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Conservation status of physico-chemical and algal components of awon reservoir

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ABSTRACT

The study was carried out to investigate the seasonal variations in physico-chemical and biological parameters of Awon Reservoir for a period of twelve months January 2009 to December 2009. Water samples were collected on monthly basis and were analyzed for water temperature, pH, phosphate phosphorus and Nitrate Nitrogen. The results revealed four divisions of Phytoplankton namely Bacillariophyta, Chlorophyta, Cyanophyta and Euglenophyta. The highest number of cells, was recorded during the dry months when nitrate and phosphate values were high. The parameters were analyzed to investigate probable pollution and suggest ways to conserve phytoplanktonic life in Awon reservoir. The different parameters used in the study showed that quality of water is within save limits and good to support the phytoplankton and other biota in Awon reservoir.

INTRODUCTION

Limnological studies include the physio-chemical and biological parameters of freshwaters. These parameters are used to analyze the quality of water (Gold man and Horne, 1983, Boyd and Tucker, 1998). The water quality in turn determines the survival and growth of animals and plants (Dehadrai, 1992). Aquatic organisms need a healthy environment to live and require adequate nutrients for their growth. The productivity depends on the physico-chemical characteristics of the water bodies. The maximum production is obtained when the physical parameters are at optimum level (Huet, 1986). If the aquatic habitat of animals and plants is unfit then these organisms would not grow and reproduce (Kamran, et al. 2003). The quantity and quality of phytoplankton/algae is a good indicator of water quality. The frequent monitoring and evaluation of physio-chemical characteristics of lakes enable one to understand its tropic status with a view to establish the level of pollution, its impact on algae/phytoplankton, the influence of the surrounding agricultural ground and fishing activities on the aquatics (Olele and Ekelemun 2008).

Aquatic habitats worldwide have been polluted by humans for hundreds of years. The causes of the dramatic reduction in community diversity were still and still are eutrophication and pollution due to surrounding arable land and pasture. Such changes have occurred worldwide but have not been properly documented.

Urbanization usually leads to a deterioration in water quality and marked changes to water bodies and hence the algal flora (Jayesh and Reddy 2008). Any alteration to the quality and quantity of water bodies will alter the composition of the inhabiting algal flora. Successful conservation must rely on appropriate catchments management. Fully protected catchments would provide ideal conservation of native flora. Yan Yean Reservoir in Australia is one of conserved algal habitats. This water body was colonized in the early days from natural lakes nearby and most species reported in 1905 are still there.

This work is centered on the determination of the physico-chemical and biological parameters in the water samples from Awon reservoir.

The data generated would create environmental awareness for the state as regards the status of the water body.

MATERIALS AND METHODS

The reservoir at an altitude of 26.0m above sea level was built in 1972 with concrete spill way. It has a catchment area of 5,260.97. It has a depth of 22.25.. The macrophytes in the study area include *Ipomoea* spp and *Pistia stratriote.*

Sample Collection

Duplicate water samples were taken from the water surface using one litre polythene bottles for the period of twelve months (dry and wet seasons) January 2009 to December 2009, between 9.00 hour and 12.00 noon. One set for physio-chemical analysis while the second set was for phytoplankton analysis.

Sample Treatment

The temperature and pH of water samples were determined using a thermometer and pH meter. Nitrate-nitrogen and phosphate phosphorus were determined spectro-photometrically.

Biological samples were in 5litre, concentrated, fixed with 4% unbuftered formalin. Observation of phytoplankton was done using a wild M11 binocular microscope with a calibrated eye piece. Taxonomic keys employed in the identification included Hustedt (1971) Patrick and Reimer (1975) and Prescott (1983).

Statistical Analysis

Simple addition, percentage and mean computation of the scores obtained were the statistical methods employed in analyzing the data.

RESULTS

It is evident from the present results that temperature showed a seasonal variation.

Table 1: Physico-chemical parameters of Awon Reservoir.

PARAMETERS	Jan	Feb	Mar	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Mean Value
Temperature ^{o}c	22.41	27.37	26.85	27.31	27.36	27.14	26.71	27.14	26.71	26.81	27.41	24.41	26.469(22.41-27.41)
Ph	6.68	6.54	6.62	6.68	6.69	6.66	6.69	7.01	6.81	6.91	6.90	6.68	6.739(6.54-7.01)
Nitrate (mgL-1)	0.61	0.75	0.68	0.71	0.41	0.31	0.46	0.42	0.48	0.39	0.42	0.71	0.529(0.31-0.75)
Phosphate (mgL-1)	0.81	0.91	0.86	0.82	0.80	0.83	0.74	0.69	0.70	0.68	0.81	0.91	0.796(0.68-0.01)

Source: *Field Survey, 2009*

The overall range of water temperature was 22.41 – 27. 41°C. (Table 1). The minimum and maximum values of temperature were observed during months of January and June respectively. PH values in the reservoir fluctuated between 6.54 – 7.01. Minimum nitrate – nitrogen value recorded was 0.31 in the month of June 2009, and the maximum 0.75 in the months of April and December 2009. Phosphate, phosphorus ranged between 0.68 – 0.91. The minimum and maximum values were observed in October 2009 and February and December 2009 (Table 1).

Table 2: Phytoplankton assemblage and percentage composition during the study period

Taxation	Total Abundance (Per Cm3)		Percentage Abundance	
	Dry Season	Wet Season	Dry Season	Wet Season
Division:				
Chlorophyta				
Class:				
Chlorophyceae				
Order 1:				
Chlorococcales				
Pediastrum				
Brganum	43	8	11.7	7.4
P. tetras	26	8	7.1	7.4
P. simplex	24	10	6.5	9.3
Scenedesmus				
quadricauda	71	19	19.3	17.6
S. denticulatus	18	4	4.9	3.7
S. bcaudatus	12	2	3.2	1.9
S. dimorphus	17	8	4.6	7.4
Order 2				
Desmidiales				
Closterium	34	4	9.2	3.7
Cosmarium	12	3.2		
Order 3:				
Zygnematales				
Spirogyra	9	1	2.3	0.9

Taxa	Total Abundance (per cm^3)		Percentage (%)		Abundance	
Division:						
Bacillariophyta						
Class:						
Bacillariophyceae						
Order 1:						
Achnanthales						
Family:						
Achnanthaceae						
Achnanthes		2		1	0.5	0.9
Order 2:						
Fragilariales						
Family:						
Fragilariaceae						
Synedra sp		8		3	2.2	2.7
Order 3:						
Tabellariales						
Family						
Tabollariaceae						
Tabellaria	*10*		*6*	*2.7*	*5.5*	
Naviculales						
Family:						
Naviculaceae						
Navicula						
Cryptocephala	*8*		*6*	*2.2*	*5.5*	
N. rhymcocephala	2		3	0.5	2.7	
N. exigua	6		1	1.6	0.9	

Taxa	Total Abundance (per cm^3)		Percentage (%)	Abundance	
Pinnularia	*19*	*4*	*5.1*	*3.7*	
Biceps					
Pinnularia sp	*10*	*5*	*2.7*	*4.6*	
Gyrosigma					
Scalproides	*11*	*6*	*3.0*	*5.5*	
Family:					
Cymballaceae					
Cymbella					
Ventricosa	*2*	*0.5*	-		
Family:					
Gomphonemataceae					
Gomphonema sp	*3*	*6*	*0.8*	*5.5*	
Order:					
Bacillariales					
Nitzschia sp	*3*	*2*	*0.8*	*1.9*	
Divison:					
Euglenophyta					
Class:					
Euglenophyceae					
Order:					
Euglenales					
Euglena					
viridis		*2*		*0.5*	-
Phaais					
orbicularis	*2*		*0.5*	-	
Division:					
Cyanophyta					
Class:					
Cyanophyceae					

Taxa	Total Abundance (per cm^3)		Percentage (%)		Abundance
Order:					
Nostocales					
Anabaena	*8*		*1.1*		
Order:					
Oscillatoriales					
Oscillatoria	*4*	*1*	*1.1*		*0.9*
Total	366	108			

Source: *Field Survey, 2009*

Four division were encountered namely Bacillariophyta, Chlorophyta, Cyanophyta and Euglenophyta.

Among the green algae, *Scenedesmus*, *Squadricauda* formed the dominant species followed by *Pediastrum boryanum* (11.7%) during the dry season. As for the wet season, S*quadricauda* (17.6%) also formed the dominant organism followed by *P. simplex* (9.3%). The diatoms were represented during the dry season by Navicula, *Pinnularia biceps and Gyrosigma* with *P. biceps* forming the dormant species. *Tabelleria* (5.5%) Navicula (5.5%), *Gyrosigma* (5.5%) and *Gomphonema* (5.5%) were the dominant organisms.

The blue-green algae were represented by *Anabaena* and *Oscillatoria* . Euglenoids were represented by *Euglena viridis* and *phacus* orbicularis (Table 2)

The chlorophyta division recorded the highest composition diversity and abundance followed by bacillariophyta. Euglenoids and blue-green algae recorded the lowest diversity and abundance. *Oscillatoria* species contributed the least abundance in species composition.

There was a definite pattern of increase in phytoplankton abundance from month to month. The dry season months recorded a higher abundance than the wet season months (Table 2).

DISCUSSION

Fresh water environmental re subjected to variations in the ecological parameters like temperature of water, pH of water, nitrate – nitrogen, phosphate – phosphorus and phytoplankton life. The physical and chemical characteristics of water differ along with its biological characteristics (Jeffries and Mills, 1992).

Monthly variation in water temperature was more pronounced in the dry season especially in November 2009. the temperature of the water samples during eh dry seasons are slightly higher than those obtained for the wet season (Table 1). The result is similar to the one obtained by Asaolu (1999).

pH of the water sample is acidic. The average seasonal pH of the water sample is favourable to aquatic life as pH 4.0 – 4.5 has been reported to be dangerous to aquatic life (Ekelemun).The results obtained thallied with that of Asaolu (1999) in the water sample of Ondo State coastal water and Akinyemi (2000) on Awon Reservoir. The pH is important because many biological activities can occur only within a narrow range. Thus, any variation beyond acceptable range could be fatal to a particular organism.

Higher concentration of nutrients was recorded during the dry season in the present study arising form concentration of nutrients from various sources such as low droppings at such items they visit the reservoir to drink water along the shallow parts of the reservoir. The use of fertilizers by farmers in the drainage basin including the use of detergent especially during the dry season, all lead to high concentration. The result is in line with the works of Olele and Ekelemun (2008). Additional nutrients may have been derived from the decomposed organic matter remains of plants, animal and sewage, releasing more nutrients whose concentration becomes more pronounced as a result of evaporation (Odukuma and Okpokwasili, 1993, although it was also argued that algae proliferation during this period depleted nutrients concentrations. Phytoplankton species occurrence, composition and diversity was influenced by water chemistry/nutrient composition, temperature and pH. The phytoplankton species density recorded during the study was remarkable arising from the nutrient rich water body and slight acidic nature of the water.

The above composition/diversity indicated that chlorophyta recorded the highest. The occurrence of desmids was made possible by the slight acidic nature of the reservoir.

The occurrence of these algae groups was an indication that the water body was relatively unpolluted (Kadiri and Omozusi, 2002). Generally, the reported high diversity of desmids in West Africa water bodies was due to the prevalence of high rainfall (Kadiri,2002). Bacillariophyta was reported as the second most abundant taxa while the genophyte, non-toxic algae was the least abundant.

According to Ayodele and Ajani (1999) green algae and diatoms dominate many tropical lake systems. The present study showed seasonal variations in water quality of Awon reservoir. The different parameters used in the study showed that quality of water is within safe limits and good to support aquatic flora and fauna.

There should be a constant monitoring of the physico-chemical and biological parameters in future because of the increase in activities around the reservoir.

REFERENCES

[1] Asaolu, S. S. (**1999**). *Af. J. Sci.*, pp. 81-86.
[2] Akinyemi, S.A. (**2000**). Seasonality of Phytoplankton and some Environmental parameters in Awon Reservoir, Ph.D. Thesis, University of Lagos, 266 pp.
[3] Ayodele, I.A. and Ajani, E. K. (**1999**). Essentials of fish farming (Aquaculture). Odufuwa Press, Ibadan. 46. p.
[4] Boyd, C.E. and Tucker C.S. (**1998**). Pond aquaculture water quality management. Kluwer Academic Publishers, London.
[5] Dehadrai, P.V. (**1992**). Aquaculture. A.D., Oxford and IBH Publishing Co. Pvt. Ltd.
[6] Goldman, C.K. and Horne, A.J. (**1983**). Limnology McGraw Hill, Tokyo.
[7] Huet, M. (**1986**). Textbook of fish culture, 2nd Edition, Fishing News Book Ltd., England.
[8] Hustedt, F. (**1971**). Kryptogamen – flora von Deutschland, Osterreichs under Schweiz Akademiscehe Vergasell Schaft M.L.H. Leipzing. 816 pp.
[9] Kamran, T., Muhammed A., Muhammed, L. and Tasveer, Z. (**2003**). *Pakistan journal of Biological sciences* 6(21) 1795-1801
[10] Kadiri, M. O. (**2002**). Periphyton of Ikpoba River. B.Sc. Thesis, University of Benin, Benin City 84 pp.
[11] Kadiri, M.O. and Omozusi, H.I. (**2002**). *African Journal of Environmental Pollution and Health* 1(1): 19-27.
[12] Jayesh, R., and Reddy K. S. (**2008**). Conservation of Hussain sagar Lake, India. Proceedings of Taal 2007: The 12th World Lake Conference: 1753-1756.
[13] Jeffries, M. and Mills, O. (**1992**). Fresh water ecology. Principle and applications. C.B.S. publishers and Distributors Put. Ltd. Dalhi, Pp. 285.
[14] Olele, N.F. and Ekelemun J.K. (**2008**). *African Journal of General Agriculture* 4(3) 183-193.
[15] Patrick, R., and Reimer, C.W. (**1975**). The diatoms of the United States exclusive of Alaska and Hawaii. Vol. 2, Part 1 – Monographs. Academy of Natural Sciences, Philadelphia. 1975:213 pp.
[16] Prescott G.W. (**1973**). Algae of the Western Great Lakes area with an illustrated key to the genera of desmids and freshwater diatoms. Brown co. Publishers, Dubuque IOWA. 1982:977 pp.