



Floral diversity and quantitative analysis of tree diversity of northern tropical semi-evergreen forests in Dhenkanal district of Odisha, India

Gyanranjan Mahalik¹, Kunja Bihari Satapathy², Sabuj Sahoo³

^{1,2} Department of Botany, Centurion University of Technology and Management, Odisha, India

³ Post Graduate Department of Biotechnology, Utkal University, Bhubaneswar, Odisha, India

Abstract

The floristic diversity is the natural resource and wealth of a region and acquiring knowledge of it is of immense scientific and commercial importance. The present work aimed to study the floristic diversity of Northern Tropical Semi-evergreen forests of Dhenkanal district of Odisha during 2014-2016. The data was collected by sampling using quadrats of 10×10m size. Ten quadrats were randomly placed at each study site. The size and number of the quadrats were determined by the species area curve method. The data were quantitatively analyzed for ecological and phytosociological analysis. Their relative values were calculated and summed to get Important Value Index (IVI) of individual species. The species were identified by following available literatures including Flora of Odisha (Saxena & Brahmam, 1994-96). The findings had very good indication towards the rich vegetation diversity in the district particularly in forests but the deforestation in the name of industrialization and economic development posing a major threat to the pristine forest.

Keywords: Dhenkanal, floral diversity, important value index, quadrats

1. Introduction

The most striking feature of the earth is the existence of life and the most striking feature of life is diversity [1]. Floral diversity is the regular asset and abundance of a nation and obtaining information of it is of enormous logical and business significance. Plant community plays an essential role in the supportable administration by keeping up biodiversity and monitoring the earth. Plants are the premise of life on earth, providing new oxygen and assume an essential job for individuals' vocation [2]. Biodiversity inventories are used to determine the nature and distribution of biodiversity resources of the forests to be managed [3]. Using resource inventory as a basis of stand structure, species composition and dynamic is important for development of strategies for achieving sustainable management of forests [4]. Furthermore, species diversity is one of the analytical tools applied in determining the degree of variability of tree species within a community or a region [5]. Quantifying tree species distribution and abundance is also an important aspect of forest conservation as they contribute to the structural characteristics of the forest [6]. Nevertheless, forest inventory data in developing countries are not up to date because the concerned forests become degraded, fragmented or patchy soon or later after logging [7]. Quantitative floristic inventories provide necessary context for planning and interpreting long-term ecological research [8]. Long-term studies of tree population dynamics are critical for our understanding of the conservation needs of tropical forest

ecosystems [9, 10]. This work aims to analyze documentation of floristic composition, patterns of plant diversity and biodiversity conservation strategies in natural and plantation forests at Dhenkanal district of Odisha, India.

2. Materials and methods

2.1 Study area

Dhenkanal is a landlocked area of Odisha with an aggregate topographical inclusion of 4595 Sq. Km. (Fig.1). The region is one of the halfway found locale in Odisha lying between Longitude 85° 58' to 86° 20' East and Latitude 20° 29' to 21° 11' North and limited by the Keonjhar area at north, Cuttack region at south, Jajpur at the east and Angul in the west. The Climate of the Dhenkanal region is hot and dry sub-muggy compose with a normal yearly precipitation of 1696 mm. The normal least and most extreme temperatures are 19.6 °C and 33.3 °C separately. The relative stickiness by and large fluctuates from 31 to 88%. Out of the aggregate inclusion of 4595 Sq. Km. of the region, a noteworthy part containing 1737.62 Sq. Km. incorporates timberland territory which is scattered all through the area. The vital species is *Shorea robusta* with different partners generally bamboos. Storm for the most part starts from second seven day stretch of June consistently. The precipitation amid June to December establishes no less than 75% of the yearly precipitation of the locale. On a normal there are 73 stormy days in a year in the locale [11].

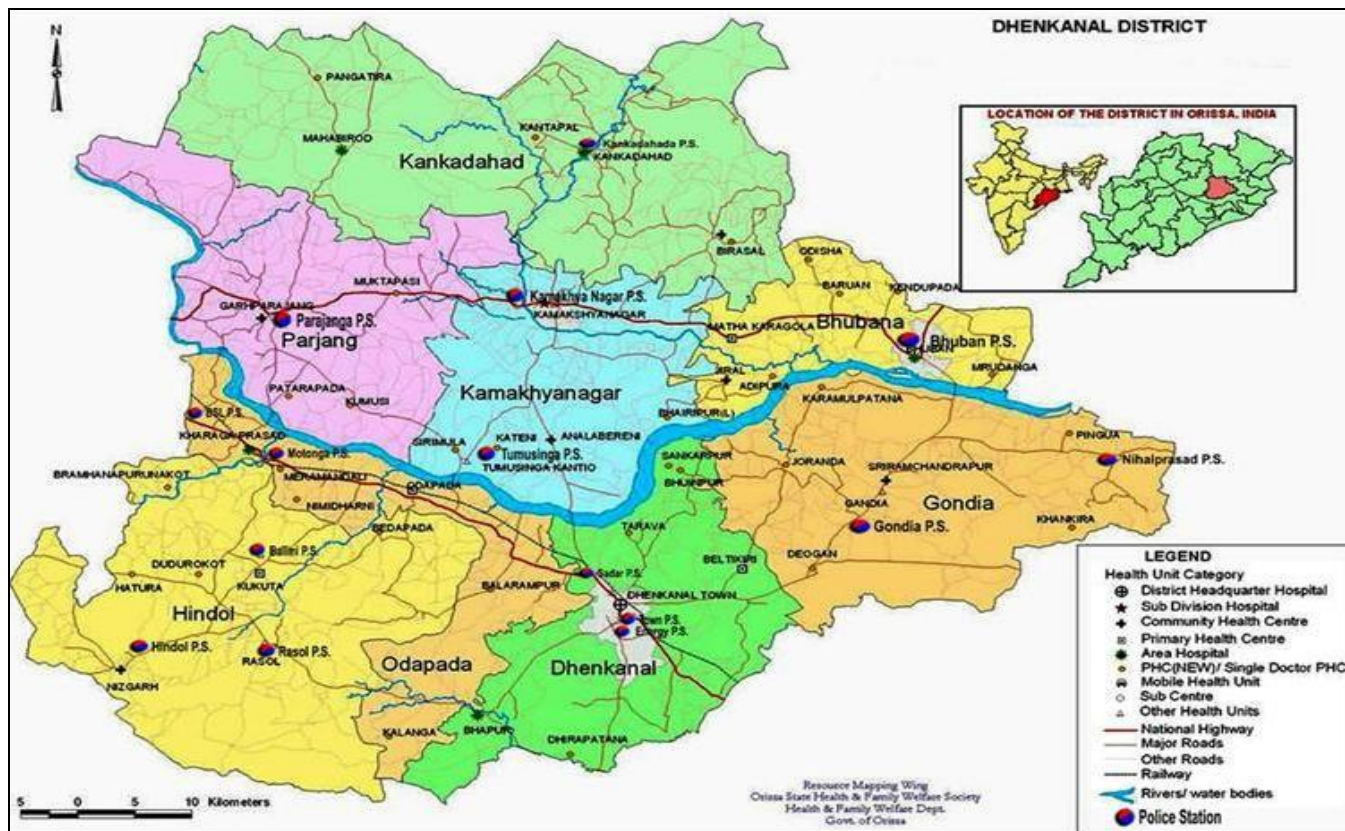


Fig 1: Map of Dhenkanal district of Odisha

2.2 Field sampling

The field study was carried out during 2014-2015 by lying quadrat. The data was collected by sampling using quadrats of 10 x 10m size. Ten quadrats were randomly placed at each study site. The size and number of the quadrats were determined by the species area curve method. The data were quantitatively analyzed for frequency, density and dominance as per [12]. Their relative values were calculated and summed to get Important Value Index (IVI) of individual species [13]. The species were identified with the help of the Flora of Orissa [14].

2.3 Data analysis

The vegetation data were quantitatively analyzed for relative density, relative frequency and relative dominance. The significance esteem file important value index (IVI) for the tree species was determined as the entire of the relative repetition, relative breadth and relative predominance [15].

$$\text{Relative Density} = \frac{\text{Density of the species}}{\text{Total density of all the species}} \times 100$$

$$\text{Relative frequency} = \frac{\text{Frequency of the species}}{\text{Total frequency of all species}} \times 100$$

$$\text{Relative dominance} = \frac{\text{Dominance (cover) of the species}}{\text{Total dominance of all the species}} \times 100$$

3. Result and discussion

During the survey 320 plant species belonging to 295 genera and 74 families have been collected, critically studied, identified and incorporated in the Herbarium [11]. Habit wise analysis of the available species in forest indicated that were 78 tree species, 38 shrubs, 42 climbers, 94 herbs and 63 grasses. Majority of family are represented one or two species. The predominant type of forest vegetation of a region mainly depends on the climate and soil. Earlier Haines reported about 227 Angiosperm taxa from the whole Dhenkanal and Angul districts in connection with the Botany of the Bihar and Orissa. According Bihar and Orissa has divided the whole region into three floristic zones and put Dhenkanal district in the Southern tract, other zones being Northern and Central tract [16].

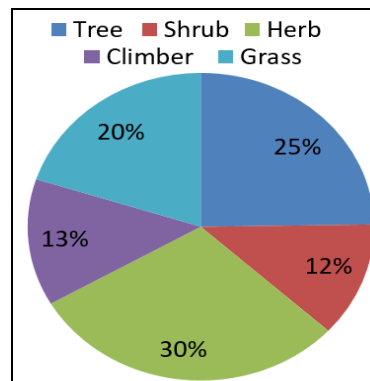


Fig 1: Total plants found in Dhenkanal forest area

Table 1: Important value index (IVI) of tree species.

Sl. No.	Scientific name	Families	IVI
	<i>Acacia auriculiformis</i> A. Cunn. ex Benth. in Hook	Mimosaceae	3.10346
	<i>Acacia leucophloea</i> (Roxb.) Willd	Mimosaceae	1.00321
	<i>Acacia catechu</i> (L.f.) Willd.	Mimosaceae	2.10346
	<i>Acacia nilotica</i> (L.) Delile ssp. <i>indica</i> (Benth.) Brenan	Mimosaceae	1.10241
	<i>Aegle marmelos</i> (L.) Corr.	Rutaceae	2.30131
	<i>Albizia lebbek</i> (L.) Benth.	Mimosaceae	2.00213
	<i>Alstonia scholaris</i> (L.) R.Br.	Apocynaceae	1.00211
	<i>Anacardium occidentale</i> L.	Anacardiaceae	6.21451
	<i>Annona reticulata</i> L.	Annonaceae	1.21342
	<i>Annona squamosa</i> L.	Annonaceae	3.12131
	<i>Artocarpus heterophyllus</i> Lam.	Moraceae	2.90213
	<i>Azadirachta indica</i> A.Juss.	Meliaceae	2.62312
	<i>Bauhinia purpurea</i> L.	Caesalpinaceae	1.23521
	<i>Bauhinia variegata</i> L.	Caesalpinaceae	1.03743
	<i>Bombax ceiba</i> L.	Bombacaceae	2.14312
	<i>Borassus flabellifer</i> L.	Arecaceae	2.00211
	<i>Bridelia retusa</i> (L.) Spreng.	Euphorbiaceae	1.21011
	<i>Buchanania lanzan</i> Spreng.	Anacardiaceae	39.02923
	<i>Butea monosperma</i> (Lam.) Taub.	Fabaceae	3.10121
	<i>Cassia siamea</i> Lam.	Fabaceae	1.00013
	<i>Cassia fistula</i> L.	Caesalpinaceae	3.10123
	<i>Casuarina equisetifolia</i> L.	Casuarinaceae	1.01241
	<i>Careya arborea</i> Roxb.	Barringtoniaceae	1.01125
	<i>Catunaregam spinosa</i> (Thunb.) Tirveng.	Rubiaceae	1.02101
	<i>Ceiba pentandra</i> (L.) Gaertn.	Bombacaceae	2.00212
	<i>Chloroxylon swietiana</i> D.C.	Rutaceae	4.10547
	<i>Cleistanthus collinus</i> (Roxb.) Benth.	Euphorbiaceae	1.01421
	<i>Cocos nucifera</i> L.	Arecaceae	3.0141
	<i>Commiphora mukul</i> (Hook. ex Stocks) Engl.	Burseraceae	4.03214
	<i>Dalbergia sissoo</i> Roxb.	Fabaceae	6.10012
	<i>Delonix regia</i> (Boj. ex Hook.) Raf.	Caesalpinaceae	1.02101
	<i>Dillenia indica</i> L.	Dilleniaceae	1.12145
	<i>Diospyros malabarica</i> (Desr.) Kostel.	Ebenaceae	1.21345
	<i>Diospyros melanoxylon</i> Roxb.	Ebenaceae	18.88908
	<i>Drypetes roxburghii</i> (Wall.) Hurus.	Euphorbiaceae	1.12411
	<i>Eucalyptus citriodora</i> Hook.	Myrtaceae	3.00213
	<i>Ficus benghalensis</i> L.	Moraceae	3.321
	<i>Ficus racemosa</i> L.	Moraceae	5.00212
	<i>Ficus religiosa</i> L.	Moraceae	2.12101
	<i>Gardenia latifolia</i> Ait.	Rubiaceae	1.23189
	<i>Gmelina arborea</i> Roxb.	Verbenaceae	1.00213
	<i>Haldinia cordifolia</i> (Roxb.) Ridsd.	Rubiaceae	1.0321
	<i>Holarrhena pubescens</i> (Buch.-Ham.) Wall. ex G.Don.	Apocynaceae	1.9342
	<i>Ixora pavetta</i> Andr.	Rubiaceae	1.2316
	<i>Lagerstroemia reginae</i> Roxb.	Lythraceae	1.2318
	<i>Leucaena leucocephala</i> (Lam.) de Wit.	Mimosaceae	2.411
	<i>Limonia acidissima</i> L.	Rutaceae	1.3241
	<i>Madhuca indica</i> Gmel.	Sapotaceae	27.69932
	<i>Mallotus philippensis</i> (Lam.) Muell.	Euphorbiaceae	3.01231
	<i>Mangifera indica</i> L.	Anacardiaceae	13.64554
	<i>Melia azedarach</i> L.	Meliaceae	2.8931
	<i>Michelia champaca</i> L.	Magnoliaceae	3.02101
	<i>Mitragyna parvifolia</i> (Roxb.) Korth.	Rubiaceae	1.21113
	<i>Morinda pubescens</i> Sm.	Rubiaceae	1.02652
	<i>Moringa oleifera</i> Lam.	Moringaceae	2.15321
	<i>Naringi crenulata</i> (Roxb.) Nicolson	Rutaceae	1.00012
	<i>Neolamarckia cadamba</i> (Roxb.) Bosser.	Rubiaceae	4.10346
	<i>Phoenix sylvestris</i> (L.) Roxb.	Arecaceae	4.20457
	<i>Phyllanthus acidus</i> (L.) Skeels	Euphorbiaceae	1.10647
	<i>Phyllanthus emblica</i> L.	Euphorbiaceae	1.11551
	<i>Plumeria rubra</i> L.	Apocynaceae	1.21123

	<i>Pongamia pinnata</i> (L.) Pierre.	Fabaceae	3.10341
	<i>Psidium guajava</i> L.	Myrtaceae	1.23121
	<i>Pterocarpus santalinus</i> L.f.	Fabaceae	1.11214
	<i>Semecarpus anacardium</i> L.f.	Anacardiaceae	2.0021
	<i>Shorea robusta</i> Gaertn.f.	Dipterocarpaceae	47.18334
	<i>Spondias pinnata</i> (L.f.) Kurz	Anacardiaceae	1.0012
	<i>Simarouba glauca</i> DC.	Simaroubaceae	3.2151
	<i>Strychnos nux-vomica</i> L.	Loganiaceae	2.12313
	<i>Streblus asper</i> Lour.	Moraceae	2.21321
	<i>Syzygium cumini</i> (L.) Skeels	Myrtaceae	1.10321
	<i>Tamarindus indica</i> L.	Caesalpinaceae	2.12126
	<i>Tectona grandis</i> L.f.	Verbenaceae	3.17431
	<i>Terminalia alata</i> Heyne exRoth.	Combretaceae	1.21113
	<i>Terminalia arjuna</i> (Roxb. ex DC.) Wight.	Combretaceae	1.31378
	<i>Terminalia bellirica</i> (Gaertn.) Roxb.	Combretaceae	2.13469
	<i>Terminalia chebula</i> Retz.	Combretaceae	2.12132
	<i>Ziziphus mauritiana</i> Lam.	Rhamnaceae	2.12712
	Total		299.9745

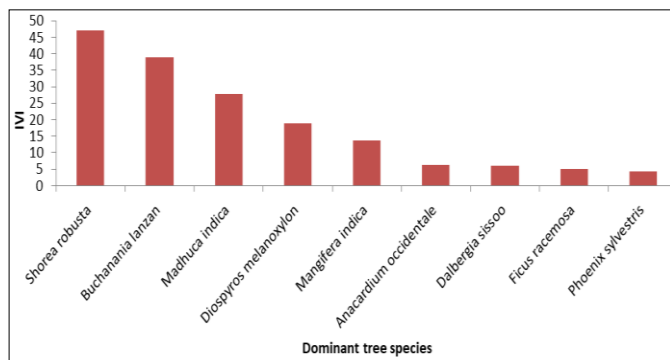


Fig 2: Dominant tree species

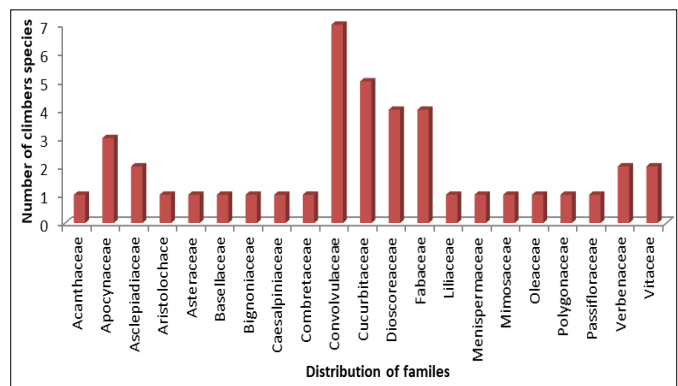


Fig 5: Family wise distribution of climber species

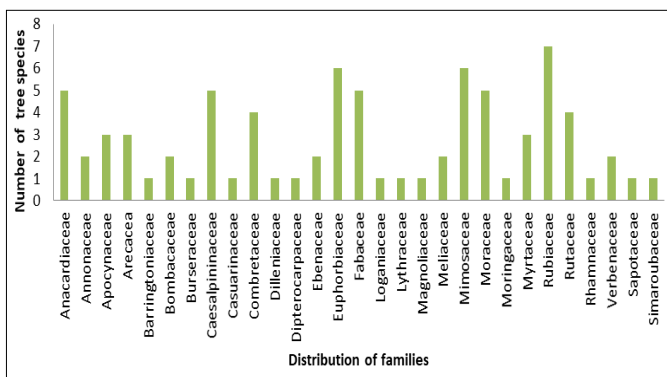


Fig 3: Family wise distribution of tree species

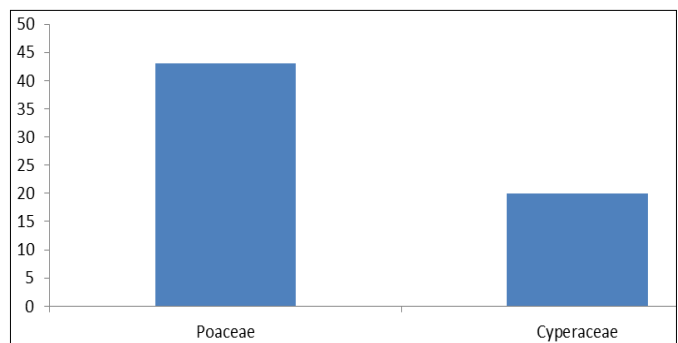


Fig 6: Family wise distribution of Grass species

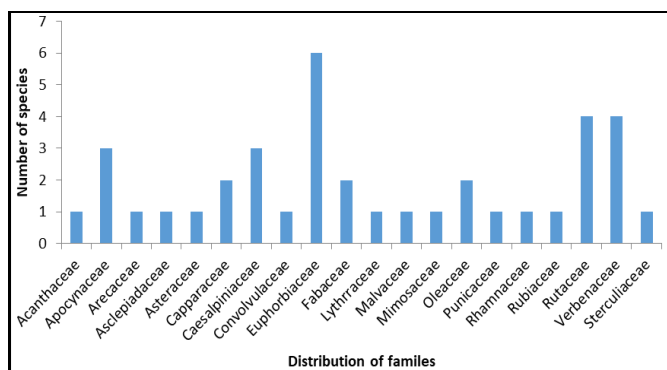


Fig 4: Family wise distribution of shrub species

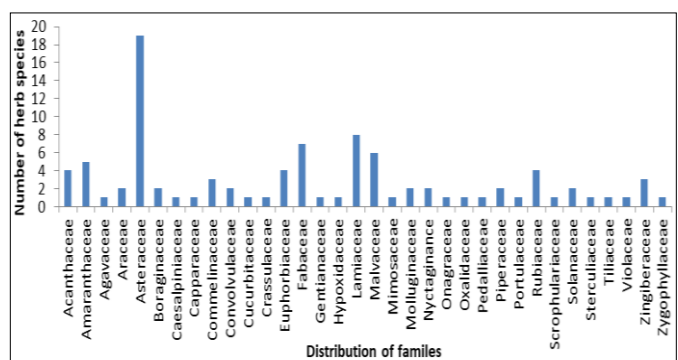


Fig 7: Family wise distribution of herb species

Among 74 families, the most dominated family of tree species is Rubiaceae followed by Mimosaceae, Euphorbiaceae, Anacardiaceae and Caesalpiniaceae. In case of shrub dominated families are Euphorbiaceae followed by Rutaceae, Verbenaceae and Apocynaceae. In herb Asteraceae is dominating family followed by Lamiaceae, Fabaceae and Malvaceae. In grass Poaceae is dominating species. This type of vegetation is mostly prevalent in moist valleys of Malaygiri, Athmallik, Kapilas and hills above 800 m. altitude. It is argued that, as per the International union for conservation of nature and natural resources (IUCN) Red list only five angiosperm species are threned in study site (1 critically endangered (CR), 3 endangered (EN), 2 near threatened (NT)) in study area. They are identified as *Piper longum*, *Gloriosa superba* and *Rouwolfia serpentine* (under EN category), *Saraca asoca* (under CR category) and *Pterocarpus santalinus* (under NT category). With respect to IVI Dipterocarpaceae is represented by a single species i.e. *Shorea robusta*, which is not a species rich family. The high density, frequency and basal area of *Shorea robusta* contributes to a higher IVI (47.18334) followed by *Buchanani lanzan* (39.02923), *Madhuca indica* (27.69932), *Diospyros melanoxylon* (18.88908) and *Mangifera indica* (13.64554).

5. Conclusions

Biodiversity is fundamental for human survival and monetary prosperity and for the biological system capacity and stability. Quantitative structure and floristic composition of tree, herbs, shrubs and climbers species have been studied. Results of the study indicated that the area under investigation have high woody species diversity. The findings had very good indication towards the rich vegetational diversity in the Dhenkanal, district particularly in forests.

6. References

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