



FULL LENGTH ARTICLE

Characteristics of Mediterranean Sea water in vicinity of Sidikerir Region, west of Alexandria, Egypt



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Abstract A hot spot region of the Mediterranean Sea located at Sidikerir west of Alexandria was chosen to evaluate the present status of its water quality due to the direct impacts of effect of the power station, petroleum pipe company (SUMED) and some tourist villages. Subsurface and near bottom water samples were collected seasonally during 2012 at eight locations to measure physicochemical and nutrient salts characteristics as indicators of the water quality.

Temporal, spatial fluctuations as well as statistical correlations between the analyzed variables were examined. They demonstrated a wide range of water temperature (17.14–26.31 °C), narrow fluctuations in salinity (37.51–39.71), and well-oxygenated seawaters (4.16–8.00 mg O₂/l), low amounts of oxidizable organic matter (1.92 mg O₂/l) and the seawater was slightly alkaline (pH range 8.03–8.53). Nutrient characteristics sustained the levels up to 1.68, 11.00, 8.82, 1.15 and 33.18 μM for reactive phosphates, reactive silicates, ammonium, nitrite and nitrate, respectively. Total nitrogen and total phosphorous were fluctuated between 17.63–118.65 and 0.20–2.80 μM, respectively. Trophic states, as well as factors affecting the water quality of study area, were evaluated. The water quality index WQI demonstrated that Sidikerir water was between medium and good.

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Introduction

Sidikerir region is unique and enchanting site and extends along the northern coast of Egypt far away from Alexandria about 35 km. It lies between Latitudes 31.05° and 31.09°N and Longitudes 29.58° and 29.70°E. There are different activ-

ities in the region, a power station which working tar instead of gas (for long periods) beside the Arab petroleum pipe company SUMED (Suez, Mediterranean pipeline) in addition to some tourist villages which may discharge their wastes directly into the sea without treatment leading to serious pollution in the region.

Little attention was paid to investigate physicochemical characteristics of coastal waters of the Sidikerir region. El-Sakka and Abu El-Soud (2007) and Zaki et al. (2009) studied the environmental parameters of the inshore north western coastal area of Alexandria including the investigated area.

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El Sikaily (2003) and Ahdy and Khaled (2009) studied heavy metal contamination and health risk assessment in relation to heavy metal pollution of the Sidikerir region.

Reflecting the composite influence of different water quality parameters, the water quality index WQI is also useful for the classification of waters, and can give an indication of the health of the water (Gharib et al., 2011).

The aim of this work is to study the distribution of the physico-chemical parameters in a hot spot area (Sidikerir) and to study the impact of different activities established in the investigated area that may discharge wastewater into the sea.

Materials and methods

Subsurface water samples were collected by Niskin bottles from 8 stations distributed inshore and offshore besides 4 near bottom water samples were collected from the offshore stations seasonally through four seasonal cruises during the year 2012–2013 representing the area subjected to discharged waste (Table 1 and Fig. 1). The following physico-chemical variables: temperature, pH and salinity were measured directly in situ using CTD apparatus (Model: YSI 556). Dissolved oxygen (DO) was analyzed according to the modified Winkler method (Grasshoff, 1976), oxidizable organic matter (OOM) according to FAO method (FAO, 1976). Nutrient salts (nitrite, nitrate, ammonia, phosphate, and silicate) were analyzed spectrophotometrically according to the recent oceanographically methods described by Grasshoff (1976) using UV/Visible double beam spectrophotometer (Janway Model: 6800). Total phosphorus (TP) and total nitrogen (TN) were determined simultaneously spectrophotometrically according to Valderama (1981).

Results and discussion

Physico-chemical parameters

The physico-chemical parameters (water temperature, dissolved oxygen, dissolved organic matter, salinity and pH) of the Sidikerir region during 2012–2013 are represented in Table 2.

Water temperature at Sidikerir hot spot area varied seasonally from a minimum of 17.14 °C during winter at station 3 (subsurface water) to a maximum of 26.31 °C during summer at stations 4 and 5 (near bottom and subsurface water, respectively) Fig. 2. It is noticed that near bottom water temperature



Figure 1 Sidikerir area, sampling stations.

is always lower than that of subsurface water temperature. The highest regional average water temperature at the Sidikerir region (25.47 °C) was observed as expected during summer and the lowest (17.34 °C) was in the winter. The annual average water temperature of the study area was 22.10 °C (Fig. 2, Table 2). The seasonal distribution of water temperature was in the following order:

summer > spring > autumn > winter (Fig. 2).

Salinity is considered as a sensitive parameter for measuring the rate of dilution of seawater caused by land-based source discharge and subsequently, it reflects the degree of contamination in aquatic environment (Zyadah et al., 2004). Salinity at Sidikerir region showed a narrow seasonal variation (Fig. 3). The lowest salinity value of 37.51 was recorded during autumn at station 3 (subsurface water–near shore station) while summer represented the highest salinity value of 39.71 recorded at stations 4 (near bottom water–offshore station) and 5 (subsurface water). Regionally, the average values of salinity, in general, showed a narrow local variation ranged between 38.30 and 38.87 whereas, the annual salinity average was 38.49.

The pH value is greatly affected by the photosynthetic activity of algal biomass as well as by the amount of sewage discharged into the hot spot areas. Seawater of Sidikerir region lies in the alkaline side (> 7 to < 9). The maximum reading of pH value (8.53) was observed during summer at stations 2, 3 and 4 (for subsurface and near bottom waters) while the lowest value (8.03) was recorded at station 2 (near bottom water) during winter. Fig. 4 shows that, the higher pH values were

Table 1 Location of different sampling sites of the Sidikerir region during 2012–2013.

Station	Latitude	Longitude	Depth (m)
1	31 03 36.81 N	29 40 37.33 E	1.90
2	31 03 55.46 N	29 40 26.46 E	11.30
3	31 03 29.55 N	29 40 26.84 E	6.40
4	31 03 51.56 N	29 40 10.14 E	11.00
5	31 03 05.59 N	26 39 48.78 E	4.60
6	31 03 27.01 N	29 39 32.24 E	11.80
7	31 02 56.28 N	29 39 26.58 E	4.00
8	31 03 12.98 N	29 39 10.10 E	11.90

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