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Abundance and Diversity of Tree and Insect Species in International Institute of Tropical Agriculture Arboretum and Forest Reserve

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Introduction

Forests throughout Nigeria and the rest of the tropical countries are diminishing at an alarming rate in land coverage over the past fifty years. The natural forests in Nigeria are increasingly but being depleted through the indiscriminate extraction of economic trees and encroachment on forestland for other purposes like agriculture, urbanization and industries. Deforestation has been attributed to be the aftermath of various activities of man in the bid for economic development. The over-exploitation of the existing tropical forest resources and the disappearance of economic and other important hardwood species is a threat to global biodiversity, conservation and abundance of insect species and this is an issue of great current concern. The great threat to global biodiversity and conservation now leads to the introduction and establishment of Arboretum in some research institute in the world.

Agricultural and urban extension has been occurring at the expense of native ecosystems and the landscape made up of the forests, woodlands, croplands, and grasslands. The cumulative effects of this expansion have produced serious global environmental and social problems, including loss of biodiversity and extreme poverty of people living in the more vulnerable areas. One solution to these problems is to plant and manage our trees species that are within our forest estate. Trees provide a range of benefits, including the potential to restore degraded ecosystem, provide wood, other non- woody products such as food and medicines, and to render environmental and other socio-economical services.

The importance of trees in addressing these problems is clearly demonstrated in traditional tree-based agricultural farming and land use systems, such as shifting cultivation in the humid tropics, fallow systems and grazing in the semi-arid savannah areas. Research during the 1970s and 1980s has shown the important role of trees in structuring landscapes and improving land productivity. However, trees outside forests received little attention from decision and policy makers until the Kotka meeting in 1993, which adopted the concept. The meeting defined trees outside forests as trees found on non-forest or wooded lands such as those occurring in agricultural or urban areas or along roadways. Their importance has become more apparent since that meeting and the ideas have been abandoned that they only make sense for small-scale farmers or have just ornamental or scenic functions in urban centers. Thus, it is therefore necessary to assess the influence of natural forest and arboretum on diversity and abundance of tree and insect species grow in the IITA in other to develop a well meaningful conservation measure for sustainability of the forest estate.

Insect Collection and Identification

Insect collection was carried out within each of the demarcated sample plots in each forest habitat used for the research and the sampling was targeted on all the free living insect herbivore foraging during the day time of the each selected forest ecosystem. These insects include leaf-chewing (e.g Lepidoptera and Orthoptera) and sap sucking insects (Hemiptera). Insect sampling was carried out monthly for a period of six months; an average of 30 minutes was spent at each collecting station. Hand picking was used to collect crawling insects on the ground and on the trees. An insect Para taxonomist was employed and field assistant was used for the recording on the field. All insect species were classified into families and orders. The frequencies were obtained to ascertain species abundance/richness.

Data Analysis on Forest Habitat

All tree and insect species that were encountered in each forest habitat were classified into families and their frequencies of occurrence were also obtained to ascertain species abundance, richness compositions and species evenness. The following biodiversity indices were used to obtain species richness and evenness within each forest ecosystem in IITA. They were also used as indices for comparing biodiversity among the different forest ecosystems. Student t-test was used to compare the different between the two forests habitats used for this study.

Abundance of Different Tree Group

Shows the average number of trees in each of the groups sorted into family. The most abundant groups were mimosasae, papilionaceae, moraceae and apocynaceae (e.g. Albizia lebbeck, Albizia zygia, Funtumia elastica and Milicia excelsa). Together, these groups of trees counted for 61.40% of the total number of tree groups. The next abundant group were Sterculiaceae, Sapindaceae, Annonaceae, Bignoniaceae and Anarcardiaceae and the least value were recorded from Lauraceae, Rhamnaceae, and Samydaceae. Each group is considered separately below:

Mimosaceae: This family is having the highest abundance in the arboretum and highest species were encountered in the same habitat compare to the natural forest.

Papilionaceae: This is second highest in terms of abundance and species encountered during the study in the study sites. Its highest abundance was recorded from the arboretum.

Anacardiaceae: Higher abundance with higher species was recorded from the natural forest compare with the arboretum.

Annonaceae: Higher abundance with higher species was recorded from the arboretum compare with the natural forest.

Apocynaceae: Higher abundance with higher species was recorded from the natural forest compare with the arboretum.

Bignoniaceae: This is having high abundance and higher species was encountered from the natural forest.

Bombaceae: This family was higher in abundance in the arboretum while two species were encountered in the two study habitats

Boraginaceae: None of this family were found in the natural forest while only one species was encountered in the arboretum with less abundance.

Chrysobalanaceae: None of this family was found in the natural forest while only one species was encountered in the arboretum with less abundance.

Combretaceae: None of this was found in the arboretum while only one species was encountered in the natural forest.

Dipterocarpeceae: None of this family was found in the natural forest while only one species was encountered in the arboretum with less abundance.

Ebenaceae: Two species were encountered in the arboretum and only one in the natural forest with less abundance in the two study sites.

It was observed from this study that, higher abundance of insects were recorded in the arboretum habitat than in the natural forest habitat, this may due to pattern of planting the arboretum, the trees were planted in groups. It can therefore be deduced that habitat fragmentation and distribution factors contribute to environmental complexity, and this may have impacted structural integrity and diversity of the habitat studied. Greater amounts of coarse woody debris that was found in the two study habitats could have influenced the similarity of insect diversity observed in this study. This observation is supported by Lattin, and Hutheson and Jones who noted that terrestrial arthropod diversity including that of homopterous could be influenced by coarse woody debris. This was found to be the critical component of structural diversity, and is greater in the natural forest habitat, the habitat with higher diversity, followed by the arboretum.