QUALIFICATION OF THE TOTAL HYDROCARBON AND ANIONSCONTENTS IN THE SURFACE WATER OF ISOLO L.G.A., LAGOS STATE, NIGERIA FOR SCHOOLS PEN AQUACULTURE

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Abstract

The unemployment situation in Nigeria has assumed a national crisis dimension. The Federal Government of Nigeria in attempt to mitigate the problem introduced fishery in the senior secondary schools as a means of acquiring vocational skills necessary for fish production on graduation. Good quality water is a key factor in aquaculture development. This study therefore analysed hydrocarbon (THC) and anions (NO_3^- SO_4^{2-} PO_4^{3-} and THC) contents *of surface water in Isolo L.G.A. for effective aquaculture development in secondary schools in the study area. The research area was mapped out into 5 research cells, and from each of the cells water samples were randomly collected from ten (10) sampling sites; bulked and a composite drawn for analysis. The analytical methods adopted were CAEM 4500 p-D, CAEM (2nd edition) colorimetric method with UV visible spectrophotometer 939 model and APHA SO_4^{2-}. The mean results obtained were NO_3^- 66.266± 2.608, SO_4^{2-} 4.66± 0.333, PO_4^{3-} 0.700± 0.160 and THC, 0.302± 0.025. The results were further subjected to test of significance with F- distribution and t-test statistics with df 4 and 0.05 level of significance. The F- Calculated value was 5.342 and F-table value was 9.276. The t-test calculated value was 0.3725 and t-table value was 3.182. These results revealed no significant difference indicating that the anions and THC concentration of Isolo surface water are still within the WHO/FME maximum permissible value. Based on the result of the analysis, it is recommended that pen aquaculture can be readily adopted for schools in Isolo L.G.A of Lagos State.*

Keywords*: Water, Analysis, THC, Anions, Pen-culture.*

Introduction

Fish is a major source of protein in Nigeria and insufficient protein intake results in malnutrition in children as well as adults and this has led to decrease in life expectancy (Tobe and Ebuka, 2011). Food and Agricultural Organization (2007) reported that fish contributes more than 60 percent of the world supply of protein especially in developing countries. Fish play an important role in the livelihood of the rural population (Are 2012; Afolabi, 2013).

Ibironke (1991) posits that Nigeria is a maritime nation with about 20 million hectares of swamp, lagoons and estuaries and numerous species of fishes both fin and non-fin. According to Essien and Effiong (2010), fish landing in Nigeria beaches are mainly from industrial and artisanal fishery sectors. Nigeria's total fish production stands at 640,000 metric. More succinctly put by Adewumi (2012), Nigeria has not been able to provide the quantity of fish needed by the citizens and this has led to importation to supplement local production. Gisarun (2006) reveals that Nigeria fish production volume is 750,000MT and her demand is 1.6 million MT, the demand supply gap has to be addressed through importation.

Adesina (2014) reported that Nigeria spends an estimated 125.38 billion Naira every year importing fish. This is in consonance with Oofa

(2012), who stated that Nigeria imports more than 750,000 MT of fish worth more than 600 million United State Dollars and thousands of jobs exported in the process. This was also corroborated by USAID (2015) that with the importation of more than 750,000MT of fish by Nigeria 600 million USD is spent in foreign exchange and thousands of jobs are exported in the process. Federal office of statistics (2015) reported that 24.5 percent or 60 million Nigerians are unemployed.

Ejiola and Yinka (2012) opined that a right step towards arresting fish demand and supply gap and create jobs for the teeming unemployed youths is through aquaculture which entails raising fish in a controlled environment. This position was equally canvassed by Akinrotimi Abu, Ibemere and Okpara (2012) who stated that aquaculture is capable of bringing sufficient development for rural and urban areas by improving family income, through providing employment and reducing the problems of foods scarcity.

The Federal Government of Nigeria in its effort to mitigate the problem of hunger and reduce unemployment among Nigerian youths introduced the trade curriculum in 34 skill areas including fishery in 2013.According to Nigeria Education and Research Development Council (2012), the philosophy of the trade curriculum is that on completion of the three years of senior secondary education, every graduate/ recipient should have been well prepared for higher education as well as the required relevant functional trade/entrepreneurship skills needed for empowerment, for jobs creation, wealth generation and poverty eradication. The aim of developing, the trade curriculum in fishery in secondary schools is for the students to have fishery as a trade for livelihood on completion of their study (NERI

Ugbogwu, (2012) advised that schools and individuals in Wetland zones could embark on cage or pen fish culture rather than waiting for huge sum of money to go into fish earth or concrete ponds. Odia (2013) warned that in aquaculture project through cage or pen, real emphasis should be placed on water quality.

Isolo L.G.A. lies within latitude $6^0$26'44'N and longitude $3^0$2'33'E. She plays host to one of the ten industrial estates in Lagos state; the surface water is therefore susceptible to pollution from industrial effluents. The effluents contain contaminants and pollutants such as polychlorinated biphenyls (PCBs) pesticides, resistant organic pollutants (POPs) Petroleum hydrocarbon (PH) and anions. Petroleum hydrocarbon and anion pollution of the surface water have been reported in (Adekola and Obioh, 2012;Asruri 2009; Amadi and Anosike, 2013; Anyakora and Coker, 2006; Oniawa 2010; Preston and Raymundo, 2014). According to Alani, Drouillerd, Olayinka and Banagide (2014), industrial effluents such as petroleum hydrocarbon and anions such as nitrate and sulphates bio-accumulate and bio-magnify in fish and other aquatic organisms.

According to United States, Environmental Agency (2010) bioaccumulation is the process by which chemicals are taken up by an organism either directly from exposure to a contaminated medium, or by consumption of food containing the chemical. United States Geological survey (2007) defines bioaccumulation as the biological sequestering of a substance at a higher concentration than that at which it occurs in the surrounding environment or medium.Bio-magnification according to Nowel and Andrew (1999) is the process whereby the tissue concentrations of a contaminant increases as it passes up the food chain through two or more trophic levels, while Bronwyn (2009) defines bio-magnification as the process by which compound such as pollutants or contaminants increase its concentration in the tissue or organism as it travels up the food chain.Pen fish culture is the process of raising fish in a pen constructed in flowing or a still natural water (Olaitan, 2010), Otunisin (2009) sees pen culture as the practice

of culturing fish in a pen built and anchored to the bed of a natural body of water. This study focuses on the determination of the total petroleum hydrocarbonand anions content of the surface water of the Isolo for schools aquaculture projects.

Purpose of the study/ Research Questions

The main purpose of this study is to characterize and quantify the petroleum hydrocarbon and anions in the surface water of Isolo for pen fish culture in schools in the study area. To achieve the main purpose, the study sought answer to the following research questions:

1. What is the concentration of petroleum hydrocarbons in surface water of Isolo L.G.A of Lagos state?
2. What are the concentrations of the anions viz: Nitrate (No_3^-), Sulphate (So_4^{2-}) and
   of Isolo?
3. H
   h

water of Isolo compare to the WHO/FME maximum permissible concentration?

Materials and Methods

The research area Isolo was mapped out into research cells and these were, Asuani, Okefa, Ejigbo, Bucknor, Ago Palaceway. From each of the cells, ten (10) water samples were randomly collected from the rivers and streams with the aid of clean plastic sampling bottles tied to a graduated string at the depth of 10cm-15cm. The samples were then bulked, a composite drawn and stored in ice-cool boxes in which they were taken to the laboratory. The parameters determined were anions viz; NO_3^-, SO_4^{2-}, PO_4^{3-}, and the total hydrocarbon THC

Analysis of Samples

The anions and THC content of the water samples were determined with the methods below:

NO_3^-: The nitrate content was determined

PO_4^{3-}: Phosphate was determined in accordance with Chemical Analysis of Ecological Matter CAEM and American Public Health Association APHA – CAEM/APHA 4500 – P-D.

SO_4^{2-}: The sulphate was determined with CAEM (2nd edition) and APHA SO_4^{2-}. The THC or oil and grease in water samples were determined with HPGC 5890 FID.

Results

Table 1 Anions and THC Content of Isolo Surface Water inMg/l

N/S	Parameter	Sample Analysis Result					
		A	**B**	**C**	**D**	**E**	
1	No_3^-	16.90	13.40	18.50	12.20	14.21	
2	SO_4^{2-}	5.00	4.00	5.00	3.00	4.00	
3	PO_4^{3-}	0.75	0.52	0.83	0.6		*Ogwu C.*
4	THC	1.48	1.35	1.75	1.52	1.61	

The results of the analysis were treated with statistical instruments of mean standard deviation and variance and presented in Table 2.

Table2. The Statistical Analysis Result of the Parameters Measured.

Parameter	No of Observation	Mean	Variance	Standard deviation
No_3^-	5	16.266	6.803	2.608
SO_4^{2-}	5	4.66	0.333	0.577
PO_4^{3-}	5	0.700	0.025	0.160
THC	5	0.302	0.412	0.025

The results were then presented graphically with bar chart shown below in Figure 1

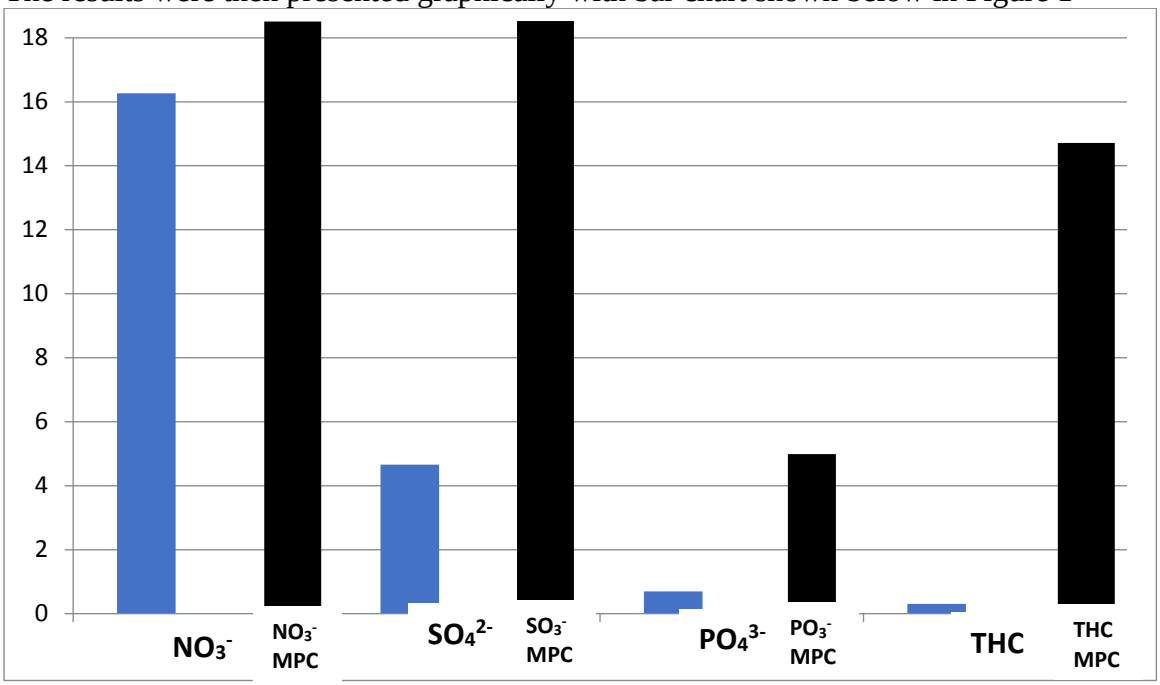

Figure 1: Bar chart of the concentration of the THC and anions in the surface water of Isolo and the WHO/FME maximum permissible concentrations for the parameters determined.

Discussion

The study investigated the concentrations of nitrate, sulphate, phosphate and total hydrocarbon or oil and grease in water. The analysis revealed the mean concentration of nitrate of 16.90mg/l, this value when compared to WHO/FME MPC of 20mg/l shows that the nitrate content is still within the acceptable limit.

The mean concentration of sulphate recorded in the area of study was 4.66mg/l while the WHO/FME maximum permissible concentration for sulphate in water is 500mg/l. This revealed that the sulphate in the surface water of Isolo is still below the toxic level.

The mean phosphate content of the area investigated is 0.700mg/l. while the WHO/FME maximum permissible concentration is 5g/l. This equally reveals a tolerable concentration of the phosphate in the surface water of Isolo Lagos.

These results of the anions measured are in disagreement with the reports of Anyakora and Momodu, (2010); Badejo and Asike (2012) who recorded high anions loadings in Surulere and Olomoge lagoon, Lagos. It is however in tandem with the report of Gbadebo, 2013, who reported high concentration of anions in upper Ogun River.

The mean concentration of the THC in Isolo surface water was 0.302mg/l and the WHO/FME maximum permissible concentration is 15mg/l. This value is also within acceptable concentration. Similar has

been reported by Oguzie, (2010); Omede, (2010) and Ogungbe, (2012) who reported low concentration of THC in Epe, Olomoge and Apapa. The result of the Nitrate, Sulphate, Phosphate and total hydrocarbon THC in the surface water of Isolo were further subjected to test of significance with F-distribution and t-test statistics at degree of freedom (df) 3 and 0.05 level of significance. The F calculated was 5.342 and F-table value was 9.276. The t-test calculated value was 0.3725 and t-test value was 3.182. These results equally showed no significant difference. This reaffirms that the anions, (NO_3^-, sO_3^{2-}, PO_4^{3-}) and THC in Isolo surface water are within the levels recommended by World Health Organisation (WHO) and Federal Ministry of Environment (FME)

Conclusion/Recommendations

This study concludes that with the result of analysis revealing low concentrations of the parameter determined. It therefore, means that pen aquaculture is practicable in the Isolo L.G.A. This study hereby recommends that schools within the Isolo L.G.A could embark on pen aquaculture. They can also adopt barrage and diversion ponds aquaculture programmes. Youths and young school leavers are equally advice to start off with pen culture for self-employment, job and wealth creation for food security.

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