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Environmental impact assessment of lesser-known creek in Benghazi

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Abstract

Environmental Impact Assessment (EIA) for lesser- known creek in Benghazi was taken for initial monitoring to add data base system by taking environmental factors and water variables into consideration in order to evaluate, protect and sustainable use of lesser known creek within the city. Temperature had played a dominant role in assessing the importance of physical factors in setting the vertical limits of zonation pattern in coastal communities. However, the daily warming of creek waters, in addition to that the pollutants present in the creek, with the help of solar radiation, produce warm mixed layer of water during the course of the day. This development of this mixed layer largely depend on wind and surface currents in turn will play a key role for the productivity and also the growth of both phytoplankton and zooplankton in certain areas in the creek. Whereas, continuous addition of pollutants all along the creek especially near fish market lead to decline of water quality and increase of organic matter. Temperature, dissolved oxygen, salinity and pH will determine water quality and the redistribution of flora and fauna in the creek are discussed briefly.

Key words: Environment impact assessment (EIA), creek, water quality.

Introduction

In recent years there has been much emphasis on Environmental Impact Assessment (EIA) concepts, which broaden it into more strategic or holistic forms of appraisal, an enormous amount work was done on environment impact assessment all around the globe and ideas and strategies are constantly emerging and implementing to be more effective (Pritchard 1996). Global climate is changing and human impacts including green house emission, deforestation, and ozone depletion are at least in part responsible. IPCC (2001) discussed about the coastal marine ecosystem and threatened by anthropogenic global climate change. Large daily temperature fluctuation in the near shore

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water column has been observed at several sites along the coast of Central and Northern Chile during summer (Kaplan et al. 2003).

These fluctuations are often seen during season over surface waters near the shore. The coastal marine environment is attracting major attention concerning the potential impact of climate change. The inter annual scale, The El-Nino Southern Oscillation in Pacific (ENSO) dramatically affect water temperature and the strength of upwelling favorable winds in coastal areas, producing noticeable changes in physical variables of water (Lluch-Cota et al. 2001). This lead to seasonal changes on surface waters due to solar radiation are usually considered the largest environmentally variability to which coastal organisms are exposed to fluctuation. Coastal upwelling dynamics is a major factor producing large drops in sea surface temperature, accompanied by dissolved oxygen; pH and salinity in addition to that, increase in nutrient availability and changes in the strata of invertebrate larvae to benthic habitats.

Due to the importance of the creek of its aesthetic value and important fishing route to the sea, Environmental Impact Assessment (EIA) was taken up to assess the impacts of anthropogenic climate changes on coastal waters of selected sites in Benghazi. The study was conducted in one of the lesser-known creek near fish market; runs into the main land of city and was surrounded by houses. Major pollutants comes from either land based or sea based activities and both point sources, such as industrial discharge, oil spill incidents from boats, domestic sewage and non point sources like agricultural run off could add major pollutants to the creek. The depth of the creek varies from 1-3 feet at the border of the fish market and more than 6 feet in the center. Due to rapid urbanization, most of the creek is being closed and encroached by different kinds of construction had made the creek narrow and shallow. The creek is almost enclosed except at Northern part, where it is connected to sea for navigation for commercial fishing.

Materials and Methods

Environment impact assessment for lesser-known creek in around Bunkina (fish market) was selected to evaluate and to assess the ecobiological changes taking place because of contamination through sewage drains connected to creek; effluent discharge and oil spills from cargo vessels are correlated with abiotic and biotic factors. The study was conducted regularly from December 2007 till March 2008 during early hours between 9-11 am. Observations were made on upper strata of

surface water (0-20 cm) depth; the sample of water was collected by using a PVC Niskin bottle. Temperature, pH, salinity and dissolved oxygen were calculated. The seawater pH were determined immediately after collection of seawater by using Digital pH meter (ELICO model: LI 127) provided with automatic temperature compensation (ATC) probe. The pH meter was calibrated with multi-point known pH standards. The values were repeatedly with an error of 0.01 pH unit scale. Similarly, dissolved oxygen was calculated by using Hana dissolved oxygen HI 8043 digital potable instrument. Simultaneously, the macro fauna was collected randomly at marginal waters by using shovel, known quadrate size 20 x 20 sq cm. Statistical analysis was done for macro fauna with mean and standard deviation was calculated.

Results

Table 1 shows the mean, standard deviation for invertebrates near fish market.

Table 1. Mean and standard deviation of invertebrates in marginal waters of creek.

Serial	Species	Mean±SD
1	Tower shell *Turritella communis*	7.8 ± 4.83
2	Mediterranean Sun-Dial *Philippia mediterranea*	2.2 ± 1.72
3	Common Cerith *Cerithium vulgatum*	3.8 ± 1.72
4	Needle shell *Cerithium reticulatum*	5.9 ± 3.54
5	Crenulate Nut clam *Leda emarginata*	6 ± 3.57
6	Mottled Triton *Pisania maculosa*	8.8 ± 2.94
7	Nutmeg *Cancellaria cansellata*	2.8 ± 2.31
8	Pelicans foot shell *Aporrhais pespelicani*	1 ± 0.70
9	Common Cockle *Cardium edule*	9 ± 2.82
10	Oblong Cockle *Cardium sulcatum*	4.6 ± 1.85

Common Cockle showed the population with mean 9 ± 2.82, Mottled Triton showed the maximum numbers during the study period with 8.8 ± 2.94, followed by Tower shell 7.8 ± 4.83 and least of Pelican foot shell 1 ± 0.70. Similarly, water variables like temperature on marginal surface waters showed fluctuation and ranges between 16.6 °C during January and February 2008 being coldest months and raised gradually around 20 °C early March. Similarly, Dissolved oxygen was subjected to dynamic

change and varied drastically, basing on apparent weather, cloudy and overcast conditions 5.7 mg/l – 8.4 mg/l in creek near fish market.

The pH ranges 7.86 – 8.4 due to precipitation and fresh water drains connectivity near fish market. Salinity of creek remained constant over 39 ppt.

Figure 1. Average temperature and Dissolved oxygen levels for surface waters.

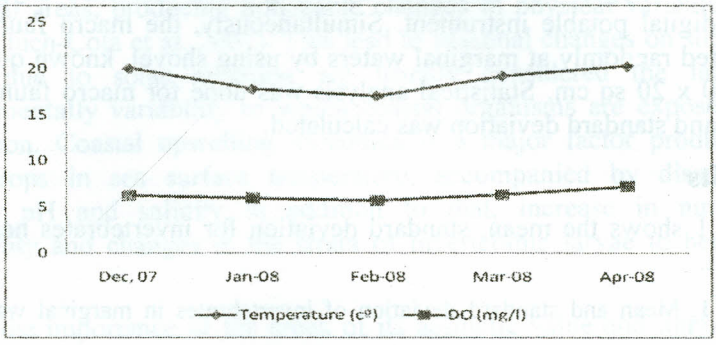
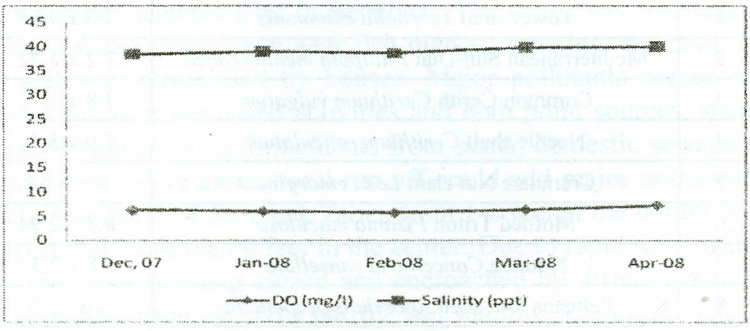


Figure 2. Dissolved oxygen levels versus salinity on surface waters.



Discussion

The earths radioactive heat balance is currently out of equilibrium due to number of reasons, firstly, mean global temperatures will continue to rise alarmingly for next several years, secondly, green house gas emission, thirdly, temperature rise at poles (IPCC 2001). The creeks in Benghazi are turbid due to number of reasons, most of the Benghazi drains are connected to the creek, in addition to that, oil spills from the boat, dumping of waste materials along the creek makes harsh environment for survival of many phytoplankton. The study shows that the presence of solid suspended materials in water, in turn reduce the physical

parameters like dissolved oxygen (Figure 1 and 2) which would have indirect effect on plankton due to tight coupling between light attenuation and plankton dynamics. Similar studies was also reported by (Hays et al. 2005, Harley et al. 2006) because of narrow tolerance of phytoplankton to light, temperature and dissolved oxygen level concentrations.

The marginal waters of creek being turbid in and around fish market, still, few species of green algae surviving, multicellular algae such as Ulva and Codium are distinctly visible at borders near fish market and are thriving to wall just below surface waters, where light attenuation is maximum. These forms are extremely important as source of food for other aquatic organisms and will improve oxygen levels in upper strata (Kuwae et al. 2006).It is clear from the studies that, pH and dissolved oxygen levels are always associated with surface waters fluctuations.

Most of the carbon dioxide from the atmosphere dissolves in the surface water there by increasing the carbon dioxide and bi- carbonates ion in surface waters will have some effect on pH and also dissolved oxygen, similar studies was also reported by (Caldiera and Wickett 2003). These changes could be attributed to the change on growth of marine plankton, further more increase of anaerobic bacteria, produces carbon dioxide and zooplankton that consume phytoplankton might be affected by pH. Environmental interactions are complicated along with subtle climatic changes during March 2008 will affect the activity of the plankton (Kurihara et al. 2004). All these factors could lead depletion in dissolved oxygen levels during cloudy and nocturnal day. Still, it is not clear that plankton activity is affected by atmospheric carbon dioxide and human activity.

From the Table 1, it is clear that, even though ten species of invertebrates were recorded in the shallow water, the population tend to be low. Common cockle (*Cardium edule*) shows 9±2, whereas, mottled triton (*Pisania maculosa*) with 8.8±2.94 are maximum during the studies. Secondly, Pelicans foot shell *(Aporrhais pespelicani)* 1±0.70 and Mediterranean Sun-Dial *(Philippia mediterranea)* 2.2±1.72, thirdly, being all the species are tight closed shell protect them from large diurnal changes in the surface waters and the pollutants. Along with these associated changes on upper surface waters, presence of high organic content in creek, oil coated surface waters near fish market (spills from boat) and finally garbage disposal may increase high levels of carbon dioxide, high levels of soil nitrate and ammonia may induce negative impact on creek waters leading to decline in species. Similar studies

were also studied in Aqaba Gulf coastal waters, where minor changes in water variables (water temperature, salinity, pH and DO) reveal that absence of high population could be the factor for minimal changes (Ahmed et al. 2007). The species recorded in the creek are in fauna with tight shells.

It is concluded from the study that, major pollutants to the creek comes from either sea based or land based activity or from both point sources like spilling of oil, industrial discharge and domestic sewage, which can affect the water quality, marine sediment. It is evident that, environmental factors along with the pollutants will determine quality and redistribution of flora and fauna.

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