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Research Paper

Diversity of Limnoplanktons in Two Fresh Water Lakes of Ethiopia

Biology

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ABSTRACT

Limnology as understood today as study of structural and functional relationships as well as productivity of organisms in inland aquatic ecosystem regulated by the dynamics of their physical, chemical and biotic communities. Study of ecosystem regulation is a perennial theme in ecology and from such studies we know that communities are influenced by a variety of physical, chemical and biological factors.

An inland lake or pond is a "self conditional institution" or "closed community "enjoying considerable independence of the adjacent land mass. But due to rapid industrial and urban development some of the physiographical features of these fresh water bodies have under gone rapid changes causing much damage to the floral and faunal diversity. Study of Limnoplankton is of paramount importance since these serve as food for many larger organisms forming important link in the food cycle.

Studies pertaining to systematic studies are getting low in recent periods. Rather much emphasis is now being given to specialized studies. The extinction of several species in aquatic environment is now an alarming omen in future to come. Present investigation is small attempt to understand the aquatic diversity of two of the rift valley Lakes of Ethiopia.

Introduction

Ethiopia, among all the African countries is quite unique for its geo-geographic conditions, rich water resources, extensive green fields, varied animal husbandry and over all, diversity of flora and fauna. The Ethiopian rift valley also known as the Afro-Arabian rift is one of the greatest East African rift valleys that divides the Ethiopian highlands in to north and south halves. The volcano-tectonic basin so created as a result of faulting millions of years ago, later modulated in to beautiful lakes. There are several fresh water lakes found embedded in this basin, among them the most prominent are e.g., the Lake Abaya, Chamo, Koka, Beseka, Ziway, Abijata, Shala and Lake Hawasa.

Present study was made on two fresh water lakes i.e., Lake Hawasa and Lake Abaya found in the central Ethiopian Rift Valley separated by a distance of about 100 km. The species composition especially that of limno-planktons of both of these Lakes were explored in the present investigation.

Area of Investigation

The Hawassa Lake is situated 275 km away from the capital city Addis Ababa of Ethiopia towards the south near the city Hawassa, the capital city of Southern Province (SNNPR) that lies in between 6° 33› - 7° 33› N and 38° 22' - 38° 29' E. The Lake stretches 16km from the north east to south west direction and extends 8 km from north-west to south east direction having an approximate water volume 1.3 billion meter cube (45.9 billion ft^3). The maximum depth of the Lake is 21.6m (70.9 feet) with mean depth however is 11m (Elias Dadebo, 2000). The catchment has a total area of 1455 km^2 of which 93.6 km^2 is the surface area of Lake that may increase up to 99.3 Km^2 in the rainy season. The annual net groundwater outflow from Lake Hawassa to adjacent basins is estimated at 58 ×106 m^3 (Yemane Gegziabiher, 2004, EFASA-2013).

The Lake Abaya on the other hand is one of the biggest lakes in Ethiopia situated near the city Arba Minch that lies in between Lat: 6 º 20' N; Long: 37 º 50' E east of the Guge mountains at an altitude of 1268m above sea level in the same state of SNNPR. Lake Abaya is 60 kilometers long and 20 kilometers wide and has a surface area of 1160 km^2. It has a maximum depth of 13 meters and is at an elevation of 1268 meters (Baxter, 2002).

Sampling

Water samples plankton analysis were collected between November, 2013 to March 2014 by dipping a wide plankton net of mesh size of 45 microns just below the surface of water in open condition. For quantitative analysis, of plankton a sub-sample of one ml. was quickly drawn with a wide mouthed pipette resembling that of a stempel pipette and poured into a counting cell similar to that of Sedgwick rafter cell of one ml. capacity and all the organisms of the aliquot were counted. However, when there was a bloom, counting was done only in selected squares in random from which total numbers per liter of water could be calculated. The classification and the identification of planktons were made possible by the available literature.

Plankton fauna

There were large varieties of species related to both phyto as well as zooplankton flora and fauna scattered in both the lakes respectively.

Phytoplanktons

Cyanophyceae (Cyanobacteria)	*Raphidiopsis sp.* *Psuedoanabaena sp.* *Planktolyngbya sp.* *Nostoc sp.* *Microcystis aeuroginesa* *Cylindrospermopsis africana* *C. curvispora* *Aphanizomenon sp.* *Anabaenopsis sp.* *Anabaena circinalis*
Bacillariophyceae (Diatoms)	*Cymbella sp.* *Fragilaria crotenensis* *Mellosira variance* *Navicula cryptocephale* *N. rostellate* *Navicula oblonga* *Nitzschia vernicularis* *Nitzschia sp.* *Surirella sp.* *Synedra sp.* *Thalassiosira sp*

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Chlorophyceae (Green algae)	*Chlamydomonas reticula* *Coelatrum sp.* *Cosmarium sp.* *Cyclotella sp.* *Pediastrum boryanum* *Pediastrum typicum* *Pediastrum graccilium* *Pediastrum duplex* *Pediastrum simplex* *Pediastrum biwae* *Phacotus lenticularis* *Spirogyra sp.(3 types)* *Scenedesmus accuminatus* *S. dimorphus* *S. armatus* *S. quadricauda* *S. acutus*
Dinophyceae (Dinoflagellates)	*Peridinium sp.*
Cryptophyceae (Cryptophyta)	*Cryptomonas obvata*
Euglenophyceae (Euglinophyta)	*Phacus longicaudar* *Lepocincilis sp.*

Zooplanktons

The lakes were basically dominated by large populations of Rotifers, Copepods, Cladocerans and Dipterans (*Chironomous*) insects. The Cilliophorans especially the *Paramecium* population was also represented by quite a good number of species.

Rotifera

Asplanchna seiboldii
Asplanchna brightwelli
Brachionus calyciflorus
B. caudatus
B. fulcatus
B.bidentata
B. quadridentata
Cephalodella gibba
Filinia longiseta
Fillinia sp.
Keratella cochlearis
K. tropica
K. valga
Lecane luna
L.bula
L. papuna
Polyarthra sp.
Testudinella sp.
Rotatoria vulgaris
Pompholyx sulcata
Trichocera elongate

Copepoda

Thermocyclops consimili
Mesocyclops aequatorialis
Mesocyclops sp.
Phyllodiaptomous
Cladocera
Diaphanosoma excisum
Moina micrura
Ceriodaphnia sp.

Ostracoda

Heterocypris sp
Strandesia sp.

Diptera (*Chironomidae*) :

Chironomous larva

Conclusion

In Lake Abaya, among the phytoplanktons the species belonging to chlorophycea and diatoms were most dominant followed by the other algal populations namely Blue green algae, Spirogyra, Mugotia, Euglena, *Planktolyngbya* and green algae. The zooplankton population basically composed of *Cyclopoid copepods*, *Celanoid copepods*, and rotifers especially species belonging to *Moina, Daphnia, Brachionus, Keratella, Diaphonosoma, Chironomidae larvae and Plecoptera* were recorded in higher number in Lake Abaya. Where as in case of Lake Hawassa the green algae were dominant compared to other phytoplanktons. The distribution and abundance of zooplanktons was basically depending upon the species composition and population of specific phytoplanktons. The climate and weather in Hawassa was much variable than that of Lake Abaya, the reason why there was greater variation in species composition in Hawassa than Abaya, where a single type of species was observed to be predominant for over a period of time.

The Lake bed was dominated with plenty of diatoms and cyanobacterians while the littoral zone was scattered with rich composition of chlorophycean algae. Much of the pelagic fauna was dominated by copepods, cladocerans and rotifers. The species composition of zooplanktons was found to be highly variable in Lake Abaya than to that of Lake Hawasa. It may be due to long stretch of Lake Abaya or non contamination of domestic as well as industrial wastes. The high population of crocodiles and fishes also might have contributed in such direction.

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