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DISTRIBUTION OF SOIL AND LITTER FAUNA IN THREE DIFFERENT HABITATS IN WAGA NATURAL FOREST RESERVE IN KALUTARA DISTRICT, SRI LANKA

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INTRODUCTION

The soil and litter fauna play an important role in nutrient cycling and alteration of soil structure. Further soil and litter animals are responsible for organic matter decay, nutrient fluxes in soil and the decomposition of litter. Forest soil represents an ecosystem comprising of water, solids, dissolved minerals, organic matter and a vast community of living organisms. Fertile top soil is mans valuable natural resource forming the life sustaining layer of the earth. The surface covering of soil which is particularly due to the leaf fall. Which is a layer of semi decomposed plant materials known as the litter layer. Both litter and soil make favorable habitats for many living organisms. (Anderson,1983) Litter has an important influence on the soil below and it provides continuing source of humus and helps to maintain moisture in the soil. (Edwards and Lofty,1977) The faunal diversity in litter and soil varies according to the physical and chemical factors of soil and litter as well as climatic and seasonal variation patterns of the environment.(Edirisinghe, 1997) Many animals associated with soil and litter temporally or permently are referred to as soil and litter fauna. (Richard, 1966). The animals live either permanently or temporarily beneath the surface of soil or among the litter make valuable contribution to the soil ecosystem. (Curry,1985)

The soil contains remarkably diverse population of arthropods. Their population reaches its greatest complexity and abundance in undisturbed habitats such as forest and woodlands. (Bahuguna,1991) Removal of the arthropods from the soil has shown that decomposition can be significantly reduced in their absence. Therefore arthropods are very important community in soil and litter fauna.

This study was undertaken with the following objectives; to identify the litter and soil animals in three habitats, to estimate the population density in relation to each animal group, to determine the relative abundance of animal groups in three study sites and to study the seasonal variation of soil and litter fauna in three study sites in the forest reserve. This type of information is virtually not available in Sri Lanka, and this is the first attempt on this aspect in the *Indikada* Forest Reserve. The ecological and biological data collected will further form a basis for future management of the *Indikada* Forest Reserve (*Waga*), Sri Lanka.

METHODOLOGY

Three microhabitas were selected in the *Indikada* Forest Reserve as the study sites, namely disturbed site (the site which is interfered by the human activities), undisturbed site (the site which is not interfered by the human activities) and riverine site (the site which is adjacent to the river). In each study site 50m x 50m plots were selected for sampling. During the study period (September 2010 – April 2011), monthly samples of litter and soil were collected, using standard quadrat method. (0.2m×0.2m×0.1m) In each plot four soil and four litter samples were collected in a stratified random way. Additional samples were collected to determine the chemical properties (soil pH, soil moisture) and physical properties (soil temperature, wind speed, light intensity) were measured at the spot using field instruments.

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The soil and litter samples were investigated by extraction method, floatation method and Winkler's sieving method (for litter) to extract the animals and they were identified and classified by using standard keys. (Brown,1978, Harris et.al.,1984, Bland and Jaques,1978) Identification and classification was done up to order level, but in some cases family level identification was done.

RESULTS AND DISCUSSION

The study identified animals belonging to four phyla namely,Nematoda, Annelida, Mollusca and Arthropoda. But Nematoda and Mollusca were found in very low numbers (24-58 N/m^2).Arthropods showed vast diversity than other phyla. The mean population density of arthropods were significant (P=0.609) than the nematode(P=0.008), annelid(P=0.0213) and mollusca(P=0.013). Undisturbed site recorded the highest density of soil and litter animals (1800 number per square meter N/m^2) than the riverine and disturbed sites. (1705 and 1035 N/m^2) this is because the favorable conditions support high density of species. Collected arthropods belonged to major taxonomical groups representing Class Symphyla, Isoptera, Hymenoptera and Coleoptera.

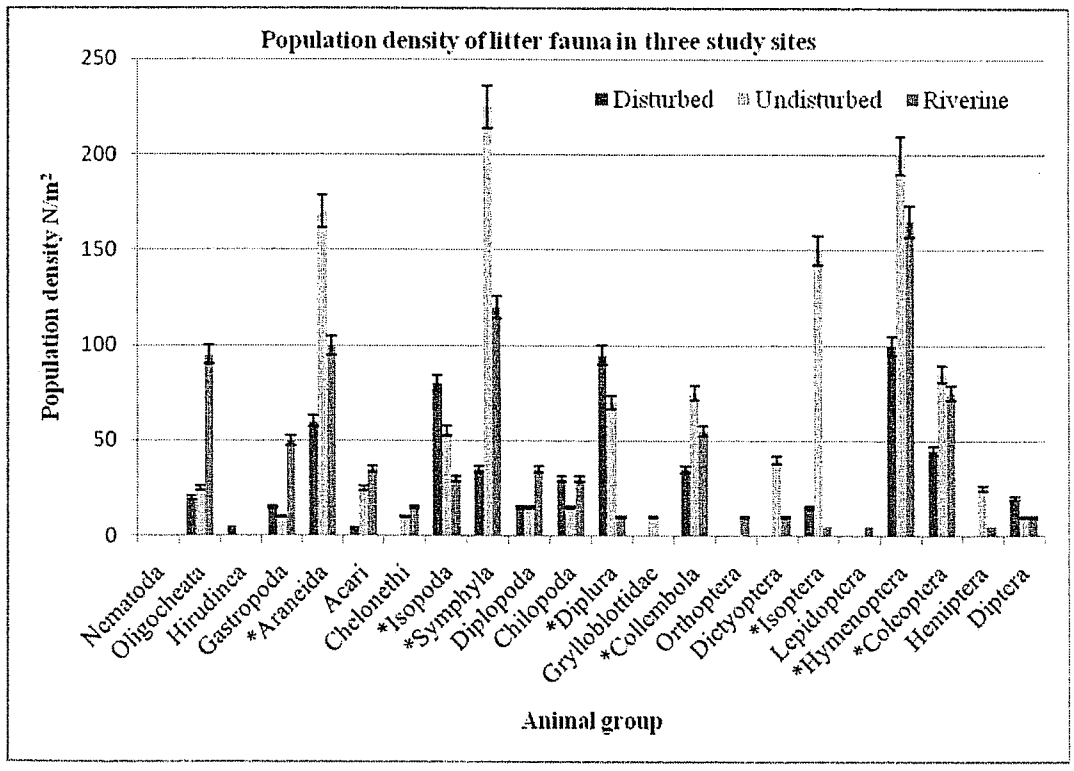

FIGURE 1.1-POPULATION DENSITY OF LITTER FAUNA IN THREE STUDY SITES. * P>0.05 ANIMAL GROUPS WHICH SHOW A SIGNIFICANT DIFFERENCE IN DENSITY.

According to the Figure 1.1, Araneida, Isopoda, Symphyla, Collembola, Isoptera, Hymenoptera and Coleoptera account most of the individuals in all three study sites. The mean population densities of these classes were significantly higher than the other classes present in the litter.

In Figure 1.2 animal groups Symphyla, Chilopoda, Isoptera, Hymenoptera and Coleoptera in soil showed significantly high mean population density.

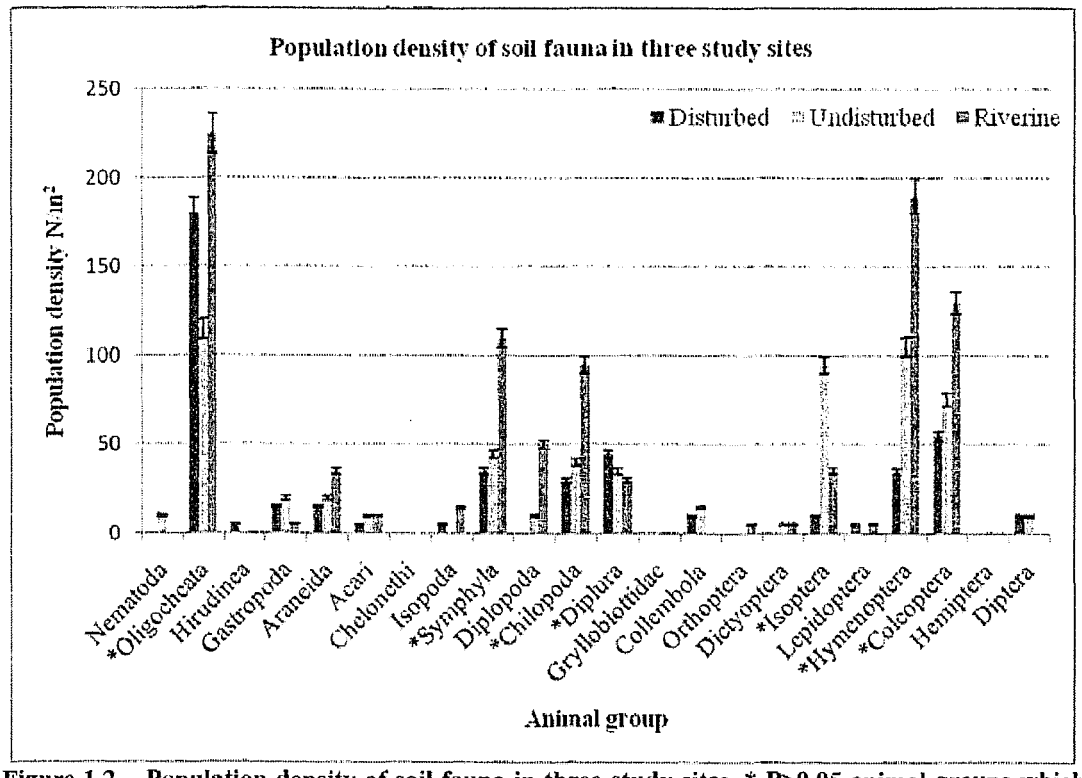

Figure 1.2 – Population density of soil fauna in three study sites. * P>0.05 animal groups which show a significant difference in density.

According to the identified samples, Coleopterans were classified up to the family level and ten Coleopteran families were identified. In all three study sites adult and larval forms were observed.

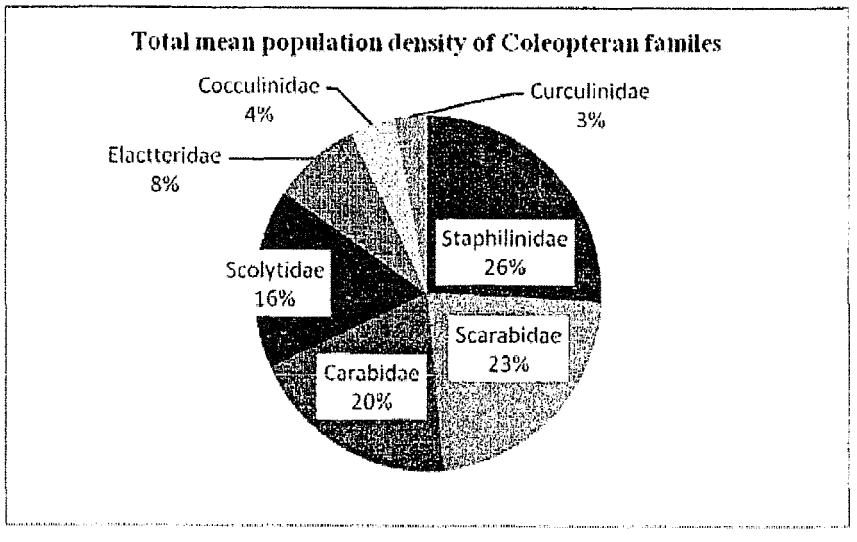

Figure 1.3- Total mean population density of Coleoptera according their family level.

This shows that most dominant Coleopteran families are Staphilinidae, Scarabidae, Carabidae and Scolytidae, and their mean population density was significantly higher than the other families.(P>0.05) The least dominant Coleopteran families Phyrochoridae,Chrysomilidae and Cerembycidae were not considered, because they found in very low numbers.

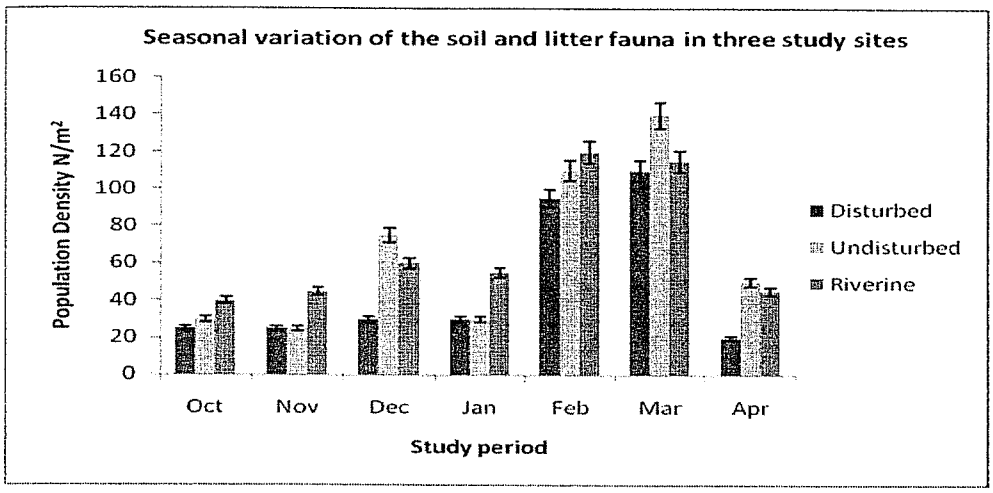

Figure 1.4-The seasonal variation of the soil and litter fauna in three study sites during the study period.

Fig 1.4 shows the mean population density of soil and litter fauna in three study sites during the study period. This shows population density was high in February and March. The seasonal variation of soil and litter animals was associated with changing physical conditions. The rainfall significantly correlated with the population density ($P>0.05$, 95% confidence level)

CONCLUSIONS

The population density of soil and litter fauna is closely related to habitat type. (disturbed, undisturbed and riverine sites) High population density was recorded in undisturbed site. Also number of species of the litter fauna was higher than the soil fauna. In all study sites Coleopterans were recorded and adult Coleopterans were more numerous than the larval forms. The correlation between the rainfall and the population density of soil and litter fauna has significantly correlated with the population density. i.e. population density increases when rainfall decreases.

REFERENCES

Anderson,J.M. (1983) Nitrigen and cation release by macrofauna feeding on leaf litter and soil organic matter from deciduas woodlands, Soil boil.Biochem.15: 463-467.

Bahuguna,V. K. (1991) Tropical forest ecosystem soil fauna in sub tropics, International Book Distributors, India.

Brown,AlisonLeadly(1978) Ecology of soil organisms, Heinemann Educational Book Ltd, London.

Edirisinghe,E.A.D.N.D.,(1997) (M.Phil. Thesis) Comparative study of soil and litter arthropods fauna in Singharaja wet zone forest and Sigiriya dry zone forest in Sri Lanka.

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