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Classification: J.2

Language: English

London Journals Press

LJP Copyright ID: 975841
Print ISSN: 2514-863X
Online ISSN: 2514-8648

London Journal of Research in Computer Science and Technology

Volume 20 | Issue 2 | Compilation 1.0

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Keywords: seasonal, parameters, dry, wet, benthos, macroinvertebrates.

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I. INTRODUCTION

Water is one of the most abundant and essential commodities of man, occupying about 70% of the earth's surface and when it contains too much contamination by certain microorganisms or chemical compounds, it is rendered unsafe in its existing state for an intended use (Eja, 2002., Iloba & Ruejoma, 2014). The addition of various kinds of pollutants and nutrients through the agency of sewage, industrial effluents, agricultural runoff etc. into the *Ntawogba* creek has brought about a series of changes in the physicochemical characteristics of water (Umunnakwe *et al.,* 2020) which have been the subject of several investigations (Nevoh *et al.*,2015). The concentrations of physicochemical parameters are useful in the assessment of water qualities (Musa *et al.*, 2016). Macroinvertebrates are small animals found in water bodies such as insects, crustaceans, molluscs, annelids that do not have backbones and can be seen with the naked eyes (Adedipe & Nwankwo, 2016).They are used as bioindicators because of different chemical and physical changes caused by pollutants entering the water body (Ekokotu,2016). Their richness, abundance, composition can change as a result of seasonal changes in water quality which can be used to assess the health of the water (Yakub *et al.*,2016). Seasonal variations in quality of water generally refer to the change in components of water, which are to be present at the optimum level for suitable growth of plants and animals., which in turn have a direct or indirect influence over the planktonic population as well as living beings, (Oyewo &Don Pedro, 2003; Izonfue & Bariweni 2002). Many researchers have reported that effluent surface run-off from market houses and abattoirs, municipal gutters and sewage water draining into rivers affected the chemical components of the water which lead to environmental pollution that affected the food chain (Tyokumbur *et al.,* 2002. George, 2008). It has been stated generally by some environmental workers (Izonfuo and Bariweni, 2002 ; Zabbey, 2002; Zabbey & Hart, 2006 and Zabbey *et al.*, 2008) that in Niger Delta water quality varies seasonally.

II. MATERIALS AND METHODS

2.1 The Study Area

Ntawogba stream is a tributary of the Bonny River which is the largest river in the Niger Deltadelta of Nigeria with an average width of 0.5km and coordinates, latitude 4°48', 4° 4'7 North and longitude 6° 58', 6° 01'East. It is a meandering stream that traverses almost the entire width of Port Harcourt and harbors several residential communities and industrial companies along its bank with different activities like waste dump, vehicle repair/car wash, sand mining, boat building/repairs, fishing, recreation and drainage construction, etc.

2.2 Sampling Stations

Three main sampling stations were established along the stretch of the stream. The stations were selected based on the ecological niche of the system, taking into cognizance human activities and accessibility to the area.

Station 1, is non tidal freshwater, draining through residential and commercial areas (Fig.1). The main activities here are bathing, car wash, mechanic work, welding and mining of sand and waste dump. This section of stream is walled with concrete embankment (Plate 1 and 2).

Station 2 is in a tidal fresh water zone walled with concrete embankment with floating algal mass (Plates 3 and 4). Human activities are car wash, welding, mechanic work and waste dumping.

Station 3 is a tidal brackish water ecological zone, occupied by residential and industrial houses with mangrove characteristics. The main human activities are fishing, bathing, car wash, sand mining/dredging, boat building, jetty operations, transportation by the use of canoe and motorized vessels. The area receives many loads of domestic and industrial waste materials input from the city *(Plates 5 and 6)*.

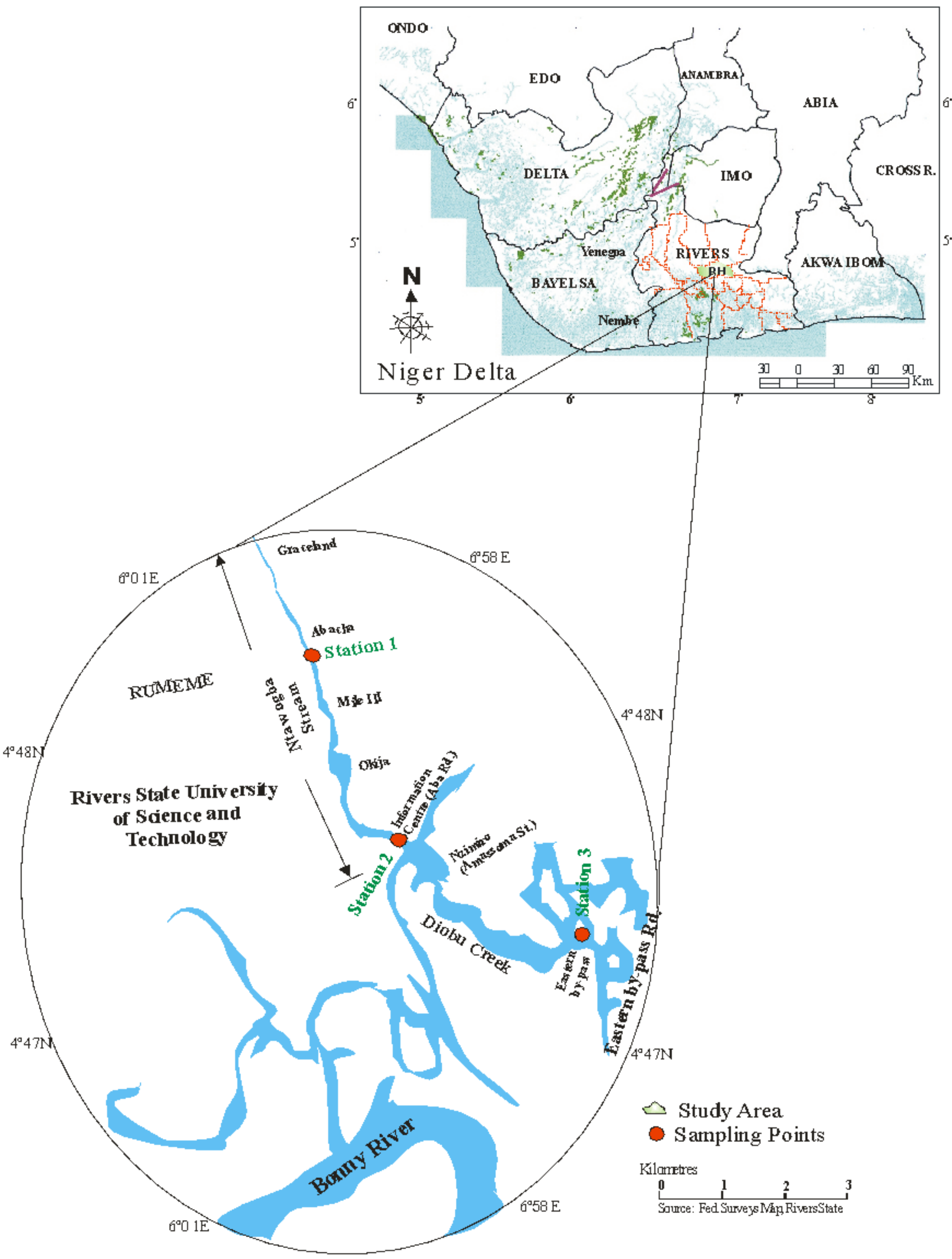

Fig 1: Map of Niger Delta showing Ntawogba Stream in Port Harcourt
The Study Area

Plate 1: Station 1 - showing the Upstream part of the Study Area (Abacha axis)

Plate 2: Station 1 - showing the Downstream part of the Study Area (Abacha axis)

Plate 3: Station 2 - showing the Upstream part of the Study Area (Okija axis)

Plate 4: Station 2 -showing the Downstream part of the Study Area (Okijaaxis)

Plate 5: Station 3 -showing Upstream part of the Study Area (Eastern-Bypass)

Plate 6: Station 3 -showing the Downstream part of the Study Area (Eastern-by-pass Axis)

2.3 Sampling and Analysis

Rainfall data were retrieved from the records of the Department of Meteorological services, Port Harcourt. The methods used for the physical and chemical parameters studied were as described by APHA (1998).The water temperature was measured in situ in the field using mercury in glass thermometer (0-50°C), graduated at 0-01°C intervals. The water pH, electrical conductivity, Salinity Turbidity and Total dissolved solids in each of the sampled stations were measured in-situ directly in the field using a multiple-probe Horiba water checker (model U -10$^{\mu}$) by dipping the probe into the water sample. Surface water samples for the measurement of Dissolved Oxygen (DO) were collected and determined according to the modified Azide or Winkler's method (APHA, 1998).

Water sample for Biochemical Oxygen Demand (BOD) was collected in the same way as DO, but the BOD samples were diluted before incubation to determine the dilution factor and the BOD_5 calculated.

2.4 Sediment Study

Sediment particle size was determined by the hydrometer method (APHA 1998), by collecting samples at the stream bed from the upper 15cm layer at each of the study stations at both wet and dry seasons.

2.5 Benthic Macroinvertebrate

ReplicateReplicate samples of benthos were collected from each sampling station randomly, monthly with Eckmann's grab measuring 16cm^2 x 16cm^2 facilitated by lowering the grab with a long rope to the water bed, and retrieved by pulling. The samples from the stations were diluted with water, thoroughly mixed into slurry and preserved with 10% formalin to which rose Bengal dye had been added, to facilitate the sorting of organisms from the sample (Claudius *et al.*, 1979). The preserved samples were transported to the laboratory for subsequent analysis (Fakayode, 2005).
The organisms were identified taxonomically to the possible lowest levels (Sikoki & Zabbey 2006) using the best keys, such as Day (1967), Mellanby (1975); Young (1976); Powell (1980); Edmond (1978), and FAO (1990), and Pennark (1978)

2.6 Data Analysis

Physico-chemical data from the monthly sampling were subjected to 2 way analysis of variance. Differences among means were separated by Tukey Honest significant differences at 95% probability. Percentage occurrence and relative numerical abundance of macroinvertebrates macro benthos were calculated using Excel Descriptive Statistical Tools. Densities of the abundant species were analyzed for each of the sampled stations. Diversity of the benthic invertebrates was determined using Shannon Wiener Index, Equitability (E) of species (Sikoki, F.D. and Zabbey, N. 2006) and Margalef Diversity index.

III. RESULTS

The maximum rainfall was recorded in September (795.0mm) while the lowest rainfall (0.mm) was observed in December and January (both dry season months). Wet season value of rainfall was significantly higher (2,267.33mm) than dry season (48.5.5mm). Seasonally, mean temperature recorded was higher in dry season than in wet season (Tables 1 and 2). Highest pH value (7.83) was recorded in May (wet season) at station 1, while the lowest pH value (6.54) was measured in November (dry season) at Station 3.

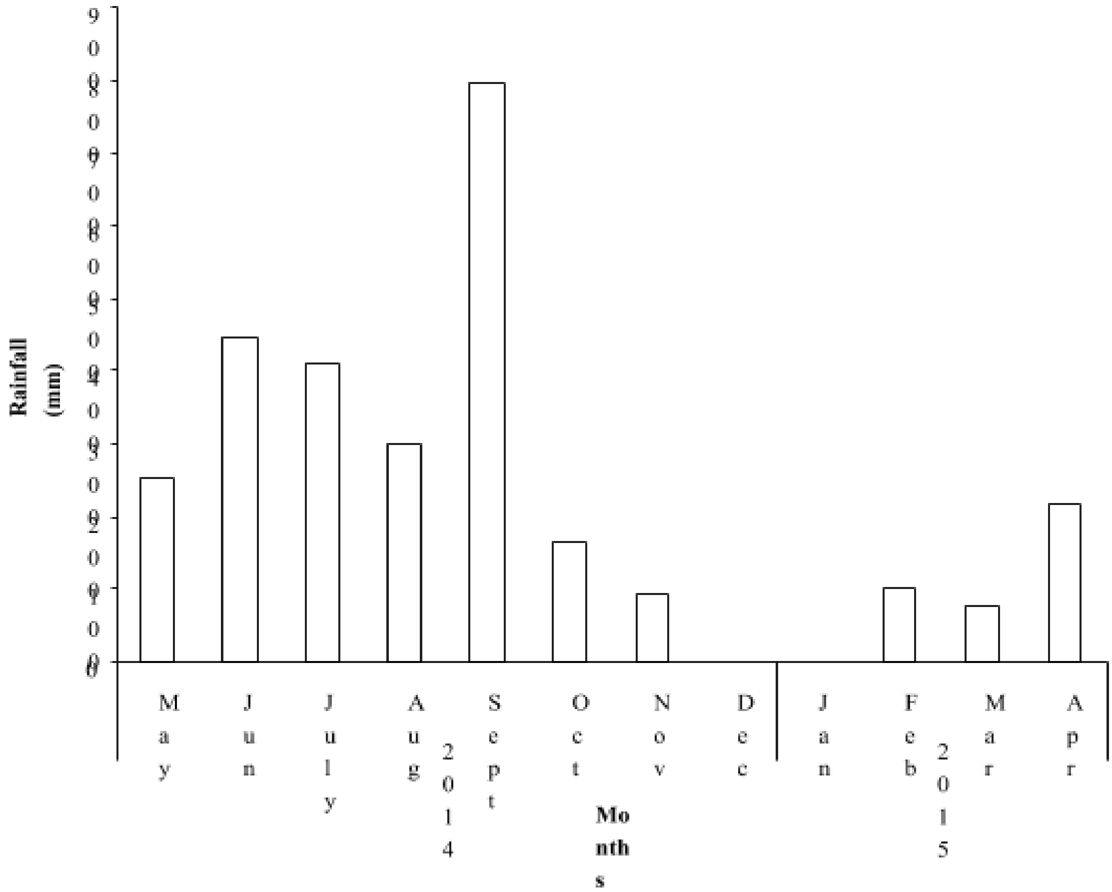

Fig. 2: Temporal Variation in Rainfall during the Study Period

Table 1: Monthly Range, Mean and Standard Deviation in Physico-chemical Parameters of Ntwogba Stream (May, 2014– April, 2015).

Month	Parameters							
	Temp. (°C)	pH	Cond. (µs/cm)	Turb. (NTU)	TDS (mg/l)	Sal (‰)	DO (mg/l)	BOD (mg/l)
May	30.07-31.05	7.63-7.83 7.73± 0.06^{a}	350-7,935 2,902.00 ± 16.58^{b}	11-782 332.33± 231.63^{a}	246-5555 2,031.33±1,761.64^{f}	0.1-0.5 1.57± 1.47^{d}	0-3.23 1.76 ± 0.94^{c}	12.12-18.20 14.62±2.15c

	30.72± 0.44[a]								
June	29.02-30.07 29.71 ± 0.34[a]	6.77-7.08 6.96 ± 0.10[a]	229-12,615 4,422.00 ± 4,096.86[f]	4-93 35.33 ± 28.87[d]	190-8831 3,105.17 ±2,862.83[f]	0.05-7.4 2.52 ± 2.44[d]	1.62-7.11 3.72 ± 1.71[a]	10.21-16.21 13.62±0.88c
July	27.04-28.06 28.10 ± 0.36	6.73-6.98 6.86 ± 0.07[a]	239-12,155 4,238.28 ± 3,958.43[f]	5-21 .11.33 ± 4.97[e]	147-8509 2,959.67 ± 2,774.51[f]	0.05-7.0 3.73 ± 2.31[c]	1.62-7.11 3.73 ± 1.71[a]	8.23-13.23 22.55±7.81b
August	26.57-29.04 27.88 ± 0.72[a]	6.75-6.97 6.84 ± 0.07[a]	234-1,504 728.33 ± 392.68[i]	7-17 12.00 ± 2.89[e]	164-6952 2,476.33 ± 2,238.25[f]	0.05-5.7 1.95 ± 1.88[d]	0.25-3.45 2.00 ± 0.94[b]	6.10-8.15 17.29±1.59bc
September	26.04-29.06 27.14 ± 0.96[a]	6.59-7.76 6.81 ± 0.14[a]	187-9930 3,517.33 ± 3,207.13[g]	8-20 13.33 ± 3.53[e]	131-6951 2,462.33 ± 2,244.91[f]	0.05-507 1.95 ± 1.88[d]	1.23-3.66 2.85 ± 0.81[ab]	5.34-6.22 16.74±2.23bc
October	29.55-30.54 29.72 ± 0.43[a]	6.88-7.12 6.98 ± 0.07[a]	238-7745 2,770.67 ± 2,487.31[h]	25-60 45.00 ± 10.01[c]	167-5422 1,939.67 ± 1,741.26[f]	0.05-4.3 1.47 ± 1.39[e]	2.61-3.25 2.71 ± 0.30[ab]	7.06-8.16 17.82±3.66b
November	29..02-31.04 29.87 ± 0.61[a]	6.54-7.25 6.90 ± 0.21[a]	8037-33,985 2,0734.00 ± 7,495.66[a]	8-84 56.67 ± 24.39[b]	5626-23790 1,4514.00 ± 5,247.08[a]	0.3-19.1 7.88 ± 5.70[a]	0-3.93 2.26 ± 1.17[ab]	13.10-16.14 15.16±4.30b

December	29.57-30.05 29.88 ± 0.16^{a}	6.67-6.93 6.77 ± 0.08^{a}	239-18,750 6,476.67 ± 6,136.94^{e}	6-16 10.33 ± 2.96^{e}	167-13125 4,533.33 ± 4,296.03^{e}	0.05-11.2 3.78 ± 3.71^{c}	0.02-3.67 2.38 ± 1.18^{ab}	13.02-14.22 13.21±4.24cb
January	31.04-33.05 32.04 ± 0.58^{a}	6.42-7.38 6.95 ± 0.28^{a}	4593-33,913 1,6949.00 ± 8,771.92^{b}	11-88 60.00 ± 24.58^{b}	3214-24439 1,2073.67 ± 6,372.92^{b}	0.4-18.5 8.08 ± 5.41^{a}	0-4.12 2.44 ± 1.25^{ab}	17.02-28.07 10.73±3.54d
February	30.03-31.04 31.87 ± 0.76^{a}	6.88-7.14 7.04 ± 0.08^{a}	749-25,000 8,919.67 ± 8,040.52^{d}	4-76 32.33 ± 22.15^{d}	306-17500 6,171.00 ± 5,665.68^{d}	0.5-13.3 7.15 ± 4.35^{a}	0.03.3.25 1.61 ± 0.93^{c}	16.16-18.41 7.13±1.45ec
March	31.04-32.52 31.054 ± 0.44^{a}	6.65-7.31 6.90 ± 0.21^{a}	629-21,450 7,632.67 ± 6,908.88^{e}	1-19 8.33 ± 5.46^{e}	439-15015 5,342.33 ± 4,836.49^{e}	0.2-13.1 4.52± 4.27^{b}	0-3.45 1.56 ± 1.01^{c}	15.16-18.32 5.78±0.62fd
April	30.52-33.02 31.52 ± 0.76^{a}	7.17-7.44 7.29 ± 0.08^{a}	579-33,845 1,1994.67 ± 1,0928.84^{c}	1-98 46.33 ± 28.18^{c}	407-18350 6,616.33 ± 5,870.16^{c}	0.2-14.3 5.07 ± 4.62^{b}	0-3.25 1.59 ± 0.94^{c}	15.23-20.41 7.61±0.78ed

Note: Means with different superscripts in the same column are significantly different @ $p > 0.05$ (Tukey HSD)

Table 2: Seasonal Range, Mean and Standard Deviation in Physico-chemical Parameters of Ntawogba Stream (May, 2014 – April, 2015)

Parameters	Wet Season Range, Mean ±SD	Dry Season Range , Mean ±SD
Temperature (°C)	26.04-31.55 28.88±0.61^{b}	29.02-33.05 31.12±0.48^{a}
pH	6.59-7.83 7.03±0.15^{a}	6.42-7.44 6.98±0.10^{b}

Conductivity (µS/cm)	187.00-12,615.00 3,090.80±568.40[b]	239.00-33,985.00 11,232.28±2,540.54[a]
Turbidity (NTU)	4.00-782.00 74.83±52.44[a]	1.00-98.00 34.42±10.78[b]
TDS (mg/l)	131.00-8,830.50 2,495.64±205.25[a]	167.00-24,439.00 2,093.78±2,131.45[b]
Salinity (%)	0.05-7.40 1.93±0.18[b]	0.10-19.05 6.08±0.80[a]
Do (mg/l)	0.0-7.11 2.80±0.52[a]	0.0-3.93 1.93±0.18[b]
BOD (mg/l)	5.34-18.20 11.70±4.90[b]	13.02-28.07 19.26±4.81[a]

a – b Means with different superscripts in the same column are significantly different at $p > 0.05$ (Tukey HSD)

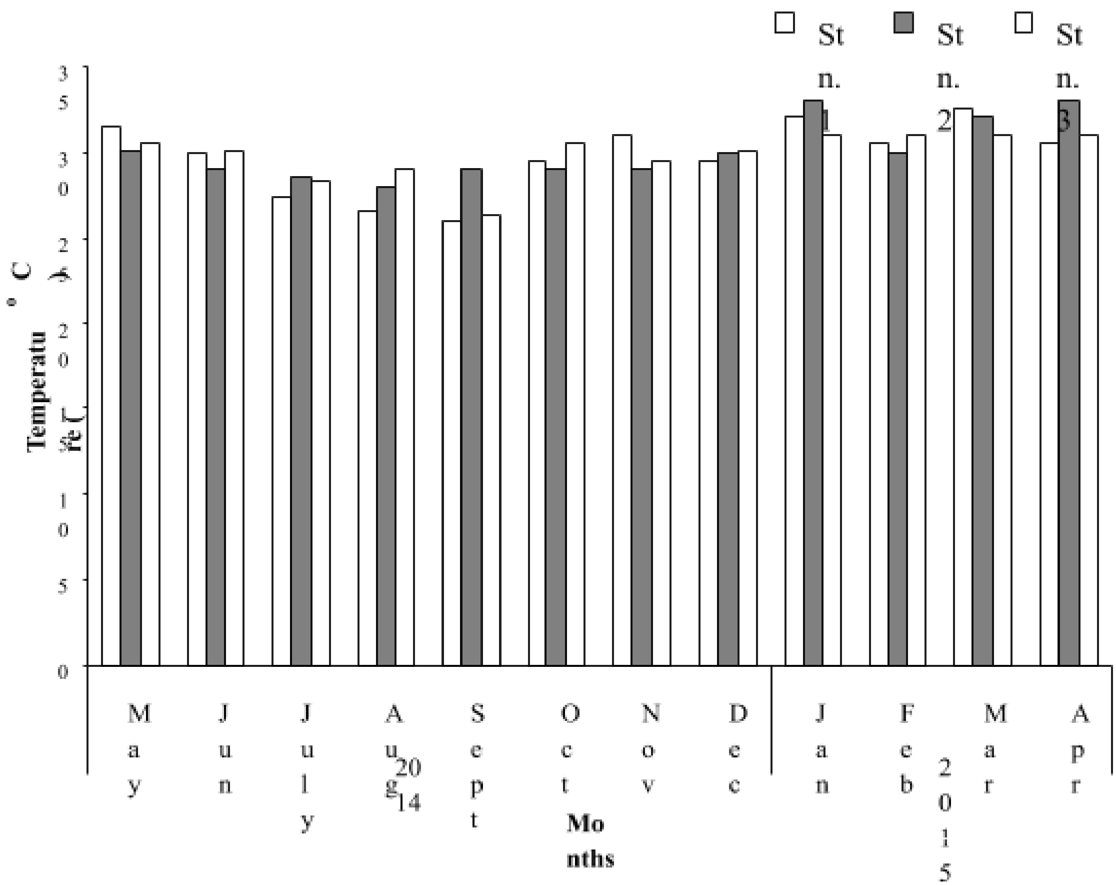

Fig. 3: Temporal Variation in Temperature of the Study Stations

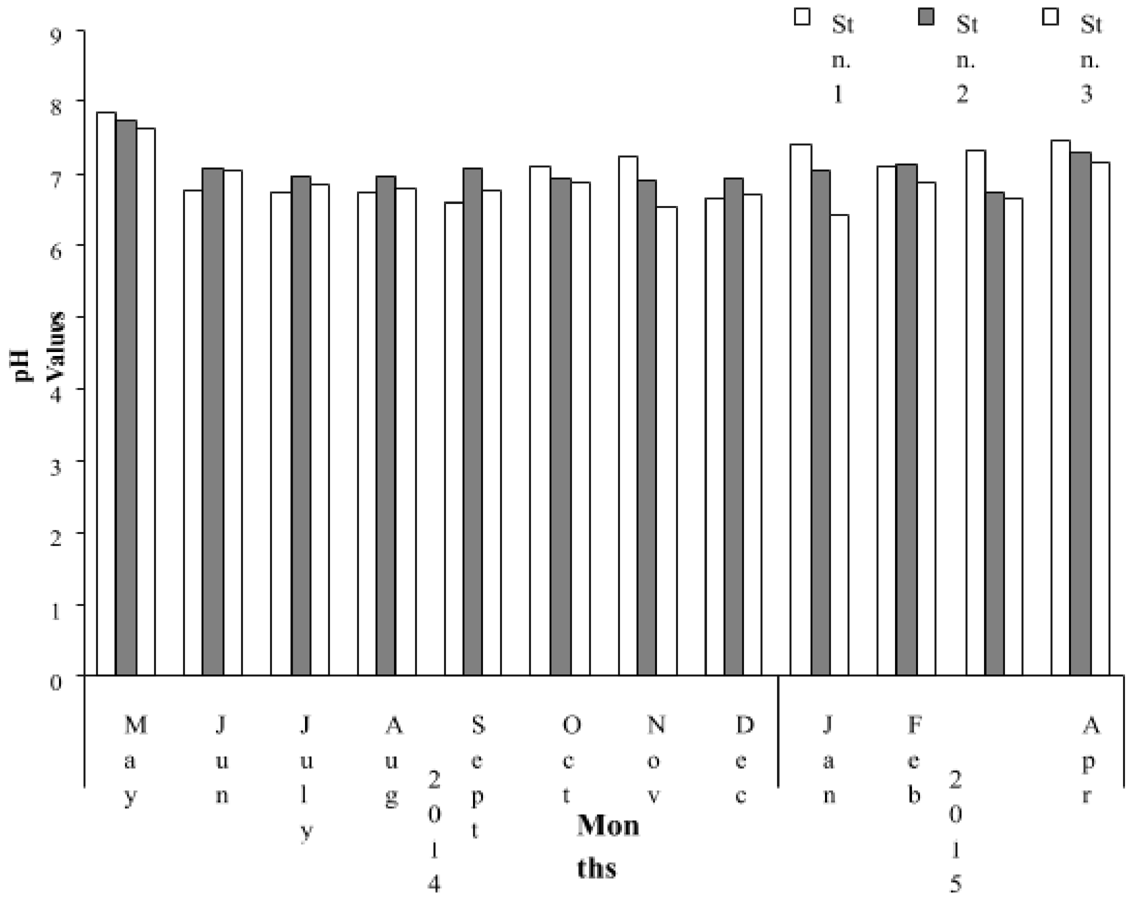

Fig. 4: Temporal Variation of pH in the Study Stations

Seasonally, conductivity varied, having higher value in the dry season (33,985.0mS/cm) than the wet season (8,830.0mS/cm). Seasonal variation was also observed in turbidity with higher values (4.00 to 782.00 NTU) during the wet season (34.42±10.78NTU) than the dry season (1.0-98.0 NTU). There was seasonal variation of total dissolved solids between dry season (2,.439. 0mg/l) and wet season (8,830.0mg/l) ;and higher salinity value was obtained in the dry season (19.05ppt) than the wet season (7.40ppt). The results of monthly dissolved oxygen values ranged between 0.0mg/l and 7.11mg/g(figure 5). Also, dissolved oxygen value was higher in the wet season than in dry season. Monthly variation of Biochemical Oxygen Demand (BOD) varied from 5.34mg/l to 28.07mg/l in September and January during the study period.

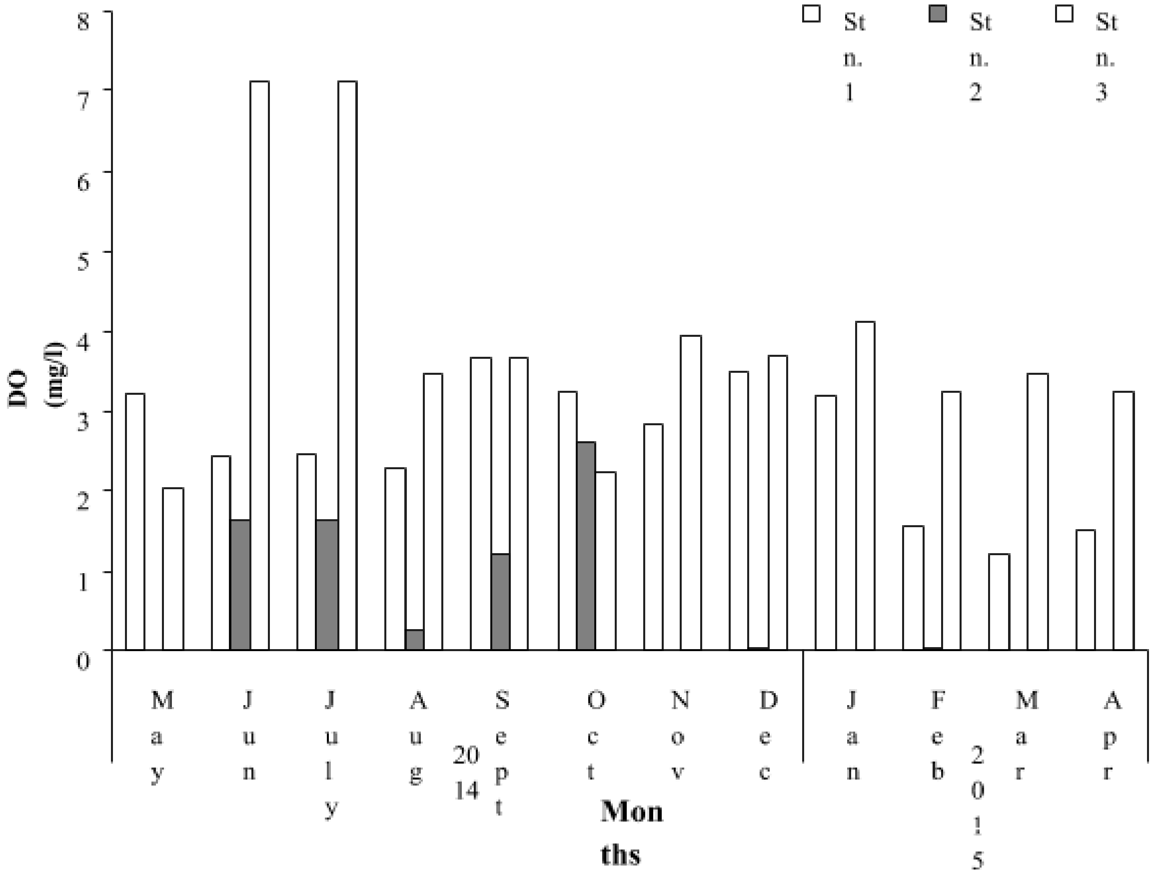

Fig. 5: Temporal Variation in DO of the Study Stations

Sediment Characteristics

Monthly value for sand ranged from 66.33% to 78.85%; the highest value was recorded in September and the lowest value in January, respectively. Seasonally, the wet season value was higher (78.85%) than dry season (74.76%). The monthly percentage silt ranged between 11.67 and 21.24% in May station 3 and January, station 2 across the stations. Dry season values were higher than wet season (21.24%) and 11.67%), having mean values of 117.03 ±0.61% and 15.94±0.74%, respectively. Clay content ranged between 3.66% and 15.73% in July and January across the stations. Meanwhile, dry season clay fraction was higher than wet season, varying significantly ($p < 0.05$).

Table 3: Monthly Range, Mean and Standard Deviation in Sediment Characteristics of Ntawoba Stream (May, 2014 – April, 2015).

Months	Clay (%) Mean ± SE	Silt (%) Mean ± SE	Sand (%) Mean ± SE
May	10.40-11.15 10.70 ± 0.23[a]	11.67-14.20 12.85 ± 0.74[a]	75.16-77.19 76.42 ± 0.64[a]

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June	5.38-10.70 7.76 ± 1.56^{bc}	14.56-18.60 16.92 ± 1.21^{ab}	74.20-77.19 75.38 ± 0.92^{a}
July	5.23-11.21 8.21 ± 1.72^{b}	13.38-19.30 16.85 ± 1.79^{ab}	75.40-75.42 74.44 ± 0.97^{a}
August	5.90-11.72 8.71 ± 1.68^{b}	14.08-19.30 16.88 ± 1.52^{ab}	72.20-76.86 74.42 ± 1.35^{a}
September	3.66-11.81 6.99 ± 2.47^{c}	12.34-16.40 16.80 ± 1.25^{ab}	75.30-78.85 76.67 ± 1.10^{a}
October	8.30-12.76 10.63 ± 1.29^{a}	13.89-19.20 17.34 ± 1.73^{a}	70.06-73.33 71.23 ± 1.05^{ab}
November	8.38-12.70 10.71 ± 1.28^{a}	13.94-19.49 17.57 ± 1.82^{a}	69.57-73.27 71.05 ± 1.13^{ab}
December	10.46-13.30 11.59 ± 0.88^{a}	14.44-19.47 17.74 ± 1.65^{a}	69.56-72.24 70.67 ± 0.81^{ab}
January	11.04-15.73 13.20 ± 1.30^{a}	21.17-15.10 19.17 ± 2.04^{a}	66.33-69.17 67.63 ± 0.83^{c}
February	10.09-13.57 11.98 ± 1.02^{a}	12.17-19.32 16.31 ± 2.14^{ab}	70.30-74.26 71.72 ± 1.28^{ab}
March	11.51-12.90 12.25 ± 0.40^{a}	12.75-18.25 16.13 ± 1.71^{ab}	70.24-74.36 71.63 ± 1.36^{ab}
April	8.22-12.80 10.44 ± 1.35^{a}	12.18-18.55 15.25 ± 1.84^{ab}	73.33-74.94 74.31 ± 0.54^{a}

Means with different superscript letters in the same column are significantly different $p > 0.05$ (Tukey HSD)

Table 4: Seasonal Range, Mean and Standard Deviation in Sediment Characteristics of Ntawogba Stream (May, 2014 – April, 2015).

Parameter Parameters	Wet Season Range, Mean ±SE	Dry Season Range, Mean ±SE
Clay (%)	3.66 -12.76 8.83± 0.77^{b}	8.22 – 15.75 11.69 ± 0.49^{a}
Silt (%)	11.67 – 19.30 15.94 ± 0.74^{b}	12.17 – 21.24 117.03 ± 0.61^{a}
Sand (%)	70.60 – 78.85 74.76 ± 0.86^{a}	66.33 – 74.76 71.17 ±0.92^{a}

Means with different *superscript letters in the same column are significantly different $p > 0.05$ (Tukey HSD)*

IV. BENTHIC MACROINVERTEBRATE

The pattern of seasonal distribution and relative abundance of benthic species is presented in Table 5. Generally, the highest density of 19,852 individuals/cm^2 (69.1%) of benthos was recorded in the dry season as compared to the wet season density of 8,878 individuals/cm^2 (30.9%). Meanwhile, the diversity and taxa richness were higher in wet (1.914; 3.960) than dry period (0.877; 2.425) for the organisms, while the evenness was higher in dry(0.627) than wet(0.583). The results of monthly density and distribution patterns of the benthos show that of the forty (40) species of benthos encountered in the area, variation in occurrence and distribution pattern was observed. The dry season month of December recorded the highest number of organisms with a total of 9,053 individuals (31.5%), closely followed by November, having total number 8,783 individuals (30.6%). The least number of individuals (217) was recorded in September (0.8%).

Table 5: Seasonal Variation in Benthic Organisms of Ntawogba Stream (May, 2014 – April, 2015)

	Species	Wet Season %	Dry Season %
ANNELIDA			
Oligochaeta	Lumbriculus sp	430	2,008
	Eiseniella tetrahidra	477	3,971
	Chaetogaster diastrophus	133	540
	Dero obtusa	174	1,577
	Nairs sp	195	78
	Ophidonais serpentina	1,650	3,231
	Paranais sp	153	394
	Stylaria lacustris	157	84
	Uncinais uncinata	1,022	3,463
	Total	4,391	15.345
	Percentage	15.3%	53.4 %
Polychaeta	Arenicola neamarina	8	-
	Capitella capitata	127	210
	Heteromastus filiformis	6	5
	Notomastus tenuis	30	8
	Notomastus abarans	569	-
	Notomastus latericieus	8	6
	Diopatra capitata	5	-
	Glycinde armingera	10	-
	Glycera capitata	2	-
	Glycera convoluta	3	-
	Nephthys hombergi	15	6
	Nereis diversicolor	49	13
	Nereis virens	26	-
	Nerieis pelagica	3	-
	Fabricia capensis	27	31
	Polydora capensis	3,367	4,096
	Syllis prolifera	5	-
	Syllis fulceligera	7	8
	Amphitrite neajohonstari	-	3
	Total	4,267	4,431
	Parentage	14.9%	15.4%
ARTHROPODA			
Crustacea	Ampithoe rubricata	-	8
	Gammarus lacusta	8	-
	Penaeus notialis	5	-
	Total	13	8
	Parentage	0%	0%
Insecta	Chironomus ablabiesmia	58	21
	Choaborus corethra	5	-
	Culex molestus	-	17
	Total	63	38
	Parentage	0.2%	0.1%
MOLLUSCA			
Gastropoda	Bullinus globuscus	2	3
	Bullinus forskali	5	-

	Pila ovata	23	12
	Planobis albus	5	-
	Physa fantinalis	106	59
	Total	141	74
	Parentage	0.5%	0.2%
Bivalvia	Tegalus andasonii	3	-
	Total	3	-
	Parentage	0%	0%
	Total	8,878	19,852
	Parentage	30.9%	69.1%
	Diversity	1.914	0.877
	Taxa richness	3.960	2.425
	Evenness	0.583	0.627

V. DISCUSSION

Rainfall records indicated a seven months wet season (April to October) period and five months dry season (November to March). The highest monthly rainfall (795.0mm) during the study period was recorded in September. NEDECO (1980) characterized this as a coastal rainfall pattern. From the variability in rainfall, some of the physico-chemical parameters of Ntawogba stream were inevitably influenced by rainfall which has been observed as one of the characteristics of Nigerian and tropical waters (Adebisi, 1980; Egborge, 1988 and 1999; George, 2008). The results of the physico-chemical condition of Ntawogba stream, Port Harcourt, Nigeria revealed that temperature values were generally higher in the dry season months due to direct solar radiation on the water body compared to wet season months. Low water temperature in the wet season may be attributed to numerous rainfall or precipitation which is typical of African inland waters (Wang et al., 2014). Also, pH values in various months of the surface water of Ntawogba Stream alternated between slightly acidic and slightly alkalinity. Bride et al., (2004) reported pH as an important ecological parameter that has a strong relationship with the physiology of most aquatic organisms. Electrical conductivity values observed in Ntawogba stream during the study was also noticed to be lower in wet season and generally higher in dry season. Most Nigerian inland waters have conductivity values below 500µS/cm at the peak of dry season and less in wet season (Egborge, 1994, Zabbey, 2002; George, 2008). Seasonal variation was also observed with higher turbidity mean values during the wet season than dry season. This was attributed to increased water velocity due to surface run off and industrialization (Chindh *et al.*, 2005).

There was also variation in total dissolved solids recorded between dry and wet seasons as a result of nature of water flow and continual discharge of effluent by humans in the area (Ajao & Fagade 2002; Zabbey 2002). Odokuma and Okpokwashili (1996) recorded higher values of TDS in dry season than rainy season in a previous work on the stream. Higher salinity values were obtained in the dry season than wet season. The lowest salinity values obtained in the rainy season are attributed to high rainfall during this period with high volumes of fresh water discharged into the water body thereby diluting and causing lower salinity. Solar radiation causes more evaporation and concentration of surface water to be more salty and increase in salinity value during the dry season (Manohar and Raghukumar (2013). The dry season months had lowest values of DO and highest in wet season. The higher values of dissolved oxygen obtained during the rainy season in Ntawogba could be due to increase in wet season rainfall and higher mixing rate. Yakubu *et al.* (1998) recorded higher values of dissolved oxygen in the early rainy season than dry season, due to increased rainfall and river runoffs resulting in increase in water current flow and high mixing rate. High BOD recorded in all seasons could be as a result of an increase in biodegradable organic substances in the study sites as noted by McNeely *et al.* (1979) . From the result of this study it may be suggested that differences in species composition, distribution and abundance recorded may be attributed to both differences in ecological, physiological, adaptations and environmental characteristics (Yakub *et al.*, 2016). Umeozor (1996) reported that during the rainy season, substrates were unstable thereby causing dislodgment of benthic invertebrates in the sediment while in dry season months, the substrate was stable and population built up. In this study, the number of macroinvertebrates increased from November and peaked in December, while the lowest numerical abundance value was recorded in September.

VI. CONCLUSIONS AND RECOMMENDATIONS

The seasonal variation was such that most of the parameters showed higher concentrations in dry season than in wet season. However Dissolved Oxygen value was higher in wet season than dry season indicating that the stream would support more life in wet season. Occurrence and distribution of the benthic macrofauna of Ntawogba stream showed marked seasonal differences. The diversity and taxa richness were higher in wet season than dry season. Species diversity of benthos in the study area compares favourably with similar environments in the Niger Delta.

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