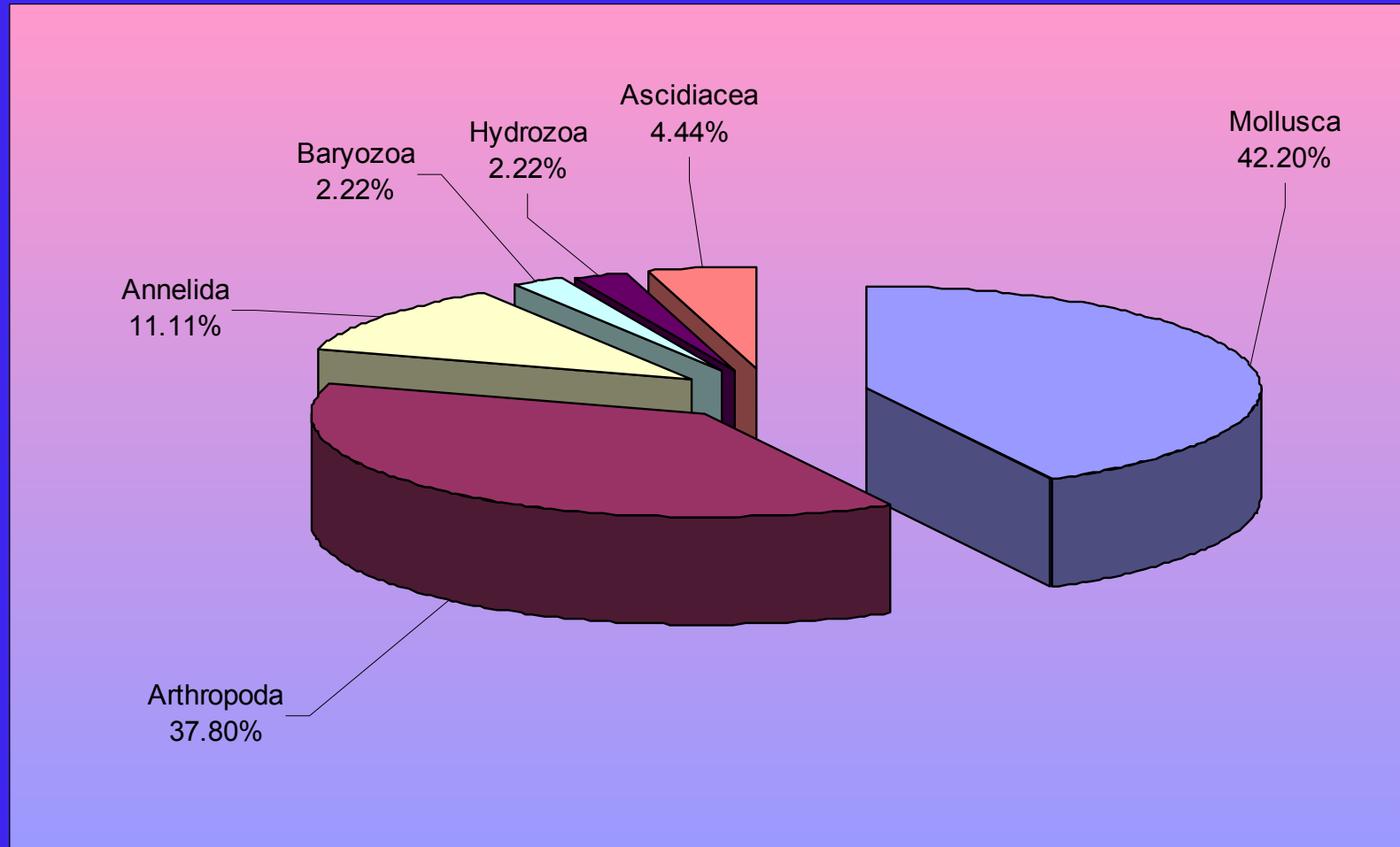


Abundance of macrobenthic invertebrates recorded from the sampling area

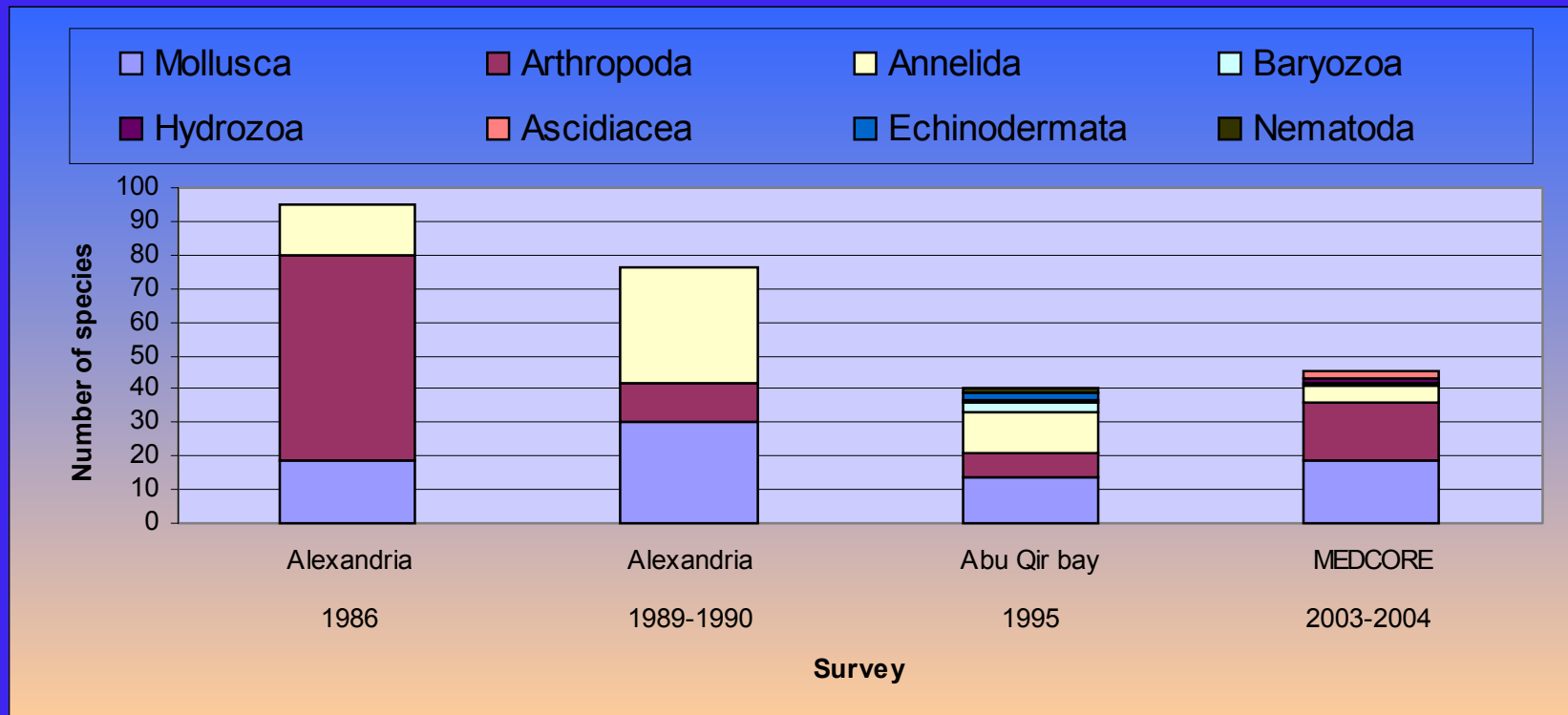
- 45 species were recorded in the whole Bay

Group	Species	Abu Qir	Lake Edku	Edku Coast	Rosetta
Hydrozoa (one species)	<i>Aglaophenia lophocarpa</i>				*
Baryozoa (one species)	<i>Bonerbankia gracilis</i>				*
Annelida (5 species)	<i>Nereis cultifera</i>	*			*
	<i>Nereis diversicolor</i>		*		
	<i>Eunice sp.</i>	*			
	<i>Polymnia nebulosa</i>	*			
	<i>Chaetogaster limmaei</i>				*
Mollusca (19 species)	<i>Donax trunculus</i>			*	
	<i>Mactra Corallina</i>			*	
	<i>Cerastoderma edule</i>			*	
	<i>Janthina sp.</i>			*	
	<i>Venerupis aurea</i>	*		*	
	<i>Phalium saburon</i>				*
	<i>Nererita josephina</i>			*	
	<i>Carcinus aestuarii</i>			*	
	<i>Thias sp.</i>			*	
	<i>Semisalsa sp.</i>		*		
	<i>Mytilus edules</i>				*
	<i>Modiolus barbatus</i>			*	*
	<i>Bellamyia unicolor</i>		*		
	<i>Cleopatra bulimoides</i>		*		
	<i>Melanoides tuberculata</i>		*		
	<i>Natica diheyni</i>	*			*
	<i>Gyralus ehernbergi</i>		*		
	<i>Bulla striata</i>	*			
	<i>Tellina sp.</i>				*
<i>Nucula nucleus</i>	*				
Arthropoda (17 species)	<i>Corophium volutator</i>		*		*
	<i>Spheroma walkeri</i>	*			*
	<i>Spheroma serratum</i>	*			
	<i>Gammarus aequicoda</i>				*
	<i>Baetis mutius</i>		*		
	<i>Baetis rhodani</i>		*		
	<i>Caenis sp.</i>		*		
	<i>Metapenaeus stebbingi</i>			*	
	<i>Idotea sp.</i>				*
	<i>Myasis sp.</i>		*		
	<i>Balanus perforatus</i>				*
	<i>Balanus amphitrite</i>				*
	<i>Carcinus maenas</i>	*			
	<i>Cyprides littoralis</i>		*		
	Hermit crab		*	*	
	<i>Caprella equilibra</i>				*
	Chironomus larvae		*		
Ascidiacea (2 species)	<i>Botryllus leachi</i>			*	
	<i>Coina intestinalis</i>			*	
Total number of species		10	14	13	17

Percentage of benthic species number in sampling area



Annual fluctuation of biodiversity of macrobenthos (number of species recorded) in some parts of Egyptian Mediterranean coastal zones for different surveyed periods



CONCLUSION

The area of study (Abu Qir Bay) have influenced by a great pressure from human impacts which cause a remarkable decrease on biodiversity of fishes and benthic invertebrates.

Recommendations

- **Construct reference conditions for benthic assemblages.**
- **Develop a monitoring strategy using selected zoobenthic quality elements.**
- **Develop benthic and fish community indexes that adequately describe the state of coastal waters.**

THANK YOU