Chapter-VII

DIVERSITY OF TREE SPECIES IN SONAI-RUPAI WILDLIFE SANCTUARY

7.1. Introduction

A forest is generally defined as a plant community predominantly of trees and other woody vegetation. It has been found that the diversity, density, vegetation complexity and resource exploitation of tree species patterns have a direct impact on the wildlife and bird communities (Wilson, 1974 and Bland, 1998). The diversity of tree species and their spatial distribution are mainly influence by biogeography, niche requirement and disturbance (Huang *et al.,* 2003). Trees in the forest conserve water, preserve biodiversity, supply food to wild animals and help to maintain the health of the habitat of many faunal species. Human being also depends on forest for different kinds of forest products mainly on tree species. Forest communities largely depend on tree diversity and its regeneration status. Population structure is generally expressed in number of individuals present in each of the definite girth class distribution of tree species. The regeneration behavior of tree species in a forest can be revealed from the population structure (Sarkar and Devi, 2014).

Nowadays, forest habitats are severely exploited by man for various purposes and therefore, the availability of plant resources for wild animals has been of immense concern. Forests specially trees are undergoing severe modifications because of various anthropogenic activities such as cutting down of forest for plantation, establishment, settlement, agriculture and timber logging (Ndah *et al.,* 2013) and these activities are

affecting the tree community structure. The evaluation of tree community structure through qualitative approach is a pre-requisite for the study which basically depends on the type, quality and stratification of vegetation in forests (Saxena and Singh, 1982b).

It has been discussed already that anthropogenic activities are increasing monotonically in the Sonai-Rupai Wildlife Sanctuary during the past few decades. Deforestation due to illegal felling and loss of forest because of bank side erosion and deposition by the rivers are taking place and is affecting significantly the community structure. The plants has been found to usually grow in the communities in the environment where the communities are characterized by various factors such as its species diversity, growth forms and structures, dominance, succession trends etc. Therefore, it is important to study the forest community structure in the Sanctuary to know the health of the forest and the habitat quality. However, herbs and shrubs were omitted because of time constrain and as a first step of investigation, only tree species have been included in this study.

The Sanctuary is found to be a suitable habitat for large number of mammalian, birds and invertebrate species. An important species of primates *Trachypithecus pileatus* (Capped langur) is known to found in the Sanctuary in fairly large numbers. These primates use large trees for their habitat. Therefore, the present study has been carried to record data on tree species so that it will be helpful to formulate conservation strategy for plant species in particular trees species and for the proper conservation of animal species inhabiting in the Sanctuary. The data generated in the study would provide information on tree species composition, dominant species in the communities, abundance of different species or population structure, etc. It would act as baseline

information for formulating proper conservation and management of vegetation in the Sonai-Rupai Wildlife.

7.2. Methodology

Community analysis was carried for tree species only. Different sites of the Sanctuary, such as - dense forests, forest areas near the river banks and forest areas near the boundary of the Sanctuary were selected for data collection. In study sites, 30 quadrats of 10 m X 10 m (10 sq m) sizes were randomly selected and different tree species observed in each quadrat were recorded. The period of field visit and data collection was so selected that the area is easily accessible and it covers the phenophases of majority of plants species like flowering and fruiting. Tree species were identified and confirmed / identified by experts at BSI, Shillong. The primary data were generated and used for quantitative analysis to find out different parameters (Curtis and McIntosh, 1950). Species Accumulation Curve was calculated by using BioDiversity Pro software.

(i) Density

Density is an expression of the numerical strength of a species where the total number of individuals of each species in all the quadrats is divided by the total number of quadrats studied in a given area.

$$\text{Density} = \frac{\text{Total number of individuals of a species in all quadrats}}{\text{Total number of quadrats studied}}$$

(ii) Frequency (%)

Frequency (%) refers to the degree of dispersion of individual species in an area and is generally expressed in terms of percentage occurrence. The working formula is as follows.

$$\text{Frequency (\%)} = \frac{\text{Number of quadrats in which the species occurred}}{\text{Total number of quadrats studied}} \text{ X } 100$$

(iii) Abundance

It is the study of the number of individuals of different species in the community per unit area. It is represented by the equation –

$$\text{Abundance} = \frac{\text{Total number of individuals of a species in all quadrats}}{\text{Total number of quadrats in which the species occurred}}$$

(iv) Importance Value Index (IVI) and Family Importance Value (FIV)

This index is used to determine the overall importance of each species in the community structure. For calculating Important Value index (IVI), the percentage values of the relative frequency, relative density and relative dominance are summed up together and this value is designated as the Importance Value Index (IVI) of the species (Curtis, 1959). Family Importance Value (FIV) was also calculated by summing the relative diversity, relative density and relative dominance (Mori *et al.*, 1983).

(a) Relative density: Relative density is the study of numerical strength of a species in relation to the total number of individuals of all the species and can be calculated as –

$$\text{Relative Density} = \frac{\text{Number of individual of the species}}{\text{Number of individual of all the species}} \text{ X } 100$$

(b) Relative frequency: The degree of dispersion of individual species in an area in relation to the number of all the species occurred.

$$\text{Relative Frequency} = \frac{\text{Number of occurrence of the species}}{\text{Number of occurrence of all the species}} \text{ X } 100$$

(c) Relative dominance: Dominance of a species is determined by the value of the basal cover. Relative dominance is the coverage value of a species with respect to the sum of coverage of the rest of the species in the area. The total basal area was calculated from the sum of the total diameter of immerging stems. In trees, the basal area was measured at breast height (1.5m) and by using the formula πr^2.

$$\text{Relative Dominance} = \frac{\text{Total Basal area of the species}}{\text{Total basal area of all the species}} \text{ X } 100$$

Family Importance Value is calculated by the following formula----

FIV = Family relative diversity + Family relative density + Family relative Dominance

(v) Species richness

The species richness of the vascular plants was calculated by using the method 'Margalef's index of richness' (D_{mg}) (Magurran, 1988).

$$D_{mg} = (S-1)/ \text{In } N$$

where, S = Total number of species and N = Total number of individuals.

(vi) Species Diversity: Shannon-Weiner Index (Shannon & Weaver, 1963)

Shannon-Weiner (1963) index of diversity is calculated by

$$H' = - \sum pi \text{ In } pi$$

Where, H' = Shannon index of diversity

pi =The proportion of important value of the ith species

and pi = ni / N,

ni is the important value index of ith species and N is the important value index of all the species).

7.3. Results and Discussion

Species accumulation curves for tree species in the study sites reached an asymptote as shown in ***Fig.7.1***. Asymptote approach of species accumulation curve indicates that the sampling area was sufficient to capture the tree species richness in each selected site.

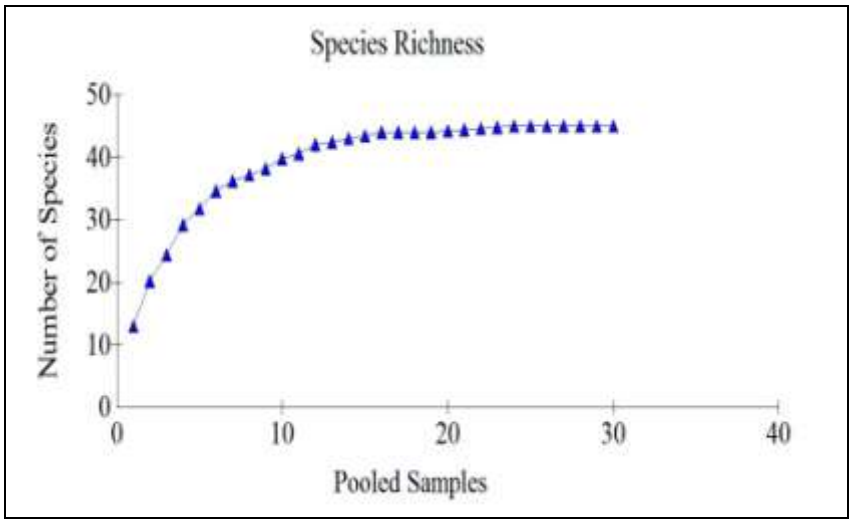

Fig: 7.1; Species Accumulation Curves

7.3.1. Important Value Index

A total of 45 tree species belonging to 41 genera and 27 families were recorded from the study sites. Scientific nomenclature of all the plant species recorded during the study period was given as per the IPNI (The International Plant Names Index). The

Importance Value Index (IVI) of tree species ranged from 0.90 - 24.50. *Terminalia Myriocarpa* had the highest IVI of 24.50 which was followed by *Ziziphus funiculosa* with IVI 16.69. The IVI value for all the tree species are presented in ***Table 7.1.*** Species dominance curve is presented in ***Fig.7.2*** was based on IVI values.

Table 7.1: Relative Density, Relative Frequency, Relative Dominance and IVI for Tree Species

Scientific Names	Relative Density	Relative Frequency	Relative Dominance	IVI
Terminalia myriocarpa	3.49	3.66	17.35	24.50
Ziziphus funiculosa	2.83	3.96	9.89	16.69
Polyalthia longifolia	2.83	2.74	9.52	15.10
Mesua ferrea L.	6.10	4.88	2.71	13.69
Canarium bengalense Roxb.	4.58	4.57	3.60	12.75
Cratava religiosa	4.36	3.96	3.63	11.95
Amoora wallichi	5.45	3.05	2.78	11.27
Phoebe goalparensis	4.58	4.57	2.04	11.19
Dillenia indica	5.45	3.05	2.20	10.70
Syzygium cumini	3.92	4.57	1.81	10.30
Terminalia chebula Retz.	3.05	3.66	3.10	9.81
Pterospermum acerifolium	2.83	3.05	3.68	9.56
Bischofia javanica	3.92	3.05	2.11	9.08
Casearia vareca Roxb.	2.83	3.35	2.51	8.69
Sterculia villosa Roxb.	3.27	3.35	1.90	8.52
Dysoxylum excelsum Blume	2.18	2.44	3.77	8.39
Tetrameles nudiflora R. Br.	2.61	2.74	2.54	7.90
Altingia excelsa Noronha	1.96	1.83	4.04	7.83
Mangifera indica L.	2.61	3.35	0.78	6.75
Khasiaclunea oligocephala	2.40	3.05	1.13	6.57
Mansonia dipikae Purkayastha	2.40	3.05	0.84	6.28
Chisocheton cumingianus	2.61	2.74	0.80	6.16
Oroxylum indicum	1.09	1.22	3.68	5.98
Michelia montana	1.74	1.83	1.76	5.33
Gmelina arborea Roxb.	1.96	2.44	0.82	5.22
Premna bengalensis	2.18	2.44	0.52	5.14
Albizia procera (Roxb.)Benth.	2.40	1.83	0.79	5.02
Morus laevigata	2.18	1.52	0.71	4.41
Michelia oblonga	1.53	0.91	1.68	4.12

Scientific Names	**Relative Density**	**Relative Frequency**	**Relative Dominance**	**IVI**
Stereospermum chelonoides(L.f.) DC	1.09	1.22	1.50	3.80
Mallotus tetracoccus (Roxb.) Kurz	1.31	1.52	0.04	2.87
Albizia lebbeck (L.) Benth.	1.31	1.22	0.04	2.57
Ficus sps	0.65	0.91	0.97	2.54
Drimcarpus racemosus	0.44	0.61	1.20	2.25
Litsea monopetala (Roxb.) Pers.	0.87	0.91	0.36	2.15
Alstonia scholoris	0.65	0.61	0.82	2.09
Bombax ceiba L.	0.65	0.91	0.48	2.05
Melia azedarach	0.65	0.91	0.34	1.91
Artocarpus chaplasha Roxb.	0.44	0.61	0.67	1.72
Shorea robusta Gaertn.	0.65	0.91	0.09	1.66
Lagerstroemia speciosa (L.) Pers.	0.44	0.61	0.18	1.22
Baccaurea ramiflora Lour.	0.44	0.61	0.14	1.18
Emblica officinalis	0.44	0.61	0.05	1.09
Cassia fistula	0.44	0.61	0.03	1.08
Ficus hispida L. f.	0.22	0.30	0.38	0.90

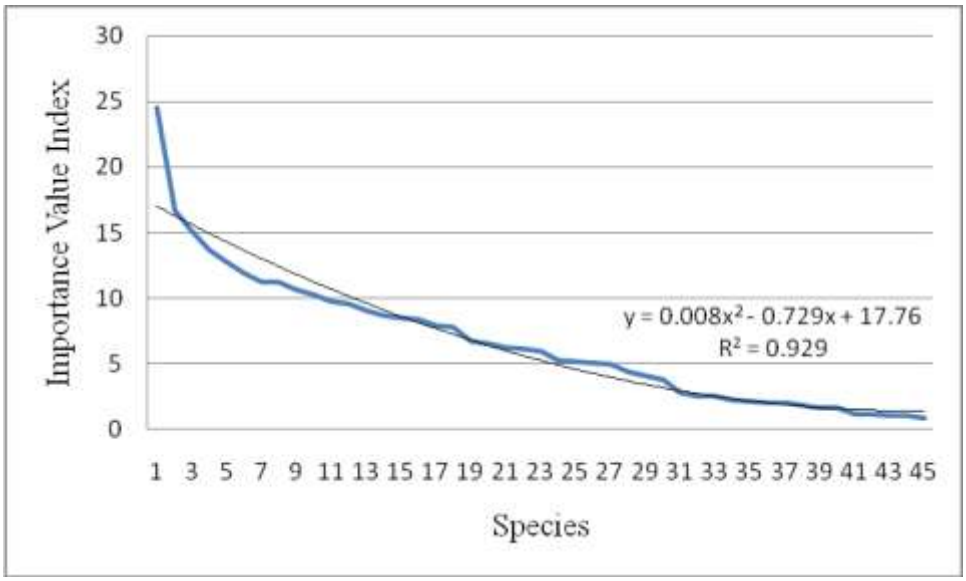

Fig.7.2: Tree species showing Dominance diversity (D-D) curve

7.3.2. Family Importance Value (FIV) and Family Diversity

In the study sites a total of 27 tree families were recorded having the highest species diversity from the family *Malvaceae, Meliaceae and Moraceae.* ***Table 7.2*** contains the name of the trees species with their family. Family wise density and basal area was calculated and is shown in ***Table 7.3.*** Species wise density, Basal Area is presented in ***Table 7.4.***

Table 7.2: Tree Species with their Family

Sl. No.	Scientific Name	Family
1	*Altingia excelsa* Noronha	*Altingiaceae*
2	*Mangifera indica* L.	*Anacardiaceae*
3	*Polyalthia longifolia* (Sonn.) Thwaites	*Annonaceae*
4	*Alstonia scholaris* (L.) R. Br.	*Apocynaceae*
5	*Oroxylum indicum* (L.) Kurz	*Bignoniaceae*
6	*Stereospermum chelonoides* (L.f.) DC.	*Bignoniaceae*
7	*Canarium bengalense* Roxb.	*Burseraceae*
8	*Mesua ferrea* L.	*Calophyllaceae*
9	*Crateva religiosa* G.Forst.	*Capparaceae*
10	*Terminalia chebula* Retz.	*Combretaceae*
11	*Terminalia myriocarpa* Van Heurck & Müll. Arg.	*Combretaceae*
12	*Dillenia indica* L.	*Dilleniaceae*
13	*Shorea robusta* Gaertn.	*Dipterocarpaceae*
14	*Mallotus tetracoccus* (Roxb.) Kurz	*Euphorbiaceae*
15	*Gmelina arborea* Roxb.	*Lamiaceae*
16	*Premna bengalensis* C.B.Clarke	*Lamiaceae*
17	*Litsea monopetala* (Roxb.) Pers.	*Lauraceae*
18	*Phoebe goalparensis* Hutch. (unresolved name)	*Lauraceae*
19	*Albizia lebbeck* (L.) Benth.	*Leguminosae*
20	*Albizia procera* (Roxb.) Benth.	*Leguminosae*
21	*Cassia fistula* L.	*Leguminosae*
22	*Lagerstroemia speciosa* (L.) Pers.	*Lythraceae*
23	*Magnolia montana* (Blume) Figlar	*Magnoliaceae*
24	*Magnolia oblonga* (Wall. ex Hook.f. & Thomson) Figlar	*Magnoliaceae*
25	*Bombax ceiba* L.	*Malvaceae*
26	*Mansonia dipikae* Purkayastha	*Malvaceae*
27	*Pterospermum acerifolium* (L.) Willd.	*Malvaceae*
28	*Sterculia villosa* Roxb.	*Malvaceae*

Table 7.2 Continued

Sl. No.	*Scientific Name*	*Family*
29	*Aglaia spectabilis* (Miq.) S.S.Jain & S.Bennet	*Meliaceae*
30	*Chisocheton cumingianus* (C.DC.) Harms	*Meliaceae*
31	*Dysoxylum excelsum* Blume	*Meliaceae*
32	*Melia azedarach* L.	*Meliaceae*
33	*Artocarpus chama* Buch.-Ham.	*Moraceae*
34	*Ficus hispida* L.f.	*Moraceae*
35	*Ficus variegata Blume*	*Moraceae*
36	*Morus macroura* Miq.	*Moraceae*
37	*Syzygium cumini* (L.) Skeels	*Myrtaceae*
38	*Baccaurea ramiflora* Lour.	*Phyllanthaceae*
39	*Bischofia javanica* Blume	*Phyllanthaceae*
40	*Phyllanthus emblica* L.	*Phyllanthaceae*
41	*Ziziphus funiculosa* Buch.-Ham. ex Wall. (unresolved name)	*Rhamnaceae*
42	*Khasiaclunea oligocephala* (Havil.) Ridsdale	*Rubiaceae*
43	*Pilocarpus racemosus* Vahl	*Rutaceae*
44	*Casearia vareca* Roxb.	*Salicaceae*
45	*Tetrameles nudiflora* R. Br.	*Tetramelaceae*

Table 7.3: Family with Density, Basal Area and FIV

Sl. No.	Family	No. of Species	Density (individual ha^{-1})	Basal Area (m^2ha^{-1})	FIV
1	*Altingiaceae*	1	23	207.32	7.83
2	*Anacardiaceae*	1	40	40.03	6.75
3	*Annonaceae*	1	40	450.77	15.1
4	*Apocynaceae*	1	147	274.1	2.09
5	*Bignoniaceae*	2	34	261.5	9.79
6	*Burseraceae*	1	57	150.94	12.75
7	*Calophyllaceae*	1	47	73.73	13.69
8	*Capparaceae*	1	60	167.32	11.95
9	*Combretaceae*	2	93	278.76	34.31
10	*Dilleniaceae*	1	67	89.7	10.7
11	*Dipterocarpaceae*	1	10	4.85	1.66
12	*Euphorbiaceae*	1	13	1.38	2.87
13	*Lamiaceae*	2	57	63.88	10.36
14	*Lauraceae*	2	73	108.59	13.34
15	*Leguminosae*	3	74	46.5	8.67
16	*Lythraceae*	1	80	136.73	1.22
17	*Magnoliaceae*	2	50	176.13	9.45
18	*Malvaceae*	4	133	339.45	26.41

Table 7.3 Continued

Sl. No.	Family	No. of Species	Density (individual ha^{-1})	Basal Area (m^2ha^{-1})	FIV
19	*Meliaceae*	4	147	369.6	27.73
20	*Moraceae*	4	73	242.37	9.57
21	*Myrtaceae*	1	53	82.26	10.3
22	*Phyllanthaceae*	3	61	100.46	11.36
23	*Rhamnaceae*	1	37	26.15	16.69
24	*Rubiaceae*	1	37	57.9	6.57
25	*Rutaceae*	1	7	61.57	2.25
26	*Salicaceae*	1	33	119.9	8.69
27	*Tetramelaceae*	1	40	130.25	7.9

Table 7.4: Tree species with Family, Density and Basal Area

Scientific Name	***Family***	**Density (Individual ha^{-1})**	**Basal Area (m^2ha^{-1})**
Aglaia spectabilis (Miq.) S.S.Jain & S.Bennet	*Meliaceae*	70	120.70
Albizia lebbeck (L.) Benth.	*Leguminosae*	20	2.28
Albizia procera (Roxb.) Benth.	*Leguminosae*	37	40.64
Alstonia scholaris (L.) R. Br.	*Apocynaceae*	147	274.10
Altingia excelsa Noronha	*Altingiaceae*	23	207.32
Artocarpus chama Buch.-Ham.	*Moraceae*	23	111.33
Baccaurea ramiflora Lour.	*Phyllanthaceae*	7	7.03
Bischofia javanica Blume	*Phyllanthaceae*	47	90.98
Bombax ceiba L.	*Malvaceae*	23	47.57
Canarium bengalense Roxb.	*Burseraceae*	57	150.94
Casearia vareca Roxb.	*Salicaceae*	33	119.90
Cassia fistula L.	*Leguminosae*	17	3.58
Chisocheton cumingianus (C.DC.) Harms	*Meliaceae*	37	37.84
Crateva religiosa G.Forst.	*Capparaceae*	60	167.32
Dillenia indica L.	*Dilleniaceae*	67	89.70
Dysoxylum excelsum Blume	*Meliaceae*	30	193.48
Ficus variegata Blume	*Moraceae*	10	49.81
Ficus hispida L.f.	*Moraceae*	10	48.67
Gmelina arborea Roxb.	*Lamiaceae*	27	37.11
Khasiaclunea oligocephala (Havil.) Ridsdale	*Rubiaceae*	37	57.90
Lagerstroemia speciosa (L.) Pers.	*Lythraceae*	80	136.73
Litsea monopetala (Roxb.) Pers.	*Lauraceae*	10	13.95

Table 7.4 Continued

Scientific Name	***Family***	**Density (Individual ha^{-1})**	**Basal Area (m^2ha^{-1})**
Magnolia montana (Blume) Figlar	*Magnoliaceae*	27	90.25
Magnolia oblonga (Wall. ex Hook.f. & Thomson) Figlar	*Magnoliaceae*	23	85.88
Mallotus tetracoccus (Roxb.) Kurz	*Euphorbiaceae*	13	1.38
Mangifera indica L.	*Anacardiaceae*	40	40.03
Mansonia dipikae Purkayastha	*Malvaceae*	30	33.54
Melia azedarach L.	*Meliaceae*	10	17.58
Mesua ferrea L.	*Calophyllaceae*	47	73.73
Morus macroura Miq.	*Moraceae*	30	32.55
Oroxylum indicum (L.) Kurz	*Bignoniaceae*	17	188.44
Phoebe goalparensis Hutch. (unresolved name)	*Lauraceae*	63	94.65
Phyllanthus emblica L.	*Phyllanthaceae*	7	2.45
Pilocarpus racemosus Vahl	*Rutaceae*	7	61.57
Polyalthia longifolia (Sonn.) Thwaites	*Annonaceae*	40	450.77
Premna bengalensis C.B.Clarke	*Lamiaceae*	30	26.77
Pterospermum acerifolium (L.) Willd.	*Malvaceae*	47	195.55
Shorea robusta Gaertn.	*Dipterocarpaceae*	10	4.85
Sterculia villosa Roxb.	*Malvaceae*	33	62.79
Stereospermum chelonoides (L.f.) DC.	*Bignoniaceae*	17	73.06
Syzygium cumini (L.) Skeels	*Myrtaceae*	53	82.26
Terminalia chebula Retz.	*Combretaceae*	43	148.53
Terminalia myriocarpa Van Heurck & Müll. Arg.	*Combretaceae*	50	130.23
Tetrameles nudiflora R. Br.	*Tetramelaceae*	40	130.25
Ziziphus funiculosa Buch.-Ham. ex Wall. (unresolved name)	*Rhamnaceae*	37	26.15

In the study area maximum Family Importance Value (FlV) was recorded for *Combretaceae* (34.31) with 2 species and 1 genera showing tree density (93 individual ha^{-1}) and basal area (278.76 m^2ha^{-1}). M*eliaceae* (27.73) and *Malvaceae* (26.40) were the co-dominant family in the Sanctuary. The highest tree density of *Alstonia scholaris* (L.)R.Br. (147 individuals ha^{-1}) was recorded in the Sanctuary followed by *Lagerstroemia speciosa* (L.)Pers. (80 individuals ha^{-1}) and *Aglaia*

spectabilis (Miq.) S.S.Jain & S.Bennet (70 individuals ha^{-1}). The highest value of basal area for tree *Polyalthia longifolia* (Sonn.) Thwaites (450.7696 m2 ha^{-1}) was recorded in the study area followed by *Alstonia scholaris* (L.)R.Br. (274.1043 m^2ha^{-1}) and *Altingia excelsa* Noronha (207.3182 m^2ha^{-1}).

Whitmore (1984) has reported that the number of tree species per hectare varies from 20 to a maximum of 223 in tropical rain forests. In the present investigation record of 45 tree species richness are found within the range of 20-223 trees. Present result of tree diversity is higher than the Devi and Yadava (2006) who have studied tree diversity in tropical semi-evergreen forest of Manipur and found 32 species of trees. Sagar and Singh (2005) have studied tree diversity in tropical dry deciduous forest of Northern India and found 7-31 species; whereas Borah and Garkoti (2011) have found 60-62 tree species in disturbed and undisturbed forests of Barak Valley.

7.3.3. Margalef's species richness index (*Dmg*) and Shannon-Wiener Diversity Index

Margalef's species richness index (*Dmg*) for tree species recorded in the present study was 7.2 (7.17). The recorded value is found to be higher in compared to study done by Arunachalam (2002) in Western Ghats. In contradictory, the value of Richness Index was found to be low as compared to studied done by Borah and Garkoti (2011) in Barak Valley of Assam and Chauhan *et al.,* (2008) in Katarniaghat Wildlife Sanctuary.

The Shannon-Wiener Diversity Index (H) used to provide information about the species diversity within the community. The value of the index are generally observed between 1.5 and 3.5 in most ecological studies, and the index is rarely greater than 4.5 (Kent and Coker, 1992). In the present study the Shannon-Weiner's Diversity Index of

3.54 were recorded for trees which are within the range as given by Kent and Coker (1992). The present value of Diversity index is found to be higher than reports from tropical semi-evergreen forest of Manipur studied by Devi and Yadava (2006). Nath *et al.,* (2005) also recorded 0.96-1.45 value of diversity index in Arunachal Pradesh.

7.3.4 Regeneration Status of Tree Species

The regeneration status of tree species was found to be low and is shown in ***Fig.7.3.*** It shows that maximum species have girth in between 90 cm to 270 cm, which shows poor regeneration status of tree species. A very few tree species are having girth in the range of 30 cm to 60 cm. It clearly shows that very few numbers of young sampling tree species were present. Therefore, a proper management plan is required for regeneration of trees in the near future. The poor generation of tree species in the Sanctuary is mainly due to human disturbances. Similar results of human interference in poor regeneration of tree species were reported by Ballabha *et al.,* (2013) in sub-tropical forest of Alaknanda Valley, Garhwal Himalaya, India and Malik *et al.,* (2016) in Western Himalaya, India.

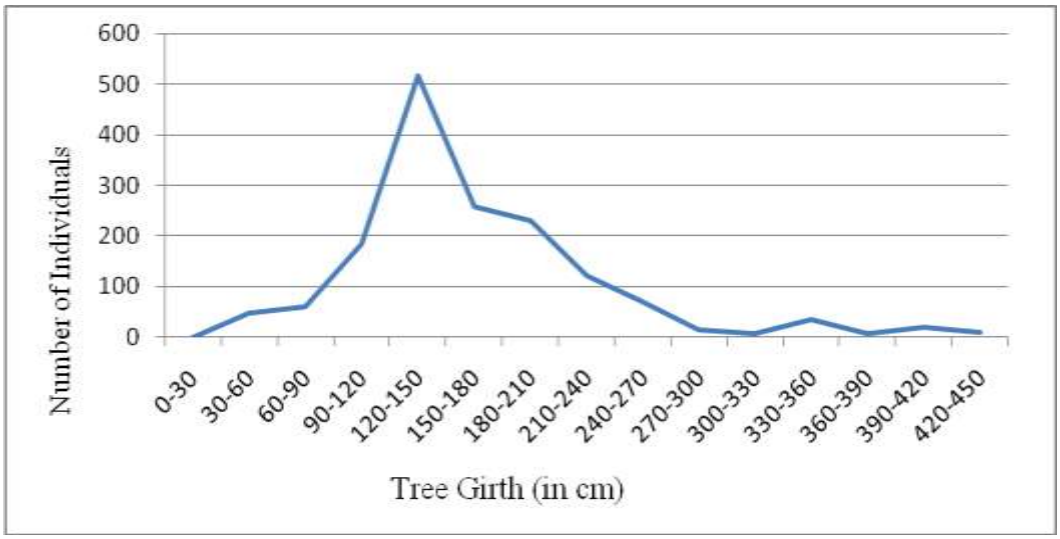

Fig:7.3. Population Structure of Tree Species

7.3.5 Economical Importance of the Tree Species

From the present investigation, it has been recorded that several tree species have medicinal and economic value such as timber and non-timber forest products (NTFP) which include firewood, wild edibles, fodder, medicinal etc. Some of the important medicinal tree species recorded in the study area are *Amoora wallichi, Chisocheton cumingianus , Casearia vareca Roxb., Terminalia chebula Retz., Mallotus tetracoccus (Roxb.) Kurz , Cassia fistula and Bischofia javanica.* Most of the trees found in the Sanctuary are used as timber for making houses and furniture. These trees are found to be commercially very important and because of this reasons the Sanctuary is facing serious threat of deforestation through illegal logging.

7.5. Conclusion

The assessment and understanding of the plant resources is very important for the sustainable management, utilization and biodiversity conservation. Tree species diversity plays an important role in monitoring and sustainable forest management. The study

provides a critical analysis of tree species richness in the Sonai-Rupai Wildlife Sanctuary. Human disturbances have affected the regeneration of tree species in the Sanctuary. The Sanctuary is still rich in tree diversity which can play an important role for the survival of wildlife. Thus, the quantitative analysis of diversity, population structure and regeneration status of tree species recorded from the present study may provide baseline information for formulating conservation and management strategies for the Sanctuary.

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