A STUDY OF THE SPATIAL AND TEMPORAL DIVERSITY AND ABUNDANCE OF PLANKTONIC FLORA AND FAUNA OF OPA RESERVOIR, ILE-IFE, SOUTHWEST, NIGERIA

Oluseun Peter BOLAWA

B. Sc. (Zoology) (Ife)

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ABSTRACT

The study investigated the spatial and temporal distribution, composition and abundance of plankton in Opa reservoir, Obafemi Awolowo University, Ile-Ife, Southwest Nigeria over a period of an annual cycle (November 2012 to October 2013). This was with a view to providing a more recent catalogue of plankton flora and fauna and an update on the trophic status of the reservoir.

Quantitative net plankton were collected monthly from both the surface and bottom levels at the three sampling stations established at the damsite, mid-lake and riverine part of the reservoir. The preserved samples were examined and enumerated in the laboratory using light compound microscope at low power magnification (×100) and the scaled pictures of the organisms taken. Relevant and appropriate identification keys were used for the identification of the recorded planktonic species. The data obtained were subjected to descriptive and inferential statistics using SPSS version 21. The trophic state of the reservoir was also determined using Ejsmont-karabin's Trophic State Index.

A total of eighty-two (82) species of phytoplankton and fifty-four (54) species of zooplankton were recorded from the reservoir. The highest number of phytoplankton species was recorded for Bacillariophyta (31 species, 37.80%) followed by 15 species (18.29%) of Cyanophyta and 12 species (14.63%) of Chlorophyta. A total of sixteen phytoplankton species showed significant seasonal variation during this study period while only seven had significant spatial variation ($p \leq 0.05$). Notable bio-indicator phytoplankton species recorded were *Anabaena circinalis*, *Anabaena flos-aquae*, *Microcystis* sp., *Aphanocapsa litoralis*, and *Microcystis aeruginosa*. Other

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pollution indicator phytoplankton species recorded were *Synedra ulna*, *Oscillatoria agardhii*, *Phacus* sp., *Surirella* sp., *Closterium* sp., *Aphanocapsa* sp., and *Euglena* sp. The order of Zooplankton abundance was Rotifera (57.41%) > Arthropoda (33.33%) > Protozoa (5.56%) > Ciliophora (1.85%) = Cnidaria (1.85%). Of all the zooplankton recorded, four species had significant spatial variation while nine displayed seasonal variations during the study period ($p \leq 0.05$). Rotiferic species, which dominated the zooplanktonic fauna were *Anuraeopsis fissa*, *Keratella tropica*, *Filinia* sp., *Brachionus angularis*, *Brachionus calyciflorus*, *Trichocerca* sp., and *Polyarthra* sp.

The study concluded that Opa reservoir, which is rich in phytoplankton notably Bacillariophyta (diatoms), Cyanophyta (blue-green) and Chlorophyta (green algae), as well as Rotifera (zooplankton), could be classified as a eutrophic lake.

Keywords: Planktonic flora / Fauna/ Reservoir/ Spatial/ Temporal diversity

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CHAPTER ONE

INTRODUCTION

1.1 Background information

The term 'Plankton', the singular of which is 'plankter' is derived from the Greek word *planktos*, an adjective meaning "errant" or "drifter" and by extension, "wanderer". It generally refers to aquatic organisms, both marine and freshwater, that flow with the current of water because they are too small or too weak (Suthers and Rissik, 2009). Plankton are found moving with the flow of their water habitat, some by the use of appendages. However, there are a few ones that are capable of swimming hundreds of meters laterally upwards in the large water body (Rajjak and Bapurao, 2013).

Several literatures show that plankton are not limited to the freshwater habitats but are also found in marine environments and can be found both in lotic and lentic waterbodies including lakes, ponds, rivers and streams (Fernando, 1980; Suthers and Rissik, 2009). Plankton are much more abundant in the sea where almost every existing phylum is represented (Rajjak and Bapurao, 2013). Plankton including copepods, invertebrate larvae, arrow worms, and as large as jellyfish could be found in the pelagic zones of the oceans constituting major indicators of presence of other higher life forms in a water body because many fishes depend on them and therefore are critically important food source in the aquatic ecosystems (Wetzel, 2001). Planktons occur in various sizes from very small ones to relatively larger ones. The planktons that produce their own food are referred to as phytoplankton (flora) while other planktons that feed on phytoplankton are called zooplankton (fauna). Plankton can also be classified according to their lifestyles. Some only live part of their lives as plankton (usually the larva stage), these

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are referred to as Meroplankton (e.g. larvae of sea urchins, starfish, crustaceans, marine worms, and most fish) while those who spend their whole lifetime as plankton are called Holoplankton (e.g. most algae, copepods, salps, and some jellyfish) (Wikipedia, 2014).

Phytoplanktons synthesize their own food, some through photosynthesis, making use of sunlight in converting inorganic nutrients to more useful organic products, making them the main source of nutrition to the zooplanktons and fishes that feed on them (Welch, 1992; Suthers and Rissik, 2009). By their position at the base of the aquatic food web, they stand as the most important factor of production in the aquatic ecosystem (Moshood, 2009). The zooplanktonic fauna feeds on the phytoplanktons and the food chain continues to some pelagic fish species, especially at their juvenile stage, while those that are obligate zooplanktivores feed on zooplankton and do so solely for their survival (Varpe and Fiksen, 2010). The death of planktons leads to their settlement on the bottom portion of the waterbody, serving as a nutrient base especially for aquatic plants and benthic (bottom-dwelling) organisms such as barnacles, bryozoans, sponges, mussels, and hydroids (Goulding, 2008). Therefore, the presence of phytoplankton in reservoirs goes a long way in determining the sustainability and productivity of most aquatic habitats. The growth significance and sustainability of any ecosystem is largely accounted for by the diversities of plankton and their abundance, and both factors are related and do change as their interaction is influenced by the environment and population processes (Benedict and Gabriel, 2012).

Phytoplankton includes Divisions such as Chlorophyta, Euglenophyta, Cyanophyta, Chrysophyta and Pyrrophyta, while Zooplankton Phyla, according to Imoobe (2011) include Rotifera, Copepoda, Cladocera and Ostracoda. Plankton composition is affected significantly by seasonal variations, by anthropogenic activities including the land use of

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