

## Quantitative Analysis of a Forest Fragment in Olokemeji Forest Reserve, Nigeria

Aderopo Akinsoji  
Department Of Botany, University Of Lagos.  
Email: [aderopoakinsoji@yahoo.com](mailto:aderopoakinsoji@yahoo.com)

### Abstract

A phytosociological analysis of a forest fragment in Olokemeji Forest Reserve, Nigeria was carried out using point-centred quarter method. 80 trees belonging to 19 species distributed in 12 families were sampled. The more important/dominant species on the basis of Importance Value ranking were *Manilkara obovata*, *Senna siamea* and *Anogeissus lieocarpus*. The dominance of a few species reflected the early successional status of the forest fragment.

**Keywords:** Nigeria, Olokemeji Forest Reserve, phytosociological analysis

### 1. Introduction

Olokemeji Forest Reserve (OFR); the Nigerian first Forest Reserve was established around 1900 (Onokerhoraye, 1985). It lies on  $70^{\circ} 25' N$  and  $3^{\circ} 32' E$  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 savanna (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

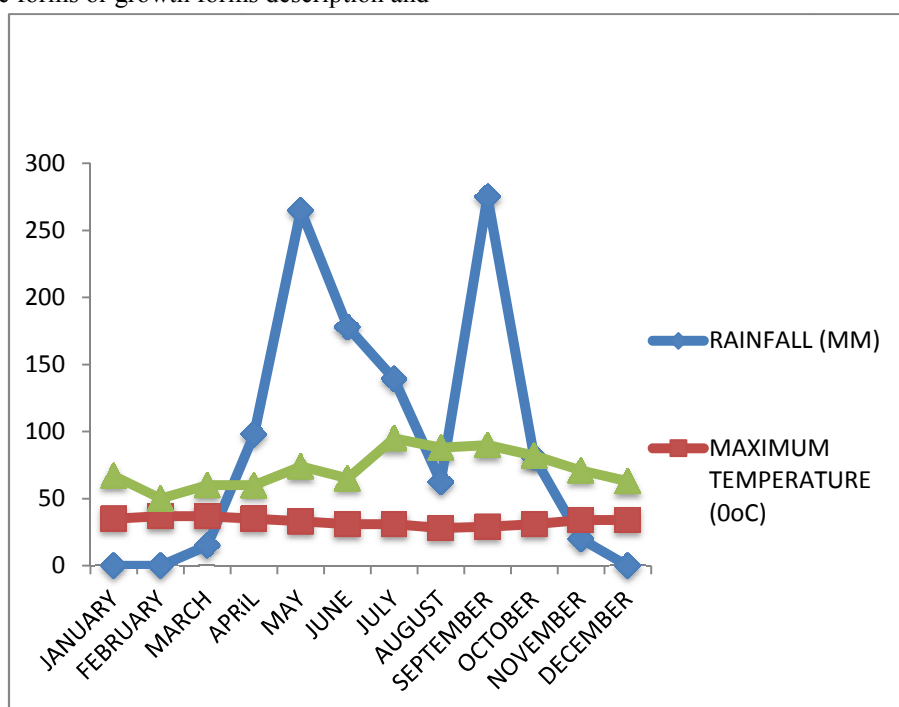


Fig. 1. Climatic data for Forestry Research Institute, 2002.

stratification. The limitations of such description methods have been stated in Akinsoji *et al.*, 2003, Mueller-Dombois and Ellenberg, 1974). 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 Mueller-Dombois and Ellenberg (1974), Smith(1974) and Greig-Smith (1964). DM 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) have found 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 Key (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. This effort reports a quantitative analysis of a forest fragment in OFR using PCQ method.

## 2. Materials And Methods.

This study was carried out in a forest fragment in the NW cornerin OFR. The forest fragment is surrounded by savanna, plantations of *Tectona grandis*, *Gmelina arborea* , 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).

## 3. Results and Discussion

The fragmented forest is open due to human interference and contains many gaps filled with grasses, forbs and tree seedlings. A total of 80 trees belonging to 19 species distributed in 12 families were sampled (Table 1). 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 trees. 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 *Manilkara obovata*, *Senna siamea*, and *Anogeissus lieocarpus*. 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.

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

SPECIES	FAMILY	NO.
<i>Afzelia africana</i>	CAESALPINOIDEAE	1
<i>Albizia ferruginea</i>	MIMOSOIDEAE	1
<i>Anogeissus lieocarpus</i>	COMBRETACEAE	7
<i>Daniellia oliveri</i>	CAESALPINOIDEAE	2
<i>Delonix regia</i>	CAESALPINOIDEAE	1
<i>Diospyros mespiliformis</i>	EBENACEAE	5
<i>Lonchocarpus sericeus</i>	PAPILIONOIDEAE	2
<i>Lophira lanceolata</i>	OCHNACEAE	1
<i>Malacantha alnifolia</i>	SAPOTACEAE	4
<i>Manilkara obovata</i>	SAPOTACEAE	32
<i>Margaritaria discoidea</i>	EUPHORBIACEAE	1
<i>Mitragyna arborea</i>	RUBIACEAE	1
<i>Polysphaeria arbuscula</i>	RUBIACEAE	2
<i>Psydrax subscorpioidea</i>	RUBIACEAE	1
<i>Pterocarpus erinaceus</i>	PAPILIONOIDEAE	1
<i>Santalum album</i>	SANTALACEAE	1
<i>Senna siamea</i>	CAESALPINOIDEAE	12
<i>Sterculia tragacantha</i>	STERCULIACEAE	3
<i>Zanthoxylum zanthoxyloides</i>	RUTACEAE	2

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

SPECIES	RDe	RF	RDo	IV
<i>Manilkara obovata</i>	40	27	26.6	93.6
<i>Cassia siamea</i>	15	15	13.45	43.45
<i>Anogeissus lieocarpus</i>	8.75	10	7.6	26.35
<i>Diospyros mespiliformis</i>	5	8.3	4.3	17.6
<i>Malacantha alnifolia</i>	5	6.7	5.83	17.53
<i>Sterculia tragacantha</i>	3.75	5	1.54	10.29
<i>Lonchocarpus sericeus</i>	2.5	3.3	2.1	7.9
<i>Daniellia oliveri</i>	2.5	3.3	1.81	7.61
<i>Zanthoxylum zanthoxyloides</i>	2.5	3.3	1.34	7.14
<i>Polysphaeria arbuscula</i>	2.5	3.3	0.61	6.41
<i>Delonix regia</i>	1.25	1.7	0.83	3.78
<i>Margaritaria discoidea</i>	1.25	1.7	0.787	3.74
<i>Afzelia africana</i>	1.25	1.7	0.65	3.6
<i>Mitragyna arborea</i>	1.25	1.7	0.64	3.59
<i>Lophira lanceolata</i>	1.25	1.7	0.35	3.3
<i>Canthium longiflora</i>	1.25	1.7	0.34	3.29
<i>Pterocarpus erinaceus</i>	1.25	1.7	0.3	3.25
<i>Albizia ferruginea</i>	1.25	1.7	0.26	3.21
<i>Santalum album</i>	1.25	1.7	0.26	3.21

**RDe**- Relative Density  
**IV**- Importance Value

**RDo**- Relative Dominance  
**RF**- Relative Frequency

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