STRUCTURAL ANALYSIS OF PATHADIPPALAM AREA OF SHOLAYAR RESERVE FOREST, SOUTHERN WESTERN GHATS OF INDIA

SHEEJA P PARAYIL[1] and ABHILASH. E.S[2]

[1]Dept.of Botany, SN College Nattika, Thrissur,Kerala,India

[2]Department of Botany, SNG College, Chelannur, Kozhikode, Kerala. India

Abstract : Biodiversity destruction is a big threat to our natural ecosystem which causes an imbalance in our ecosystem. To understand the diversity and structure of a population phytosociological studies are very helpful. This study deals with the tree species diversity of Sholayar, Southern Western Ghats of India. Trees in one hectare area of Pathadippalam was studied. Typical *Cullenia exarillata-Palaquiumelipticum-Agrostistachysborneensis-Drypetesvenusta-Mesuaferea* association is seen in Pathadipalam area.The low stand density of (544 trees/ha), of this Pathadippalam area is mainly due to past anthropogenic interactions like selection felling operations prevailed up to 1987 and subsequent biotic pressures. The area is still rich with Endemics, RET' s etc. Further periodic studies and conservation measures to be taken to ensure the recovery of this Tropical Rain Forest.

Key words: Tropical Rain Forest, Phytosociology, Vegetation analysis.

I. INTRODUCTION

Forest is an ecosystem which is dominated by trees. Rainforests are multistoried, closed, broad leaved vegetation with continuous tree canopy of different height and with species diversity (Sneadaker, 1970).Tropical rainforests are considered as treasures of biodiversity. They cover only 7% of the land area. But have more than half of all living species (Galley, 2014).Forests play many important roles such as floral and faunal preservation, prevention of soil erosion, climate change mitigation etc. Sustainable management of any ecosystem is necessary for conserving diversity among living organisms. There are two hotspots in India, Himalayas and Western Ghats. In addition there are two biotic provinces in Western Ghats, wet coastal plain, and a continuous line of steeply rising hills and mountains which extends from 22º N in south Gujarat to 8º N in extreme south of Tamil Nadu; consists of 1, 60,000 km² area and covered by forest in one third area. An important feature of Western Ghats is the presence of tropical rainforests along the windward side.When compared to moist deciduous forests,evergreen forests are fragile and cannot withstand disturbances.Richand diverse vegetation in our country is the result of varying climatic and geographical conditions. Being one among the global biodiversity hotspots, the need of protection and sustainable management of forests of Western Ghats have already been highlighted (Collins,et al,1991)The current rate of tropical forest loss and disturbances will result in 5- 10 percentage loss of all tropical species per decade during next quarter century (McNeely *et.al.*1990).It is very essential to have an assessment of flora and fauna of different ecosystems for optimum utilization of resources.

The current study has been carried out in evergreen forest of Pathadippalamarea in Sholayar reserve forest, Western Ghats of India. Sholayar region lies between 10⁰ 15 and 10⁰25 N altitude and 76⁰40 and 76⁰55E longitude in central part of Kerala. It is coming under Vazhachal forest division in Thrissur District, Kerala.The main objective of the present study was to determine species diversity,density,frequency and IVI of tree species (CurtisandMc-Intosh, 1951) in the study area. It will be helpful for further monitoring of the vegetation dynamics on a long term basis.

II.RESEARCH METHODOLOGY

Stratified random sampling methods has adopted for the present study. 1ha.quadrates has been established in the study area. The tree species having >30 cm GBH (girth at breast height) were measured and recorded (Chandrasekhara, 1998). To determine the dominance and ecological success of different species the Importance Value Index (IVI) was worked out (Curtis and

McIntosh, 1951). The ratio of abundance to Frequency (AB/F) was also carried out for the interpretation of distribution pattern of species (Curtis and Cottom 1956)

The identification of individual trees within the sampling plots were done based on observations during field study and their local names were noted during field visit with the help of tribal people and forest guards. Binomial names of different tree species were determined by scientific literatures, floras and monographsand also by consulting with specialists (Fyson 1915-20, Gamble and Fischer 1967, Mathew 1983,Sasidharan,2004). Identified species were classified by using Red data list according to their conservation status.

III. RESULTS AND DISCUSSION

Table I Vegetation status of Pathadippalam area in sholayar reserve forest.

No	Species	D	F	R D	RF	AB	B A	RBA	A/F	IVI	No.Sps
1	*Actinodaphne malabarica*	10	10	0.18	0.96	1.00	223.44	0.67	0.100	1.81	1
2	*Aglaia perviridis*	40	10	0.74	0.96	4.00	1672.44	5.00	0.400	6.70	4
3	*Aglaia tomentosa*	220	50	4.04	4.81	4.40	232.74	0.70	0.088	9.55	22
4	*Agrostistachys borneensis*	930	100	17.10	9.62	9.30	305.77	0.91	0.093	27.63	93
5	*Alseodaphnae semecarpifolia*	100	30	1.84	2.88	3.33	264.83	0.79	0.111	5.51	10
6	*Calophyllum polyanthum*	50	20	0.92	1.92	2.50	189.43	0.57	0.125	3.41	5
7	*Canarium strictum*	20	10	0.37	0.96	2.00	988.93	2.96	0.200	4.29	2
8	*Cullenia exarillata*	640	100	11.76	9.62	6.40	2834.40	8.48	0.064	29.86	64
9	*Cyathocalyx zeylanica*	10	10	0.18	0.96	1.00	161.08	0.48	0.100	1.63	1
10	*Diospyros paniculata*	90	20	1.65	1.92	4.50	989.91	2.96	0.225	6.54	9
11	*Drypetes malabarica*	370	40	6.80	3.85	9.25	546.92	1.64	0.231	12.28	37
12	*Drypetes venusta*	780	70	14.34	6.73	11.14	552.40	1.65	0.159	22.72	78
13	*Dysoxylum malabaricum*	80	40	1.47	3.85	2.00	3441.45	10.29	0.050	15.61	8
14	*Elaeocarpus tuberculatus*	40	20	0.74	1.92	2.00	1929.62	5.77	0.100	8.43	4
15	*Ficus banghalensis*	20	10	0.37	0.96	2.00	534.86	1.60	0.200	2.93	2
16	*Garcinia gummi-gutta*	40	10	0.74	0.96	4.00	272.22	0.81	0.400	2.51	4
17	*Gomphandra tetrandra*	100	30	1.84	2.88	3.33	330.93	0.99	0.111	5.71	10
18	*Knema attenuata*	150	50	2.76	4.81	3.00	1151.83	3.44	0.060	11.01	15
19	*Macaranga peltata*	90	30	1.65	2.88	3.00	765.69	2.29	0.100	6.83	9
20	*Meiogyne pannosa*	20	10	0.37	0.96	2.00	202.86	0.61	0.200	1.94	2
21	*Mesua ferria*	220	70	4.04	6.73	3.14	3119.93	9.33	0.045	20.11	22
22	*Myristica dactyloides*	10	10	0.18	0.96	1.00	2245.09	6.71	0.100	7.86	1
23	*Otonephelium stipulaceum*	30	20	0.55	1.92	1.50	447.44	1.34	0.075	3.81	3
24	*Palaquium elipticum*	840	100	15.44	9.62	8.40	1515.39	4.53	0.084	29.59	84
25	*Poeciloneuron indicum*	90	30	1.65	2.88	3.00	466.20	1.39	0.100	5.93	9
26	*Syzygium cumini*	10	10	0.18	0.96	1.00	3642.86	10.89	0.100	12.04	1
27	*Syzygium mundagam*	250	60	4.60	5.77	4.17	436.06	1.30	0.069	11.67	25
28	*Tetrameles nudiflora*	10	10	0.18	0.96	1.00	616.00	1.84	0.100	2.99	1
29	*Turpinia malabarica*	10	10	0.18	0.96	1.00	1837.82	5.50	0.100	6.64	1
30	*Vataria indica*	150	40	2.76	3.85	3.75	1388.80	4.15	0.094	10.76	15
31	*Xanthophyllum arnottianum*	20	10	0.37	0.96	2.00	130.47	0.39	0.200	1.72	2
											544

No.Sps -Number of Individuals, D-Density, F-Frequency, BA-Basal area, RBA-Relative basal area, RD-Relative density, RF-Relative frequency, AB-Abundance, IVI-Importance Value Index

Most dominant species based on Importance Value Index (I.V.I) are *Culleniaexarillata*(29.86), *Palaquiumelipticum*(29.59),*Agrostistachysborneensis*(27.63), *Drypetesvenusta*(22.72)and *Mesuaferea*(20.11)
During the present study, 31 species of 28 genera coming under 21families (Angiosperms) were observed in the study area. There are a total of 544 individuals/ha were documented during this study of which 65.07 % were Endemics, 6.98 % were under rare category and 0.73 % belongs to vulnerable category

The most representative families wereMeliaceae (3species) and Euphorbiaceae(3species). Followed by Lauraceae,Clusiaceae,Annonaceae,Myristicaceae,andMyrtaceae(2species). The most representative genera were*Aglaia*,*Drypetes*and *Syzygium*. According to the Red data list, two species viz., *Actinodaphnemalabaricum* and *Drypetesmalabarica*are classified under rare category and *Aglaia perviridis* is a vulnerable species.The maximum frequency (100) was for*Culleniaexarillata*, *Palaquimelipticum* and *Agrostistachysborneensis*followed by*Drypetesvenusta* and *Mesuaferea*(70) and *Syzygiumcumini* (60). On the same time result of abundance index, density, relative dominance indicated that *Culleniaexarillata*(29.86), *Palaquimelipticum*(29.59),*Agrostistachysborneensis*(27.63), *Drypetesvenusta*(22.72)were highly dominant in Pathadippalam area of Sholayarforest.A small number of tree species have high IVI values. The phyto-sociological observation of this study indicates that the dominant *Culleniaexarillata*in the Pathadippalam which had maximum important value index (29.86). The co-dominant species were, Palaquium*elipticum*,,*Agrostistachisborneensis* and*Drypetesvenusta* with IVI value of 29.59, 27.63 and 22.72, respectively.

Profound species hierarchy is one of the most stricking features of the evergreen forests of the Western Ghats (Pascal, 1988).The five main species *viz. Culleniaexarillata*, *Palaquiumellipticum*, *Agrostistachysborneensis*,*Drypetesvenusta***,**and *Mesuaferrea* and (order in terms of IVI) representing 62.68% percentage of the total species present, constitute more than 40 percentage of the total IVI and 5% of the total basal area

The phytosociological analysis of this study revealed the presence of 31 species out of 544 individuals/ha. Association of species depend on edaphic, climatic and biotic factors, species which have similar ecological requirements usually form associations or communities.

The Shannon diversity index is 2.65 for the study area. It is similar to the value reported by Sundarapandian and Swamy (2000) for the Tropical forest of Kodayur in the Western Ghats of Southern India. The following values are reported for the evergreen forests of other regions of Kerala *viz.:* Silent valley - 3-3.9 (Basha, 1988), Nelliampathy - 3-3.7 (Chandrasekhara, 1991), Achankoil - 1.5-2.2 (Sankar and Sanal Kumar, 1997), Agasthyavanam Biological Park - 2.8 (Vargheese, 1997) and New Amarambalam- 3.29 (Jayakumar, 2003). The Goodrical West coast tropical evergreens showed 4.410(Abhilash and Menon, 2007).

Less species diversity may be due to impacts of disturbances prevailed in the area. Species evenness value is 0.77. When compared with the values at Peppara (0.93), Nilambur (0.94) and New Amarambalam (0.687), the index value of the study area is less except Amarambalam (Varghese, 1997; Sankar and Sanalkumar, 1997; Jayakumar, 2003).

The low stand density of (544 trees/ha), of this Pathadippalam area ismainly due to past anthropogenic interactions like selection felling operations prevailed up to 1987 and subsequent biotic pressures. In 1987 Kerala State Government imposed moratorium on Selection felling (GovindanKutty, 1987). Tropical rainforests are very sensitive to disturbances, and its recovery to disturbance is still slower in Asian Tropical rainforests, The slower recovery rate apparent in Asia may be attributable to current abiotic drivers, such as soil fertility and climate, and biotic influences such as vegetation life histories determining functional group composition, tree species diversity and age structure; variables inherently linked to the regime of past disturbance events (Cole et al., 2014). ThePathadippalam area are nearer to the human settlements is also a causative factor for the low stand density.

The earlier studies on stand density of evergreen forest are as follows: Western Ghats - 635 trees (>30 cm gbh/ha) (Pascal and Pelissier, 1996); Agastyavanam Biological Park - 460trees/ha, Bonoccord - 860 trees/ha, (Varghese, 1997); Ranni - 892 trees/ha, Parambikulum - 881 trees/ha (Sankar and Sanal Kumar, 1997).

IV.SUMMARY AND CONCLUSION

Typical *Culleniaexarillata-Palaquiumelipticum-Agrostistachysborneensis-Drypetesvenusta-Mesuaferea* association is seen in Pathadipalam area.The low stand density of (544 trees/ha), of this Pathadipalam area is mainly due to past anthropogenic interactions like selection felling operations prevailed up to 1987 and subsequent biotic pressures. The area is still rich with Endemics, RET' setc. Further periodic studies and conservation measures to be taken to ensure the recovery of this Tropical Rain Forest.

VI. REFERENCES

Abhilash, E. S and A.R.R. Menon. 2007. Structural analysis and regeneration status of Goodrical reserved Forest: a Tropical Rain Forest Ecosystem of Western Ghats, India. *Srilanka Forester.* (In Press.)

Basha, S.C. 1988.Studies on the ecology of evergreen forests of Kerala with special reference to Silent valley and Attapady**.** Ph.D Thesis*,* University of Kerala*,* Trivandrum. 232 p.

Chandrasekhara, U.M. 1991. Studies on the gap phase dynamics of humid tropical forests.Ph.D thesis, Jawaharlal Nehru University. New Delhi. 148p.

Chandrasekhara, U.M, A.R.R. Menon, K.K.N. Nair, N. Sasidharan and K. Swarupanandan. 1998. Evaluating plant diversity in different forest types of Kerala by laying out permanent sample plots. KFRI Research Report No. 156. Kerala Forest Research Institute, Peechi, Thrissur. 86 p.

Curtis, J. T. and R. Mc-Intosh. 1951. An upland forest communities in the prairie forest border region of Wisconsin. *Zoology*. 32: 476-496.

Curtis, J. T. and Cottom. 1956. Plant ecology workbook. Laboratory field reference manual.Burgess Publication Co., Minnosota, 193 p

Cole, L., Bhagwat, S. & Willis, K. Recovery and resilience of tropical forests after disturbance. *Nat Commun* **5,** 3906 (2014). https://doi.org/10.1038/ncomms4906

Collins, N. M., J. A. Sayer and T. C.Whitmore,1991, The conservation Atlas of tropical Rainforest, Asia and the Pacific Macmillan, London,335.

Fyson, P.F.1915-20.The flora of the Nilgiri and Pulney hill tops Superintendent,Government Press,Madras.3Vol.

Galley, R.E,2014 In R. K Monson Ecology of tropical rain forests (Ed),Ecology and environment. New York ,NY:The plant sciences 8,Springer

Gamble ,J. S and Fischer CEC 1967. Flora of the Presidency of Madras, Vol.1-3, Culcutta.

GovindanKutty, M.1987. Forest Management- A retrospect.Natural Resources of India (Balachandran Thampy, K; Nayar, N.M and Nair, C.S; eds). World Wide Fund for Nature- India. Kerala State Office, Trivandrum.p.460-466.

Jayakumar, R. 2003. *Studies on the Angiosperm flora and its diversity in New Amarambalam Reserve Forest of the Nilgiribioreserve, Western Ghats of India.*Ph.D thesis, FRI Deemed University, Dehra Dun. 596 p.

Matthew KM1983. The The Flora of the Tamil Nadu CarnaticRapinet Herbarium, St. Joseph's College, Tiruchirapalli.

McNeely, J. A., K.R. Miller, W.V. Reid, R.A. Mittermeir and T.B. Werner. 1990. Conserving the world Biological Diversity. IUCN, Gland, Switzerland. pp 215-218.

Pascal, J. P. 1988. Wet evergreen forests of Western Ghats of India: Ecology, structure, floristic composition and succession. Travaux de la Section ScientifiqueetTechnique.Institute de Francais, Pondichéry.345p.

Pascal, J. P. and Pe1issier. 1996. Structure and floristic composition of a tropical evergreen forest in southwest India. *Journal of Tropical Ecology.* 12:191- 214.

Sankar, S. and M.G. Sanalkumar. 1997. Ecological and Environmental assessment of Forest Cover of Kerala with special reference to soil, vegetation and wildlife. KFRI Extension Report No.17.Kerala Forest Research Institute, Peechi, Thrissur. 84 p.

Sasidharan, N. 2004. Biodiversity Documentation for Kerala, Part 6: Flowering Plants. *KFRI Handbook No. 17*. Kerala Forest Research Institute, Peechi. 702 p.

Sneadaker, S. C. 1970. Ecological studies on tropical moist forest succession in eastern lowland Guatemala.Ph.D Thesis, University of Florida (Gainesville). 131p.

Sundarapandian,S.M, Swamy,P.S,2000, Forest ecosystem structure and composition along an altitudinal gradient in the Western Ghats ,South India. Journal of Tropical Forest Science12:104-123

Varghese, A. O. 1997. Ecological studies of the forests of the Peppara Wildlife Sanctuary using remote sensing techniques. *Ph.D thesis*, Forest Research Institute, Dehradun. 279 p.