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1ZTJDP DIFNJDBM 1BSBNFUFST PG UIF 6QQFS $BMBCBS 3JWFS /JHFS %FMUB

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Abstract

7KH SK\VLFR FKHPLFDO SDUDPHWHUV RI WKH XSSHU DQG ORZHU UHDFK RI WKH relation to season were investigated from December 2013 to May 2014.The result showed that the water was slightly acidic across months with pH range of 6.18 to7.08 and across Stations. Relatively high Do levels were observed during the study with higher value at the upstream sampled stations than downstream sampled stations. There was QR VLJQL¿FDQW YDULDWLRQ LQ 7HPSHUDWXUH DQG %2' DFURVV 6WDWLRQV DQG V variation in salinity values, lowest salinity was recorded in station 5 (5.93 mg/l) and lowest in station 2 (1.08 mg/l) while WKH KLJKHVW VDOLQLW\ LQ 'HFHPEHU 'LVVROYHG 2[\JHQ GHFUHDVHG DFURV variation across season.

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Station 5: Elibrada (Emuoha) Station 5 lies on longitude 6°52.01E and latitude 4°54.80N in Emuoha village where Ogbodo rivers empties into, there is dredging activities in this river and villagers around carry out shing activities. It is also used for recreational activities by neighboring villages. e distance of this Station to Rumuokparali is 510.97 meters.

e sampling was done twice in a month from December 2013 to May 2014 which covers a period of six months (three months of dry season and three months of wet season).

Sample collection and laboratory analysis

At each of the Stations a set of water samples were collected in a pre-cleaned 50 cl poly propylene container and transported to the laboratory for further analysis. e physico-chemical parameters that were analyzed are: pH, Temperature measured in °C, Salinity measured in mg/l, Chemical Oxygen Demand measured in mg/l, Biological Oxygen Demand measured in mg/l and Dissolved Oxygen measured in mg/l.

e physico-chemical parameters were determined according to the procedure s outlined in the Standard Methods for the examination

Station	pH	Temp.	DO.	Salinity	COD	BOD
Rumuokparali	6.37d	26.53a	6.45a	5.50a	2.67a	0.23a
Choba bridge	6.41c	26.25b	5.50b	4.07b	2.20c	0.18b
Aluu (ARAC)	6.46b	26.15c	4.89c	1.08c	2.25b	0.18b
2 J E R G R , V L R S R	6.89a	26.12c	4.62d	7.18b	1.93d	0.17c
Elibrada	6.72a	26.02d	4.49e	5.93e	1.74e	0.17d
SEM	0.013	0.029	0.014	0.029	0.003	0.002

6XSHUVFULSWV RI WKH VDPH DOSKDEHSK À

life [9]. e seasonal variation of pH values observed in this study is in agreement with results of previous studies conducted by Dublin-green [3] in Bonny River , where the highest pH values were recorded in the dry season and lower values of pH in the wet season. Similar trend was reported by Ekeh and Sikoki [10] in the New Calabar River and also by Ansa [11] in Andoni ats of Niger Delta area.

Temperature value was at the highest in December 27.38ºC and lowest in March 25.30ºC. e mean temperature values in the study area ranged from 26.02°C to 26.53°C across the Stations and ranged between 26.26°C and 27.28°C across the months are observed normal with the reference to the location in Niger Delta region, Alabaster and Lloyd [12] reported that temperature on natural inland waters in the tropics generally varies between 25°C and 35°C. e ndings agree with earlier reported works in the Niger Delta water by Abowei [13] who reported temperature range of between 27°C–31°C, Chinda [14] who reported temperature range between 26°C and 30.5°C, Zabbey [15] recorded between 26.3°C and 30.4°C, Braide [16] reported a range between 26.64°C and 30.83°C, Ansa [11] reported range between 25.9ºC and 32.4ºC, Uedema-Naa [17] reported range between 28.94ºC and 29.72ºC, Hart and Zabbey [18] reported range between 25.8ºC and 30.4ºC, Sikoki and Zabbey [19] recorded values between 26.0ºC and 27.8ºC and Jamabo [20]reported a temperature range between 27ºC and 30ºC in the upper Bonny River of Niger Delta. e temperature values are signi cantly higher in the dry season with 26.48ºC and 25.95ºC in the wet season. Similar trend was reported in the main Bonny River by Dublin-Green [3], 31.2ºC dry season and 27.5ºC wet seasons. Amakri [21] recorded 27.6ºC wet season and 31.6ºC in dry season but in the New Calabar River, Ekeh and Sikoki [10] reported lowest temperature of 25ºC in wet season which corroborates with ndings of this study and 30ºC in the dry season .Temperature is positively correlated to pH and is signi cant at (P<0.01) and negatively correlated to Dissolved Oxygen (DO), Salinity, Chemical Oxygen Demand (COD) and Biological Oxygen Demand (BOD).

Dissolved oxygen (DO) values ranged from 5.81 mg/l in May to 4.58 mg/l in December. e Dissolved Oxygen (DO) values in the Stations were higher at the upstream sampled Station than the downstream Station with the highest of 6.45 mg/l in Station 1 and lowest 4.49 mg/l in Station 5. Similar trend was also reported by Hart and Zabbey [18] for Woji Creek, Davies et al. [22] also made similar report for the Trans-Amadi (Woji) Creek Port Harcourt. ey attributed it to the e ect of higher temperature and abattoir waste. is is in agreement with the ndings of the study. ere is signi cant di erence at (P<0.05) in the variation between dry and wet season, higher mean value for dissolved oxygen was recorded in the wet season agree with the ndings of Eborge [23] who reported that Dissolved Oxygen is generally higher in the wet season in the tropics but this is contrary to the result of Abowei [4] who recorded a higher mean value of Dissolved Oxygen in the dry season. He attributed it to the e ect of higher temperature and abattoir waste. In the study area there was signi cant di erence in Dissolved Oxygen across the station at (P<0.05) and season which is in agreement with the result of [24,25] who reported that at higher temperature which is usually observed in dry season, the solubility of oxygen decreases while at lower temperature (wet season) it increases.

Highest value of Salinity was recorded in December 6.10 mg/l and lowest value 1.01 mg/l in January. e salinity value ranging from 7.18 mg/l in Station 4 to 1.08 mg/l in Station 3 showed a slight uctuation in salinity from the upstream to downstream Stations along the river. is trend could be attributed to e uent water discharge from several industrial establishment carrying out dredging activities, slaughter house operation and domestic activities which are prevalent along the upstream area of the river. Lower salinity value of 102.11 mg/l was recorded in the dry season than the wet season value of 376.29 mg/ which is in contrast with the report by Payne [26] and Abowei [4] reported higher salinity values during dry season than the wet season, this could be attributed to variation in the amount of rainfall during the year. Uedeme-Naa [17] reported that the mean value of salinity were the same in all the sampled Station in Nta –Wogba stream in Port-Harcourt which is in contrast with the ndings of the study.

Chemical Oxygen Demand (COD) mean value ranged between 2.85 mg/l in December and 1.82 mg/l in January. Chemical Oxygen Demand (COD) mean values for the study ranged from 2.67 mg/l in Station 1 to 1.74 mg/l in Station 5, is is in contrary to the ndings of Woke [27] who reported 20.80 mg/l in his ndings in a Station in the New Calabar River, he stated that chemical Oxygen Demand (COD) was generally higher than standards allowed to be discharged into the Nigerian inland waters [28] comparing his result values with other ndings made by Clerk [29] they were greater than 40 mg/l and therefore indicated higher degree of pollution in the water body but the result of this study fall within the accepted range.

Biological oxygen demand (BOD) value of 0.20 mg/l was recorded in April and May while 0.16 mg/l in December, mean values showed slight variation among the various Stations with the highest BOD recorded in Station 1 0.23 mg/l and lowest in Station 4 and 5 0.17 mg/l. is may be as a result of dead plants (organic matter) which will require higher amount of Dissolved Oxygen to decompose. is is in contrast with the result of Uedema-Naa [17] reported Biological Oxygen Demand (BOD) had the lowest value of 51.78 mg/l and highest 171.28 mg/l in Nta-Wogba Stream.

e Pearson correlation in Table 3 showed that pH, Temperature and Chemical Oxygen Demand (COD) correlated negatively to the month, but only pH and Temperature were signi cant at (P<0.01) while Dissolve Oxygen, Salinity and Biological Oxygen Demand (BOD) were positively correlated and were signi cantly di erent at(P<0.01). pH is positively correlated to Station and signi cant at (P<0.05) while other parameters were negatively correlated but DO, Salinity, COD and BOD were signi cant at (P<0.05). Temperature was found to be

Month	Station	pH	Temp.	DO	Salinity		