ASUU Journal of Science
A Journal of Research and Development
Vol. 2, No. 1, December, 2014 pp. 47-54

QUANTITATIVE ANALYSIS OF A FOREST FRAGMENT IN OLOKEMEJI FOREST RESERVE, NIGERIA

Aderopo Akinsoji

Abstract

A phytosociological analysis of a forest fragment in Olokemeji Forest Reserve, Nigeria was carried out using point-centred quarter method. Eighty trees belonging to 19 species distributed in 12 families were sampled. The more important/dominant species on the basis of Importance Value ranking were Manilkaraobovata, Sennasiamea and Anogeissuslieocarpus. The dominance of a few species reflected the early successional status of the forest fragment.

INTRODUCTION

Olokemeji Forest Reserve (OFR); Nigeria's first Forest Reserve was established around 1900 (Onokerhoraye, 1985). It lies on 70° 25' N and 3° 32' E at approximately 32km W of Ibadan in Oyo State and 35km NE of Abeokuta in Ogun State. It covers an area of 7,124ha of which,1,088ha is savannah (MacKay, 1933). The reserve lies at the boundary of a mixed deciduous forest and derived savanna on its northern fringe and contains both savanna and high forest species in equal proportions (Udugba, 1977). The derived savanna is characterized by burning, shifting cultivation, grazing and hunting (Akinsoji and Sowemimo, 2005). The soil formation is derived from a pre-cambrian basement complex of banded biolite gneisses with granite intrusions. This has an overlaying layer of alluvial deposits along river courses and floodplains. The reserve is situated on an undulating topography between 90asl to 140asl except for the ridge where the altitude rises up to 240asl. Over the years,Ogun River had cut its course through the ridge thus separating it into two

peaks hence the name Olokemeji (which means two hills in Yoruba language). The climate is tropical with the rainy season that spans between March and November while the dry season runs from November to March. However, there is a brief dry, cold spell of harmattan between December and January. Figure 1 shows the climatic data for Forestry Research Institute, Ibadan (the nearest meteorological station to the Reserve). The general features and vegetation of the reserve has been described by Hopkins(1962).

Vegetation description of such a reserve can be either qualitative or quantitative. Qualitative methods include checklists, life forms or growth forms description and stratification. The limitations of such description methods have been stated in Dombois and Ellenberg (1974), Akinsoji *et al,* (2003), Mueller-. In quantitative methods, vegetation data are objectively collected and analysed. The two types of quantitative methods are count plot methods (CPM) and plotless or distance methods (DM). CPM involves use of quadrats, point interception and line interception. Plants that occur in the plots are counted and other measurements are used to estimate species abundance, frequency and cover. The merits and demerits of CPM have been stated by Greig-Smith(1964), Mueller-Dombois and Ellenberg (1974), and Smith(1974). Distance methods have been described by Cottam and Curtis(1956),and Mueller- Dombois and Ellenberg, (1974). Of the four DM methods described, Cottam and Curtis (1956) reported Point-Centered Quarter (PCQ) to be the most efficient. They are less laborious, time conserving and they eliminate personal errors in estimating the parameters being studied (Akinsoji *et al*, 2003).

Some studies already reported for OFR include those of MacKay (1933), Charter and Keay (1960), Hopkins (1962, 1963, 1965, 1968), Ola-Adams (1980), Adegeye and Ayodele (1992), Akinsoji (1992), Akinsoji and Obadina (2004), Akinsoji and Sowemimo (2005), but none has been reported on quantitative analysis of the forest. The observation informed the basis for this study with the objective of providing a quantitative analysis of a forest fragment in OFR using PCQ method.

Methodology

This study was carried out in a forest fragment in the NW corner in OFR. The forest fragment is surrounded by savanna, plantations of *Tectonagrandis*, *Gmelinaarborea*, transition woodland and River Ogun to the north. A baseline was established parallel to the forest-woodland ecotone. A point was randomly located near one end of the baseline where a transect was located. Nine other transects were located at intervals of fifty meters from the first transect. Two sampling points were randomly located along each transect thus making a total of twenty sampling points. Each sampling point was taken as the origin of the PCQ method. The terrain was divided into four quarters. The distance between the origin and the nearest tree in each quarter was measured and recorded. The tree was identified and the girth at breast height was recorded. A plant is regarded as a tree if its girth at breast height is more than 15 cm. The trees that could not be identified in the field were brought to the University of Lagos herbarium for identification and confirmation.

With PCQ, the three parameters required to determine importance of species are density, frequency and size (measured as girth of the tree). The data collected was used to calculate these parameters for each species sampled. Then, relative density, relative dominance and relative frequency were computed following Mueller-Dombois and Ellenberg (1974) and Akinsoji et al. (2003).

Results and Discussion

The fragmented forest is open due to human interference and contains many gaps filled with grasses, forbs and tree seedlings (Table 1). A total of 80 trees belonging to 19 species distributed in 12 families were sampled. The tree density was calculated to be 711/ha. The actual density could be higher than the calculated value as Akinsoji *et al.*, (2003) and Skarpe (1990) had shown that PCQ underestimated species richness and absolute densities of tress. As a result rarer species tend to be missed out during sampling (Akinsoji *et al.*, 2003). Thus, relative values of the measured parameters are used in phytosociological analyses to determine the importance values (IV) of species as indicators of their dominance status in the community. The phytosociological analyses of the forest fragment

are summarized in Table 2. The more important species in order of magnitude of their IV were *Manilkaraobovata, Sennasiamea*, and *Anogeissuslieocarpus*. The ranking of the species not only reflected their abundance but also their size and distribution on the landscape (frequency). As a result of dominance of a few species, the Shannon-Weiner Index (Shannon and Weaver, 1962) of diversity is expected to be relatively low indicating the early successional status of the forest fragment.eson

References

Adegeye, A. O. and Ayodele, I.A. (1992.) The effect of fire on the soil nutrient, microorganism and seed microorganisms of Olokemeji Forest reserve, Nigeria.*The Nigerian Journal of Forestry*22:11-14.

Akinsoji, A. (1992.) Studies on epiphytic flora of a tropical rainforest in southwestern Nigeria II: *Bark microflora. Vegetatio* 92:181-185.

Akinsoji, A. and Obadina, O. (2004.) Studies on epiphytic flora of tropical rainforest in Southwestern Nigeria III. Bark mycoflora. *Nigerian Journal of Botany* 17:104-107.

Akinsoji, A. and Sowemimo, E. (2005.) Effects of prescribed burning on bacterial and fungal communities of top soil in Olokemeji Forest Reserve, Nigeria.*TheEkologia* 3(2):13-19.

Akinsoji, A, Ayanbamiji, T. and Durugbo, E.U. (2003.) Comparative phytosociological analysesin the GashakaGumti National Park, Nigeria using point-centred quartermethod and quadrat methods. *Nigerian Journal of Botany* 16:133-143.

Charter, J.R. and Keay, R.W.J. (1960.) Assessment of Olokemeji Fire Experiment 28 years after institution.*Nigeria Forestry Information Bulletin* No. 3. 32p

Cottam, G. and Curtis J.J. (1956.) The use of distance measures in phytosociological sampling. *Ecology*37:451-460.

Hopkins, B.J. (1962.) Vegetation of Olokemeji Forest Reserve, Nigeria. General features of the reserve and research sites. *Journal of Ecology* 50:690-705.

Hopkins, B. (1963.)The role of fire in promoting the sprouting of savanna species.*Journal of West African Science Association* 7:154-162.

Hopkins, B. (1965.) Observations on savanna burning in Olokemeji Forest Reserve, Nigeria.*Journal of Applied Ecology* 2:367-381.

Hopkins, B. (1968.) Vegetation of Olokemeji Forest Reserve, Nigeria V.The vegetation of the site with special reference to the seasonal changes.*Journal of Ecology* 56:97-115.

Mackay, J.H. (1933.) Report on the enumeration of Olokemeji Forest Reserve. Forest Department, Ibadan, Nigeria. (Unpublished report)

Mueller-Dombois, D. and Ellenberg, H. (1974.) Aims and methods of vegetation ecology.John Wiley and Sons.Inc. New York. 547p

Onokerhoraye, A. (1985.) An outline of Human Geography.The Geography and Planning Notes.Dept.of Geography and Planning, University of Benin.

Shannon, C. E. and Weaver, W. (1962.)The mathematical theory of communications. University of Illinois Press,Urbana.

Skarpe, C. (1990.) Shrub layer dynamics under different herbivore densities in an arid savanna, Botswana.*Journal of Applied Ecology* 28:873-885.

Udugba, I.A. (1997.) The effects of forest fires on the growth of a tropical low-land rainforest. A thesis submitted in partial fulfilment for the award of Master of Tropical Science (M.Sc.Forest Trop.) degree of the faculty of Forestry and Ecology, Georg-August University Gottingen. 97p

Acknowledgement

Many thanks to Ogun State Director of Forestry and his staff especially Messrs Otesile, Alamu, and Awen who facilitated the field work.

Table 1. Species composition of sampled plots and their numbers.

Species	Family	No.
Afzeliaafricana	CAESALPINOIDEAE	1
Albiziaferruginea	MIMOSOIDEAE	1
Anogeissuslieocarpus	COMBRETACEAE	7
Danielliaoliveri	CAESALPINOIDEAE	2
Delonixregia	CAESLAPINOIDEAE	1
Diospyrosmespiliformis	EBENACEAE	5
Lonchocarpussericeus	PAPILIONOIDEAE	2
Lophiralanceolata	OCHNACEAE	1
Malacanthaalnifolia	SAPOTACEAE	4
Manilkaraobovata	SAPOTACEAE	32
Margaritariadiscoidea	EUPHORBIACEAE	1
Mitragynaarborea	RUBIACEAE	1
Polysphaeriaarbuscula	RUBIACEAE	2
Psydraxsubscorpioidea	RUBIACEAE	1
Pterocarpus erinaceous	PAPILIONOIDEAE	1
Santalum album	SANTALACEAE	1
Sennasiamea	CAESALPINOIDEAE	12
Sterculiatragacantha	STERCULIACEAE	3
Zanthoxylumzanthoxyloides	RUTACEAE	2

Table 2. Phytosociological Analysis of a forest fragment in Olokemeji Forest Reserve, Nigeria.

SPECIES	RDe	RF	RDo	IV
Manilkaraobovata	40	27	26.6	93.6
Cassia siamea	15	15	13.45	43.45
Anogeissuslieocapus	8.75	10	7.6	26.35
Diospyrosmespiliformis	5	8.3	4.3	17.6
Malacanthaalnifolia	5	6.7	5.83	17.53
Sterculiatragacantha	3.75	5	1.54	10.29
Lonchocarpussericeus	2.5	3.3	2.1	7.9
Danielliaoliveri	2.5	3.3	1.81	7.61
Zanthoxylumzanthoxyloides	2.5	3.3	1.34	7.14
Polysphaeriaarbuscula	2.5	3.3	0.61	6.41
Delonixregia	1.25	1.7	0.83	3.78
Margaritariadiscoidea	1.25	1.7	0.79	3.74
Afzeliaafricana	1.25	1.7	0.65	3.6
Mitragynaarborea	1.25	1.7	0.64	3.59
Lophiralanceolata	1.25	1.7	0.35	3.3
Canthiumlongiflora	1.25	1.7	0.34	3.29
Pterocarpuserinaceus	1.25	1.7	0.3	3.25
Albiziaferruginea	1.25	1.7	0.26	3.21
Santalum album	1.25	1.7	0.26	3.21

RDe = Relative Density
RDo= Relative Dominance
IV = Importance Value
RF = Relative Frequency

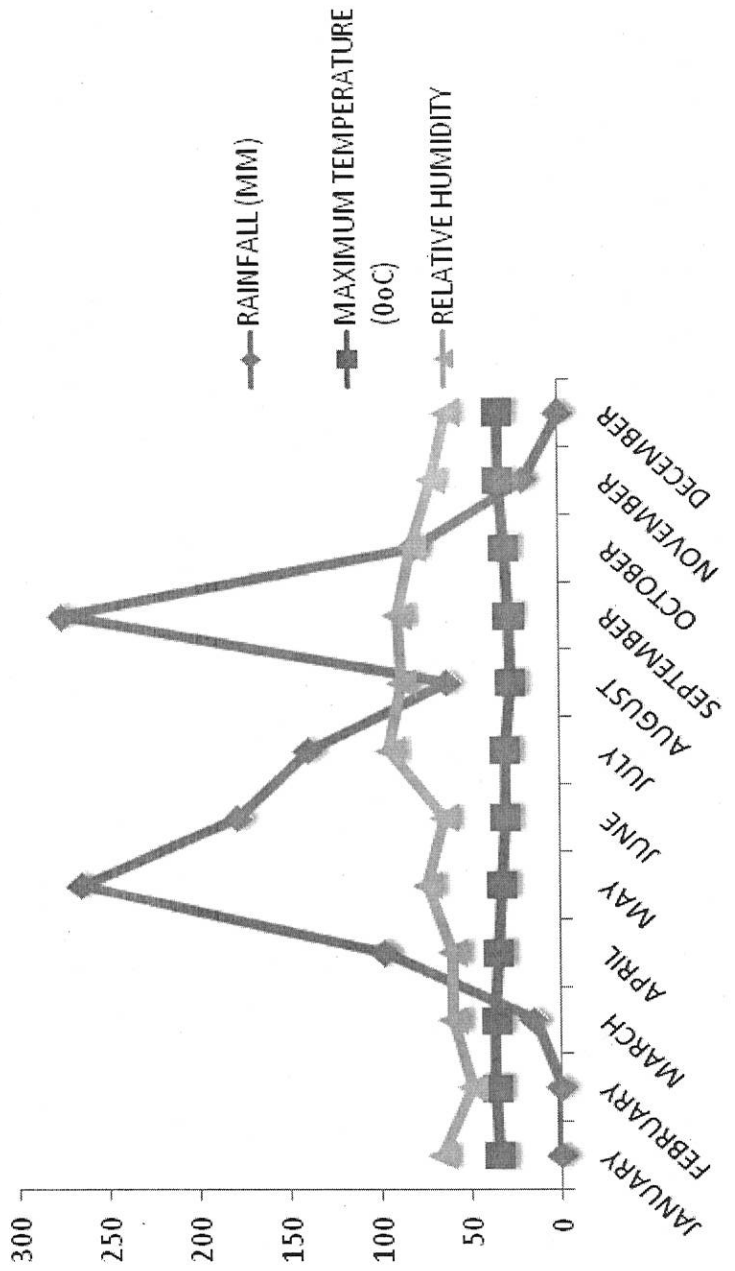

Fig. 1.Climatic data for Forestry Research Institute, 2002.