OBAFEMI AWOLOWO UNIVERSITY

ASSESSMENT OF THE IMPACT OF LAFENWA MARKET WASTE ON THE ZOOPLANKTON AND PHYTOPLANKTON DIVERSITY IN OGUN RIVER, ABEOKUTA, OGUN STATE, NIGERIA

BY

ALARA FOLASADE ABIDEMI

B. Sc. (ZOOLOGY)

SCP10/11/R/0012

A THESIS SUBMITTED TO THE INSTITUTE OF ECOLOGY AND ENVIRONMENTAL STUDIES, OBAFEMI AWOLOWO UNIVERSITY, ILE-IFE, NIGERIA, IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE AWARD OF THE DEGREE OF MASTER OF SCIENCE DEGREE IN ENVIROMENTAL CONTROL AND MANAGEMENT.

2014

OBAFEMI AWOLOWO UNIVERSITY

CERTIFICATION

This research project was supervised and approved in accordance with the partial fulfilment for the award of Master of Science (M.Sc.) Degree in Environmental Control and Management, ObafemiAwolowo University, Ile-Ife, Nigeria.

_____ _____

Prof. I. E. Ofoezie Date

(Supervisor)

_____ _____

Prof. A.A. Awotoye Date

Director

DEDICATION

I dedicated this work to God almighty, my creator, the one that knows the beginning and the end of this research work and has never cease to be there for me

AND

To my ever supportive parents,Mr and Mrs J.O Alara. You are the best

ACKNOWLEDGEMENTS

My profound appreciation goes to my supervisor, Prof. I.E. Ofoezie, for his untiring assistance rendered to me and his rigorous corrections made during the course of this research work. I am sincerely grateful sir.

I also appreciate my director Prof. O.O. Awotoye, and all my lecturers Dr. M.B. Adewole, Dr. A.A. Okoya, Dr.Omodanisi, Dr.Kayode for their assistance and impacting more knowledge into me

To my wonderful parents Mr and MrsAlara and lovely siblings Funmilayo, Bukola, Yewande, Monisola and Frances thank you very much for your unending word of encouragement, prayers and financial support. I love you all.

My gratitude also goes to Mr.Akinola of Central Science Laboratory, Mr.Aduwo of Zoology Department, Mr.Olayiwola chairman canoe drivers, Ogun River and to all the technologist of central science laboratory and zoology department for dedicating their time and energy to me during the course of this research work.

I want to appreciate my friends David Ossai, Ife Daramola, AdelabiOlolade, TomiOjo and colleagues especially AdesanyaMicheal and OlorunfemiTitilayo for always being there for me and never letting me down. I really appreciate you guys.

And to everyone that their names has not been mentioned and has contributed immensely to the successful completion of this research work. Thank you all very much

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

Figure

ABSTRACT

This study investigated types of waste generated and patterns of waste disposal in relation to activities in Lafenwa market, Abeokuta, Ogun State, Nigeria. It also characterised the abundance of plankton species and physico-chemical properties in the adjoining Ogun River. This was with a view to determining the impact of market waste on the physico-chemical and biological quality of the receiving river.

A preliminary survey of the market was carried out to determine patterns of daily activities in different sectors of the market. A structured questionnaire was administered on 5% of randomly selected individuals from each sector to collect information on the type of waste generated, and patterns of disposing such waste. Polythene bags were assigned to each selected individual to collect waste generated for six consecutive days. The bags were retrieved each morning and waste weighed using a standard weighing balance. Plankton samples were collected from eight sampling stations (two upstream, three within the market, and three downstream) once every three months for 12 months and analysed for plankton species diversity and number. Twenty litres of each water sample was strained through a fine meshed plankton net (mesh size = 45 µm) to a concentrate volume of 30 ml and preserved with 5% formalin solution. Water samples for the analysis of physico-chemical properties were collected in 2-L plastic bottles and returned to the laboratory and analysed using both instrumentation and non-instrumentation methods. Data were analysed using ANOVA and correlation coefficient.

Ninety-nine of 150 selected respondents (66.0%) disposed their waste directly to dumpsite and 22.7% directly to Ogun River. The major types of waste generated were polythene, vegetables, food waste, smoke/ashes, paper/carton, waste water and chaff. Rice milling sector generated the heaviest mean waste weight of 1,527.5 kg and saloon sector the least (6.95 kg).

The differences were statistically significant at $p < 0.05$. Seven genera and thirty-seven species of phytoplankton recorded were Bacillariophyta and Chlorophyta (14 species each), Cyanophyta (5 species), Chrysophyta, Dinophyta, Euglenophyta, and Rhodophyta (1 species each). The most abundant phytoplankton was *Skeletonemacostatum* (54.68 ± 19.49 org/m^3), while the least was *Gyrosigmafasciola* (1.56 ± 1.56 org/m^3). Similarly, four genera and 10 species of zooplankton were recorded namely, Rotifers (4 species), Copepoda (3 species), Insecta (2 species), and Cladocera(1 species). The most abundant zooplankton were *Chaoborussp* (31.25 ± 10.4 org/m^3), while the least was ***Eudiaptomussp*** (4.69 ± 2.62 org/m^3). Phytoplankton species abundance decreased from upstream to downstream while zooplankton followed an inverse direction. The peak abundance of biological indicators of pollution (*Oscillatoriasp* 87.5 ± 37.5 org/m^3, *Nitzchiasp* 62.5 ± 36.29 org/m^3, *Brachionusdimiadiatus* 41.67 ± 14.86 org/m^3 and *Euglena* sp 6.25 ± 6.25 or/m^3) was recorded at the market area while the least upstream (29.17 ± 37.5 org/m^3, 33.33 ± 17.77 org/m^3, 0 ± 0 org/m^3, 4.17 ± 4.17 org/m^3) respectively. Mean biochemical oxygen demand ranged from 2.90 ± 0.40 mg/l (upstream) to 6.80 ± 1.92 mg/l (market) while the dissolved oxygen ranged from 3.80 ± 0.41 mg/l (upstream) to 5.00 ± 0.73 mg/l (market). The correlation coefficients showed both negative and positive statistical significance between plankton species and some physico-chemical parameters.

The study concluded that the peak abundance of biological indicators of pollution at the market area was a clear indication of pollution due to direct waste disposal to the river.

CHAPTER ONE

INTRODUCTION

1.1 Background to the Study

Man in an attempt to satisfy his daily needs, engages in the production of goods and services, in the process waste is generated. Man has always generated waste materials which are either bye-products of his activities, for which he could not find any use, or products which have reached the end of their useful life (Syed, 2006). Although this has been the trend throughout the ages, it was seen not as a problem until recently when human production wastes seem to have surpassed natural purification processes. Nature has the capacity to deal with waste through dispersion, dilution and degradation processes. For instance, wastes dumped into rivers are washed away quickly and diluted to a point where they constitute no threat to water quality. Also wastes left on land, decay by spontaneous chemical and physical degradation processes. However, as the dump persists in quantity and frequency, natural balance becomes adversely affected. This is because the natural degradation processes are slow and can take care of only limited amounts and specific kinds of wastes (Syed, 2006). Many items considered as waste include household rubbish, sewage sludge, packaging items, discarded cars, old television sets, garden waste, old paint containers etc. These are generally classified as commercial, municipal, manufacturing, construction and demolition, electrical and electronic and agricultural waste depending on their origin. Wastes from market are very variable because nearly all materials are sold and bought in different markets. Market waste may either be biodegradable e.g vegetable, food waste, paper, cardboard, animal, and wood waste e.t.c, or non-biodegradable for example, tyres, plastic, electronic component, polythene nylon and metals e.t.c.

In Nigeria, there are several markets which generate all kinds of waste, most of which are disposed off indiscriminately into drainage systems, dumpsite or nearby water body. According to Eludoyin *et al.,*(2004) various types of waste generated from Oja titun market include fresh vegetable, plastic bags, animal dung, decaying food stuff, metal scraps, meat waste, and waste water from grinding and washing of various items. Lafenwa market is also one of the numerous markets in Nigeria that engages in all kinds of trading activities such as food stuff, tailoring, abattoir, vegetables, fruits, electrical and electronics appliances e.t.c, each of these generate different types of waste ranging from polythene, plastics, cans, papers, vegetables, fruits, decayed food, electrical, and meat waste.These are mostly disposed off into dumpsites, an adjoining river or directly into the river (Olalekan *et al*., 2012). Dumping of waste into water bodies has the potential to seriously affect the natural characteristics of the river.For instance abattoir waste produces large amounts of suspended solid, liquid waste and odour generation in water bodies (Gauri, 2006). The ecological implications of waste disposal into surface water such as rivers include alteration of water quality parameters from environmental background levels which in turn result in upsetting the ecological equilibrium of water bodies and exerting acute toxic and chronic effects on resident organisms. Chemical toxicants directly and/or indirectly affect the life processes of flora and fauna of a water body (Kumari*et al.*, 2006; Krishnan *et al.*, 2007). Planktons are very sensitive to the environment they live in and any alteration in the environment leads to change in the plankton communities in terms of tolerance, abundance, diversity, and dominance in the habitat. Therefore, plankton population observation maybe used as a reliable indicator for bio-monitoring studies to assess the pollution status of aquatic environment. The planktons comprises of microscopic plants and animals known as phytoplankton and zooplankton respectively. They are the primary producers and consumers in water, and are therefore very essential for the maintenance of population stability in the aquatic

environment. Their growth, distribution and abundance area affected by some biotic and abiotic factors such as temperature, salinity, food availability, predation, competition, and presence of hazardous substances (Beyst *et al.*, 2001). Thus changes in these factors will affect their ecological balance. Since waste dump in waterwhich may be biodegradable or hazardous can facilitate changes in the physico-chemical properties of water as well as factors that affect planktons in water. Therefore, it is important to determine the type of waste potentially dumped in rivers and its effects on planktons and water quality. Hence, this study was designed to determine the effect of waste from Lafenwa market on the plankton of Ogun River.

1.2 Specific Objectives of the Research:

The specific objectives of the study are to:

(a) determine the types of waste generated in Lafenwa Market;

(b) determine the pattern of waste disposal in the market;

(c) characterize the abundance of plankton species in the river water, upstream and downstream Lafenwa Market;

(d) characterize the physico-chemical properties of the river; and

(e) examine the relationship between plankton diversity and physico-chemical quality of the river water.

1.3 Statement of the Research Problem:

Dumping of waste in flowing water has detrimental effect on the chemical and biological characteristics of receiving waters. Municipal wastes are biodegradable and may contain hazardous substances that may affect plankton species diversity and distribution. Information on the effect of waste generated from Lafenwa market on the biological quality of the receiving Ogun River in Abeokuta, Ogun State, Nigeria is not readily available, hence this study.

1.4 Expected Contributions to Knowledge

The study will provide information on waste generation and management in the study area, and the effect of these wastes on the biological quality of Ogun River