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Assessment of fisheries and marine biodiversity of Sallum Gulf, Egypt

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ABSTRACT
A research cruise was carried out to assess the fisheries and marine biodiversity of the Gulf of Sallum, with a view for the protection, conservation, and management of its resources. To achieve this aim, the Egyptian Research Vessel "*Salsabil*" was used, deploying otter bottom trawl for fisheries data, CTD for collecting environmental parameters, and a bottom grab sampler for obtaining samples of benthos fauna. Moreover, diving was used to survey the under-water sea grass beds.

The Gulf of Sallum supports a wide range of ecosystems, from the rich sea grass meadows and rocky reefs of the coastal zone, to the little seamounts. It is thus considered as a great resource for many economic fish species.

Seagrass plants were found forming from scattered small areas to dense vegetation that covered extended areas of the sea floor. The macrobenthic community in the investigated area consisted from 57 species belong to seven groups, while fish populations contained more than 90 species. Species Richness was closely correlated to depth, organic matter concentrations and sediment characteristics.

Some invasive polychaete and introduced fish species were recorded in the present study, moreover few considered as threatened species.

Using GIS analysis to the survey result showed that diversity of seagrass beds, benthic fauna and fish species in the Gulf could be divided into two sections. First section lies to the west of 25º 30'E longitude; contains the highest species composition, while second section (eastward of 25º 30' E) contains the lowest species composition.

It was highly recommended, therefore, to declare the first section as a marine protected area (MPA). As the results of this study, the Gulf of Sallum was declared as the first marine Egyptian protected area in the Mediterranean Sea by the Egyptian Prime Minister's decision No. 533 for the year 2010.

1. INTRODUCTION
The Sallum area a part of the western Mediterranean coastal region of Egypt, ling about 600 km from Alexandria in the East and the Libyan border in the West. It is quite distinct from the remainder of the vast Western Desert.

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Near the Town of Sallum, the shoreline changes its east-west facet, to a northerly direction in a rather sharp bend, forming the Gulf of Sallum. The coastal plain narrows towards the west, as inland limestone ridges approach the coast and meet the coastline just north of the town of Sallum. Sea cliffs are formed further north of the town.

For Egypt, the Mediterranean Sea is one of its major natural resources. The Biological diversity of the Egyptian Mediterranean waters is therefore important at the community and ecosystem levels, where it can affect natural recourses functioning. Diversity can be measured in terms of the numbers of species and their relative importance in different ecosystems. Such information can be obtained using a variety of survey methods, and can be gathered in terms of the abundance of different species or in terms of their presence absence in an ecosystem.

The Mediterranean coastline of Egypt is undergoing rapid development, where every section of the coast has witnessed rapid, large-scale environmental changes. The coastal challenges here include road construction, drainage form wastewater and irrigation, lagoon management and land reclamation. Major view settlements are being constructed along coastal areas with little land planning and little infrastructure (Mostafa, 2000).

Unfortunately, inspite of some sporadic and fragmentary studies that have been undertaken in the Sallum area of the Mediterranean Sea in a rather individual or occasional fashion (NIOF, 1975; 1983 and 2005), very little attention was given in the past to the question of the biodiversity in this area.

The present study is a serious attempt to assess, through field surveys, the marine biological diversity status in this critical and sensitive area of the Egyptian Mediterranean coast from the viewpoint of their conservation and sustainable development.

2. MATERIAL AND METHODS

The marine research cruise was carried out in the Sallum Gulf, Egyptian Mediterranean Sea coast from 20 to 31 August 2007, using the Egyptian Research Vessel "*Salsabil"* of the National Institute of Oceanography and Fisheries. The survey area extended between 31° 31' 25" and 31° 44' 55" N latitudes, and 25° 09' 55" to 25° 44' 55" E longitudes. The R/V "*Salsabil"* (31 m long and 950 HP) was fitted with all navigational and hydrographic equipments, oceanographic instruments and fishing gears, necessary for undertaking the field survey of the project. Fish samples were collected using the otter bottom trawl (horizontal opening 14 m & height 1.8- 2 m). A CTD was used to collect the environmental parameters and a grab sampler for collecting bottom samples.

Seagrass plants were harvested haphazardly from the seafloor by hand, through scuba diving. Three transects were made at each site to cover most of the seagrass meadow. An iron quadrate (25 cm x 25 cm x 5 cm) with sharp edges for cut of the seagrass rhizomes and roots was used for the collection of the different seagrass species from the chosen sites. The biomass of the different seagrass species was determined by weighting them as dry weight and calculated as gram/m2.

Benthic macroinvertebrates samples were collected using three different methods:

1. Bottom trawl net was used for collection of fishes. Benthic collection by this method was carried out in areas with large depths (usually more than 40 meters).
2. Van Veen Grab with opening area equivalent to 250 cm² (for sites with depths between 40 and 20 meters).

3. Quadrate (0.5 m^2) from the bed of the shallow areas of depth less than 20 meters were collected.

The collected samples were washed in the field through a small hand net of 500 μm mesh diameter.

Invertebrates were identified to species level wherever possible. Results were given as the total numbers of bottom fauna per square meter.

Bottom otter trawl net (Japanese design) was used to collect fish samples. The trawling time in sampling areas did not more than 3/4 of an hour. Speed of the boat during trawling time and geographical position were measured using differential GPS. Trawling was carried out during night and daylight hours. Classification and ordination were performed in order to identify demersal fish assemblages. FishBase (Froese and Pauly 2000) and FAO Identification Sheets for Fishery Purpose – Mediterranean and Black Sea Fishing Area 37 (Fischer, 1973, Fischer *et al*, 1987, FAO 2006) were used for that purpose. After each tow, the total catch was weighed and measured. The commercial targeted fish and the bycatch were recorded.

Factor analysis was applied as a data reduction or structure detection method. The software STATISTICA 7 was used in performing factor analysis technique. Based on the ray-Curtis similarity analysis between the fish production in the 4 years, the cluster or dendrogram explaining the similarity between the 4 years were plotted. Cluster analysis, diversity, richness and evenness were calculated using PRIMER 5 statistical package. A stratified survey design (depth, latitude) with fixed positions was used for spatial distribution (GIS analysis). The study area was divided in to 7 sectors (sub-areas) along the coast of the Gulf of Sallum for comparison and distinguishing between the different parts of the Gulf (Fig. 1).

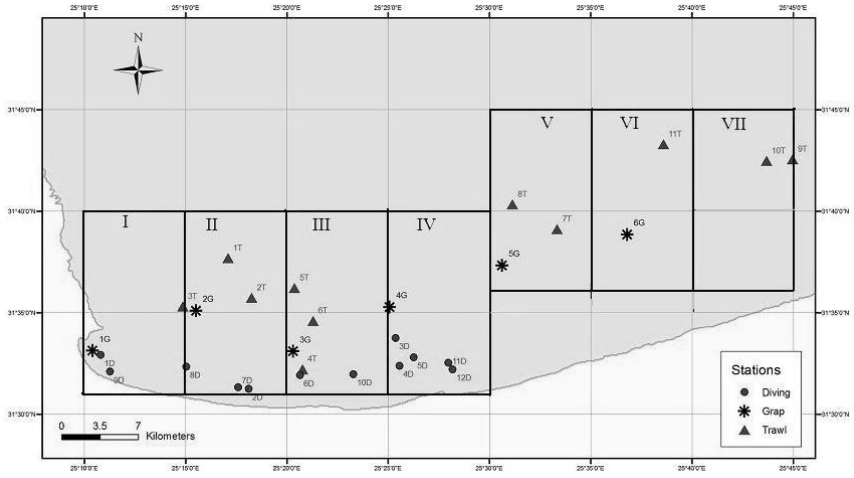

Fig. 1: Location of sampling sits in the different sections taken during the Sallum Gulf survey in August 2007.

Spatial analysis production was calculated using the inverse distance squared weighted interpolation technique using ArcGis ARCMAP 9.2 software. Created colour contour areas are representing a prediction values calculated by interpolation of the sampling stations (which are represented on the maps by points). The prediction (spatial) values are subdivided into classes. These classes are represented by different colours on the maps.

3. RESULTS

3.1. Macrophytes

Two seagrass species belonging to the families: Posidoniaceae (*Posidonia oceanica*) and Cymodoceaceae (*Cymodocea nodosa*) were identified

during this survey along the study sites. Seagrass plants were found forming from scattered small areas to dense vegetation that covered extended areas of the sea floor. Plants of *Posidonia oceanica* were found from 6 meters to a depth of more than 28 meters forming monospecific populations that covers large areas of the sea floor. It was observed that *P. oceanica* grows on sandy and/or rocky substrates, and in some sites on dead *Posidonia* mats.

Mean biomass of *P. oceanica* varies between sites and with depth. The highest biomass was recorded in station 3D while the lowest was recorded in station 10D (Table 1).

Table 1: Biomass (gm dry weight /m^2) of *Posidonia oceanica* at different sampling sites collected from Sallum Gulf during August 2007.

Mean Biomass (gm dry weight /m^2)	**Dive type**	**Site number**
1181.19	Deep	**1D**
1455.8	Deep	**2D**
1679.46	Shallow	**3D**
1287.91	Deep	**4D**
1597.28	Deep	**5D**
1381.7	Deep	**6D**
1343.07	Shallow	**7D**
1045.9	Deep	**8D**
1535.3	Shallow	**9D**
916.5	Shallow	**10D**
1309.12	Deep	**11D**
1050.94	Shallow	**12D**

Cymodocea nodosa was found in only one site (station 10D, <4m depth), occurring in a small scattered monospecific population which was mixed with *Posidonia* in the offshore direction. The recorded biomass for this seagrass plant was: 82.47 gm dry weight /m^2.

3.2. Macrobenthos

The macrobenthic community in the investigated area consisted from 57 species belong to seven groups (Appendix No 1). Mollusca and Annelida represent the main components of the benthic fauna in the area of investigation constituting 35.92% & 32.60% of the total number of benthos, respectively. Echinodermata and Crustacea occupied the second set of community with percentages of 9.59% & 9.10%, respectively. The remaining orders were recorded with fewer numbers, where Porifera represents a percentage of 7.87% followed by Ascidiacea (3.69%), Cnidaria (1.23%) as shown in Fig. 2. Average standing crop of macrobenthos was calculated in the whole sampling area by 37 Organisms/m^2.

The community of sponges consisted from 9 species namely *Myxilla prouha*, *Spongia afficinalis*, *Halichondria panacea*, *Suberites doumuncula*, *Cacospongia molliar*, *Agelas oroides*, *Spongia zimocca, Ircinia fasciculate*, *Hisppaspongia communis*.

The highest average number of benthos was recorded in stations 1D and 4D (92 and 70 organisms/m^2) which was mainly

due to a high number of mollusk and annelid species in these sites. On the other hand, the eastern sites (6G & 3D) were the poorest sites in the investigated area with values of 6 and 10 organisms/m^2, respectively. The results showed that site 4T is the most diverse site in the area because it represented by 5 groups of macrobenthic fauna.

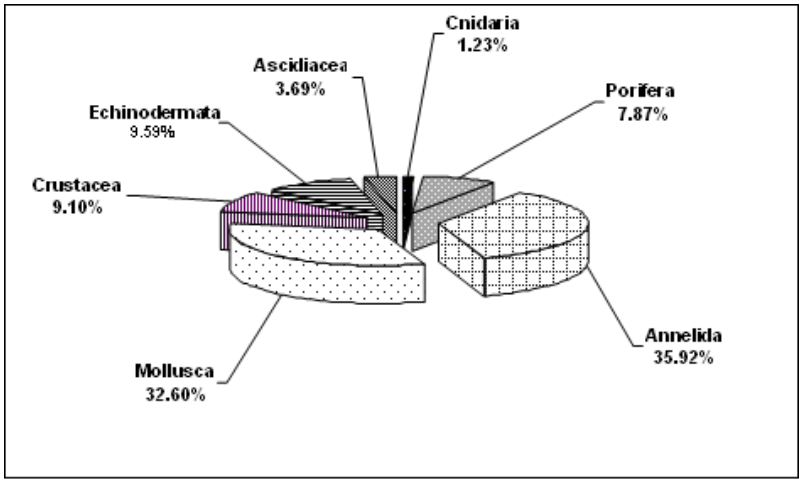

Fig. 2: Percentage of different benthic groups in study area.

3.3. Fisheries

Only three to five artisanal boats are sailed from Sallum port. Although about 30 motorized fishing boats (using longline or trawl net) registered and landing in Alexandria eastern harbour or Matrouh fishing port are utilizing the Sallum fishing ground.

Landing of Matrouh port was dominated by 15 species during eight years (1998-2006) according to General Authority for Fisheries Resources Development (GAFRD). Grouper (*Epieniphelus aeneus and E. alexandrnus*) is the most landed fish group followed by common sea bream (*Pagrus spp and Pagellus spp*) and cartilaginous fishes (*Ray spp* and *Mustelus spp*). Also, red mullet (*Mullus spp*), bogue, lizard fish (*Synodontus spp*) and cuttlefish are important economic landed species (Fig. 3).

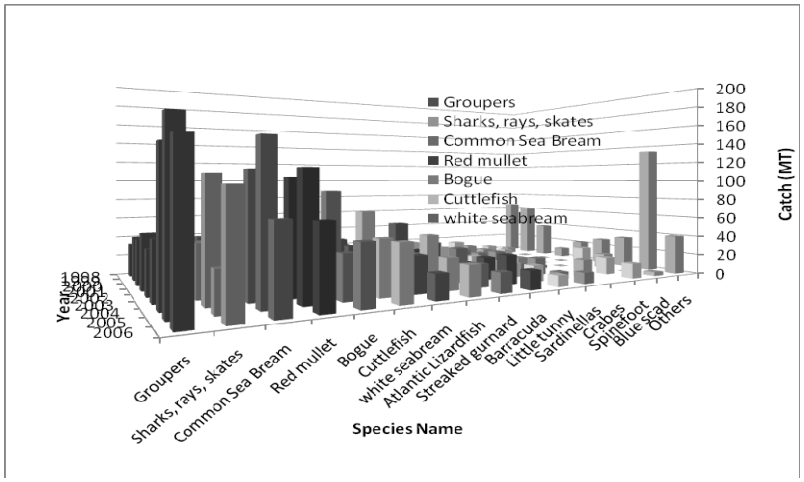

Fig. 3: Catch composition in Matrouh Sector (Source data: GAFRD, 1998-2006).

Bottom trawl catch composition was estimated during the August 2007 cruise, cuttlefish *Sepia spp* was the most dominant species followed by common sea bream (*Pagrus spp and Pagellus spp*) Octopus, *Synodontus spp* and *Mulles spp.*

Moreover, cartilaginous fishes, *Bothus spp, Serranus spp* and *Xyrichtys spp* which were bycatch fishes came next while its small sized one discards (Fig. 4).

Through four surveys carried out in Sallum Gulf (during five years from 2003 to 2007), the total number of recorded species rise up to 89 species (6 Mollusca, 5 Crustacea, 7 Cartilaginous and 71 Bony fish) (Appendix 2). Almost all of these species are demersal or semidemersal fishes. Some pelagic fishes were recorded in the catch of other boats catching fish in the same area with different types of nets (e.g. longline, trammel or gill net). Those species mainly include *Scomber japonicas, Sardinella aurita, Sardina pilchards* and, *Sphyreana sphyreana*.

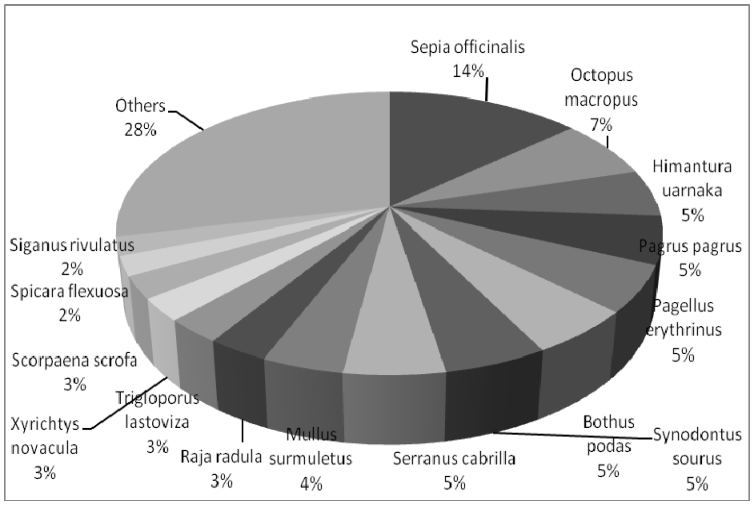

Fig. 4: Dominant species in the catch (in weight) of bottom trawl net of Sallum Gulf during August 2007 cruise.

Catch per unit effort, defined as average weight (kg) per hour trawling, and the spatial distribution was expressed using Bottom Trawl Survey data collected during August 2007 in Sallum Gulf. Among seven sections that the gulf was divided (Fig. 1), section II and V had higher CPUE. While, sections I, VI and VII had lower CPUE as shows Fig. 5.

3.4. Invasive species

During the present study only one invasive polychaete species was recorded in the present study, *Hermodice curunculata* (Appendix I), and 5 introduced fish species were recorded (*Fistularia commersonii, Lagocephalus spadiceus, Himantura uarnaka, Siganus rivulatus, Stephanolepis diaspros*). Moreover, 10 species were recorded during previous cruises in Sallum Gulf by the NIOF research vessel, these are; *Apogon taeniatus, Atherinomorus lacunosus, Diplodus bellottii, Lagocephalus sceleratus, Oratosquilla massavensis, Pteregogus pelycus, Saurida undosquamis, Scomberomorus commerson, Siganus luridus, Upeneus asymmetricus*, (Appendix 2).

3.5. Threatened species

According to the Protocol of Specially Protected Areas and Biological Diversity in the Mediterranean (SPA Protocol 1995+) and including Annexes on endangered and threatened species two species recoreded in this survey are on Annex II. These species are the Echinoderm *Ophidiaster ophidianus* and the mollusk *Pinna nobilis.* Furthermore, 3 species of Porifera were recorded during this study, namely *Hippospongia communis, Spongia officinalis* and *Spongia zimocca* are on Annex III.

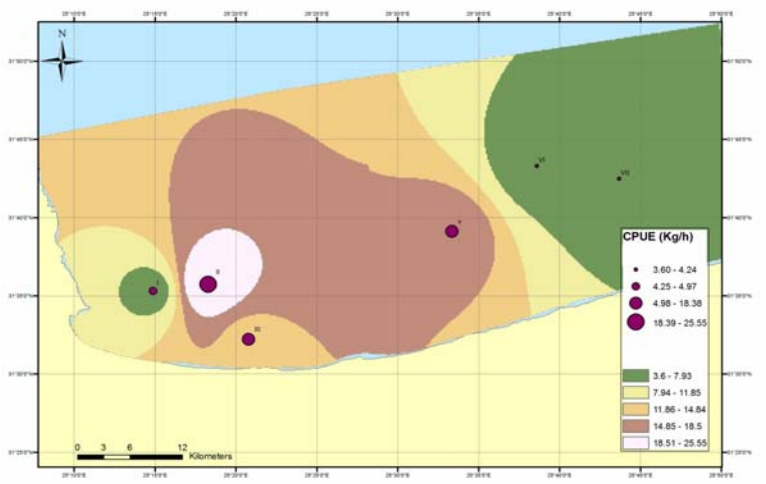

Fig. 5: Fish spatial distribution in Sallum Gulf using CPUE as index of abundance.

4. DISCUSSION

Study of species richness, density and abundance (the number of species per area) has been key points in biodiversity. The indicators of habitat change are generally expressed in spatial terms, usually as some aspects of the habitat area, while feasible, geographic information systems should be used to map important habitats on a regular basis.

Only 9 species of sponge were reported in the present study that seem few if compared with 589 sponge species recoided in the Mediterranean (Pansini, 1995, 1996). It has to be mentioned that a sharp decrease in the annual catch of the Egyptian commercial sponge fisheries was repealed in 1987. A total of about 5663 Kilogram were obtained in 1986, dropped suddenly to about 1087 Kilogram in 1987 (under the same fishing conditions, e.g. numbers of fishing vessels and divers), and reached about 615 kilogram only in 1992.

According to Protocol concerning Specially Protected Areas and Biological Diversity in the Mediterranean (Mediterranean SPA Protocol) which was revised in Barcelona, Spain, on 9-10 June 1995 and including Annexes which were adopted in Monaco, on 24 November 1996. The Echinoderm *Ophidiaster ophidianus* and the mollusk *Pinna nobilis* were recorded as endangered or threatened species (Annex II). Moreover, 3 species of Porifera namely *Hippospongia communis*, *Spongia officinalis* and *Spongia zimocca* were recorded according to Annex III (List of species whose exploitation is must regulated).

Only one invasive polychaete species was recorded in the present study, *Hermodice curunculata*. Beltagi (1993) previously recorded this species in Marsa Matrouh. Fishelson *et al*. (2002) stated that this species Invertebrates of Red Sea origin dominant along the Israeli Mediterranean shore. The appearance of this species means that it continues widespread westward.

In the present study, 15 introduced (invasive) species were recorded. The Mediterranean, the impact of invasive species on biodiversity (from species to community to ecosystem level) and to a lesser extent on socioeconomic values and health have been partially covered in various syntheses. Many cases of economic losses to fisheries and aquaculture associated with invasive species have been reported. Displacement of native fish and prawns (due to *Upeneus moluccensis and Saurida undosquamis, Oratosquilla*

massavensis) has also economic implications, as these animals are fishery commodities, which now require more effort for their harvesting. Abundant populations of fish of no economic importance is another example of economic burden to fishermen as fish are caught in fishing gears and have to be discarded, as in the case of *Sphoeroides pachygaster* (Golani *et al*., 2002). The opening of the Suez Canal in 1869 allowed entry into the eastern Mediterranean of Indo-Pacific biota, having a significant effect on the community structure and function of the Levantine littoral zones (Goren & Galil, 2005).

Some irrational and unsustainable fishing activities have serious negative impacts on the fisheries resources and the ecosystem in general and on the fish biodiversity, the benthic and the demersal environments in particular. The impacts of such fishing activities could have either direct effect (e.g. removal of species) or indirect effect (e.g. habitat modification, changes in prey or predator densities). These effects include the capture of non-target species, known collectively as bycatch. Bycatch includes species that are unwanted and thrown away (discards), and species that are retained and sold (byproduct). In the present study, discards of bottom trawl net ranged between 50 and 80% of the total weight of different benthic organisms and plants collected by the net in every shot.

The Mediterranean Sea is markedly different from most other areas where impact studies have been conducted because of its oligotrophy, high level of salinity, high temperatures, negligible tidal currents and deep trawlable depths (Smith, *et al*., 2000). Several studies on the impacts of trawling on benthic communities state that trawling is the most disruptive and widespread anthropogenic disturbance on benthic habitats and may alter benthic communities (Rumohr and Krost, 1991; Watling and Norse, 1998; Koslow *et al.,* 2001).

The use of trawling in demersal fisheries should be banned by law in areas of sensitive benthic habitats such as sea-grass beds, corals, sponge, etc. and be strictly controlled in other areas with no such habitats. An integrated management approach should be developed and adopted for the coastal areas of the Mediterranean Sea, particularly for such fast developing areas as in the North Coast of Egypt.

The result of the survey revealed that diversity of benthic fauna, fish species and seagrass beds in the Gulf could be divided into two sections. The first section lies to the west of 25º 30’ E longitude and contains the highest species composition, while second section (eastward of 25º 30’ E) contains the lowest species composition (Fig. 6). Moreover, there is a positive correlation in the spatial distribution which is clear in the section I. Therefore, it is suggested that section I should be considered as a marine reserve, as it has an observable potential to be declared as a marine protected area (MPA) GIS map showed that richness of benthos was high in most western part of Gulf (in front of Sallum City), and decreased towards east and closely correlated with organic matter and mud. This agreed with Taylor (1993) who stated that there is usually high species abundance in organically rich environment than in organically poor environment.

An important element within the aim of the present work had been to provide the scientific basis and relevant information that would assist in conserving biodiversity and the natural ecosystem in this important area, and to ensure that economic development and uses of marine resources therein are ecologically sustainable. This is with the view to ultimately declaring the western part of the Gulf of Sallum in the

Egyptian territorial waters as a Marine Protected Area. As the results of this study, the Gulf of Sallum was declared as the first marine Egyptian protected area in the Mediterranean Sea by the Egyptian Prime Minister's decision No. 533 for the year 2010.

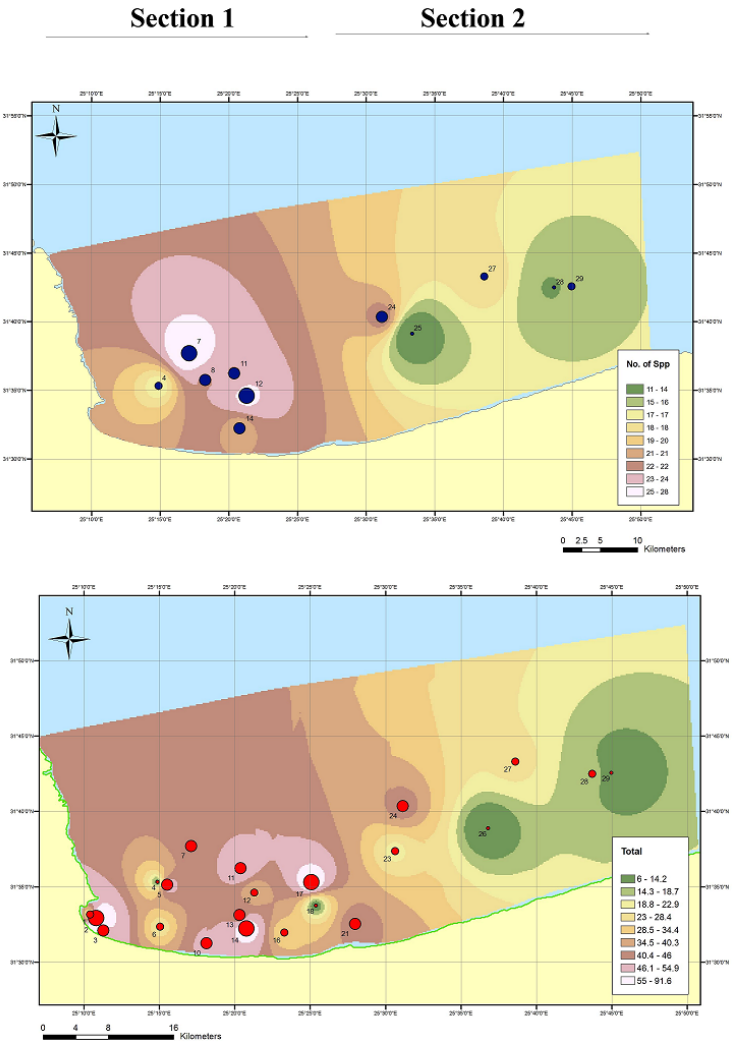

Fig. 6: Diversity of benthos and fish species (expressed in number) in the western part (section 1) and the eastern part (section 2) Gulf of Sallum in August. 2007.

5. APPENDICES

5.1. Appendix (1)

Checklist of recorded benthic macrobenthic invertebrates recorded during August 2007 at Sallum Gulf, Egypt. (* indicates invasive species).

Species	Group	Species	Group
Atylus swammerdami	Crustacea		
Bathyporeia		*Stylophora* sp.	Cnidaria
Sphaeroma walkeri		*Myxilla prouha*	Porifera
Hayle schimediti		*Spongia afficinalis*	
Atilecylus sp.		*Halichondria panacea*	
Pagarus anachoretus		*Suberites doumuncula,*	
Aceroides latipes		*Cacospongia molliar*	
Echinaster sepositus	Echinodermata	*Agelas oroides*	
Ophidiaster ophidiarum		*Spongia zimocca*	
Ceramaster placenta		*Ircinia fasciculate*	
Cidaris cidaris		*Hisppaspongia communis*	
Astropecten bispinosum		*Sabella* sp.	Annelida
Anseropoda placenta		*Harmothoe* sp.	
Sphaerechinus granularis		*Lanthina commun*	
Amphiura chiajei		** Hermodice carunculatta*	
Arbacia lixula		*Eteone* sp	
Ophiomyxa pentagona		*Capetella capitata*	
Didemnum gelatinosum	Ascidiacea	*Syllidia armata*	
Ascidia mentula		*Myxicola* sp.	
Styela partita		Aeolidacea sp.	Mollusca
Botrylloides leachi		*Pecten jacobaeus*	
Botryllus schlosseri		*Abra alba*	
Halocynthia papillosa		*Spondylus gaederopus*	
		Pinna nobilis	
		Arca noae	
		Venus verrucosa	
		Natica dilwyni	
		Thias haemastome	
		Cerithium vulgatum	
		Turritella communis	
		Bulla striata	
		Calyptraea chinensi	
		Conus mediterraneus	
		Tricolia pulla	
		Murex trunculus	

5.2. Appendix (2)

Fish species identification sheets during four cruses carried out in the Sallum Gulf, Egypt during the period from 2003 to 2007. (* indicates invasive species).

Aug 2007	May 2005	Oct 2004	May 2003	Arabic name	English name	Scientific name	Family	Group
X			x	قرش	Shark	*Scyliorhinus canicula*	Scylirhinidae	**Cartilagenous fish**
X				مستولا	Smooth hound shark	*Mustelus mustelus*	Triakidae	
X				بقره مزركشة	Common Stingray	*Dasyatis pastinaca*	Dasyatidae	
X	x			بقره	Honeycomb Stingray	* *Himantura uarnaka*		
	x			وطواط	Common Eagle Ray	*Myliobatis aquilaa*	Myliobatidae	
	x			راي بعينين	Browen Ray	*Raja miraletus*	Rajidae	
X	x	x		رايه	Rough Ray	*Raja radula*		
X	x			أبجون	Cardinal Fish	*Apogon imberbis*	Apogonidae	**Bony fish**
	x	x		أبجون	Twobelt Cardinal	**Apogon taeniatus*		
		x		بساريا	Hardyhead Silverside	**Atherinomorus lacunosus*	Atherinidae	
	x			خنزير بثلاث شوكات	Gray Tigger Fish	*Balistes carolinesis*	Balastidae	
X	x	x		أبو قراع	Butterfly Blennie	*Blenius ocellaris*	Blennidae	
	x			أبو قراع	Blennie	*Parablennius incognitus*		
X	x	x	x	سنجتا	White-Eyed Flounder	*Bothus podas*	Bothidae	
X	x			شاخورة	Blue Scad	*Trachurus mediterranean*	Carangidae	
X	x		x	موزة الجر	Picarel	*Spicara flexuosa*	Centracanthidae	
	x	x	x	موزة	Plotched Picarel	*Spicara meana*	Centracanthidae	
	x	x	x	موزة	Picarel	*Spicara smaris*		
X	x	x	x	موسى منقطه	Spotted Flounder	*Citharus linguatula*	Citharidae	
X	x			ثعبان	Balearic Conger	*Ariosoma balearicum*	Congridae	
				أنشوجه	Anchovy	*Engraulis encrasicolus*	Engraulidae	
X	x	x		ابو صفارة	Cornetfishes	**Fistularia commersonii*	Fistularidae	
	x			أبوكرش	Black Goby	*Gobius niger*	Gobiidae	
			x	جحاية	Red Soldier Fish	*Holocentrus rubrum*	Holocentridae	
	x	x	x	عروسه	Rainbow Wrasse	*Coris julis*	Labridae	
	x			عروسة بخط بني	Sideburn Wrasse	**Pteregogus pelycus*		
	x			عرائس		*Symphodus spp*		
X		x	x	ببغاء	Cleaver Wrasse	*Xyrichthys novacula*		
X			x	نازلي	*European Hake*	Merluccius merluccius	**Merluccidae**	
X		x	x	خنزير بشوكة	*Leatherjacket*	*Stephanolepis diaspros	**Monacanthidae**	
	x			خنزير بشوكة		Stephanolepis hispidus		
X				بربوني	*Striped Red Mullet*	Mullus barbatus	**Mullidae**	
X	x	x	x	بربون حجر	*Striped Mullet*	Mullus surmuletus		
	x			بربونى	*Golden Striped Goatfish*	*Upeneus asymmetricus		
X	x			بربونى		Upeneus francisi		
		x		دمسل	*Scissortail Sergeant*	Abudefuf sexfasciatus	**Pomacentridae**	
X	x	x		فناشة	*Damsel Fish*	Chromis chromis		
X	x			مرزبان		Scarus cretensis	**Scaridae**	
X		x	x	مرزبان	*Parroy wrasse*	Sparisoma cretensa		
	x			دراك	*Spanish Mackerel*	*Scomberomorus commerson	**Scoberomoridae**	
X	x	x	x	عقرب أحمر	Small-Scaled Red Scorpionfish	*Scorpaena notata*	Scorbaenidae	
X		x	x	عقرب أحمر	Red Scorpionfish	*Scorpaena scrofa*		

			x	عقرب بنى	Small-Scaled Black Scorpionfish	*Scorpaena porcus*		
	x	x		وقار	White Grouper	*Epieniphelus aeneus*	Serranidae	
	x			وقار	Golgen Grouper	*Epieniphelus alexandeinus*		
X	x	x	x	شيخ	Comber	*Serranus cabrilla*		
X	x	x	x	شيخ	Brown Comber	*Serranus hepatus*		
		x	x	بطاطا	Dusky Spinefoot	**Siganus luridus*	Siganidae	
X	x	x	x	بطاطا	Marbled Spinefoot	**Siganus rivulatus*		
X	x	x		شبه موسي بدوائر	Thickback Sole	*Microchirus ocellatus*	Solidae	
			x	موسى	Egyptian Sole	*Solea aegyptiaca*		
X	x			موسى	Adriatic Sole	*Solea impar*		
	x			موسى مزركشة		*Solea nasuta*		
X		x	x	موسى	Common Sole	*Solea vulgaris*		
X	x	x		موزة	Bogue	*Boops boops*	Sparidae	
X				سبارس	Annular Sea Bream	*Diplodus anunularis*		
			x	وزانية		*Diplodus bellottii*		
		x	x	شرغوش حر	Two-Banded Bream	*Diplodus sargus*		
X	x	x		شرغوش رشيدى	White Sea Bream	*Diplodus vulgaris*	Sparidae	
X		x	x	مرمار	Striped Sea Bream	*Lithognathus mormyrus*		
X		x	x	غزيله برونزية	Spanish Bream	*Pagellus acarne*		
X	x	x	x	غزيله حمراء	Pandora	*Pagellus erythrinus*		
X	x	x	x	مرجان	Common Sea Bream	*Pagrus pagrus*		
X				سرب	Salema	*Sarpa sarpa*		
			x	دنيس	Gilt-head Sea Bream	*Sparus aurata*		
	x		x	مكرونة مخططة	Brushtooth Lizard Fish	**Saurida undosquamis*	Synodontidae	
X		x	x	مكرونة صفراء	Atlantic Lizard Fish	*Synodus sourus*		
	x			أرنب ببقع		**Lagocephalus sceleratus*	Tetradontidae	
X	x	x		أرنب	Half-Smooth Golden Bufferfish	**Lagocephalus spadiceus*		
	x	x	x	بلامة	Spotted Weaver	*Trachinus araneus*	Trachinidae	
X		x	x	بلامة	Greater Weaver	*Trachinus draco*		
X	x	x		بلامة	Starry Weaver	*Trachinus radiatus*		
X	x			فرخة	Large-Scaled Gurnard	*Lepidotrigla cavillone*	Triglidae	
X		x	x	فرخة حمراء	Streaked Gurnard	*Trigloporus lastoviza*		
		x		فرخة	Tub Gurnard	*Trigla lucerna*		
X		x		فرخة	Piper Gurnard	*Trigla lyra*		
X	x	x	x	قط	Stargazer	*Uranoscopus scaber*	Uranoscopida	
X	x	x	x	عفريت	John Dory	*Zeus faber*	Zeidae	
X		x		كاليماري		*Loligo vulgaris*	Loliginidae	**Mollusca**
X				سبيط	Common cuttlefish	*Sepia officinalis*	Sepiolidae	
X	x	x	x	سبيط		*Sepia elegans*	Sepiolidae	
	x	x	x	أخطوبوط	Common octopus	*Octopus vulgaris*	Octopodidae	
X				أخطوبوط	Musky octopus	*Eledone moschata*		
X				أخطوبوط	Long-legged octopus	*Octopus macropus*		
X			x	جمبرى عجوز(عقر)		*Trachypenaeus curvirostris*	Penaeidae	**Crustacea**
		x		أستاكوزا		*Panulirus homzrus*	Portunidae	
X				استاكوزا	Medit. Locust lobster	*Scyllarus latus*	Scyllarides	
X				شكالة	Mantis shrimp	*Squilla mantis*	Squilidae	
	x			شكاله		*Oratosquilla Massavensis*		

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