



FULL LENGTH ARTICLE

Comparative study of some physico-chemical parameters along Egyptian Mediterranean western coast, winter 2009 and 2010



Aida B. Tadros, Ahmed Radwan ^{*}, Hoda Hemaida, Maged Gurguess, Manal Mahmoud, Fakry Asaad

National Institute of Oceanography and Fisheries, Egypt

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Abstract The present study aims to evaluate and compare the environmental parameters; temperature, salinity, dissolved oxygen (DO), oxidizable organic matter (OOM) and total alkalinity during winter 2009 and 2010 of the western Mediterranean coast of Egypt starting from El Mex to El Salum with three to four vertical stations being sampled at each marine sector. The surface distributions of both temperature and salinity decrease westwards during both winter seasons. The data revealed that, the total averages of temperature (except El Mex area) and dissolved oxygen during winter 2009 (16.6 °C and 10.96 ml/l) in the studied marine sectors are higher than their corresponding values during winter 2010 (16.61 °C and 5.81 ml/l) but an opposite trend is obtained with total averages of salinity (38.55 and 38.675) and total alkalinity (2.52 meq/l and 2.98 meq/l) measured during 2009 and 2010. The maximum average of oxidizable organic matter at El Hamam sector during winter 2009 was found to be 2.23 mgO₂/l lower than its value during 2010 (2.72 mgO₂/l), while an opposite result was obtained with the total average of OOM at El Salum sector.

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Introduction

The northwestern coast of Egypt is extending 510 km from Alexandria to El-Salum. The coast of this area is covered with fine and white carbonate sands, El Wakeel et al. (2006). The coastal zone is distinct by clear blue water; mild weather and sun prevailing most of the year which made this coast an

attractive site to be developed rapidly for tourists. The previous study revealed that, during the last three decades, many touristic cities were constructed along the western coastal area exhibiting signs of stress, population pressure which cause an impact on the area, Hemiada et al. (2008). In this study, seawater samples were collected at sites distributed along the western coast of Egypt lying between longitudes 25.5°E and 29.5°E during winter seasons of 2009 and 2010 for studying the parameters; temperature, salinity, dissolved oxygen, oxidizable organic matter and total alkalinity. The distribution of these parameters was investigated and the comparison of their values during winter 2009 and 2010 was discussed.

^{*} Corresponding author.

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Material and methods

Study area

The seawater samples were taken at ten sectors during winter 2009; El Mex, Sidi Krir, El Hamam, El Alamein, El Dabaa, Fuka, Alam El Rum, Marsa Matrouh, Sidi Barrani and El Salum and from six marine sectors during winter of 2010; El Mex, Sidi Krir, El Hamam, Marsa Matrouh, Sidi Barrani and El Salum of the western Mediterranean coast of Egypt for measuring the parameters; temperature, salinity, dissolved oxygen, oxidizable organic matter and total alkalinity.

The samples were taken from three stations at each sector during winter 2009 to the following depths: station 1; surface, 10, 20 m, station 2; S, 10, 20, 30 and 50 m and station 3; S, 10, 20, 30, 50 and 100 m. During winter 2010, four stations were chosen for each sector to collect the water samples of the following depths, station 1; S, 10, 20 m, station 2; S, 10, 20, and 50 m, station 3; S, 10, 20, 50 and 100 m and station 4; S, 10, 20, 50, 100, 150 and 200 m water depth. The sampling sectors are represented in Fig. 1.

Measurement of seawater parameters

Temperature and salinity were measured in situ using CTD. Dissolved oxygen, oxidizable organic matter and total alkalinity were measured according to the following methods:

Dissolved oxygen (DO)

DO was determined according to modified Winkler's method (Grasshoff, 1976).

Oxidizable organic matter (OOM)

A modified method described by Calberg (1972) was applied.¹

Alkalinity

Total alkalinity was analysed by titration against HCl using methyl orange as indicator (Strickland and Parsons, 1972).²

Study area

The study area lies between longitudes 25.5°E and 29.5°E of the western Mediterranean coast of Egypt. The locations of the studied sectors during winter of 2009 and 2010 are shown in Fig. 1.

Results

Seawater temperature and salinity

Except El Mex sector all the other sectors recorded the highest temperature values in both winter seasons; 17.52 °C, st.2 (2009) and 18.47 °C, st.4 (2010), the temperature of the studied

marine sectors during 2009 lie in the range 16.47 °C, El Salum, st.2, 50 m – 17.46 °C, surface El Hamam, st.2 and the salinity 38.517 and 38.52, El Salum, st.3, 30 m and 50 m – 38.984, El Hamam, st.2, surface. In general, the seawater temperature was slightly decreased in their values during 2010 while the salinity increased. The range of temperature found to be 16.27 °C and 16.28 °C, Sidi Barrani, st.1, 10 m and 20 m depths and El Salum st.1, 20 m to 17.55 °C, El Hamam, st.2, surface and salinity 38.561, El Salum, st.3, surface – 39.139 Sidi Krir, st. 4, surface and 200 m depth. A higher surface water temperature was observed at longitudes 26° and latitude 30°E (16.6–18.5 °C) with a general tendency to increase eastwards with lowest values (16.6–16.8 °C) during the period 1959–2008, Said et al. (2011). During winter 1971, the temperature varied between 15 and 18 °C with maximum 17.8–18.0 °C at stations located on the cross sections from Damitta to the Bay of El Salum, Al Kholy and El Wakeel (1975).

Horizontal distribution of temperature and salinity

Surface distribution

The horizontal distribution of both temperature and salinity of surface water of the marine sectors, winter 2009 and 2010 are presented in Figs. 2 and 3.

During winter 2009, the surface distributions reached their lowest values of temperature 16.61 °C and salinity 38.618 at Matrouh, st.3, while the maximum values of temperature 17.52 °C and salinity 38.916 were recorded at El Mex, st.2. Also, high value of temperature 17.47 °C and salinity 38.984 were measured at El Hamam, st.2. The rest of the surface marine stations recorded variations in the range of temperature (16.8 °C, Fuka st.2, – 17.43 °C, El Mex st.1) and salinity varied between 38.618 at Matrouh, st.2 and 38.911, Sidi Krir st.3.

The surface temperature of the Egyptian coast decreased during winter 2010 except at El Mex sector, st.4, 18.47 °C. The values lay in the range 16.27 °C, Sidi Barani, st.1, 17.55 °C, El Hamam st.2 with corresponding salinity 38.596 and 38.951. The change of temperature and salinity values in the rest of the marine areas varied between 16.36 °C and 38.561, st.3, El Salum – 17.45 °C and 39.003, sts.1 and 2 of El Mex sector.

During winter 2010 and as it is clear from Fig. 3, the salinity of the surface water of station 4 of Sidi Krir and El Salum marine sectors and station 3 of Matrouh measured higher values in comparison with their values in surface waters of the rest of the stations.

Subsurface distribution

The change of temperature recorded at subsurface water depths of 10 m and 20 m along the marine area extending from El-Mex–El-Salum during winter 2009 lies between values 16.58 °C, Matrouh, station 2, 10 m and station 3 at both 10 m and 20 m depths – 17.31 °C and 17.30 °C, El-Hamam, station 3 at both 10 m and 20 m depths. The salinity at 10 m lies in the ranges 38.572, Sidi Barani, st.2, – 38.886psu, Sidi Krir, st.1 with difference 0.314. At 20 m depth the variation of salinity was found to be 38.552psu, El Salum st.2, 38.908psu, Sidi Krir st.3 with difference 0.356, Figs. 4 and 5.

During winter 2010, the temperature of the subsurface water depths at both 10 m and 20 m recorded lower values

¹ Alkalinity http://water.me.vccs.edu/exam_prep/alkalinity.html

² <http://www.marinebio.net/marinescience/02ocean/swcomposition.htm>

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