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Chandu PG

Adarsha Vidyalaya (RMSA),
Bhoomishettyhalli, Chintamani Tk,
Chikkaballapura Dt. Karnataka,
India

Razika CS

Adarsha Vidyalaya (RMSA),
Bhoomishettyhalli, Chintamani Tk,
Chikkaballapura Dt. Karnataka,
India

Usha CN

Adarsha Vidyalaya (RMSA),
Bhoomishettyhalli, Chintamani Tk,
Chikkaballapura Dt. Karnataka,
India

Mamatha S

Adarsha Vidyalaya (RMSA),
Bhoomishettyhalli, Chintamani Tk,
Chikkaballapura Dt. Karnataka,
India

Kavya K

Adarsha Vidyalaya (RMSA),
Bhoomishettyhalli, Chintamani Tk,
Chikkaballapura Dt. Karnataka,
India

Divya R

Adarsha Vidyalaya (RMSA),
Bhoomishettyhalli, Chintamani Tk,
Chikkaballapura Dt. Karnataka,
India

Shashikala S

Adarsha Vidyalaya (RMSA),
Bhoomishettyhalli, Chintamani Tk,
Chikkaballapura Dt. Karnataka,
India

Jegan G

Jyothi English Medium School,
Oolavadi, Chintamani Tk,
Chikkaballapura Dt. Karnataka,
India

Muthuchelian K

Director, Centre for Biodiversity and
Forest Studies, School of Energy,
Environment and Natural Resources,
Madurai Kamaraj University,
Madurai, Tamil Nadu, India

Correspondence

Jegan G

Jyothi English Medium School,
Oolavadi, Chintamani Tk,
Chikkaballapura Dt. Karnataka,
India

Angiospermic distribution in a dry deciduous forest - Kaiwara Reserve forest, Chintamani Tk, Chikkaballapura Dt. Karnataka, India

Chandu PG, Razika CS, Usha CN, Mamatha S, Kavya K, Divya R, Shashikala S, Jegan G and Muthuchelian K

Abstract

The study provides descriptive information of the floristic composition of tropical dry deciduous forest of Kaiwara Reserve forest, Chintamani, Karnataka, Southern India. Sampling plots of 20 × 100 m² (2000 m², 0.2 ha) were surveyed in twenty different locations within a large patch, giving a total sample area of approximately 2 ha. All individual stems (≥ 1 cm dbh) of trees, shrubs and lianas from these plots were identified to species level and counted. A total of 2117 individuals (≥ 10 cm dbh) comprising 134 species, 75 genera and 65 families were included. Mimosaceae, Caesalpinaceae and Rubiaceae were the most dominant families. Moreover, the study shows that two-hectare floristic inventories of dry deciduous forest can provide a useful tool for assessing plant biodiversity, and provide useful information for effective conservation and management of nature reserves.

Keywords: Reserve forest, Angiosperms, Diversity, Mimosaceae, floristic composition

Introduction

Plants are an essential part of any ecosystem and their function as producers in any food web is of great importance. They bring about an ecological balance and help maintain the serenity of the ecosystem. Their usefulness to the human race and the planet is duly noted. However, with all the development especially in the economic sector, it has been observed that there has been a major degradation of plant diversity in most parts of the world. Deforestation, industrialization, urbanization, climate change, etc. have contributed towards the dwindling species richness of plants (Anonymous, 2010) [1]. Therefore, it is the need of the hour to inventories and study plant biodiversity before some species are lost without even being discovered. A taxonomic study of the flora and forests is essential to understand and assess richness of the biodiversity of a region.

As per the survey in 1995, more than 1.1 billion people were found to inhabit biodiversity hotspots. The annual population growth rate of 1.8% in these hotspots (1995-2000) was substantially higher than the annual global population growth rate of 1.3% (Cincotta *et al.* 2000) [5]. Alarming growth rate of population in developing countries, owing to their increased demand for land, material products, and development projects, threaten natural habitats (Sahu *et al.* 2008; Thapa and Chapman 2010) [16]. The most serious consequences of further habitat loss occur in hotspot areas, which are high in species endemism and low in pristine vegetation. Hence, conservation biologists, including Myers *et al.* (2000) [11], have called for immediate steps to conserve these hotspots (Myers 1990; Shi *et al.* 2005) [10, 15].

Landscape matrix surrounding the protected areas has received much attention recently from the conservation point of view (Haplin 1997; Hannah *et al.* 2002) [8]. Very few ecological studies are available on comparison of protected areas and its surrounding matrix (Khan *et al.* 1997; Velazquez *et al.* 2003; Bhagwat *et al.* 2005) [9, 18, 3]. However, Understanding the species distribution and its functional attributes of protected areas and its surrounding areas are important for the management and conservation of biodiversity (Roy 2003) [13]. When forest expansion occurs through the conversion of fields or scrub growth into plantation of monocultures, as it has many forest scare nations, the expansion of biodiversity from monoculture plantation to a forest transition can be quite small (Spellerberg 1996) [14]. The re-emergence of secondary forests on uncultivated lands allows many species to re-colonize an area by extending the range of some species through migration and seed dispersal; re-growth

probably reduces ecological fragmentation and prevents additional extinctions (Schelhas and Greenberg 1996) [14]. For the conservation and wise use of these forests, a greater understanding of their biodiversity is required (Van Andel 2001) [17]. Unfortunately, there are still many gaps in this knowledge that to be filled in order to develop a sound management system. Our present study aimed at investigating forest structure and composition of angiospermic species in Kaiwara Reserve forest.

Methodology

Study Site

The present study was carried out in Kaiwara Reserve Forest, Chintamani Karnataka State. The study site is situated in Chintamani between 13.34' N latitude and 77.98' E Longitude at an altitude of 1.1 Kms above the sea level. The annual rainfall of Kaiwara Reserve forest is 700 to 800mm. The high temperature was noted in the month March & April 32°C and lower temperature in January 20°C The humidity was 50-80% The dominant fauna Found in Kaiwara Reserve Forest were peacock, Rabbit, Deer, Parrot etc.

Sampling

Our plot 0.2 ha of largely mature phase Forest was investigated. The plot was permanently marked and sub divided into twenty 10x10m quadrates to facilitate quantitative biodiversity inventory. All plants with ≥ 10 cm dbh were taken into account. All plants were identified from their Vegetative & reproductive Feature with the help of "Regional Flora" of Gamble & Fisher (1915-1938) and the "Field Key" of Pascal and Ramesh (1987).

Result and Discussion

Floristic Diversity

The present study includes Angiospermic flora of the study site. Among these the Dicotyledons occupy the major portion. The angiospermic members in the present study include 134 species 2117 and individuals. The dicotyledons are represented by 44 families; 88 genera and 125 species and the monocotyledons are represented by to 21 families, 7 genera and 9 species. The most dominant families of the study area is Mimosaceae (15 species) followed by Caesalpiniaceae (12 species), Rubiaceae (18 species), Cyperaceae (7 species), Combretaceae (6 species), Fabaceae (6 species) and Asclepiadaceae (5 species) (Table 1). The list of angiospermic species is given in Table 2. The number of tree species per ha in our study is less than that of Varagaliar (148) (Ayyappan and Parthasarathy 1999) [2] and higher than Nelliampathy (Chandrashekara and Ramakrishnan 1994) [4].

The diversity indices of our study plot are Shannon index 3.82 and the Simpson dominance index is 0.97. The comparison of diversity dominance indices of various habitat is given in Table 4. The tree species shows high diversity (3.21) whereas liana shows less diversity (0.64)

In our study site, tree species constitute 55.9% of the total diversity. It is followed by shrub (34.32%), herb (6.71%) and liana (2.9%).

Species – area curve

There is an addition of new species occurred in each quadrat of our study site. The species- area curve of our study site is not stabled one (Fig 2).

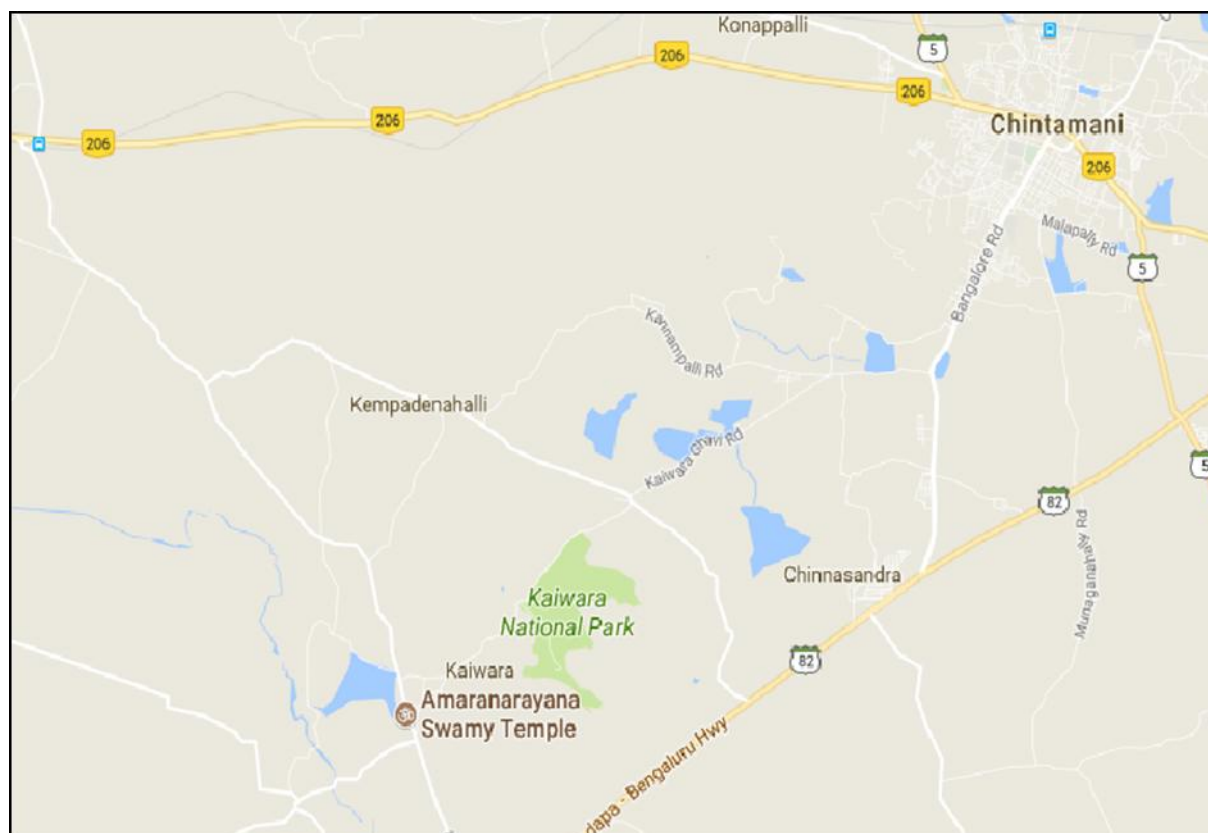


Fig 1: Map showing study site Kaiwara Reserve forest, Chintamani Taluk, Chikballapur District, Karnataka, India.

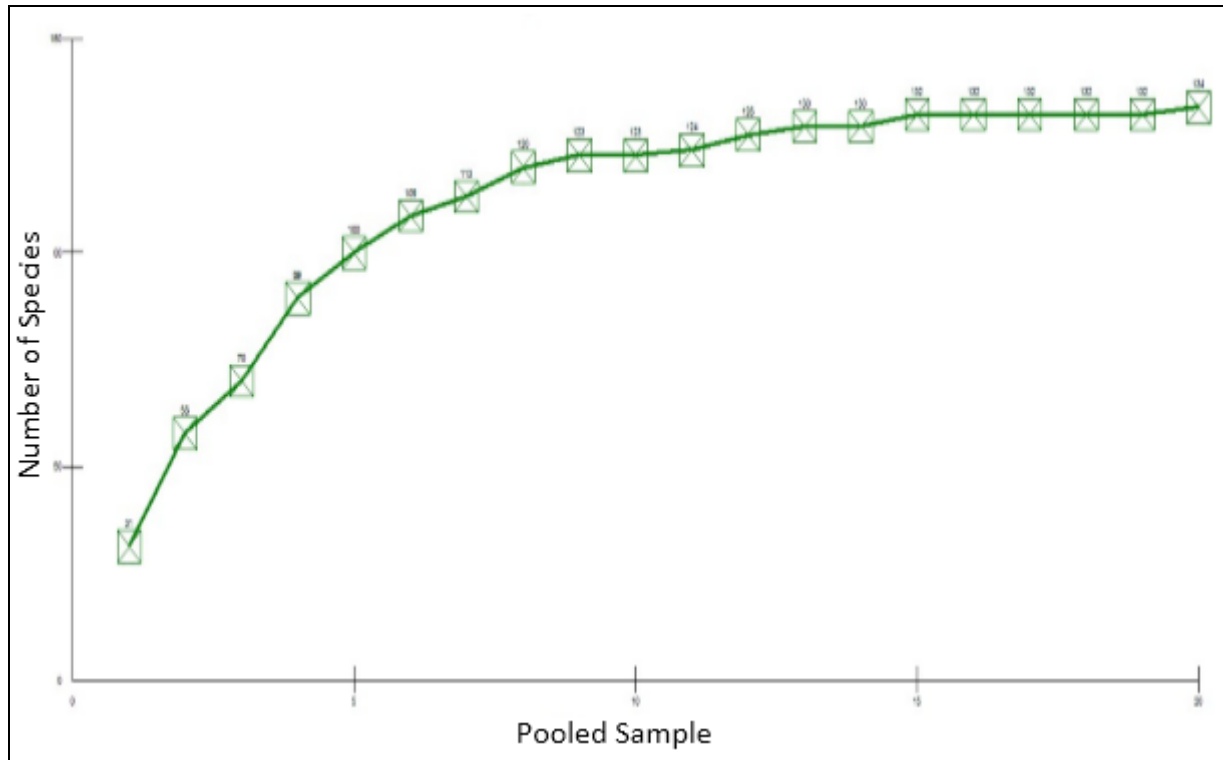


Fig 2: Species - Area curve of the species in the study site.

Table 1: Dominant families of the study site

Sl. No	Family	Genera	Species
01	Mimosaceae	3	15
02	Caesalpinaceae	5	12
03	Rubiaceae	5	8
04	Cyperaceae	5	7
05	Combretaceae	2	6
06	Fabaceae	5	5
07	Asclepiadaceae	5	5
08	Euphorbiaceae	4	5
09	Rutaceae	5	5
10	Verbenaceae	5	5

Table 2: Check list of angiospermic species present in the study site.

S. No	Species	Habit	Family
1	<i>Abrus precatorius</i> L.	Liana	Fabaceae
2	<i>Abutilon indicum</i> (L.) Sweet.	Shrub	Malvaceae
3	<i>Acacia auriculiformis</i> A. Cunn. (Ex Benth.)	Tree	Mimosaceae
4	<i>Acacia catechu</i> Willd.	Tree	Mimosaceae
5	<i>Acacia chundra</i> (Roxb.) Willd.	Tree	Mimosaceae
6	<i>Acacia concina</i> (Willd) DC.	Liana	Mimosaceae
7	<i>Acacia farnesiana</i> (L.) Willd.	Tree	Mimosaceae
8	<i>Acacia ferruginea</i> DC.	Tree	Mimosaceae
9	<i>Acacia leucophloea</i> (Roxb.) Willd.	Tree	Mimosaceae
10	<i>Acacia nilotica</i> (L.) Del.	Tree	Mimosaceae
11	<i>Acacia sinuata</i> (Lour.) Merr.	Liana	Mimosaceae
12	<i>Acacia torta</i> (Roxb.) Bran.	Shrub	Mimosaceae
13	<i>Adina cordifolia</i> (Roxb.) Bran.	Tree	Rubiaceae
14	<i>Alangium lamarckii</i> Thw.	Tree	Alangiaceae
15	<i>Alangium salvifolium</i> (L. f.) Wang.	Tree	Alangiaceae
16	<i>Albizia amara</i> (Roxb.) Boiv.	Tree	Mimosaceae
17	<i>Albizia lebbek</i> (L.) Willd.	Tree	Mimosaceae
18	<i>Albizia odoratissima</i> (L.F.) Benth.	Tree	Mimosaceae
19	<i>Albizia polycantha</i>	Tree	Mimosaceae
20	<i>Annona reticulata</i> L.	Shrub	Annonaceae
21	<i>Annona squamosa</i> L.	Shrub	Annonaceae
22	<i>Anogeissus latifolia</i> (Roxb.) Wall.	Tree	Combretaceae
23	<i>Aristolochia indica</i> Juss.	Shrub	Aristolochiaceae
24	<i>Azadirachta indica</i> Juss.	Tree	Meliaceae
25	<i>Bambusa arundinacea</i> Retz.	Herb	Poaceae

26	<i>Barleria involurata</i> Nees.	Shrub	Acanthaceae
27	<i>Bauhinia purpurea</i> L.	Tree	Caesalpiniaceae
28	<i>Boswellia serrata</i> Coleb.	Tree	Burseraceae
29	<i>Bridelia retusa</i> Spreng.	Tree	Euphorbiaceae
30	<i>Buchanania lanzan</i> Sprengel.	Tree	Anacardiaceae
31	<i>Butea frondosa</i> Roxb.	Tree	Fabaceae
32	<i>Cadaba indica</i> Lam.	Tree	Capparidaceae
33	<i>Caesalpinia bonducella</i> flem.	Shrub	Caesalpiniaceae
34	<i>Calotropis gigantea</i> (L.) Dryand.	Shrub	Asclepiadaceae
35	<i>Canthium angustifolium</i> Roxb.	Tree	Rubiaceae
36	<i>Canthium dicoccum</i> (Gaert.) T&B.	Tree	Rubiaceae
37	<i>Canthium didymum</i> auct.	Tree	Rubiaceae
38	<i>Canthium parviflorum</i> Lam.	Tree	Rubiaceae
39	<i>Capparis sepiaria</i> L.	Liana	Capparidaceae
40	<i>Carex</i>	Herb	Cyperaceae
41	<i>Careya arborea</i> Roxb.	Tree	Myrtaceae
42	<i>Cassia angustifolia</i>	Tree	Caesalpiniaceae
43	<i>Cassia auriculata</i> L.	Shrub	Caesalpiniaceae
44	<i>Cassia fistula</i> L.	Tree	Caesalpiniaceae
45	<i>Cassia montana</i> Roth.	Tree	Caesalpiniaceae
46	<i>Cassia occidentalis</i> L.	Shrub	Caesalpiniaceae
47	<i>Cassia siamea</i> Lam.	Tree	Caesalpiniaceae
48	<i>Cassia surattensis</i> Burm.	Shrub	Caesalpiniaceae
49	<i>Cassia torta</i> L.	Shrub	Caesalpiniaceae
50	<i>Cassine paniculata</i> (W&A) Romam.	Tree	Celastraceae
51	<i>Celastrus paniculata</i> (Willd.)	Shrub	Celastraceae
52	<i>Chloroxylon swietenia</i> DC, Prodr.	Tree	Meliaceae
53	<i>Chromolaena odoratissima</i>	Shrub	Asteraceae
54	<i>Cocculus villosus</i> DC.	Shrub	Menispermaceae
55	<i>Cyperus alternifolius</i> L	Herb	Cyperaceae
56	<i>Cyperus esculentus</i> L.	Herb	Cyperaceae
57	<i>Cyperus rotundus</i> L.	Herb	Cyperaceae
58	<i>Daemia extensa</i> (Jacq) R.Br.	Shrub	Asclepiadaceae
59	<i>Dalbergia latifolia</i> Roxb.	Tree	Fabaceae
60	<i>Dalbergia sissoo</i> Roxb.	Tree	Fabaceae
61	<i>Dendrocalamus strictus</i> (Roxb.) Nees.	Herb	Poaceae
62	<i>Diospyros montana</i> Roxb.	Tree	Ebenaceae
63	<i>Dodonaea viscosa</i> Jacq.	Shrub	Sapindaceae
64	<i>Eriophorum</i> sp.	Herb	Cyperaceae
65	<i>Erythroxylon monogynum</i> Roxb.	Shrub	Erythroxylaceae
66	<i>Eucalyptus glabulus</i> L.	Tree	Myrtaceae
67	<i>Eugenia jambolana</i> Lam.	Tree	Myrtaceae
68	<i>Euphorbia antiquorum</i> L.	shrub	Euphorbiaceae
69	<i>Euphorbia thirukalli</i> L.	Shrub	Euphorbiaceae
70	<i>Feronia elephantum</i> Corr.	Tree	Rutaceae
71	<i>Ficus benghalensis</i> L.	Tree	Moraceae
72	<i>Ficus religiosa</i> L.	Tree	Moraceae
73	<i>Ficus tinctoria</i> Forst.	Tree	Moraceae
74	<i>Glycosmis pentaphylla</i> (Roxb.) DC.	Shrub	Rutaceae
75	<i>Gmelina arborea</i> Roxb.	Tree	Verbenaceae
76	<i>Grewia hirsuta</i> Vahl.	Shrub	Tiliaceae
77	<i>Grewia orientalis</i> L.	Shrub	Tiliaceae
78	<i>Gymnema sylvestre</i> (Retz.) Schultes.	Shrub	Asclepiadaceae
79	<i>Helicteres isora</i> L.	Shrub	Sterculiaceae
80	<i>Holarrhena antidysenterica</i> (Roth.) DC.	Tree	Apocynaceae
81	<i>Holoptelea integrifolia</i> (Roxb.) Planch.	Tree	Ulmaceae
82	<i>Hyptis suaveolens</i> (L.) Poit.	Shrub	Lamiaceae
83	<i>Ipomoea carnea</i> Jace.	Shrub	Convolvulaceae
84	<i>Ipomoea repens</i> auct.	Shrub	Convolvulaceae
85	<i>Ixora polyantha</i> Wt.	Shrub	Rubiaceae
86	<i>Jasminum pubescens</i> Willd.	Shrub	Oleaceae
87	<i>Justicia montana</i> (Nees.) & ess.	Tree	Acanthaceae
88	<i>Kirganelia reticulata</i> (Pior.) Baill.	Tree	Euphorbiaceae
89	<i>Kyllinga</i>	Herb	Cyperaceae
90	<i>Lantana camara</i> L.	Shrub	Verbenaceae
91	<i>Leptadenia reticulata</i> (Retz.) W&A	Shrub	Asclepiadaceae
92	<i>Limonia acidissima</i> auct.	Tree	Limoniaceae
93	<i>Murraya paniculata</i> (L.) Jack.	Tree	Rutaceae
94	<i>Ocimum sanctum</i> L.	Shrub	Labiaceae

95	<i>Olea dioica</i> Roxb.	Tree	Oleaceae
96	<i>Opuntia dellenii</i> (K.G.) Haw.	Shrub	Cactaceae
97	<i>Paramignya monophylla</i> Wt.	Tree	Rutaceae
98	<i>Passiflora foetida</i> L.	Shrub	Passifloraceae
99	<i>Phyllanthus emblica</i>	Tree	Euphorbiaceae
100	<i>Plumbago zeylanica</i> Willd.	Shrub	Plumbaginaceae
101	<i>Plumeria alba</i> Vent.	Tree	Apocynaceae
102	<i>Polygonum glabrum</i> Willd.	Tree	Polygonaceae
103	<i>Pongamia glabra</i> Vent.	Tree	Fabaceae
104	<i>Premna tomentosa</i> Willd.	Tree	Verbenaceae
105	<i>Prosopis spicigera</i> L.	Shrub	Mimosaceae
106	<i>Pterocarpus marsupium</i> Roxb.	Tree	Fabaceae
107	<i>Pterolobium hexapetalum</i> (Roth.) S&W.	Shrub	Caesalpiniaceae
108	<i>Randia dumetorium</i> (Retz.) Poir.	Tree	Rubiaceae
109	<i>Rhynchospora corymbosa</i> Britton	Herb	Cyperaceae
110	<i>Santalum album</i> L.	Tree	Santalaceae
111	<i>Sida cordifolia</i> L.	Shrub	Malvaceae
112	<i>Streblus asper</i> Lour.	Tree	Moraceae
113	<i>Strychnos potatorum</i> L.F.	Tree	Loganiaceae
114	<i>Tamarindus indica</i> L.	Tree	Caesalpiniaceae
115	<i>Tarenna asiatica</i> (L.) Schumann.	Shrub	Rubiaceae
116	<i>Tecoma stans</i> (L.) Kumth.	Shrub	Bignoniaceae
117	<i>Tectona grandis</i> L.F.	Tree	Verbenaceae
118	<i>Terminalia arajuna</i> (Roxb. ex DC.) W&A.	Tree	Combretaceae
119	<i>Terminalia bellerica</i> (Gaertn.) Roxb.	Tree	Combretaceae
120	<i>Terminalia chebula</i> (Gaertn.) Retz.	Tree	Combretaceae
121	<i>Terminalia paniculata</i> Roth.	Tree	Combretaceae
122	<i>Terminalia tomentosa</i> (DC.) W&A	Tree	Combretaceae
123	<i>Tinospora cordifolia</i>	Tree	Menispermaceae
124	<i>Toddalia asiatica</i> (L.) Lam.	Shrub	Rutaceae
125	<i>Tylophora pauciflora</i>	Shrub	Asclepiadaceae
126	Unidentified 1	Shrub	
127	Unidentified 2 (Nagare gida)	Shrub	
128	<i>Vitex altissima</i> L.F.	Tree	Verbenaceae
129	<i>Wrightia tinctoria</i> R.Br.	Tree	Apocynaceae
130	<i>Wrightia tomentosa</i> R.&S.	Tree	Apocynaceae
131	<i>Ziziphus jujuba</i> Lamk.	Tree	Rhamnaceae
132	<i>Ziziphus mauritiana</i> Lamk.	Tree	Rhamnaceae
133	<i>Ziziphus oenoplia</i> Miller.	Shrub	Rhamnaceae
134	<i>Ziziphus xylopyrus</i> Willd.	Tree	Rhamnaceae

Table 3: Consolidated details on the floral diversity of Kaiwara Reserve Forest.

Parameters	Values
Number of Species	134
Number of individuals	2117
Shannon index	3.82
Simpson index	0.97

Table 4: Species diversity indices for different habit

Habit	Number of species	Shannon index	Simpson index
Tree	75	3.21	0.958
Shrub	46	2.972	0.9454
Liana	04	0.64	0.44
Herb	09	1.31	0.711

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