BENSON IDHOSA UNIVERSITY

22nd INAUGURAL LECTURE

T O P I C :

"THE INVISIBLE DANCERS" NATURE'S LIFE SUSTAINING POWERHOUSE IN THE AQUATIC ENVIRONMENT

D E L I V E R E D B Y

PROFESSOR OSONDU C. AKOMA
B.Sc. (Botany), University of Benin, (1990)
M.Sc. (Botany) University of Benin (1999)
Ph.D Botany (Limnology/Algology)
University of Benin (2004)
Fellow of the Freshwater Biological Association of Nigeria

PROFESSOR OF LIMNOLOGY & ALGOLOGY

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DEDICATION

This inaugural lecture is dedicated to the glory of God and service to humanity.

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Distinguished Invited Guests
Ladies and Gentlemen

PROLOGUE

I present today, with a heart full of profound gratitude and appreciation of the opportunity God has given me to serve my generation and add value to the academic community and society. This 22nd inaugural lecture affords me the stage to present my modest contributions in the area of Limnology and Algology.

"To me, being an intellectual doesn't mean knowing about intellectual issues; it means taking pleasure in them" Chinua Achebe

I grew up in my hometown Azumini-Ndoki and ancestral home Obeaku-Ndoki both in Abia State surrounded by fresh crystal clear rivers and streams and it was both interesting and fascinating growing up in such aquatic ambience. The Azumini Blue River flows from its source at Aba and drains into the Imo River at Okpontu-Ndoki in Rivers State into the Atlantic Ocean at Opobo creek. The riparian vegetation and clear waters of the Blue River used to be a major tourist destination for expatriate staff of the oil and gas companies based in Port Harcourt in the 1980s and 1990s and for the locals, provided veritable economic opportunities. Yours truly developed interest in the aquatic environment influenced by my early exposure to the Azumini Blue River.

My secondary education at Ascension Junior Seminary, Umuebulungwu-Asa, Abia State further sharpened by interest in the sciences to the detriment of the almost family tradition of being arts and humanities inclined. Growing up my father, being a language and literary person, ensured that every holiday we must read and write short descriptive note or summary of at least one prose novel (preferably from the African Writers Series) abundant in our home library. It was almost sacrilegious not to offer Literature in English at the O'level West African School Certificate/General Certificate of Education Examinations. Thus as the last child of the family, I was able to get away with not offering Literature and settled for pure sciences and ultimately ended up

studying Botany at University of Benin.

During our undergraduate days, at precisely 300 level, we were introduced to courses in Ecology, Mycology, Phycology and other aspects of applied Botany. My interest in Algology/Phycology was primarily kindled by the instructional methods of my teacher, mentor and academic father, Prof. Fred I. Opute. His lucid and interesting lecture delivery on the wonderful world of algae, their elegance, beauty and intricate ornamentations as hidden treasures in the aquatic environment rekindled my primordial interest from my native Azumini Blue River upbringing.

On graduation, I participated in the mandatory one year National Youth Service Corps and was posted to Command Secondary School, Abakaliki in 1990/1991 service year as a Biology Teacher. The most eventful aspect of the one year was my exposure to Barrack Life at the 24th Support Engineering Regiment, Nkwagu, Abakaliki which afforded me the opportunity to experience firsthand the heterogeneity of Nigeria. All tribes, creed and tongues in Nigeria were virtually present in the barrack and coexisted in peace and harmony.

Few months after National Service in May 1992 I was employed into the newly created Abiapalm Nigeria Limited – a state owned oil palm estate and rural development company. I quickly settled down in my rural roots at Azumini/Obeaku. Between 1992 and 1998 I became fully involved in my community youth mobilization and development think tank and was elected as Secretary-General of Azumini Youth Association (Worldwide), Chairman, Abiapalm Branch of Agricultural and Allied Senior Staff Association (AASA) and Assistant Manager (Collection), Abiapalm Nigeria Limited, Ukwa.

My determination for self-improvement led to my returning to University of Benin in 1998/1999 academic session to pursue graduate

studies. As fate would have it, I landed in the waiting hands of my academic father – Prof. Opute and fast forward, I ended up with a Ph.D awarded in the area of Limnology and Algology in 2004. Initially, pursuing an academic career was not the main objective for the doctorate degree. However, improvement in the industrial relations/remunerations in the civil service and University system between 1998 -2001 made academic attractive for some of us who initially could not consider academic career because of the paltry pay during the late 1980s to the IBB years of diarchy up until the living wage offered by Abdulsalam/Obasanjo era. I joined Benson Idahosa University in 2005 as a Lecturer Grade II, in the then Department of Basic Sciences (Microbiology Unit).

A year after appointment – October 2006, I proceeded to Ethiopia, East Africa as a member of the contingent of Nigerian academics under the auspices of the Technical Aids Corps of the Directorate of Technical Aids of the Federal Ministry of Foreign Affairs, Abuja. Mr. Vice Chancellor Sir, and distinguished guests seated, you may recall the media buzz about six hundred professors leaving Nigeria to Ethiopia in 2006, during the regime of Chief Olusegun Obasanjo; yours truly was one of them! However, there were a total of forty-two academic and professionals drawn from Universities, Polytechnics and organized private sector with the main objective of assisting a sister African country requiring specialized manpower to transit from one University State (Addis Ababa University) to sixteen new universities funded by the United Nations Development Programme (UNDP).

During the 2006 -2008 biennium of the Technical Aids Corps programme, I served as an Assistant Professor in the Department of Biology, Bahir Dar University North West Ethiopia. It was really an exciting period for me. I acquired pedagogical training in studentcentred, active learning methods and effective use of ICT in the teaching/learning process. Bahir Dar is situated at the southern gulf of Lake Tana – the source of the Blue Nile. I collaborated with researchers

in the Fisheries and Aquatic Biology research group in the Amhara Regional Agricultural Research Centre, Bahir Dar resulting in many academic publications.

Mr. Vice Chancellor Sir, I am the fifth practicing Limnologist/Algologist in the Nigerian University System. This inaugural lecture is the fourth delivered in Nigeria in this area of specialization. The pioneers and trail-blazers in this field include our father and the fore-most Phycologist in Nigeria – Professor F.I. Opute, who delivered the 31st Inaugural Lecture in the series of University of Benin in 1990 and entitled "The Botanical Frontiers: With Periscope on the Nigerian Coastal Environment. The second was by Prof. D.I. Nwankwo at University of Lagos in 2004 and titled "The Microalgae: Our Indispensible Allies in the Aquatic Monitoring and Biodiversity Sustainability" while Prof. M.O. Kadiri in 2010 elucidated on the topic "They Bop, They Sink: Nature's Energy Chargers and Aquatic Environmental Purifier" at the 108th University of Benin inaugural lecture. This is the fourth inaugural lecture delivered in the Department of Biological Sciences, the sixth in the Faculty of Science and the first by a Limnologist/Algologist in Benson Idahosa University.

My research interests cover the areas of limnology, algal systematics, Water quality and aquatic resource management, Pollution studies and Biomonitoring in the aquatic environment. In the course of this lecture – the 22nd in the series and titled "The Invisible Dancers: Nature's Life Sustaining Powerhouse in the Aquatic Environment" I will attempt to deconstruct the complexities of aquatic ecology and thrill you on the wonderful world of our friends – the phytoplankton.

1.0 INTRODUCTION

1.1 What is Limnology/Algology?

Limnology is the study of water bodies found within the continent and these include; rivers, streams, lakes, reservoirs, ponds, estuaries, wetlands, temporary water bodies and unique environments like abandoned water receptacles and containers. The study of the physical, chemical and biological (mostly planktonic organisms) in the aquatic environment. Limnology shares similar concepts and methodologies with oceanography which is the study of oceans.

Limnology as a subject area adopts scientific methods to unravel the dynamics in the inland aquatic environment with useful application in algal systematics, pollution studies, bioremediation, water quality assessment, biofouling and environmental studies.

Algology or phycology is the study of algae. Algae are photosynthetic organisms possessing chlorophyll and simple reproductive structures but lacking true root, stems and leaves (Lee, 1989). They are cosmopolitan, occurring in nearly all habitats and showing wide adaptive radiation including terrestrial, aerial, aquatic, on and within other plants and animals, rocks, hot springs, snow or ice and fossil records. They form associations such as lichen, algal-coral and algal-sponges association. They have been variously described as 'pond scum', 'grass of the sea', sea weeds and kelps (Kadiri, 2010).

Algae are found in terrestrial and aquatic environments provided there is adequate moisture. Their adaptive radiation in diverse habitats affords them survival opportunities as attached to aquatic plants (macrophyte) thereby growing as epithytes (on plants), endophytes (in plants), found growing on wooden posts and fences, bogs, marshes, swamps, mud flats, rock surfaces, on animal fur and turtle backs and in extreme environments like hot springs, snow and ice and fossil records.

1.2 "The invisible Dancers" What are They?

In the aquatic environment there are plankton. Planktonic organisms are classified into two broad groups – phytoplankton and zooplankton describing the plant and animal groups respectively. Plankton are free

floating organisms that are tossed about in the water current and not capable of determining their position in the water column. Therefore, they are at the perpetual danger of sinking. To maintain their position in the water column they glide, swirl, bop, dance, oscillate and by all means remain afloat. The challenge of all plankton is sinking.

1.3 Phytoplankton, Nature's Life Sustaining Powerhouse in the Aquatic Environment

The word "phytoplankton" consists of two Greek words phyto – meaning "plant" and plankton meaning "wanderer". Thus phytoplankton are free-floating microscopic plants that are mostly unicellular (Opute and Kadiri, 2013). They are free-floating algae in water bodies capable of only passive movement by wind and current. Most phytoplankton are motile, however, movement in water column is mostly through transport by currents (Dawes, 1998). The phytopkanton are the plant components of the planktonic community in the aquatic environment. They constitute the base of the aquatic food chain/web as they capture solar energy and synthesize carbohydrate and release oxygen and thus contributing substantially to the oxygen in the earth's atmosphere. Therefore, every other trophic levels depend on them as the primary producers. Phytoplankton account for half of all photosynthetic activities on earth (Thurman, 2007).

These invisible dancers are the predominant and primary producers in the aquatic environment. Life originated in oceans which constitute more than 95% of biosphere. The ocean continues to support all lives by generating oxygen, absorbing carbon dioxide, recycling nutrients and regulating global climate and temperature. In the ocean, the phytoplankton (especially the diatoms) are referred to as the "grasses of the sea" and their number, forms and photosynthetic activity support life in the ocean and contribute up to 70% of atmospheric oxygen content of our planet. The material budget through the aquatic environment is a culmination and interaction between the physical, chemical and biological components.

1.4 Factors Affecting the Growth of Phytoplankton

1. Light intensity

   As primary producers through the process of photosynthesis, light is a critical factor in the growth of phytoplankton. This explains why most phytoplankton exist within the photic zone of the water column which is the maximum depth to which light can penetrate the aquatic environment. Phytoplankton reproduce rapidly under conditions of optimum light intensity and nutrient availability. Light at high intensity can also be inhibitory to phytoplankton growth.

2. Nutrients

   Phytoplankton produce energy through photosynthesis. However, they still require both organic nutrient like vitamins and simple inorganic elements like nitrogen, phosphorus, silicon, iron etc. for growth and development. Generally, micronutrients requirement in the form of inorganic elements is a major limiting factor in the growth of phytoplankton while there is low requirement levels for organic compounds and vitamins

3. Temperature

   Temperature variation in the various climate zone and cross the season in each climatic zone is crucial in phytoplankton growth. The maximum rate of cell division for each 10°C increase in temperature. The upper limit of phytoplankton growth is determined by temperature (Reynolds, 2006)

4. Dynamics in the aquatics environment comprising of dilution and wash-out, sedimentation, death and decomposition and grazing by herbivores.

1.5 Diversity of Algae

Algae generally are categorized based on size as microalgae and macroalgae. Microalgal phytoplankton include species from the following divisions:

Cyanobacteria (blue green algae)
Chlorophyta (green algae)
Euglenophyta (euglenoids)
Pyrrhophyta (dinoflagellates)
Chryptophyta (cryptomonads)
Chrysophyta (golden brown algae)
Chrysophyta (diatoms)
According to Reynolds (2006), microalgal phytoplankton can be characterized based on their size as follows;

< 0.22μm Femtophytoplankton
0.2 - 2μm Piccophytoplankton
2 - 20μm Nannophytoplankton
20 -200μm Microphytoplankton
200μm – 2mm Mesophytoplankton
>2mm Macrophytoplankton

The microphytoplankton, microphytoplankton and macrophytoplankton are categorized as net plankton because the can be collected using plankton nets of varying mesh size while the first nannophytoplankton, piccophytoplankton and femtophytoplankton groups can be obtained through centrifugation, filtering or settling of samples.

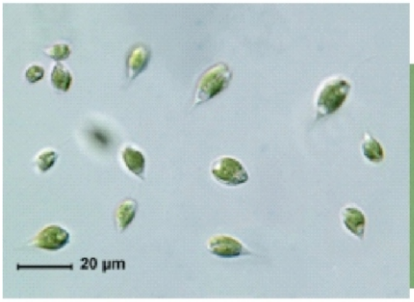
Phytoplankton communities and assemblages have been used as indicators of water quality. Their presence and prevalence coupled with nutrients and dissolved salts in any water body can determine the trophic status of the habitat.
Based on the level of nutrients accumulation and plankton density and diversity, water bodies can be classified into three categories, namely; oligotrophic, eutrophic and mesotrophic.

Oligotrophic waters are characterized by low levels of dissolved salts and nutrients. Oligotrophic rivers or lakes support sparse phytoplankton growth and other planktonic organisms, and have high oxygen concentration as a result of the low organic matter content. Eutrophic water bodies are rich in materials, dissolved salts, organic nutrients that promote proliferation of planktonic and plant life which reduces the

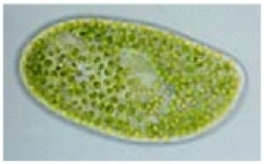
dissolved oxygen content of the water and thereby causing the extinction of other organism. Eutrophic waters have high phytoplankton density and low diversity.

Mesotrophic water bodies like lakes are intermediate between eutrophic and oligotrophic lakes in the level of nutrient enrichment within it.

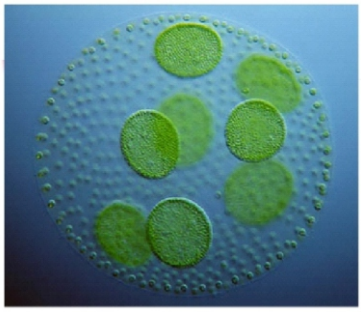
The above classification of water bodies is most significant and find application in pollution studies and water quality monitoring in the aquatic environment.



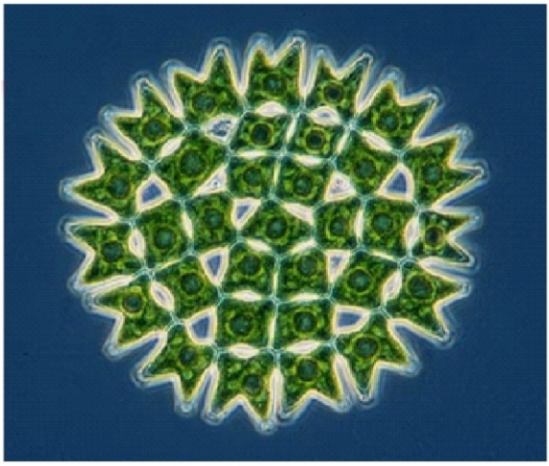
Ochromonas is a single-celled, motile, golden- brown alga.



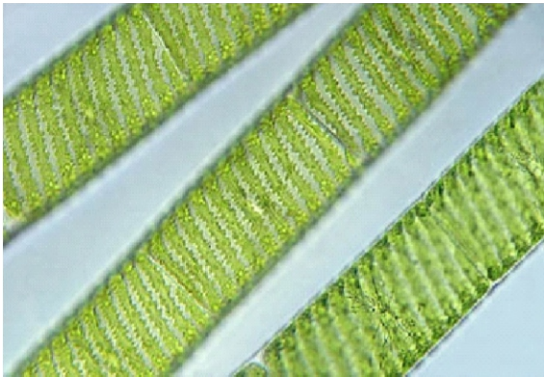
Chlorella

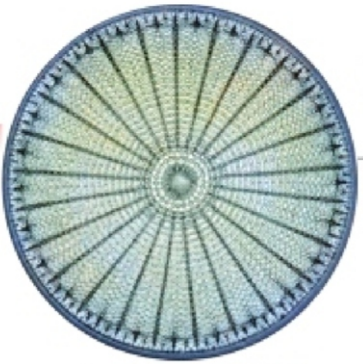


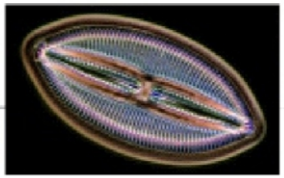
Volvox

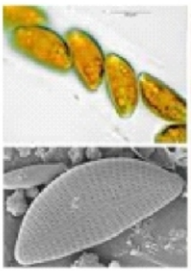


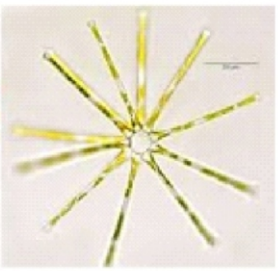
Pediastrum











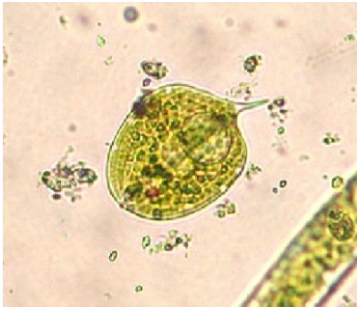


Plate 2: Filamentous grenn algae, diatoms, euglenoid and Dinoflagellates

Economic Importance and Role of Algae in Environment

- Primary producers in the aquatic environment
- Supply of oxygen in the aquatic habitat
- Indicators of water quality
- Bioremediation, Sewage and effluent treatment
- Mitigation of global warming by CO_2 sequestration
- Food for humans
- Pollution and biofouling
- Harmful algal bloom and health consequences of dangerous toxins emanating from blooms and "red tides"

Bioremediation

Benefits of phycoremediation include;

- Algae are not pathogenic
- Provide oxygenation of the system
- Safe, cost effective and ecofriendly process
- Phycoremediation detoxifies and removes toxic wastes

Pollution Control

- Application of algae in pollution control include;
- Wastewater treatment thereby reducing intensive use of chemical treatment
- They can be used to trap fertilizers in runoff from farms
- Algae bioreactors are used in some industrial power plants to reduce CO_2 emission

Research Potentials of the "Invisible Dancers"

- Medicinal Phycology

a) Biomedical products – Many seaweeds like *Digenia simples* and *Sargassum* spp. contain natural products with curative potency against bacteria and helminths (Borowitzska, 1995)

b) Cancer treatment – antimutagenic substances have been isolated from *Amphora zonata* (Harada and Kamei, 1997)

c) Algotherapy: Refers to the use of algae such as the seaweed *Fucus serrata* in facial and body wraps and baths for rejuvenation and detoxification of human body (Guiry, 2009; Soler-Vila *et al*., 2022).

d) Bone Tissue Engineering: Calcerous marine algae are used as ceramics for bone tissue engineering (Stein and Borden, 1984).

e) Alternative energy source

Table 1: comparison of sources of biodiesel

Crop	Oil yield (L/ha)	Land area needed (Million ha)
Corn	172	1540
Soybean	446	594
Canola	1190	223
Jatropha	1892	140
Coconut	2689	99
Oil palm	5950	45
microalgae		2 – 4.5

Chisti (2007)

Products include: biodiesel, bioethanol, biomethanol, and biogas. Processes are trending in New Zealand, Israel, Japan, Spain, Netherlands, Australia, Canada, USA and Argentina

2.0 THE NIGERIAN ESTUARINE AND COASTAL MARINE ENVIRONMENT

Nigeria is a littoral country with about 850 km of coastline spanning from the Great Kwa River and Bakassi Peninsular to the east and the Badagry Marina to the west. Though water is abundant in the ocean, potable water is a scarce resource. It provides a substantial portion of the global population with food and livelihood and is the means of transportation for 80% of global trade. The marine and coastal fronts bestow a key resource to the tourism industry; provide all elements for tourism development of the familiar concept of "sun, sand and sea" and help the diverse and expanding domain of nature-based tourism (Michael, 2012; Oloyede *et al*., 2022).

The exclusive economic zone and continental shelf of Nigeria provide area for economic exploitation and exploration for a viable blue economic strategy for national development. The unique ecosystem of the Niger Delta is estuarine. The region is the hub of oil and gas exploration in sub-Saharan Africa and accounts for over 90% of the revenue of Nigeria. Major cities like Port Harcourt and Warri, Benin, Sapele, Calabar and Uyo are located in the River Niger Delta. This zone is also characterized by the lush vegetation of lowland rainforest and alluvial sandy beaches on the coastline.

An estuary is a semi enclosed coastal body of water that has a free connection with the open sea. It is strongly affected by tidal action, and within it seawater is mixed and diluted with freshwater from land drainage (Lee, 1989). Estuaries are among the most complex bodies of water encountered by the limnologist and they are the most productive. The dominant features of an estuary are, variable salinity, a salt wedge or interphase between salt and freshwater and often large area of shallow turbid water overlying mud flats, salt marshes and mangrove swamps (Lee, 1989). Increased human activities, industrialization and urbanization have put a lot of pressure on the estuarine habitat. These activities have direct effect on the water quality, quantity and quality of phytoplankton and other biocoenoses. Nutrients supply to the estuary is usually from the sea, inflowing rivers, adjacent marshes and vegetation and from anthropogenic sources. The shallow and well-mixed waters of the estuaries are often ideal sites for high rates of photosynthesis and secondary production (Pearl, 1988). It is a matter of common knowledge that eutrophication is continuously taking place through the daily enrichment from natural systems and human wastes. This leads to nutrient enrichment of water and when coupled with adequate solar radiation gives rise to hydrobiological changes which may result in bloom formation (Opute, 1990).

The diversity in the shape and symmetry of phytoplankton has attracted naturalists and phycologists in particular for over a hundred years. A cursory examination of the range of planktonic algae reveals the existence of a wide array of diversity of forms, functions and adaptive strategies. At the base of the aquatic ecosystem are the phytoplankton,

which are the primary producers. Within an aquatic environment (lentic or lotic), they grow as either benthos (on sediment), periphyton (attached) or phytoplankton (free floating).
The existence of discrete phytoplankton in rivers has not been studied as much as in lakes and seas for several reasons. (Reynolds and Descy, 1996). Thus, a study of phytoplankton distribution in space and time and the nutrient dynamics in any body of water is important in understanding the structure and functioning of the aquatic ecosystem. (Opute, 1990; Kadiri, 1999a; Akoma and Opute, 2010; Nwankwo and Adesalu, 2019).

Bernt (1978) surmised that estuarine phytoplankton normally consist of a varied and heterogeneous collection of algae and the distribution and seasonal succession of the species present are of interest to the limnologist and they may also have effect on the higher components of the food chain and are thus of economic value. Their economic importance and biological significance include among others the following; their troublesome contamination of water supplies, their use in general physiological research in finding solutions or at least clarification of many problems in general biology and physiology. For instance, their uses for assay and detection of vitamins and growth promoting or growth-inhibiting substances. Algal studies have also found relevance and useful application in purely scientific problems such as the role of algae in organic evolution - paleolimnology. The biology of their life cycle, reproduction and ecology are common subjects of investigation; not to mention their use in some cancer research owing to their physiology and cell division and the use of algae in sewage oxidation ponds, bioremediation and for oxygenation in space flights (Prescott, 1975).

2.1 The Imo River Estuary

The Imo River is one of the major rivers in the southeastern part of Nigeria. Its length from source to month is about 215km. The river originates on the Achi Okigwe highlands in the southern elevation of the Udi Hills. The source is dendritic. The Imo River estuary is located between latitudes 4° 15′, 4° 59′ North of the Equator and longitudes 7° 20′, 7° 45′ East of Greenwich Meridian. With the Great Kwa River Estuary, they form the major estuaries in the eastern shores of the Nigerian

coastline.

The river flows through highland areas cutting deep gorges with steep valleys. Its catchment area is mainly the derived Savannah and dense rain forest where the allochthonous input of organic matter from the surrounding vegetation is derived from surface run-off. The river flows through coastal plain, alluvium and mangrove swamp and empties into the Atlantic Ocean through the Opobo Creek at the Bight of Bonny.

The two major tributaries Otamiri and Aba Rivers drain into the river and play a major role in the hydrology of the Imo River estuary. The lower part of the estuary has a shallow depth ranging from 5 to 8 m at flood and ebb tides though some spots may be deeper. The area is a multi-use resource for artisanal and commercial fishing and transportation. Other economic activities in and around the estuary include oil exploration and aluminum smelting (Udosen *et al*., 2016).

The physical parameters investigated showed both spatial and temporal variations during the study period. pH, conductivity, nitrate, silica and magnesium recorded high wet season values while alkalinity, dissolved oxygen, sulphate, phosphate and calcium were high during the dry season. A distinct spatial salinity gradient was observed from the freshwater stations to the near marine station. Nutrient concentration and abundance followed a seasonal trend of input during the wet season and utilization during the dry season.

We carried out the pioneer limnological study of the Imo River estuary for a period of fifteen months (2001 – 2002) to investigate the spatial and temporal characteristics of phytoplankton and nutrient dynamics in the estuary. A wide array of phytoplankton consisting of 221 phytoplankton taxa distributed into 7 divisions, 16 orders, 37 families and 85 genera was recorded; with the order of dominance Chlorophyta > Bacillariophyta > Cyanophyta > Dinophyta > Euglenophyta > Chrysophyta > Rhodophyta. Phytoplankton distribution and assemblage exhibited both seasonality and periodicity with the diatoms *Eunotia asterionelloides, Ditylum* spp and *Odontella regia* appearing in near bloom proportions in the late dry season months of the study. Phytoplankton density was remarkably high in the brackish water zone of the estuary with the diatoms dominating.

The desmids were the dominant members of the Chlorophyta and were most abundant in the freshwater zone of the estuary (Akoma and Opute, 2011).

The phytoplankton of the Imo river estuary presented an array of typically freshwater forms, brackish water and neritic marine species. Nwankwo (1994) observed that many estuarine diatoms exhibit a broad salinity tolerance and as such cannot be used as indicators of salinity.

The overall benefit of the study of the spatial and temporal characteristics of the phytoplankton and nutrients of Imo River was an attempt to reduce the information gap and contribute to our current knowledge of the limnology of Nigerian water bodies in general and estuarine systems in particular.

The work which involved a detailed study of an estuarine system with illustrated taxonomic information, was carried out in the Eastern Niger Delta of Nigeria.

The need for such studies has become important, as they provide baseline information, help in providing data for monitoring changes in the chemical content of the environment, provide necessary tools in management of the fisheries, irrigation, pollution control and abatement and other intervention strategies that will positively affect the socio-economic wellbeing of the communities found along the river banks (Akoma 2008, Udosen *et al*., 2016).

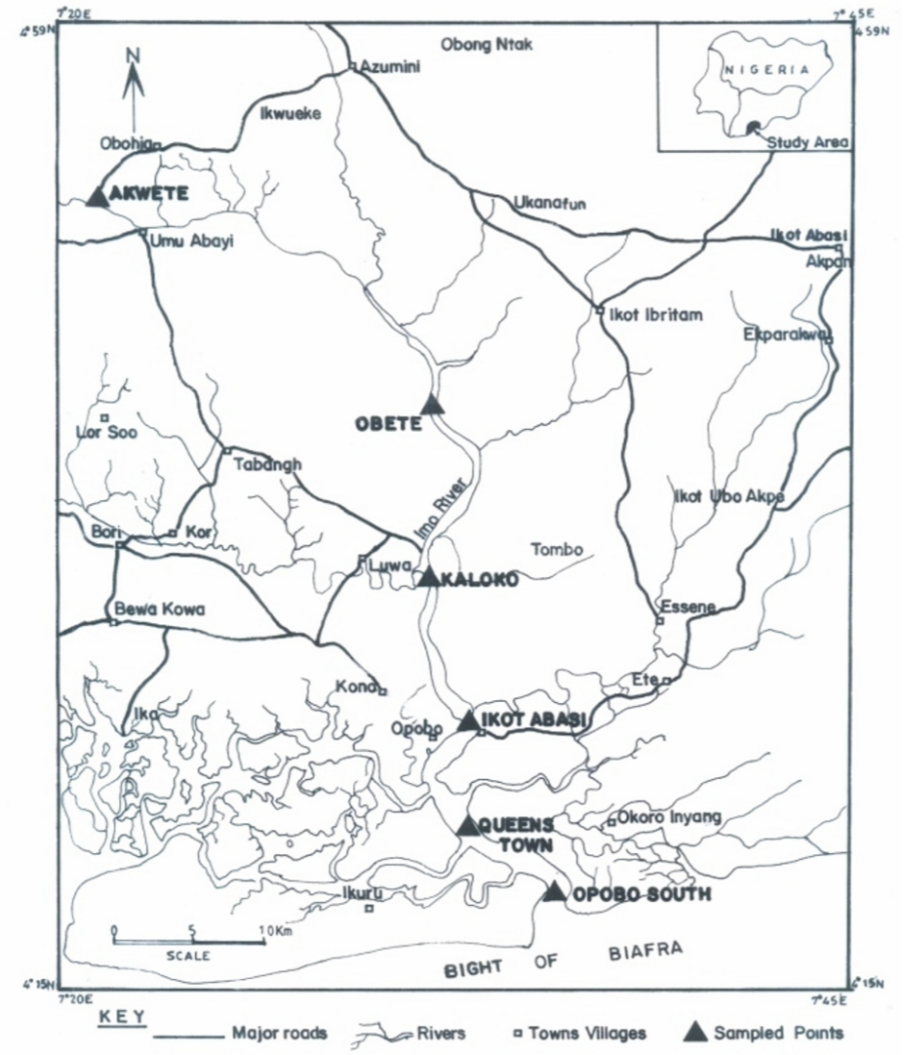


Fig. 1: Map of Imo River Estuary showing sampling stations

Table 2: Phytoplankton Composition of Imo River Estuary

Divisions	Orders	Families	Genera	Taxa	% Composition
Bacillariophyta	2	15	42	84	38
Chlorophyta	6	12	30	110	49.8
Cyanophyta	3	3	4	9	4.1
Dinophyta	2	3	4	8	3.6
Euglenophyta	1	1	2	7	3.2
Chrysophyta	1	2	2	2	0.9
Rhodophyta	1	1	1	1	0.4
	16	37	85	221	100

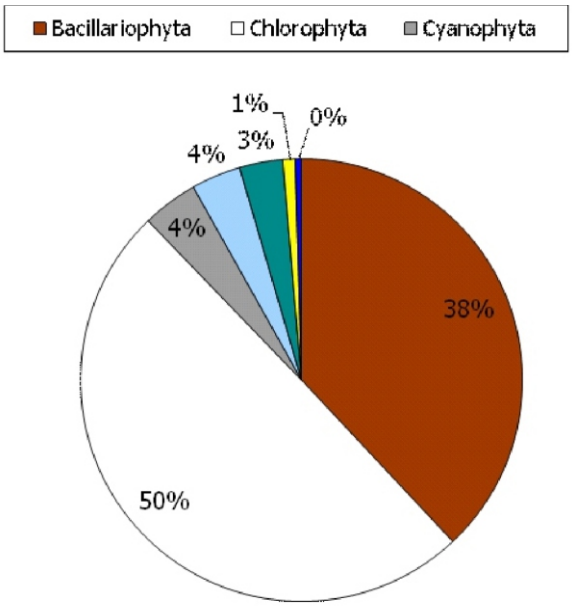


Fig. 2: A pie chart showing phytoplankton composition of Imo River Estuary

Akoma and Opute (2011) reported a taxonomic description of 21 centric diatom species belonging to 8 families namely; Biddulphiaceae (3), Chaetoceraceae (4), Coscinodiscaceae (1), Eupodiscaceae (5), Lithodeamiaceae (2), Melosiraceae (4), and Thalassiosiraceae (2) sampled from the Imo River estuary in south eastern Nigeria. Although most of the taxa have been reported in various water bodies in Nigeria and Africa, this was the first report of centric diatoms from the Imo River estuary with taxonomic details.

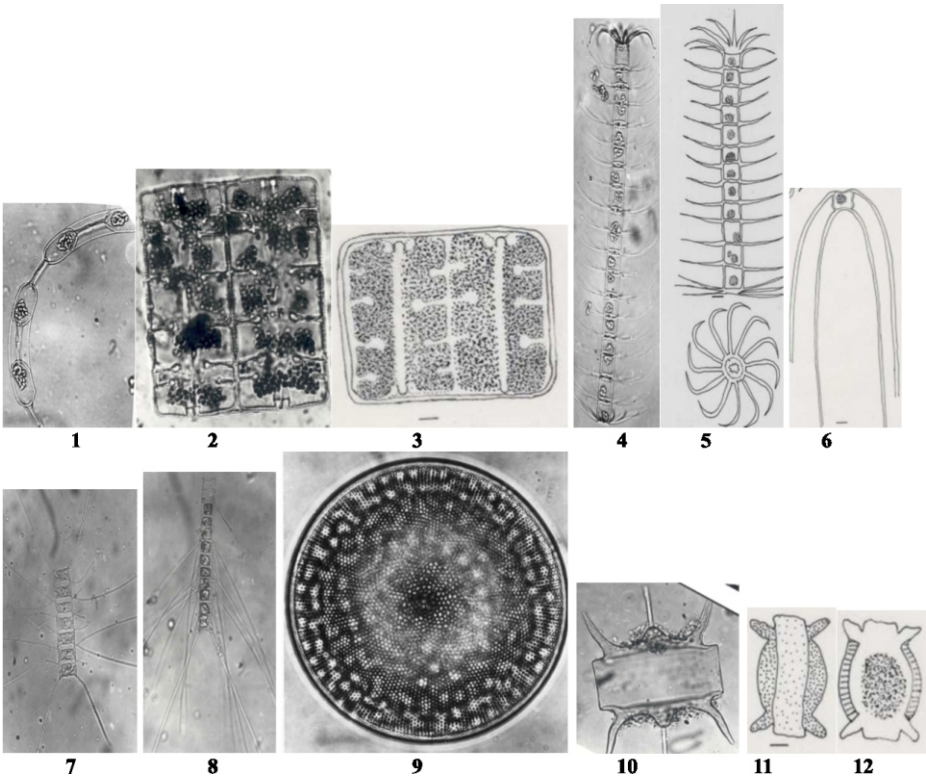


Plate 3: Centric diatoms from Imo River Estuary

1. *Hemiaulus sinensis*
2. *Hydrosera* sp.
3. *Terpsinoe musica*
4. *Bacteriastrim hyalinun*
5. *Bacteriastrim hyalinun* (end view)
6. *Chaetoceros convolutus*
7. *Chaetoceros lorenzianus*
8. *Chaetoceros* sp.
9. *Coscinodiscus centralis*
10. *Odontella longicruris*
11. *Odontella regia*
12. *Odontella regia*

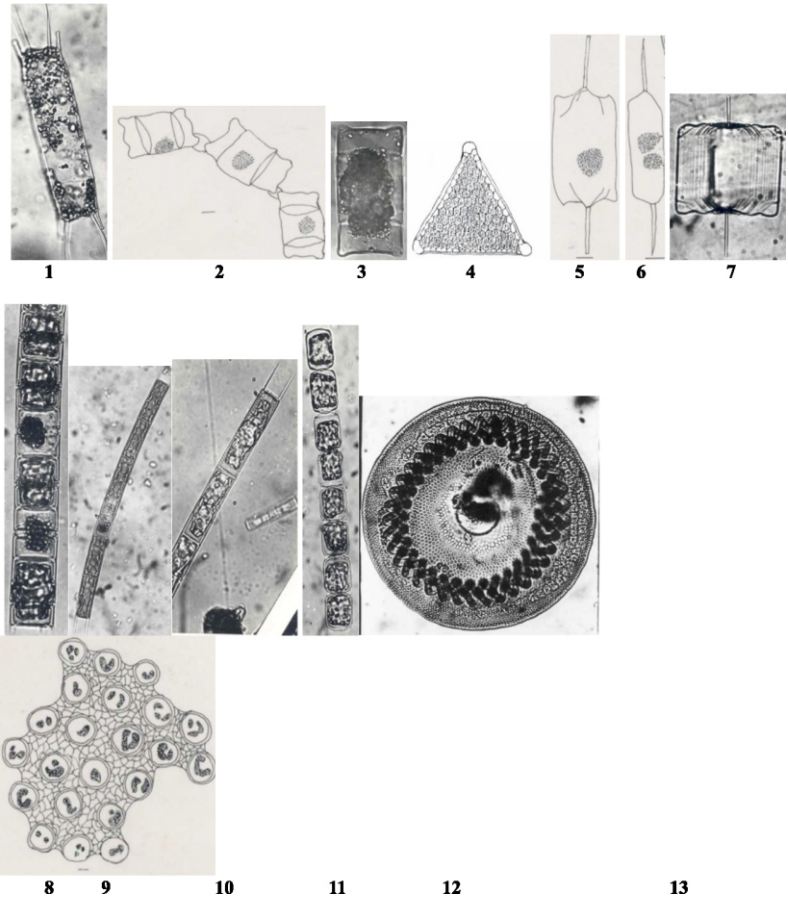


Plate 3: More centric diatoms from Imo River Estuary

1. *Odontella sinensis*
2. *Pleuroseira laevis*
3. *Pleuroseira laevis* (single cell)
4. *Triceratium favus*
5. *Ditylum brightwellii*
6. *Ditylum brightwellii*
7. *Ditylum sol*
8. *Aulacoseira granulata*
9. *Aulacoseira granulata* var. *muzzanensis*
10. *Aulacoseira* sp.
11. *Leptocylindrus danicus*
12. *Cyclotella* sp.
13. *Planktoniella muriformis*

In terms of nutrient composition, nitrate, sulphate, phosphate and silica were some of the nutrients measured during the study period and their range, mean and standard error are shown in Table 1. Akoma (2004 and 2007a) reported that these nutrients increased downstream in the estuary except silica which showed a reverse trend of decreasing values. Generally the nutrients variations were subject to seasonal changes due to flood influx from land drainage and tributary stream during the rainy season (Akoma, 2007b). Table 2 shows correlation coefficient of the various parameters investigated in the Imo River estuary and reveals positive correlation between conductivity and total dissolved solids and also between nitrate and phosphate (the major limiting nutrients for phytoplankton growth and primary productivity) (Akoma, 2008). Tidal action could also lead to resuspension of nutrients from the sediments. Inundation of the fringing mangrove vegetation at high tides yield decaying plant and animal materials into the estuary and these are potential sources of nutrient enrichment (John, 1986). It is important to note the effect of suspended matter on the result owing to non-filtration of the samples. This no doubt could have contributed to the high nutrient concentrations recorded in this study (Akoma, 2008).

Unlike other estuarine systems in the Niger Delta, the Imo river estuary has very minimal oil exploratory activities and its attendant pollution effects and the habitat is largely pristine as at the time of the study. As a result of reduced anthropogenic impact allochthonous input of nutrients from wet season run off, decaying organic matter from the fringing swampy vegetation and flocculation at the freshwater and brackish water interface coupled with biological activities are responsible for high nutrient concentrations. The results from the study presented a preliminary information on baseline conditions of the physico-chemical conditions in the estuary and proffer suggestions about possible sources of nutrient enrichment.

Table 3: Correlation coefficient of physico-chemical parameters in the Imo River estuary

	Temp	TDS	Cond	DO	Nitrate	Sulph	Phosph	Silicate
Temp								
TDS	.357							
	.096							
Conductivity	.053	.870**						
	.099	.000						
DO	-.389	-.380	-.514*					
	.076	.081	.025					
Nitrate	-.445*	-.252	-.017	.031				
	.048	.182	.476	.457				
Sulphate	.035	.101	.126	-.148	.423			
	.451	.361	.327	.299	.058			
Phosphate	-.353	-.047	.106	-.232	.811**	.404		
	0.98	.435	.353	.203	.000	0.68		

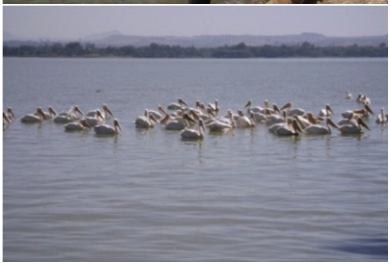
3.0 LAKE TANA RESEARCH

Vice Chancellor Sir, my involvement in the Technical Aids Corps programme in the 2006 – 2008 biennium was an opportunity for me to collaborate with researchers at the Bahir Dar University, the Ethiopian Fisheries and Aquaculture Unit of the Amahara Regional Agricultural Research Institute (ARARI), both in Bahir Dar,Ethiopia. The studies assessed seasonal variations of phytoplankton biomass in lake Tana (Wondie and Akoma, 2008), phytoplankton and zooplankton compositions (Akoma and Imoobe, 2009; Imoobe and Akoma, 2009 and Akoma *et al*., 2014).

The city of Bahir Dar is the capital of the Amhara Region (the second largest region in Ethiopia) and it is located at the southern gulf of Lake Tana. Lake Tana is a tropical high altitude (approximately 1,800 m above sea level), located in the north-western range of the Ethiopian highlands. The Tana-rift in which Lake Tana lies is a shallow trough which is not directly connected to the main Eastern Rift Valley but is certainly related to it. From geological evidences the lake was formed through volcanic blocking of the Blue Nile in early Pleistocene times. Subsequently the lake

basin filled up and now covers an area of approximately 3150 km^2 (Mohr, 1961). The lake is bordered by low plains in the north, east and south-west that are often flooded in the rainy season forming extensive wetlands and some steep rocky shores in the west and north-west (Nagelkerke, 1997). It is the source of water for the city of Bahir Dar and irrigation, fishing, sand excavation, tourism and recreation. The southern gulf of Lake Tana is a wetland with rich biodiversity of flora and fauna including various migratory bird species, pelicans and the popular Nile monitor lizard. The wetland is also spawning site for the Nile carp, and tilapia species endemic in Lake Tana. There is abundant vegetation of Papyrus reed in the wetland and many endemic plant species.

The Ethiopian highland presents and environmental challenge with the rugged peaks and isolated biomes with various exotic plant and animal species and several biodiversity hotspots yet to be explored and documented. The emphasis on the plankton assemblages of Lake Tana was to highlight the role of flora and fauna as bioindicators of water quality in the lake. The phytoplankton composition of the Bahir Dar gulf of Lake Tana as reported in the study of Akoma and Imoobe (2009) provided baseline data as there was hitherto no records of this aspect of the lake biology. The Bahir Dar gulf of Lake Tana is located at the southern edge of the lake. It has a vast wetland that is usually submerged most part of the year.



3.1 Seasonal Variation of Phytoplankton Biomass in Lake Tana (Ethiopia)

Wondie and Akoma (2008) presented the report from the investigation of seasonal dynamics of major phytoplanktonic communities estimated by biovolume in a tropical high altitude lake studied from June 2003 to July 2004. Four seasons were clearly distinguishable; Main-rainy season (MRS), Post-rainy season (PORS), Dry season (DS) and Pre-rainy season (PRS) with different phytoplankton assemblages. Total phytoplankton biovolume ranged from 708.5mm^{3}ml^{-1}during the main-rainy and dry seasons to 302751.5mm^{3}ml^{-1} during the post rainy season. The major divisions were Bacillariophyta, Chlorophyta and Cyanophyta. Blue greens were clearly the most dominant taxonomic group during the postrainy season while diatoms were dominant during the other three seasons. However, the predominance of diatoms generally occurred during periods of strong vertical mixing and that of blue green algae under relatively less mixed water column (post-rainy season). Generally, phytoplankton seasonality was influenced more by hydrological (runoffs associated nutrient availability) and hydrographic (internal mixing) changes. In addition, the fact that the lake is shallow and lacks marked thermal stratification has enabled it to have its own pattern of seasonality compared with other large African lakes.

The study on revealed the presence of dense phytoplankton assemblages with *Microcystis* and *Melosira* spp. as important components; a positive relationship between total diatom and total blue green algae abundance, particularly during the post-rainy season was observed. However, the predominance of diatoms generally occurred during periods of strong vertical mixing and that of blue green algae under relatively less mixed water column (post-rainy season). In addition, the fact that the lake is shallow and lacks marked thermal stratification has enabled it to have its own pattern of seasonality compared with other large African lakes.
From the study it was also surmised that seasonal variability of phytoplankton abundance was less at reduced or low latitudes.
Though hydrographic factors have been reported to have less effect on turbid lakes, internal changes in water quality (especially nutrient content) were influential in Lake Tana during the pre-rainy season. Generally the

lake had been characterized as oligotrophic by levels of algal biomass expressed in chlorophyll a content (Talling, 1986, Dejen *et al*., 2004; Elena *et al*., 2004) and this was positively corroborated by the study.

Phytoplankton seasonality was dominated more by hydrological and hydrographic changes. That is runoffs associated nutrient availability and internal mixing are the major factors for seasonality when compared with other physico-chemical parameters.
A number of studies were also carried out on water quality assessment of ground water and research ponds (Goraw and Akoma, (2010); Goshu and Akoma, (2011)). These studies provided valuable information on the physico-chemical conditions in the aquatic environments.

Goshu and Akoma (2010) investigated changes in nutrient composition of four on farm research fish ponds measuring 100m^2 in area and 1.5m depth and located on the North Eastern range of the Ethiopian highlands in the wet season. The ponds stocked with *Oreochromis niloticus* were categorized according to their sources of water; subsurface and surface waters. The study was aimed at investigating differences in physico-chemical characteristics and nutrient composition of the ponds.
Results showed that conductivity, total hardness, nitrate and ammonium were remarkably high in the subsurface water sourced ponds while temperature, turbidity, chloride, dissolved oxygen concentration and nitrite were high in the surface water sourced ponds. Higher turbidity in the ponds with water replenishment from surface water did not result in higher ionic concentrations and highly significant correlation between two nitrogen species (nitrate and ammonium) and dissolved oxygen in subsurface water ponds reinforced the overriding effect of management practices adopted by the farmers (which may include use of organic fertilizers and animal dung) rather than water source related factors in influencing the nutrient composition and material budget of the pond.

3.2 Water Quality Assessment Studies (Surface and Groundwater)

Vice Chancellor Sir, I have been fascinated by the aquatic habitat from my early rural upbringing. Water is the most essential requirement for all

living things. It is the most essential chemical substance for the survival of all known forms of life.
In Nigeria, a large number of rural and suburban dwellers derive their drinking water from groundwater and surface water resources such as rivers, lakes and reservoirs. Therefore, the quality of drinking water remains a critical factor in the Nigerian public health (FMWR, 2000). Earth is a "blue" planet and water is abundant, covering over three quarters of the earth's surface. More so, that Nigeria is among 80 countries of the world reported to be facing water deficit (Ahuja, 2012) calls for reliable information for effective management.

The concept of water quality is closely related to the use or utilitarian function of the water. Water quality is a measure of the suitability of water for a designated use based on set physical, chemical and biological parameters/characteristics. This explain why the quality of water for drinking food processing, industrial heating, irrigation, aquaculture, sports and recreation and potable water vary. Therefore, the physical, chemical and biological components of water vary with the specific use it is subjected to and there are regulatory standards prescribed by World Health Organisation, Environmental Protection Agencies like USEPA and Federal Ministry of Environment. Water bodies are monitored by limnologists and hydrobiologists to ensure that the set standards are met to support the designated uses. Routine and frequent monitoring is very necessary as advisory for public health interventions and pollution monitoring and abatement (Alloway and Ayres, 1993).
Water in the natural environment is also impacted by allochthonous and autochthonous factors. Global water availability is not uniform and has been used by global developmental agencies as an indicator of resource poor or underdeveloped nations.

In the course of my academic career several research output from our team presented interesting reports on the water quality of streams (Ekhator *et al*., 2011, 2014 and 2018), and groundwater Akoma and Uhunmwangho (2017).
Ekhator *et al*. (2011) undertook a comparative water quality assessment of five rivers located in Benin City and peri-urban areas between December 2001 and July 2002. The physico-chemical parameters

investigated were pH, turbidity, conductivity, total dissolved solids (TDS), dissolved oxygen (DO), nitrate and sulphate. Turbidity, pH, nitrate and sulphate values were significantly different in the rivers ($P<0.05$). Electrical Conductivity and TDS were positively correlated showing their over-riding importance in determining trophic status and nutrient content of the rivers studied. The rivers were remarkably low in nutrients and there was no discernible seasonal pattern in the variability of the parameters studied. Although most of the parameters measured did not exceed the WHO/FEPA standards for drinking water, it is recommended that water from these rivers must be treated to avoid possible health hazard.

The result also revealed a negative correlation between the anions (nitrate and phosphate) and the two parameters that were positively correlated (conductivity and TDS) (table 2). This means that the concentrations of both nitrate and phosphate decreased as total ionic concentration and dissolved solids increased thus underscoring the role of these anions in the overall ionic composition of the rivers. This could have been better corroborated if only total hardness was measured. Low sulphate values have also been reported for some Nigeria rivers (Omoigberale and Ogbeibu, 2007).

Table 4: Pearson's correlation coefficient of physico-chemical parameters

						Sulphate	
	pH	Cond.	DO	TDS	Nitate		phosphate
pH	1.000						
Cond	.295	1.000					
DO	-.537	.131	1.000				
TDS	.363	.933**	.037	1.000			
Nitrate	-.618	-.824*	.194	-.877*	1.000		
Sulphate	.097	-.710	-.486	-.702	.667	1.000	
Phosphate	-.349	-.814*	.095	-.793	.511	.186	1.000

** Correlation is significant at the 0.01 level (2-tailed)

The findings from this study presented comparative assessment of the rivers and provide necessary fundamental information on physical and chemical parameters, necessary for assessment of the impact of changes within the respective river basins in the future. Collection of systematic biological data on biodiversity using replicable, quantitative methods are recommended to provide the foundation for comprehensive studies for better understanding and management of aquatic resources in a sustainable manner. The study therefore showed that the five rivers investigated under the period were oligotrophic in nature with acidic pH and fluctuating physicochemical conditions without obvious seasonal pattern of variability. Akoma and Uhunmwangho (2017) investigated microbiological and physico-chemical characteristics of groundwater collected from GRA and Oliha quarters and surface water collected from Ikpoba dam and Ogba River, all in Benin City to ascertain their water quality, pollution load and suitability as sources of potable water. Microbiological analyses were carried out using pour plate method and most probable number (MPN) technique while physico-chemical properties were investigated using standard analytical methods.

Microbial colony counts were most prominent in Nutrient Agar medium with values ranging from 7 x 103 cfu/ml to 59 x 103 cfu/ml, while counts in MacConkey and PDA ranged from 5 x 103 cfu/ml to 40 x 103 cfu/ml and 2 x 103cfu/ml to 8 x 103 cfu/ml respectively. Bacterial and fungal isolates were *Bacillus* spp. *Klebsiella* spp. *Enterobacter* spp. *Micrococcus* spp. *Flavobacterium* spp, *Serratia marcescens*, *Aspergillus* spp and *Candida* spp. The MPN result ranged from 1.0 x10MPN/100ml to 30.0 x10 MPN/100ml. There was no record of fecal coliform count. Physico-chemical parameters were compared with regulatory standards from Federal Ministry of Environment for drinking water and they all fell within permissible limits except (Dissolved oxygen 28-30.55 mgl-1), total suspended solids (1644.5mg/l), and Biological oxygen demand (8.3-76.5). This study highlighted the socio-economic and public health implications of using these sources of water for domestic use. Constant monitoring is recommended to provide information on water quality and health guide.

3.3 Further Studies on Coastal Marine Environment

Mr. Vice Chancellor Sir, I am pleased to inform you that in the past three years I have provided consultancy service to the Marine Environment Management (MEM) Department of the Nigerian Maritime Administration and Safety Agency (NIMASA). The agency has a broad mandate which includes; effective Maritime Safety Administration, Maritime Labour Regulation, Marine Pollution Prevention and Control, Search and Rescue, Cabotage enforcement, Shipping Development and Ship Registration, Training and Certification of Seafarers, and Maritime Capacity Development. Using modern tools that guarantee efficiency and effectiveness, we are determined to develop indigenous capacity and eliminate all hindrance.

I have provided technical input in the project involving designation of marine Protected Areas (MPA) in the Nigerian maritime environment and involved in the Stakeholder Engagements/Workshop as a resource person. Currently I am participating in another stakeholder engagement on the implementation of International Convention on the Control of harmful Anti-fouling System on Ships. Marine biofouling is the undesirable accumulation of biological matter on surfaces of submerged objects such as ship hulls and pier pylons. There are over 4000 marine species that have been identified as biofouling organisms, all of which are sessile forms. These include bacteria, microbes, small invertebrates, algae, eggs, cysts and larvae of various species. Most of the biologic groups that form marine biofouling, also known as 'fouling community' are composed of algae, barnacles, mollusks, polychaetes, tunicates and hydrozoans. Among these, the barnacles and the mollusks (clams, oysters, mussels) present very rigid calcareous structures, which are difficult to remove and are referred to, along with some species of calcareous algae, polychaetes and bryozoans, as 'hard fouling'.

4.0 ACTIVITIES OUTSIDE CORE RESEARCH INTEREST

Mentoring and Professional Development

Mr. Vice Chancellor, I have supervised several undergraduate and postgraduate students projects and seminars and in the process mentored

so many on the path of academic success. I have also collaborated with a number of my junior colleagues in joint publications of our research output in reputable journals. Occasionally, those having challenges in making progress at their Ph.D programmes have received useful ideas and counsel from me. Academics is based on the tripod tenets of teaching, research and service. I have participated in several technical groups for curricular improvement at the National Universities Commission and also a member of the African Quality Assurance Network (AfriQAN). I have participated in several NUC prrogrammes accreditation exercises and was Chairman of the B.Sc. Botany Programme at Joseph Saruwan Tarka University, Makurdi, Benue State in 2022.
Human Capacity Building

I am a strong proponent of synergy between the academia and industry. There is enormous benefit derivable when quality research output from the universities and research institute find industrial application for the benefit of the larger society. Also, university teachers should from time to time be part of the industry by having hands-on experience of the principles and theories they teach thereby building robust teaching/industry experience. This synergy strengthens the instructional capacity of the teacher and also providing quality knowledge base for the industry players.

Mr. Vice Chancellor Sir, in 2015 I was opportune to participate in the Shell Petroleum Development Company (SPDC), Nigeria sabbatical programme. As a Research Adviser in the Environment Department, I was exposed to field monitoring and discussions on Various Environmental Studies and Services Contract (ESSC) issues, performance, challenges and the ways forward with respect to compliance monitoring. I acquired useful skills and immersed myself on the application of virtually every aspect of the oil and gas business and the opportunity of working in a world class business environment changed my perspective towards service oriented approach to academic matters. I was able to undertake several online courses at the Shell Online University (SOU) to acquire competencies in critical areas like; Impact Assessment, Biodiversity and Ecosystem Services, Medical Emergency Response, Data Privacy Knowledge Training, Anti-bribery Principles, Conflict of Interest and Code of Conduct.

Shortly after resumption from sabbatical leave, I was appointed the Head of Department, Basic Sciences. I quickly adopted a paperless policy at the departmental level as I mandated all staff to ensure all official communications are made through the university domain email addresses. This policy was carried to the faculty level when I was appointed Dean (the pioneer Dean of the Faculty of Science) in 2017. My desire and passion for excellence in the use of ICT in teaching, learning and administration and the immense value added to the university business caught the attention of the Vice chancellor – Prof. Sam Guobadia; and in August 2018, I was appointed the first academic Director of ICT in Benson Idahosa University, a position I hold till date.

Community Service

Service elevates and we rise by lifting others. There is an immeasurable reward that comes when one is able to provide impactful service to individuals, bodies, communities and under dispensations without seeking personal gain or reward. I strongly subscribe to the maxim that "Community service cures malaria". I have been involved in my early upbringing and seminary training that it is noble to seek the good of all men at all times. I was the Secretary General of Azumini Youth Association (Worldwide) 1994 – 1997. In this capacity I was a community youth opinion leader and championed various youth empowerment programmes and served as a role model to many struggling youths in my community.

My involvement in politics is also a fall out of my innate commitment to impact my community positively and be a positive voice for societal change and development. The time has come for good people, professionals and people with pedigree for service and minimal greed to occupy the political space for positive change. Everyone knows what the problems of Nigeria are but few are ready to take the bold steps to find solutions. You can hardly change the system by staying outside and not involved.

5.0 CHALLENGES

There are myriads of challenges encountered in carrying out research in

the subject area of Limnology/Algology. Environmental research and data gathering is a resource and logistics intensive activity. Boat hire, sampling equipment and laboratory reagents are not easy to come by.
There is need for fully equipped and functional research laboratories with Atomic Absorption Spectrophotometers, Gas Chromatography MS analysers and high precision microscopes for effective and reliable research outputs.
Lack of funding for field trips and routine monitoring of the aquatic environment is a major constraint.
We also observed that the prerequisite field sampling skills and technical competencies in the subject area is increasingly dwindling in the university system.

There are security risks associated in research in the internal and coastal waterways especially with increasing militancy and piracy in the creeks of the Niger Delta Region. There have been recorded cases of kidnap and fatalities associated with researchers on sampling trips.

6.0 RECOMMENDATION

.Vice Chancellor Sir, water is the most abundant resource in our plant and also a scarce resource in terms of availability of potable quality. There is a strong correlation between availability of good quality water and national development. Based on my studies on the estuarine and coastal marine environment and other areas of aquatic ecological research I wish to recommend as follows;

- An advocacy on increased awareness on the relevance of scientific research in water quality related studies based on well-established correlation between availability of good water quality, sanitation and public health.
- Constant and regular monitoring of inland and coastal waterways in Nigeria for compliance with regulatory standards of water quality and for controlled management strategies using appropriate legislations.
- The promulgation of laws to bring into force the institution of a Ministry of Waterfronts Development to manage and oversee the unique environment and the ministry will be

headed by a Limnologist, Algologist, Hydrobiologist or specialist Aquatic Biologist/Environmentalist.

- The earth is a “blue” planet as water covers about 80% of the planet. The potentials of “Blue Economy” are boundless - water helps lives to grow and supports sustainable living. Nigeria has potentials and scope for implementing the Blue Economy but strong political commitments, plenty of researches, societal awareness and attitude to optimize the dependency are required to achieve long-term sustainable prosperity. Let us today declare ourselves as the champion of the Blue Economy Concept and let the concept be the champion as well.

- I strongly recommend the designation of Marine Protected Areas in our coastal maritime environment. Just like we have forest reserves and designated flora and fauna sanctuaries in the terrestrial ecosystem, there is not an inch of the nation's inland, coastal or marine resources free from encroachment. UCN defines a 'marine protected area' as: "any area of intertidal or subtidal terrain, together with its overlying water and associated flora and fauna, historical and cultural features, which has been reserved by law or other effective means to protect part or all of the enclosed environment.
- I recommend that all endeavors, small or large, on and around the sea will be in line and following the Blue Economy Concept.

7.0 CONCLUSION

My Vice Chancellor Sir, I have in the course of this lecture, attempted to elucidate and arouse enough interest in the unique characteristics and environmental importance of phytoplankton – invisible dancers and nature's powerhouse in the ocean, rivers, streams, lakes, reservoirs and estuaries. I highlighted the significance of constant monitoring and evaluation of water resources, use and misuse of this abundant yet finite resource. This lecture has emphasized the importance on phytoplankton as primary producers in the aquatic environment and in combination with the physical and chemical component determine the quality of water for specific used.

I have shared my modest contributions towards the study of the ecology of coastal marine environment and estuarine systems especially in the Imo River estuary of south east Nigeria. The documentation of various phytoplankton assemblages recorded for the first time in scientific research literature.

I have also advocated for strong legislations to drive the pursuit of the 'Blue Economy' concept for harnessing the abundant resources available in the marine environment for national development. This coupled with the need to designate certain portions of the littoral environment as 'protected areas'.

My foray into the subject area of Limnology/Algology and aquatic ecology generally and the modest accomplishments made in my academic career as a teacher, researcher and human resource management in university system has added value to Benson Idahosa University in the past eighteen years. I am convinced that we can do more for the community and society at large by coming out from our cocoon and make positive changes for the benefit of mankind and as a Limnologist/Algologist my story is an integral part of this societal transformation.

"An investment in knowledge pays the best interest". Benjamin Franklin

8.0 ACKNOWLEDGEMENT

I return all glory, majesty and adoration to God Almighty for bringing me thus far. I most profoundly thank my parents Late Ven. Israel and Madam Manda Akoma for sparing nothing in making sure that my siblings (Dede, Nne, De Fe and Chi) and I lacked nothing while growing up and for providing us the most valuable assets in life – good education and the fear of God.

The President Bishop FEB Idahosa, Vice President Prof. John Okhuoya (who also doubles as my teacher), Vice Chancellor Prof. Sam Guobadia, Deputy Vice Chancellor, Prof. Johnson Oyedeji, Registrar Mr. Vinton-Okoedo Itoya, Bursar Dr. Gladday Igweagbara and University Librarian Dr (Mrs) Rosemary Odiachi are roundly appreciated for providing the convivial atmosphere for robust academic pursuit for both staff and students of Benson Idahosa University.

I am eternally grateful to my academic father, mentor and life coach – Professor Fred 'Idiem Opute and his amiable and graceful wife Mrs.

Esther Opute for their care, love and guidance. I am privileged to be instructed under your tutelage. It is never easy coping with a perfectionist, it's a case of 'many are called but few are chosen'. Prof. Medina Omo Kadiri also is of worthy mention as my guiding light and compass throughout my professional and career journey. My teachers in the Department of Botany, University of Benin are worthy of mention too and they include, Prof. John Okhuoya, Prof. J.F. Bamidele, Prof. Obi Anoliefo, Prof. A.E. Ogbeibu, Prof. Mcdonald Idu, Prof. T.O.T. Imoobe. My old school colleagues like Prof. Emma Ukpebor, Prof. F.I. Okungbowa, Prof. Mike Omoigberale, Prof. Dennis Vwioko, Mr. Tom Okonkwo, Mr. Akin Ogunsanmi (Jelenge), Mr. Peter Batey (Skill), Chief Ambrose Oyovwe (Olorogun), my bosom friends and roommates, Chief Franklin Igbodo, John Daukoru and Chief Philip Onwuka (Young Money). May God bless you all for being part of my success story.

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At this juncture I would like to salute my political family and members of the Action Peoples Party (APP) starting with my principal and boss – Sir Mascot Uzor Kalu (APP Governorship candidate in the 2023 General Election), all state and Local Government Area Executives and the campaign team. We ran a wellcoordinated campaign and moved a little known political party to National prominence. Our Leader – Sir Mascot Uzor Kalu (Enyi Abia), I salute you specially. I thank you for the opportunity to be on a joint ticket with you as the Deputy Governorship candidate of our great party in the 2023 general elections. The trust you bestowed on me and love and kindred spirit between us is worthy of emulation.

My native Ndoki community structure is based on the age grade system and this is applicable to many igbo communities in Nigeria. The entire members of the Uke George of Azumini Ndoki, I greet you! My Chairman, Comrade Ekwueme Nkagbu, Secretary, Hon. Emeka Waribo and all the village Chairmen are also given special accolade here. My brother from another mother, Captain Okey Nwagbara (Oboski), Enyinna Akarahu (Maan), Pastor Emeka Emuchay, Pastor Osondu Dents (Ghandhi), Dr. Chichi Nwajei, Dr. Chike Okogwu, Dr. Dakuku Peterside, Mr. Somiari Halliday, Chief Echefulachi Onyema, Mr. Dinne Nwagboso, Amaech Agunwa (Azeez), Mrs Ihuoma Olughu (Starlady), Mrs. Ezinne Onyegbule, Chief (Barr.) and Mrs. Joseph Dents, and others. I love you all. My long time children friend and brothers, Chiedozie Njoku (Ghana), Chief Eke Aja, John Okonkwo, Charles Ngeme Akoma and my very dear best and lovely brother – Maduforo Nwankwo (Adeshina), you are simply the best! My second family and in-laws of the Reginald Ekeke family are specially appreciated too – Emeka, Ebuzor, Oluchi and Chisindi.

I will conclude my appreciation by thanking God for giving me a loving and stable family. My parents did well raising us in a Godly way and gave us good home training and morals to last for a life time. My father, Late Venerable Israel Akoma was a consummate teacher and a bearer of the light of practical Christian faith. Referencing Prof. Chiji on father's day (2013), *"Papa. Everything I know about the mystery of faith, the wonder called grace; everything I know about humility so powerful that it cripples; everything I know about the arts-poetry, theatre, folklore, music, language-so rapturously delightful that it is hedonistic; everything I know about; love as dust best expressed unspoken; everything....."*

My mother who is seated here today Madam Manda Akoma, a retired school teacher has always sacrificed for us her children, coming through for us at times of need. Mama, "Nne ndi Professor", today Chiji and I can stand tall in our academic careers as Professors of English and Afro-diasporic Literature and Limnology/Algology and we are happy to have you as our mother. We love you and God bless.

My parents did well, however, my wife – Ijeoma - finished the work by molding me to this person standing here today. About three decades ago she saw my potentials and stuck with me; with all my faults and imperfections and my dear wife, I owe you a debt of gratitude for being my strong pillar of support. You and Miekikem are the driving force behind my striving harder for success and pushing boundaries. I love you with my life!

For everybody here today, I thank you for coming and God bless us all.

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PREVIOUS INAUGURAL LECTURES

S/N	NAME OF LECTURER	LECTURE TOPIC	DATE
1.	Professor Johnson Olajide Oyedeji	Bricks with Little Straws: How efficient are the meat and egg-type chickens?	27 July 2010
2.	Professor R. A. Masagbor	Language: A Complementarity of Being	17 April 2012
3.	Professor A. A. Borokini	Female Genital Mutilation: The Nexus between Anthropology, Law and Medicine	19 May 2015
4.	Professor Ernest B. Izevbigie	From Growth Biology to HIV associated Neuropathy to the Discovery of Anti-Cancer Agents: Economic Implications	8 December 2015
5.	Professor Andrew O. Oronsaye	The Anatomy of Nigeria Federalism and the Physiological Imperatives for Sustainable Development	22 March 2016
6.	Professor Rex O. Aruofor	Economic Systems Engineering- Poverty, Unemployment and Underdevelopment: A Quest for Solution and Imperatives for Developing the Nigerian Economy	6 March 2017
7.	Professor Sam Guobadia	It's the Environment	19 October 2017
8.	Professor (Mrs.) Clara Leyibo Igeleke	Microbes The Good and The Bad, and The Fascinating: Man the Effective Manager"	26 November 2019

9.	Professor (Mrs.) Nora Omoregie	Educational Administration and Quality of Products of the school system	2 April, 2021
10.	Professor Duze Chinelo Ogoamaka	Nigeria's Legacy in Education, Nigeria's Education System and Sustainable National Development: Thought for Food	13 July 2022
11.	Professor Theresa Uzoamaka Akpoghome	Taming the Beast: IHL in a Bleeding Environment	26 July 2022
12.	Professor Alexandra Esimaje	Because War is much too serious to be left to the Military, Corpus Linguistic is a thing and it is a very Useful Thing too	18 October 2022
13.	Professor Mark Osamagbe Ighile	The Poet Prophetic Voice in the Wilderness of our Time: an Oral, Literary and Biblical Prognosis	8 November 2022
14.	Professor Augustine E. Akhidime	Financial Gatekeepers, Watchdogs and Bloodhounds in the Eyes of the Storm of Public Trust; and the House that is Divided Against Itself	22 November 2022
15.	Professor Ehimen Pius Ebhomielen	Take Responsibility: Comprehensive accountability culture is mandatory for all and sundry	13 December 2022

16.	Professor Kingsley Osamianmionmwan Obahiagbon	From Medieval to Modernity: Odyssey of an Information Scientist (informatics)	17 January 2023
17.	Professor Frederick Omonkhegbe Joseph Oboh	Exploration and modification for better Utilization: Adding value to plant based resources for nutritional, medicinal, and industrial applications	21 February 2023
18.	Professor Taidi Ekrakene	The paradoxical life of insects: The testimonials of an entomologist.	28 March 2023.
19.	Professor Godwin O. Oboh	The Same Difference between the Media and Politicians has implication for Nigerian Elections.	18th April, 2023
20.	Professor John O. Ohiorenoya	Management Fads: The Human Factor	25th April, 2023
20.	Professor (Mrs) Mabel O. Ehigiator	Humanity is the Salt of the Physical Universe from Subatomic Particles to Universal Space. The Testament of a Physicist	9th May 2023