Floristic Composition and Structural Diversity of Shasha Forest Reserve in Ile-Ife, Southwestern Nigeria

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Abstract

The floristic composition and structural diversity were studied in two plots, 25 m x 25 m each, in three different sites of varying vegetation physiognomy: Taungya system, Regrowth forest and Gmelina arborea plantation (TS, RF and GA respectively) of Shasha forest reserve in Ile-Ife southwestern Nigeria. A total of 119 plant species belonging to 51 families and 100 genera were identified in the forest reserve. Woody species represented the most diverse life form. Plant species diversity was higher in the GA ($H'=3.5$) compared to the RF ($H'=3.4$) and TS ($H'=2.9$). Woody plant species density also differed significantly ($p < 0.05$) among the different physiognomy. Mean basal area and mean girth size were higher in RF compared to TS and GA. Species evenness was also quantitatively higher in the TS ($E=0.12$) compared to RF ($E=0.09$) and GA ($E=0.08$). Sorensen index of similarity were 12.12% (TS and RF), 19.71% (TS and GA) and 20.20% (RF and GA), which is an indication of the heterogeneity of the three different sites, as a result of different management systems of the sites. The knowledge about species composition in the forest reserve will go a long way in identifying important elements of plant diversity, protecting and preserving threatened plant species, monitoring and providing effective management of the forest reserve.

Keywords: density, flora, heterogeneity, physiognomy, structure, woody species

Introduction

Worldwide the degradation, fragmentation and conversion of forest ecosystems is progressing rapidly (Abramovitz, 1998). Globally, concerns are raised over the rapid loss of biodiversity in all its forms and at all levels. Habitat destruction is the main cause of the biodiversity loss. Habitats can either disappear completely or they may be degraded and/or fragmented, both causing serious impacts on species development, as well as lack of balance between ecosystems' processes (Raghubanshi and Tripathi, 2009). Presently, many forests persist as forest fragments and there is a growing interest in quantifying habitat characteristics such as forest structure, floristic composition and plant species richness in intact and degraded forest fragments and forest landscapes (Bierregaard et al., 1992; Myers et al., 2000). Knowledge of the floristic composition and structure of forest reserves is critical to understanding the dynamics of forest ecosystems and for identifying important elements of plant diversity, protecting threatened or economic species and monitoring the state of reserves, and it is with this data that management practices can be applied. The effective management of such ecosystems requires the understanding of their functioning, not only for their improvement, but also to arrest their further degradation (Oke and Isichei, 1997). Thus, the study of floristic composition and structure of tropical forest becomes more imperative in the face of ever increasing threat to the forest ecosystem.

Studies have shown that composition and structure of forests are influenced by a number of factors (Klinge et al., 1995; Haugaasen et al., 2003; Wittmann and Junk, 2003). One of these factors are disturbances which cause local species variation within forests based on their intensity, scale and frequency (Hill and Curran, 2003; Laidlaw et al., 2007). Disturbance regimes dominated by natural and anthropogenic factors may alter composition, diversity and structure of the forest. There have been massive deforestation and forest degradation of forest reserves in Nigeria as a result of human activities and inadequate or lack of effective management of the reserves. This endangers the forest reserves and the services (socio-economic and ecological) they render. The Shasha forest reserve was one of the forest reserves established in Nigeria, generally believed to be ecologically rich and biologically abundant with forest tree species. Shasha forest reserve was originally created in 1925 and has witnessed a rapid rate of destruction from excessive logging, conversion to plantations and farming (Field Trip Earth, 2008). Deforestation is widespread, leaving no section untouched (Salami et al., 2007). For the conservation status of the Shasha forest reserve to be known and to allow effective management of the forest reserve there is a need for proper documentation of its plant species. Knowledge of the current floristic composition and structure of the Shasha forest reserve is thus invaluable. Floristic data obtained in this regard would be useful for the application of sound management practices in the forest. This study was therefore carried out to determine the composition, structure and assess the soil status of the forest reserve.
Materials and methods

Study area

The study was carried out in the Shasha forest reserve in Ife south Local government Area of Osun state, southwestern Nigeria (Fig. 1). The forest reserve lies between latitude 7°8′ and 7°10′ N and longitude 4°20′ and 4°40′ E. The study site has a land area of 310798 km²/31079.85 ha (Salami et al., 2007). The vegetation is part of the tropical rainforest ecosystem in Southwest Nigeria. The altitude of the forest is 122 m, with a mean annual rainfall of 1421 mm (Adekunle, 2006). It is an area with high relative humidity. There are two prominent seasons: dry and rainy season. The dry season lasts from November to March, while the rainy season is from April to October. The soil of the site is ferruginous tropical soil on crystalline acid rock, the topography gently undulating plain. The study was specifically carried out in three distinct study sites, namely a Taungya system (TS), cultivated site consisting of arable crops and woody species- a natural Regrowth forest (RF) and a mono-culture plantation of Gmelina arborea (GA), which were all selected from the forest reserve based on their physiognomy. The reserve has witnessed some form of disturbance such as logging and farming activities.

Data collection and analysis

The data was collected in March (dry season month). Two sample plots of 25 m x 25 m in each being identified vegetation physiognomy (sites TS, RF and GA). The sites were laid out using a measuring tape and demarcated with wooden pegs for the study. In all three sites, all woody plants that were greater than (or about) one meter in height were enumerated and identified to species level. The diameter at breast height (dbh) of all the identified woody species was measured. The identification followed the Flora of West Africa (Hutchinson and Dalziel, 1954-1972). The species whose identities were in doubt were collected and taken to IFE herbarium where proper identification was carried out. Floristic composition, densities, diversity and distribution of the plant species were determined using the following parameters: species richness, diversity indices, Shannon – Wiener index, Sorenson’s index and species evenness (E).

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Results and discussion

Floristic composition

A total of 119 plant species were identified in the three selected sites in the Shasha forest reserve. These belonged to 51 families and 100 genera (Tab. 1). Euphorbiaceae, Moraceae, Papilionaceae and Rubiaceae were the overall diverse families (in terms of species richness) of the adult species, contributing 28.5% of all the species in the study (Fig. 2). Trees (39.5%) were the most dominant life forms, followed by herbs (22.7%), shrubs (21.8%) climbers (12.6%) and grasses (3.4%) (Fig. 3). Euphorbiaceae and Moraceae were the most diverse families in the TS, whereas Euphorbiaceae and Rubiaceae constituted the most diverse families in RF. The most important family in GA was Rubiaceae (Fig. 4). Generally, 26 woody species were encountered in TS, 41 woody species in RF and 42 woody species in GA. Woody species common to the three sites include Deinbollia pinnata, Ficus exasperata, Milicia excelsa, Rauwolfia vomitora, Rinorea dentata and Terminalia superba.
Tab. 1. List of plant species encountered in the three study sites in Shasha forest reserve

| S/N | Woody species                  | Family               | S/N | Woody species                  | Family               |
|-----|--------------------------------|----------------------|-----|--------------------------------|----------------------|
| 1   | Althea syriaca                 | Mimosaceae           | 62  | Spindola momin                 | Anacardiaceae        |
| 2   | Albourea cordifolia            | Euphorbiaceae        | 63  | Sterculia rhinoptata           | Sterculiaceae        |
| 3   | Alstonia boonei                | Apocynaceae          | 64  | Sterculia trigancanta          | Sterculiaceae        |
| 4   | Allamanda floribunda           | Guttiferae           | 65  | Teucria gratus                 | Verbenaceae          |
| 5   | Allophylus africans            | Sapindaceae          | 66  | Terminalia ivorensis           | Combretaceae         |
| 6   | Amphispononcophyaid            | Ceasalpinaceae       | 67  | Terminalia superba             | Combretaceae         |
| 7   | Angonocyclus zonkeri           | Papilionaceae        | 68  | Trema guineensis               | Ulmaceae             |
| 8   | Anisochetae djalouensis        | Loganiaceae          | 69  | Trichilia praecoxa             | Malvaceae            |
| 9   | Anisochetae macrophylla        | Caesalpinaceae       | 70  | Trichilia avicennae            | Malvaceae            |
| 10  | Anisochetae macrophylla        | Caesalpinaceae       | 71  | Vernonia amygdalina            | Asteraceae           |
| 11  | Anisochetae macrophylla        | Caesalpinaceae       | 72  | Voacanga africana              | Apocynaceae          |
| 12  | Blighia unijugata              | Sapindaceae          | 73  | Xylea spp                      | Annonaceae           |
| 13  | Bridelia ferruginea            | Euphorbiaceae        | 74  | Xylopia spp                    | Annonaceae           |
| 14  | Bridelia micrantha             | Euphorbiaceae        | 75  | Xylopia spp                    | Annonaceae           |
| 15  | Bulbocastor curvisera          | Capparidaceae        | 76  | Xylopia spp                    | Annonaceae           |
| 16  | Ceiba pentandra                | Bombiacaceae         | 77  | Xylopia spp                    | Annonaceae           |
| 17  | Celtis mildbraidi              | Ulmaceae             | 78  | Xylopia spp                    | Annonaceae           |
| 18  | Celtis zenkeri                 | Ulmaceae             | 79  | Xylopia spp                    | Annonaceae           |
| 19  | Chausalia kolly                | Rubiaceae            | 80  | Xylopia spp                    | Annonaceae           |
| 20  | Clausena anisata               | Rutaceae             | 81  | Xylopia spp                    | Annonaceae           |
| 21  | Cleistophila patens            | Annonaceae           | 82  | Xylopia spp                    | Annonaceae           |
| 22  | Cunntis ferruginea             | Connaraceae          | 83  | Xylopia spp                    | Annonaceae           |
| 23  | Colua gigantea                 | Sterculiaceae        | 84  | Xylopia spp                    | Annonaceae           |
| 24  | Deinobilia pinnata             | Sapindaceae          | 85  | Xylopia spp                    | Annonaceae           |
| 25  | Dicyandra spp                  | Rubiaceae            | 86  | Xylopia spp                    | Annonaceae           |
| 26  | Dialpnoe mohutetanus            | Ebenaceae            | 87  | Xylopia spp                    | Annonaceae           |
| 27  | Endrophanoga angulina           | Meliaceae            | 88  | Xylopia spp                    | Annonaceae           |
| 28  | Euphroia macrophylla           | Rutaceae             | 89  | Xylopia spp                    | Annonaceae           |
| 29  | Ficus exasperata               | Moraceae             | 90  | Xylopia spp                    | Annonaceae           |
| 30  | Ficus micrus                   | Moraceae             | 91  | Xylopia spp                    | Annonaceae           |
| 31  | Funstonia elatica              | Apocynaceae          | 92  | Xylopia spp                    | Combretaceae         |
| 32  | Glypha brevis                   | Tiliaceae            | 93  | Xylopia spp                    | Combretaceae         |
| 33  | Gmelina arbores                | Verbenaceae          | 94  | Xylopia spp                    | Combretaceae         |
| 34  | Hymalium alpineri              | Simaroubbieae        | 95  | Xylopia spp                    | Combretaceae         |
| 35  | Ixania triaetha                | Icacinaceae          | 96  | Xylopia spp                    | Combretaceae         |
| 36  | Jatrotha geospiloid            | Euphorbiaceae        | 97  | Xylopia spp                    | Combretaceae         |
| 37  | Kentia solitaria               | Rubiaceae            | 98  | Xylopia spp                    | Combretaceae         |
| 38  | Lonciodocidae capunoides       | Sapindaceae          | 99  | Xylopia spp                    | Combretaceae         |
| 39  | Loncicarpus cyanescens          | Papilionaceae        | 100 | Xylopia spp                    | Combretaceae         |
| 40  | Macaranga barberris            | Euphorbiaceae        | 101 | Xylopia spp                    | Combretaceae         |
| 41  | Macaranga spp                  | Euphorbiaceae        | 102 | Xylopia spp                    | Combretaceae         |
| 42  | Maguirea dixleodus             | Euphorbiaceae        | 103 | Xylopia spp                    | Combretaceae         |
| 43  | Massularia macrophyllyia       | Rubiaceae            | 104 | Xylopia spp                    | Combretaceae         |
| 44  | Microdemis pueberia            | Pandaceae            | 105 | Xylopia spp                    | Combretaceae         |
| 45  | Milicia excelsa                | Moraceae             | 106 | Xylopia spp                    | Combretaceae         |
| 46  | Momordora tomentosa            | Annonaceae           | 107 | Xylopia spp                    | Combretaceae         |
| 47  | Morinda lucida                 | Rubiaceae            | 108 | Xylopia spp                    | Combretaceae         |
| 48  | Musanga crenopoides            | Moraceae             | 109 | Xylopia spp                    | Combretaceae         |
| 49  | Myristaceus arbores            | Moraceae             | 110 | Xylopia spp                    | Combretaceae         |
| 50  | Oxanthus spp                   | Rubiaceae            | 111 | Xylopia spp                    | Combretaceae         |
| 51  | Pycnanthum angulennis          | Myristicaceae        | 112 | Xylopia spp                    | Combretaceae         |
| 52  | Rausolva comitioria            | Apocynaceae          | 113 | Xylopia spp                    | Combretaceae         |
| 53  | Rinorea dentata                | Violaceae            | 114 | Xylopia spp                    | Combretaceae         |
| 54  | Rinorea velutiflora            | Violaceae            | 115 | Xylopia spp                    | Combretaceae         |
| 55  | Rhusmania unifoli            | Rubiaceae            | 116 | Xylopia spp                    | Combretaceae         |
| 56  | Sabico africana                | Rubiaceae            | 117 | Xylopia spp                    | Combretaceae         |
| 57  | Salacia pallescens             | Calatraceae          | 118 | Xylopia spp                    | Combretaceae         |
| 58  | Senna berrata                  | Ceasalpinaceae       | 119 | Xylopia spp                    | Combretaceae         |
| 59  | Senna occidentalis             | Ceasalpinaceae       | 120 | Xylopia spp                    | Combretaceae         |
| 60  | Solanum verbascifolium         | Solanaceae           | 121 | Xylopia spp                    | Combretaceae         |
| 61  | Sphenocnemum jolynsum         | Menispermaeae        | 122 | Xylopia spp                    | Combretaceae         |
More herbaceous species were recorded in TS (14) than in the GA (12) and RF (7) sites, whereas climber species richness was greater in the GA (8) in relation to the other vegetation physiognomy TS (7) and RF (4). The herbaceous species common to the three sites is 

Composition of plant species in the various life forms identified in the study sites in Shasha forest reserve

Structure

There were a total of 2628/ha individuals of woody species (excluding other life forms) identified in the three different physiognomies. Woody species density was highest in GA (1192/ha) followed by RF (1092/ha) and least in TS (344/ha) (Tab. 2). Shannon-Wiener index was higher in the GA (H = 3.5) compared to the RF (H = 3.4) and TS (H = 2.9) (Tab. 3). Density of woody species differed significantly between the forest types (p < 0.05). In all, Gmelina arborea and Terminalia superba were the most abundant species accounting for an average 26% and 10% respectively of stems in all the three sites. In terms of basal area, Alchornea cordifolia had the highest basal area in TS, contributing with 33% of the total, in RF Alstonia boonei had the highest values contributing 65% of the total, while in GA Gmelina arborea had the highest basal area contributing 35% of the total.

On physiognomy basis, Celtis zeneri, Ficus exasperata, Gmelina arborea and Spindras manhim were the dominant species in the TS (Tab. 2). In the case of RF, Ficus exasperata, Rauwolfa vomitoria, Senna hirsuta, Terminalia superba and Trichilia preureana were the dominant species. In GA, Blighia unijugata, Chassalia kolly, Funtumia elastica, Gmelina arborea and Rauwolfa vomitoria were the species that dominated the woody flora.

In terms of size, majority of the trees were of the smaller diameter class (0-20 cm) (Fig. 4). The number of individual trees in the categories decreased with increasing size of the trees. Larger diameter trees (< 100 cm) were very low in TS and GA, but not found in RF. Mean basal area recorded in the RF (5.8±2.1 m²/ha) was higher compared with that of GA (2.5±0.2 m²/ha) and TS (0.1±0.05 m²/ha). The result of species evenness showed that evenness was quantitatively higher in TS (E =0.1) compared with RF (E =0.07) and GA (E = 0.08) (Tab. 3).
Tab. 2. Mean density of woody species (per hectare) in the three sites of the Shasha forest reserve

| S/N | Species | Family    | TS | RF | GA |
|-----|---------|-----------|----|----|----|
| 1   | Albizia stygia | Mimosaceae | 24 | 24 |    |
| 2   | Albizzia candiflora | Euphorbiaceae | 8  |  8 |  8 |
| 3   | Alstonia bumia | Apocynaceae | 16 | 16 |    |
| 4   | Allamanda floribunda | Onagraceae | 16 |  8 |  8 |
| 5   | Allium africanaus | Sapindaceae | 32 |    |    |
| 6   | Annona pyriformis | Caricaceae |  8 | 32 |  8 |
| 7   | Anogeissus celebensis | Papilionaceae | 16 |    |    |
| 8   | Antidesma lanceolatum | Loganiaceae |  8 |    |    |
| 9   | Annona squamosa | Caricaceae | 32 |    |    |
| 10  | Annona reticulata | Moraceae |  8 | 16 |  8 |
| 11  | Paphia nitida | Papilionaceae | 16 |    |    |
| 12  | Baphia stipulata | Sapindaceae | 40±8 | 16 |  8 |
| 13  | Bridelia ferruginea | Euphorbiaceae |  8 |    |  8 |
| 14  | Bridelia micrantha | Euphorbiaceae | 24 |    |    |
| 15  | Bulnesia soroea | Combretaceae | 32 |  8 |    |
| 16  | Ceiba pentandra | Bombacaceae | 32 |    |    |
| 17  | Celtis mildbraedi | Ulmaceae |  8 | 16 |  8 |
| 18  | Celtis zeyheri | Ulmaceae | 24±8 | 24 |    |
| 19  | Clusia wrightii | Rubiaceae |  8 | 48 |    |
| 20  | Clusia contorta | Rubiaceae |  8 | 16 |    |
| 21  | Clusia sp. | Annonaceae | 32 |    |    |
| 22  | Croton malagashina | Commelinaceae |  8 |  8 |  8 |
| 23  | Cola gigantea | Sterculiaceae | 24 |  8 |  8 |
| 24  | Dioscorea picta | Sapindaceae | 16 |  8 |  8 |
| 25  | Diospyros officinalis | Rubiaceae |  8 |    |    |
| 26  | Diospyros stenophylla | Ebenaceae |  8 |    |    |
| 27  | Eucalyptus grandis | Myrtaceae |  8 |    |    |
| 28  | Ficus exasperata | Moraceae | 3216 | 40±8 | 24±8 |
| 29  | Ficus pschidla | Moraceae |  8 | 16 |  8 |
| 30  | Ficus macrocarpa | Moraceae |  8 | 16 |  8 |
| 31  | Ficus natalensis | Moraceae | 32 |  8 |  8 |
| 32  | Glyphos brevis | Tiliaceae |  8 | 48 |    |
| 33  | Gmelina arborea | Verbenaceae | 32 | 320±8 |    |
| 34  | Homalium glaucum | Simaroubaceae |  8 |    |    |
| 35  | Isoëtes latifolia | Isoëtaceae |  8 |    |    |
| 36  | Jacaranda gymnophylla | Euphorbiaceae |  8 |    |    |
| 37  | Koompassia excelsa | Moraceae |  8 |  8 |  8 |
| 38  | Koompassia tomentosa | Moraceae |  8 |  8 |  8 |
| 39  | Lannea coromandelica | Moraceae | 3216 | 16 |  8 |
| 40  | Maesopsis emodii | Euphorbiaceae |  8 |    |    |
| 41  | Maesopsis monosperma | Euphorbiaceae |  8 |    |    |
| 42  | Magnoliaceae didieri | Euphorbiaceae | 16 |  8 |  8 |
| 43  | Manihot esculenta | Euphorbiaceae | 24 |    |    |
| 44  | Morinda peregrina | Moraceae | 24 |    |    |
| 45  | Milicia excelsa | Moraceae |  8 | 16 |  8 |
| 46  | Mussaenda tessellata | Annonaceae | 32 |    |    |
| 47  | Morinda lucida | Rubiaceae |  8 | 16 |    |
| 48  | Musanga crassipes | Moraceae |  8 |    |    |
| 49  | Myristica arborescens | Moraceae |  8 |  8 |  8 |
| 50  | Oxyanthus spp | Rubiaceae | 24±8 |    |    |
| 51  | Pterocarpus angolensis | Myristicaceae |  8 |  8 |  8 |
| 52  | Ravenala madagascariensis | Acanthaceae | 16 | 32±8 | 48 |
| 53  | Rioua densata | Vi厥ceae | 32±8 | 16 |  8 |
| 54  | Rioua velutina | Vi厥ceae | 32 |    |    |
| 55  | Rhus copallifer | Rubiaceae | 24 |    |    |
| 56  | Sabia africana | Rubiaceae | 24 |    |    |
| 57  | Salacia pallens | Celastraceae |  8 | 16 |  8 |
| 58  | Senna bicolor | Cassia | 32 |    |    |
| 59  | Senna occidentalis | Caricaceae |  8 |  8 |  8 |
| 60  | Selasman veracissimum | Selasmanaceae | 16 |    |    |
| 61  | Simmondsia chinensis | Simmondsiaceae | 16 | 16 | 16 |
| 62  | Speciosus mombin | Anacardiaceae | 24 |    |    |
| 63  | Sterculia rhomboidea | Sterculiaceae | 16 | 24 |    |
| 64  | Sterculia trigynocarpa | Sterculiaceae | 24±8 |    |    |
| 65  | Tetraganodes | Verbenaceae | 16 |    |    |
| 66  | Terminalia lucida | Combretaceae | 32 |    |    |
| 67  | Terminalia superba | Combretaceae | 16 | 24±8 |    |
| 68  | Tetrastigma | Ulmaceae |  8 |    |    |
| 69  | Tetracha pruinosae | Moraceae |  8 |  8 |  8 |
| 70  | Tetradium glabrum | Sterculiaceae | 24 |    |    |
| 71  | Veronica angolensis | Anacardiaceae |  8 |  8 |  8 |
| 72  | Veronica arborea | Apocynaceae | 16 | 16 | 16 |
| 73  | Xylopia spp | Annonaceae |  8 |    |    |

TS – Taungya system
RF – Regrowth forest
GA – Gmelina arborea plantation
agreement with Tripathi and Bajrang (2009) who observed Oberhauser, 1997) as observed in this study. This is in agreement with the results of White (1985) who noted that species richness at ground layer was higher in forest plantation than in natural re-growth forest. It has been observed that pure stands (i.e. deciduous or coniferous) could support, in some cases, a richer understory vegetation than mixed- species stands and that species richness was generally greater in deciduous stands than in coniferous stands (Barbier et al., 2008). Furthermore, some conifer plantations may have greater plant species richness than broad-leaved secondary forests (Nagaïke, 2002).

Grass species were present in both TS and GA, but not in RF. This observation could be as a result of open canopy in the plantations versus closed canopy in Regrowth forest. The observations in this study regarding the re-growth forest is in agreement with the results of White (1985) who noted that in a forest the ground layer is often sparse or absent, as grasses are absent or if present are localized or inconspicuous. The low similarity index observed among the three study sites is an indication of the heterogeneity in species composition in the standing vegetation of the three sites. Species similarity indices were 12.12 % (TS and RF), 19.71% (TS and GA) and 20.20% (RF and GA). Similarity index showed that similarity is highest between Regrowth forest and Gmelina arborea plantation and lowest between Taungya system and Regrowth forest. This may be due to the different system of management in the three sites. TS is a vegetation of tree species and arable crop species, while RF is a natural re-growth forest and GA is a mono - culture plantation of Gmelina arborea, Shannon-Wiener diversity index (H’) followed the order Gmelina arborea > Regrowth forest >
Addo-Adekunle VAJ (2006). Conservation of tree species diversity in rainforest sites in Nigeria (Adekunle, 2006) is similar to that of RF and GA, but higher than that of TS. The high species diversity of RF (3.47) and GA (3.49) is a reflection of the presence of high number of species found in these sites. Our results revealed that species evenness was low in all the three study sites. This might be due to the different disturbance in form of human activities such as slash and burn agriculture and gathering of wood for fuel in TS, logging in RF and GA where certain species are preferred than others. In rainforests from India, tree species richness decreased with the increase in intensity of forest disturbance (Nath et al., 2005).

Tree size class distribution can be used as indicators of changes in population structure and species composition (Newbery and Gartlan, 1996). The distribution of the girth size class has shown that TS, RF and GA were characterized by small and young tree species whose girths were mostly 0-20 cm, 21-40 cm and 41-60 cm. Most species in the study plots followed reverse J-shaped distribution with greater number of individuals in small size classes. Such a trend has also been reported in the forests of Great Andaman groups (Padalia et al., 2004). This might be as a result of selective felling and logging of larger girth size classes’ trees, hence most of the tree species are secondary forest re-growth species. It also indicates that the forest sites are disturbed and they are in their early successional stages. Moreover, the basal area of the woody species (8 × 10^3-4.5524 m^2) further shows that the sites were characterized by recovery from disturbance. The general small basal area of most species, respectively small girth size, is an evidence of disturbance and degradation in the three study sites of Shasha forest reserve.

**Conclusion**

The study revealed that Shasha forest reserve has a reasonably good tree and shrub species composition and richness in the face of logging and slash and burn agriculture in the forest. Anthropogenic disturbances have affected the floristic composition of the forest reserve to an extent. Logging affected the structural composition of the forest reserve through the removal of large and tall trees. Thus, there is need to control human activities in the forest reserve so as to protect the plant species for effective management and utilization.

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