ISSN-0971-720X (Print) • ISSN-0973-1283 (Electronic)

Volume 20, Number 3 July-September 2020

Medico-Legal Update

An International Journal

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Changes of Some Environmental Factors in the Iraqi Coastal Waters

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Abstract

Some environmental factors were studied in the areas near Umm Qasr Port and near Buoy 17 in addition to the Basra oil port area. Where the monthly study was conducted on the changes occurring in the water temperature, pH degree, salinity, conductivity, turbidity, light penetration, total suspended solids, total dissolved materials and alkalinity were studied. The current study showed that the temperature values were within their annual rates as they ranged from 14-34 °C, while the values of the acid function and alkalinity were that within the ranges prevailing characteristic of Iraqi coastal waters, while conductivity recorded low values during January in all study stations, also recorded low values of transparency for the first and second stations (14-40 cm) compared to the third station that recorded higher values as 200-250 cm, while the turbidity values in the third station decreased and high values were recorded in the first and second stations and this is the case in the TSS and TDS values as well.

Key words: *environmental factors, Iraqi coastal waters.*

Introduction

The marine ecosystem constitutes about two-thirds of the planet's surface. This system includes most of the water bodies on Earth, such as: seas, oceans, estuaries, and the tidal environment, which together represent environments for different types of organisms characterized by a dynamic interaction in which there is a continuous overlap between living and non-living components [1]. The Arabian Gulf forms an important part of the marine waters. It is an arm of the Arabian Sea that extends from the Gulf of Oman in the south to the north of the Shatt al-Arab. The Iraqi coast occupies an area of 64 km and is short when compared to the rest of the coasts of neighboring countries [2]. The Arabian Gulf is located between the º24 و º30 north circles and classified as a semi-closed sea surrounded by land from most of its sides, and has great political, economic and environmental importance [3] and it is considered as one of the busiest waterways with the movement of oil and commercial ships as well as ships carring Natural gas [4]. The importance of studying the coasts is evident throughout the Arab Gulf States, as it has a strategic coastal location and a distinct geo-economic location, including the Iraqi coast, which is characterized by special conditions such as shallow waters that determine its morphological appearance, as well as the problems of the marine confrontation represented by its limited breadth, while some other neighboring coasts extend to Several kilometers, but it does not exceed a few kilometers in the northern and northwest coasts of the Arabian Gulf. This increasing interest in the region comes as a result of its economic status in addition to several geological and biological aspects [5]. The marine ecosystem consists of non-living and living components that are in a state of continuous dynamic interaction, just like the wild ecosystem, and they provide the appropriate atmosphere for living organisms to continue their vital activity. Several studies were conducted in the field of marine chemistry in the Iraqi coast and the Arabian Gulf (Hartman et al. [6]; Brewer and Dyressen [7]; Kany, [8]; Al-Shawi, [9]; Al-Mahmood et al. [10] and Al-Imarah et al. [11].

Method

The present study samples were collected monthly

from three station for the period from February 2018 to January 2019 at a depth of 10-20 centimeters from below the surface of the water by means of a plastic container. A medium-sized Tugboat was used in the collection process. A set of environmental characteristics were measured in the field.

The first station is located near the Port of Umm Qasr and represents the northern part of the creek and its coordinates N 30° 06′ 47.3″ and E °47 55′ 14.7″, the water depth ranges between 12-15 meters and this station is characterized by frequent movement of commercial ships to and from the port. The edges of this plant are characterized by loose clay, free of plants, and water recedes from large areas during the tidal period. With high water turbidity due to the speed of tidal currents. As for the second station, it is located at the bottom approaches of the Khor Abd Allah near Buoy 17, which is a navigational channel and its coordinates E ″48.9 ′19 °48, N ″26.2 ′53 °29 . This station is characterized by having large tidal areas with high turbidity water due to tidal currents.

Sampling was collected monthly for the period from February 2018 to January 2019. Water samples were taken from under the surface of the water at a depth of 10-20 centimeters by a plastic container and a medium-sized marine tug was used in the collection of samples. A US-made HORIBA U-5030 multimeter was used to measure water temperature, pH, salinity, electrical conductivity, field soluble solids.

Light penetration = (d1+d2)/2 (Stirling, [13])

The total suspended matter was measured by the method described by the American Public Health Association APHA [14]. The turbidity was measured using the TURBIDIMETTE LaMotte2020we type and were expressed in units NTU.

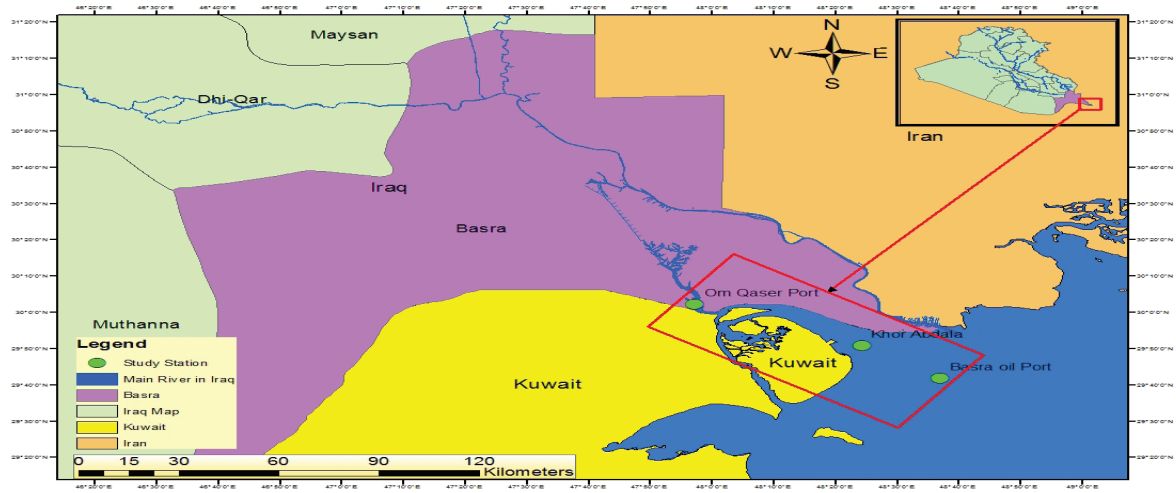

Figure (1): A map showing the three study stations at the NW Arabian Gulf sampled for the period from February 2018 to December 2019.

Results and discussion

Water Temperature

The water temperature ranged between 14 °C in January in the first and second stations and 34 °C during August in the third station (Figure 2). The first and second stations recorded values ranging between 14-31 °C, the with the highest values were recorded during August, September and October at the first station while it was at the second station during August and September, where as at station three the values ranged between 15 and 34 °C during January and September, respectively. The results of the statistical analysis showed that there were no significant differences ($p>0.05$) between the study stations.

Hydrogen Ion Concentration (pH)

The pH values ranged between 7.7 and 8.49 in the first station during May and March, and in the second station they ranged between 7.9 during April and May and 8.47 during June, and in the third station they ranged 7.6 and 8.5 during May and February, respectively

(Figure 3). The results of the statistical analysis showed that there were no significant differences ($p>0.05$) between the study stations.

Alkalinity

The values of alkalinity for the first station ranged between 60 and 73 mg/l during July and February, which is the highest range among the three stations. The monthly changes in alkalinity values in the second station ranged from 62 to 71 mg/l during January and August, respectively. The alkalinity values for the third station recorded a ranged between 61 and 72 mg/l during December and September, respectively (Figure 4). The results of the statistical analysis showed that there were no significant differences ($p>0.05$) between the alkanity values in the study stations.

Salinity

The salinity values ranged between 40.3 and 49.3 parts per thousand, in April and June, respectively, in the first station, where as in the second station, their values ranged between 36.2 and 45. 1 parts per thousand in April and February, respectively, and in the third station between 37.5 and 44 parts per thousand in April and February, respectively (Figure 5). The results of the statistical analysis showed that there was a significant difference ($p>0.05$) between the first station and the second and third stations, while no significant difference was recorded between the second station and the third station.

Light penetration

The values of light transmittance showed ranges of convergence at the first and second study stations as their values ranged between 14-25 cm in the first station during April and July, while the second station recorded values that ranged between 25-40 cm during May and October, while the third station recorded high values for light transmittance ranged between 200-250 during July and December, (Figure 6). Statistical analysis indicate a significant difference ($p>0.05$) between the three study stations.

Turbidity (NTU)

The Turbidity values showed different ranges in the three study stations, as their values ranged between 0.64 and 81 NTU. Figure (7) shows the clear fluctuation in these values during time, as the lowest value of 0.64 NTU was recorded in January at the third station, while the second station recorded a low value of 3.7 NTU during August, while the first station recorded the lowest value of 31.6 NTU in September, and the highest in the three stations 75, 81 and 3 NTU during November, December and August respectively. Statistical analysis showed that there was a significant difference between the first and third stations only ($p>0.05$), and no differences were recorded between the other study stations.

Total Suspended Solids (TSS)

The values of the total suspended solids showed different ranges during the study, as their values in the first station ranged between 0.11 and 0.34 mg/liter during October and April, respectively, while they were in the second station between 0.09 and 0.32 mg/liter October and September, consequently, as for the third station, its values ranged between 0.04 and 0.13 mg/liter during August and January, respectively (Figure 9). The statistical analysis showed that there was a significant difference between the first and third stations only ($p>0.05$) and no significant difference was recorded between the other stations.

Total Dissolved Solids (TDS)

The values of total soluble solids were recorded level in all study lowest stations during January with values of 34.2 and 31.3; 25.3 mg/l, in the three stations respectively, as where higher values of 50 mg/l was recorded in the first station during December and 401.2 and 40 mg/l in the second and third during November and February, respectively (Figure 10). The results of the statistical analysis showed that there were no significant differences ($p>0.05$) between the study stations.

Electrical Conductivity (ms/cm)

The lowest level of conductivity values were recorded during January with values ranging from 53.4, 48.9 and 45.7 ms/cm at the first, second and third stations, respectively, the highest values were recorded in june in the first and third stations (77.1 and 66 ms/cm, respectively), While the second station recorded the highest conductivity values during September (67 ms/cm) (Figure 11). The results of the statistical analysis

showed that there were no significant differences ($p>0.05$) between the study stations.

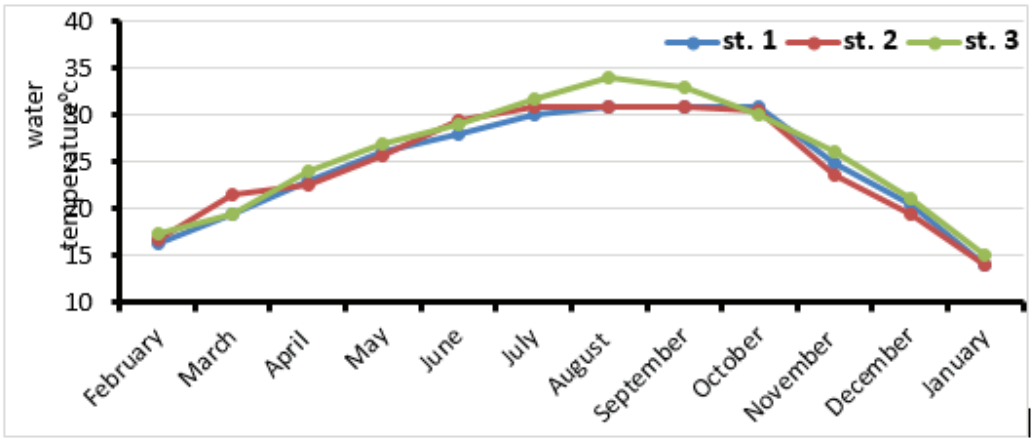

Figure (2). Monthly variation in the water temperature at the three stations of the NW Arabian Gulf during the period from February 2018 to January 2019.

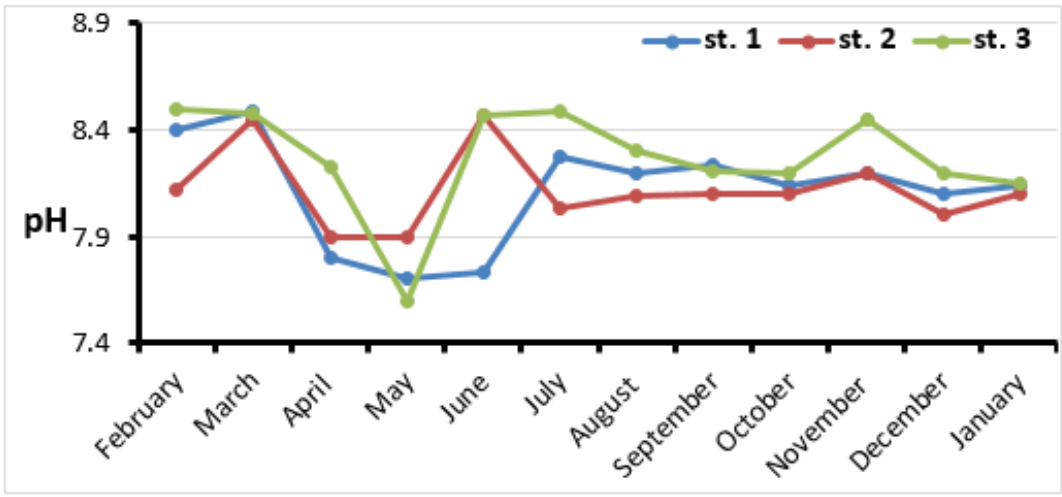

Figure (3). Monthly variation of pH values at the three stations of the NW Arabian Gulf during the period from February 2018 to January 2019.

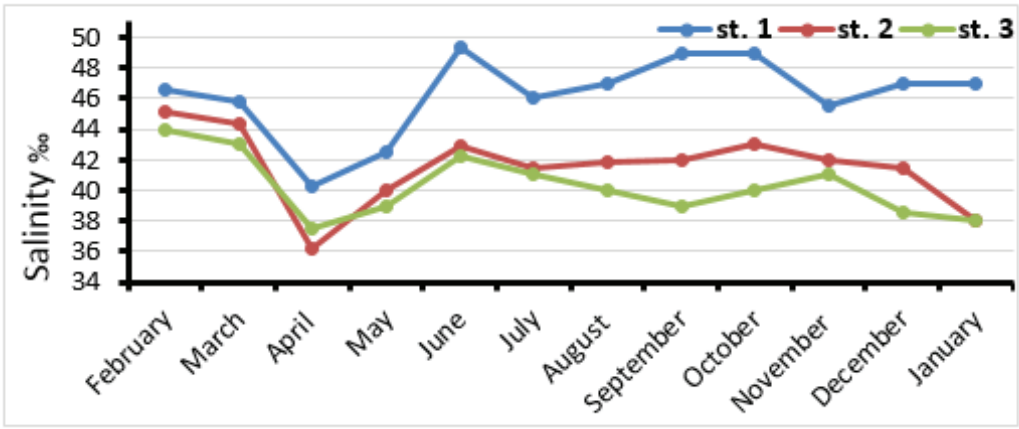

Figure (4). Monthly variation in the salinity of water at the three stations of the NW Arabian Gulf during the period from February 2018 to January 2019.

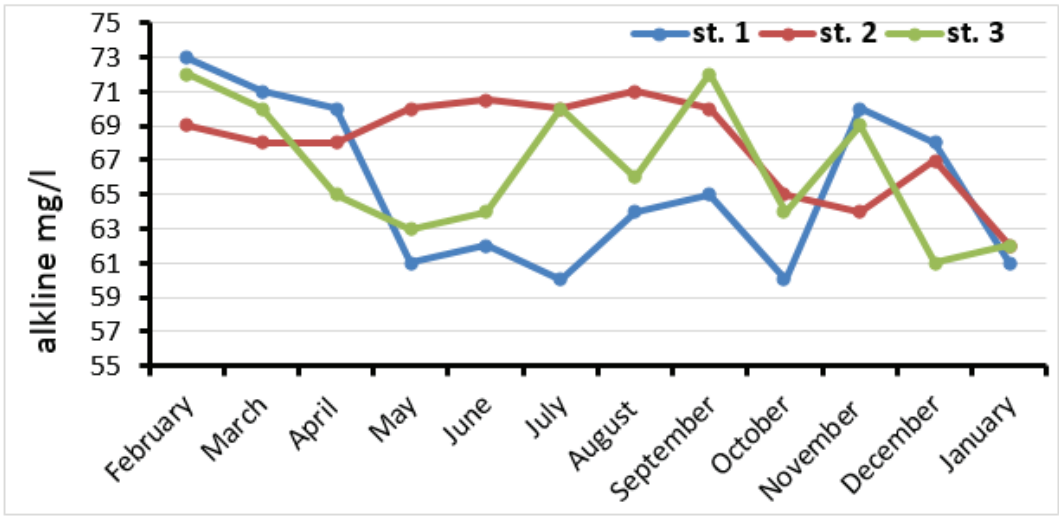

Figure (5). Monthly variation in the alkalinity at the three stations of the NW Arabian Gulf during the period from February 2018 to January 2019.

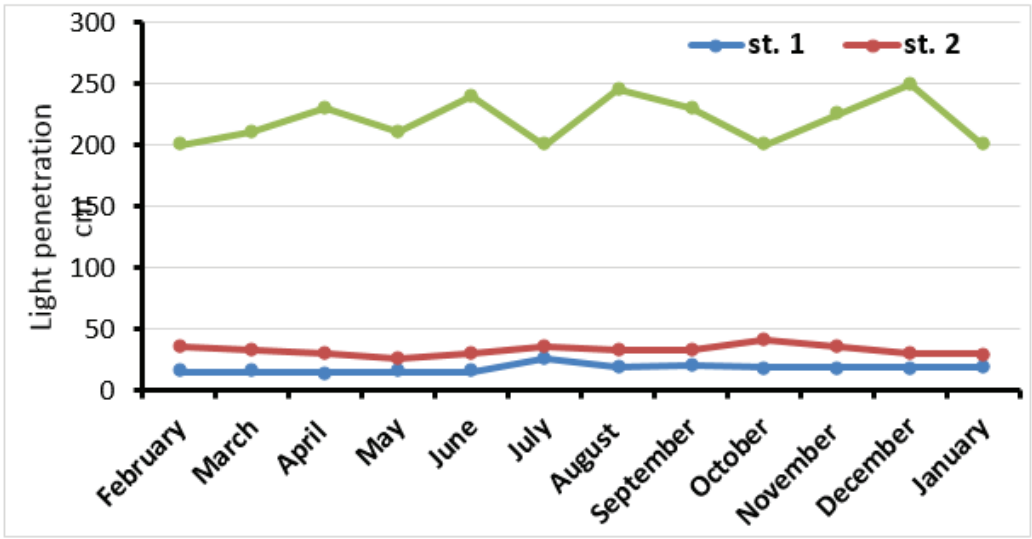

Figure (6). Monthly variation in light penetration values at the three stations of the NW Arabian Gulf during the period from February 2018 to January 2019.

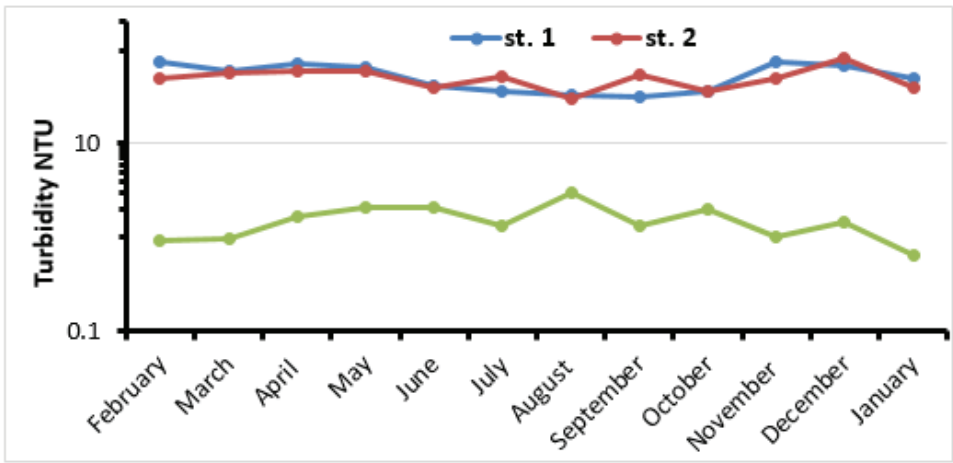

Figure (7). Monthly variation in the turbidity values at the three stations of the NW Arabian Gulf during the period from February 2018 to January 2019.

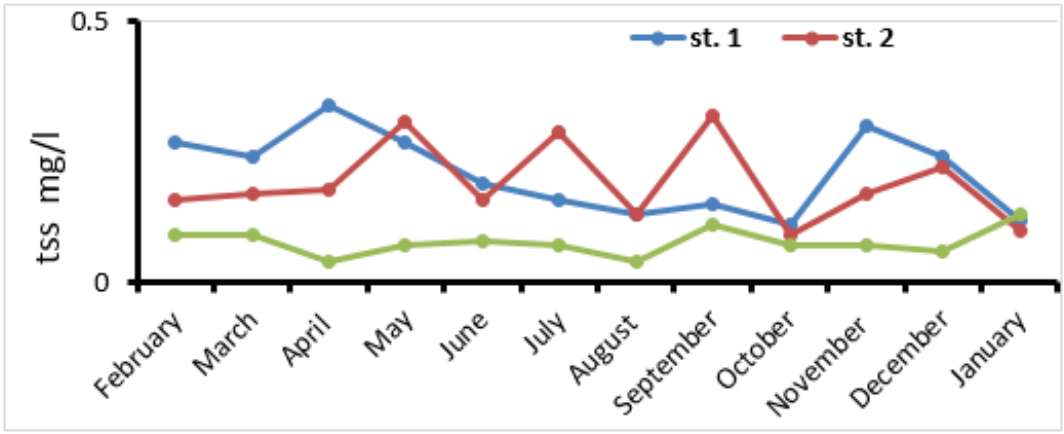

Figure (8). Monthly variation in the total suspended solids values at the three stations of the NW Arabian Gulf during the period from February 2018 to January 2019.

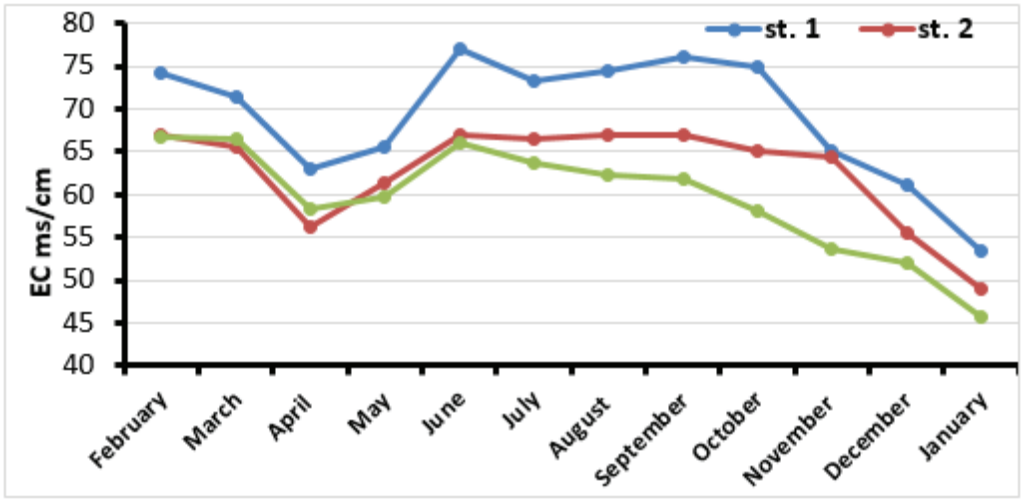

Figure (10). Monthly variation in the conductivity values at the three stations of the NW Arabian Gulf during the period from February 2018 to January 2019.

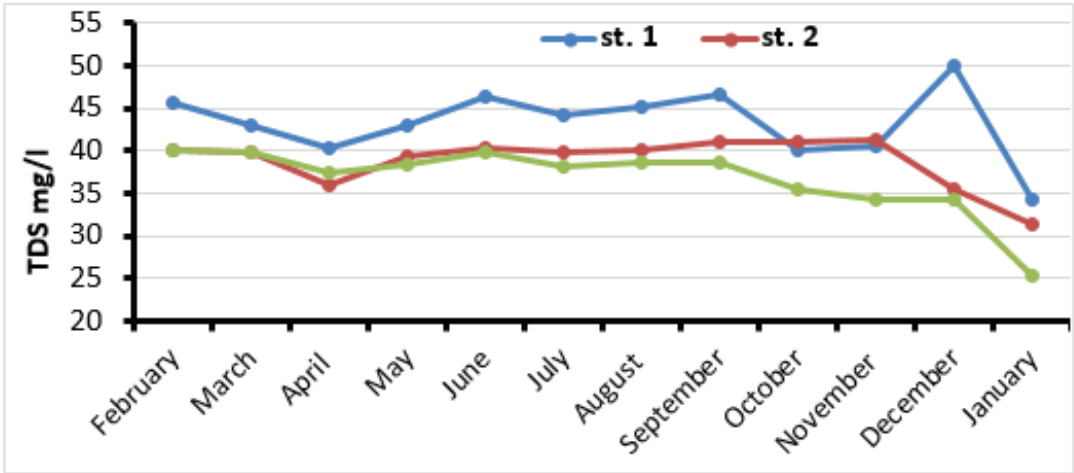

Figure (10). Monthly variation in the total dissolved solids values at the three stations of the NW Arabian Gulf during the period from February 2018 to January 2019.

Statistical Analysis

Using XLSTAT-Premium 2018.1 Multingual software to analyze the values of the environmental factors in the three studied stations. the value of the intrinsic vectors and the cumulative values of the studied values are shown in Figure (11), values and through which Figure (12), was extracted which in turn shows the PCA analysis of the factors of study stations association with the environmental variables studied during year.

The figure showed that in the third station the transparency was a limiting factor and to a lesser extent the pH is the next most influencing factor at this station, while in the first and second stations the rest of the factors as EC, TDS, Sal., Alkalinity, TSS, Turbidity and to a lesser extent WT are of greater influence on the environment of these stations. Also, through the tree drawing that were drawn by the above statistical program (Figure 13), we can see three groups that are most closely related to each other, the first group has included most of the months of the third station, while the second and third group has included most of the time of the second stations.

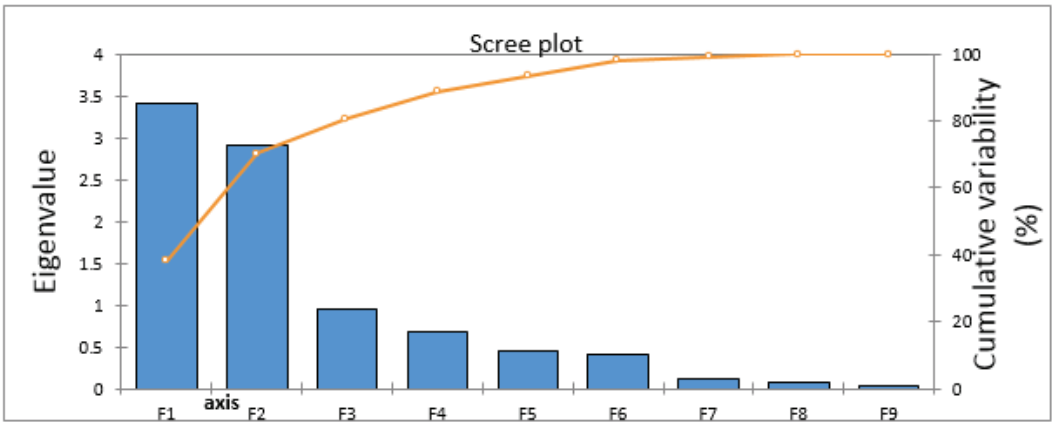

Figure (11). Values of the vector and the cumulative values of the studied values at the three stations of the NW Arabian Gulf.

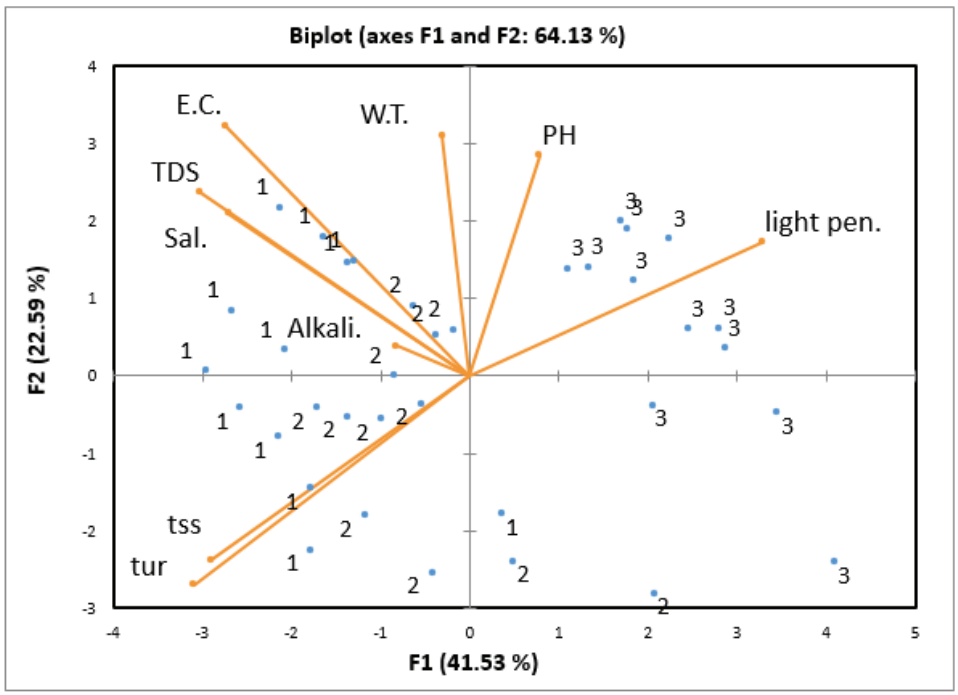

Figure (12). Analysis (PCA) of the F1 and F2 vectors for the factors of association of the study stations with the environmental variables studied during the months of the year at the NW Arabian Gulf.

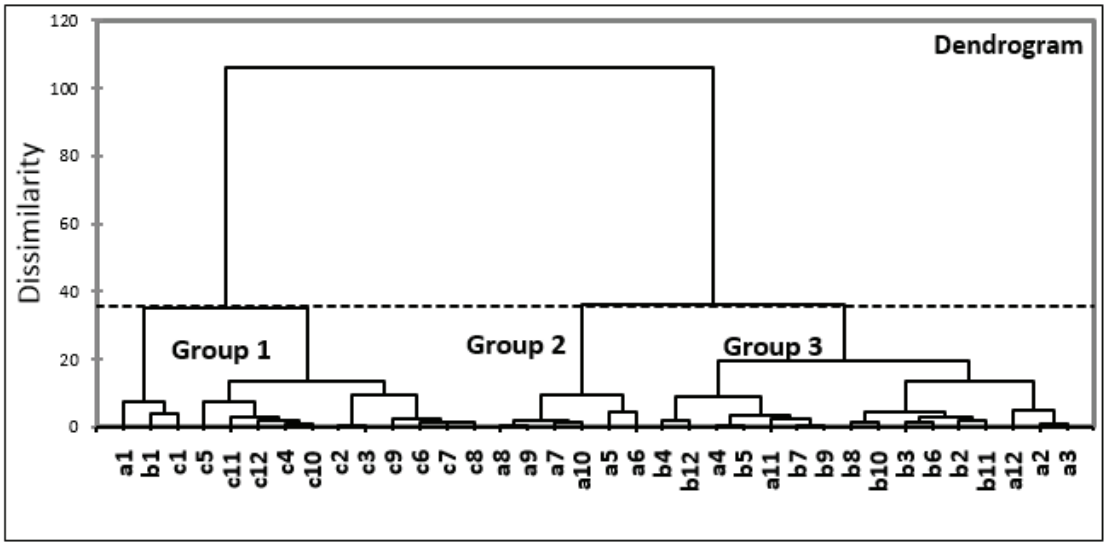

Figure (13). Tree diagram for similarity and differences between the factors studied at the three stations during the period's February 2018-January 2019 of the year at the NW Arabian Gulf.

a= first station, b= second station, c= third station. As for the numbers, they represent the months of the year.

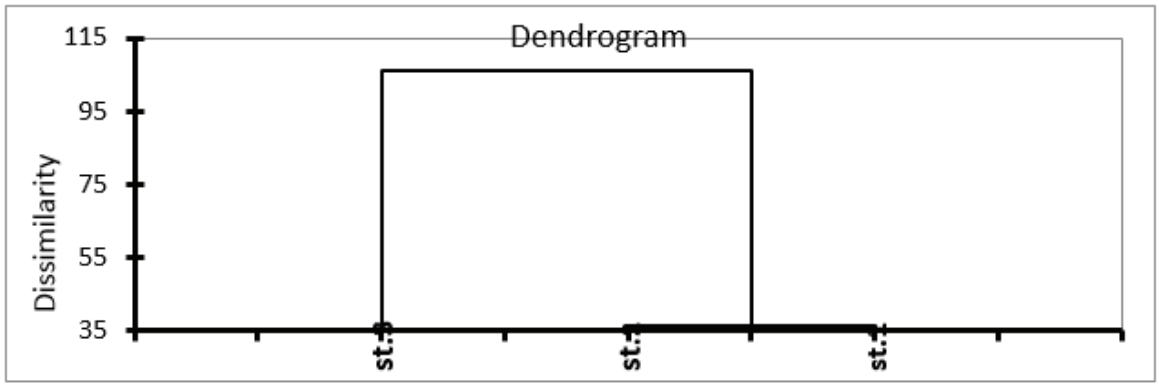

Figure (14) shows a summary of the tree diagram for similarity and difference between the factors studied for the three stations of the NW Arabian Gulf.

Conclusionss

It was found through the current study that the temperature values were equal in all stations because the three stations are subject to the same climatic conditions. Whereas the pH and alkalinity values indicated the basic characteristic of this water. The values of transparency also showed that the third plant is less cloudy than the first and second stations, as the water has a deeper and lower speed for the current, and it is also an open water area. The salinity and conductivity values recorded relatively low values in the third station, while they were higher in the first and second stations, as the last two are subjected to the conditions of higher evaporation, which results in an increase in salinity values, and the TSS and TDS values were carved in the same direction.

Financial Disclosure: There is no financial disclosure.

Conflict of Interest: None to declare.

Ethical Clearance: All experimental protocols were approved under the Marine Biology Department and all experiments were carried out in accordance with approved guidelines.

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