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Benthic Invertebrates Diversity and Relative Abundance in Boye Pond, Jimma Zone South Western Ethiopia Muzeyin Abde and Eba Alemayehu

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ABSTRACT

Benthic macro fauna and meio fauna include those biotas that spend a significant portion of their life in the bottom of the water. The present study, aimed at comparing both of the macro and meiofaunal organisms as bio indicator of boye pond. A total of three sampling station were selected for collection of samples used for determination of the taxonomic composition, abundance and diversity of benthic invertebrates. Samples were taken using sample corer. Standard dichotomous key was used for identification of the organisms. Water temperature, power of hydrogen (pH) and dissolved oxygen were measured during the study period. The average temperature of the pond was 23.57°C, pH 6.46 and dissolved oxygen (DO) was 5.18 mgL-1. The study clearly revealed that the abundance and diversity of macro benthos and meiobenthos fauna differed in such a way that macro fauna communities are most abundant and highly diverse groups unlike meiofauna communities in Boye pond. Among the benthic fauna nematodes were found to be the most numerous and diverse groups both in the meiofauna and macro fauna communities. Due to growing urbanization and expansion of Jimma town towards the pond, there is strong anthropogenic impact on Boye pond which needs further investigation on the benthic fauna.

Key words: Meiobenthos, Macrobenthos, Diversity, Relative Abundance and Boye Pond.

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INTRODUCTION

Benthic invertebrates are common in habitants of lakes, stream, and rivers where they are important in moving energy through food webs. Benthic organisms usually inhabits bottom substrates for at least part their life cycle. Among them macro invertebrate communities play a vital role in linking the transfer of energy from primary producers to fish, and in turn fish biomass and production have correlatation with macro invertebrate biomass and production (Richardson *et al.*, 2002).

Benthic macro invertebrates species are deferentially sensitive to many biotic and abiotic factor in their environment, consequently macro invertebrates community structure has commonly been used as indicator of the condition of an aquatic system (Armitage *et al.* 1983; Rosenberg and Resh, 1993).Benthic invertebrates being widely spread and sensitive to environmental changes and therefore most often these organisms used for assessment of quality of freshwater lakes and river (Reice and Wohlenberg, 1993).

The use of macro invertebrates for assessment and monitoring of lake conditions is minimal in Ethiopia. In Ethiopian even though not frequently used there are some studies on benthic macro benthos distribution, abundance, diversity and water quality assessment and environmental degradations (Tudorancea and Harrison, 1988; Tilahun and Harrison, 1989; Baye sitotaw ,2006; Dereje Tewabe ,2009, Betael Assafa ,2010; Habiba, G and Seyoum, M, 2012). Even though, there is a growing interest of using macroinvertebrates for water quality assessment in Ethiopia there is still less attention is given to the meiobenthos fauna for characteristics assessment and monitoring of lakes, ponds and rivers conditions. Therefore this study tried to assess the abundance and diversity of both meiobenthos and macrobenthos fuana in boye pond, Jimma zone, south western Ethiopia.

MATERIAL AND METHODS

Jimma town is the capital town of Jimma zone which is located 353km away from Addis Ababa. Boye pond is found in the periphery of Jimma town which is located at $07^{0}40'N$ and $36^{0}60'E$ of altitudes and longitude respectively. The average maximum and minimum T^{0} is 28.8°c and 11.8°c respectively with a mean daily T^{0} of 19.5°c (CSA, 2005). The study was conducted from March to June, 2012.

Different materials and equipments were used to sample sediment from the study site. Sample corer was used to sample sediment (mud) for sampling biota and sieves with 1mm and 0.25 mm opening mesh sized sieves were used to separate macrofauna from meiofana communities. The sediment sample was collected from three sampling stations namely station A, B, C and from each stations three replicate sediment sample were taken (A^1 , A^2 , A^3 , B^1 ,... and up to C^3).

To assess the water physico-chemical properties in situ measurements were made at three different sampling sites. Some of the physico-chemical parameters that were examined include water temperature (⁰C), pH and Dissolved oxygen (DO) (mg/L).

Dissolved oxygen, pH and water temperature were measured in the field using a multi-probe meter (HQ40d Single-Input Multi-Parameter Digital Meter). Air temperature was measured by mercury thermometer. The samples were thoroughly mixed by water in a bucket and then dispense over 1mm and 0.25 mm sieve at least for three times. The contents from the sieves were separately placed into bottles, 4% formalin was added to preserve the organisms and were brought to Jimma University Biology department Zoological sciences laboratory for identification.



Fig 1. Map of the study area

RESULT AND DISCUSSION

Water temperature, power of hydrogen (pH) and dissolved oxygen were measured during the study period. The average pond temperature was 23.2^oC and power of hydrogen (pH) value 6.46 and the value of dissolved oxygen (DO) was 5.18 mgL-1 (Table1).

Physico-chemical parameters	Mean
Temperature (^o c)	23.57
рН	6.46
Dissolved oxygen (DO) in mg	5.18

 Table 1. Some physico-chemical parameters in Boye pond.

From the study site 20 meiofauna organisms were collected and among these nematodes were with the highest abundance (35%) followed by crustaceans (35%), annelid (15%) and water mite net-wing midges and crawling water beetles with (5%) in boye pond (Fig. 2)



Fig. 3 Dominance rank of meiobenthos fauna in Boye pond.

The highest dominant organisms (Fig 3) are nematodes and crustacean from meiobenthos fauna approaching about 70% of the total community and annelids followed with15%. The remaining communities together add up to 15% of the total communities.



Fig. 4 Macrobenthos fauna abundance in Boye pond.

From the sampled sediments in the study area about 42 species of macrofauna were identified (Fig. 4). From these nematodes (19.05%) found to be the highest followed by the larvae of macro fauna (11.9%). The least abundance which comprises 2.38% each were dens flies , coleopteran, caddis flies, dipteral, water mite, dragon fly water penny, water scavenger beetles and giant water bugs.



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The highest dominant organisms among macrofauna were also large sized nematodes with 19.0% followed by larvae of macro fauna 11.9%. (Fig 5.) Most studies in Ethiopian lakes and ponds focused on macrofauna community (Tudorancea and Harrison, 1988; Tilahun and Harrison, 1989; Habiba, G and Seyoum, M, 2012) also revealed the diversity of macrofauna in different water bodies. In most of the studies in Ethiopian lakes and ponds meiofauna community were understudied and not given much emphasis. In this study we have tried to compare the relative abundance of meiobenthos community in comparison with the macrobenthos community in the study site. We believe that longitudinal study should be conducted so as to compare the impact of seasonal variations in benthos communities in the study site. Moreover, because meiobenthos fauna have great densities and relatively high metabolic rates, these small forms of benthic groups should also be critically examined to clearly demonstrate the benthos diversity and community structure. Moreover the impact of anthropogenic activity and expansion of Jimma town towards Boye pond and its adverse effect on the benthic groups in this water body should deserve attention and need further investigation.

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