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# Plant Inventory in Disturbed and Undisturbed Sites of Pachakumachi Hill (Highwavys Mountains), Cumbum Valley, Western Ghats, Theni District, Tamil Nadu, India

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## Abstract

Disturbances play an important role in the determination of species diversity. **A**s an exception, undisturbed areas (VS) possess lower number of species compared to disturbed areas (TS). The richness of family is not affected by disturbance. The number of individuals decreases from undisturbed to disturbed sholas. Lauraceae is the abundant family not respect to the disturbances.

**Key Words:** Disturbance, Lauraceae, sholas, Western Ghats.

## Introduction

Tropical forests occupy ca. 7% of the earth's area (Myers 1984). In India, they occupy ca. 84% of the total forest cover (637293 $Km^2$) which is 19.39% of the total geographical area. Tropical evergreen forests face a serious threat, both natural as well as anthropogenic. Due to the disturbances many species have become endangered. This implies a poor regeneration potential of the tree species. Thus, the need to set priorities for conservation of tree diversity has become inevitable. Identification of conservation areas ideally requires exhaustive knowledge of species and ecosystem diversity and distribution (Menon et al. 2001). Primary forests of Asia, particularly those of the Western Ghats and the Eastern Ghats of peninsular India are disappearing at an alarming rate due to anthropogenic activities and are replaced by forests comprising inferior species or their land use pattern changed (Parthasarathy 1999). Many of the quantitative plant biodiversity inventories have been conducted in species rich forests and data on species- poor forests are inadequate (Johnston and Gillman, 1992). Disturbance is one of the major factors to influence the distribution pattern of biodiversity (Ma 1995). Quantitative plant biodiversity inventories of Indian tropical forests are available from various forests of Western Ghats (Sukumar et al. 1992; Ganesh et al. 1996; Pascal and Pelissier 1996; Ghate et al. 1998;

Parthasarathy 1999; Parthasarathy and Karthikeyan 1997a; Ayyapan and Parthasarathy 1999). But there were no quantitative plant biodiversity inventories on forests of Pachakumachi hills. The disappearance of tropical forests comes at a time when our knowledge on their structure and dynamics is woefully inadequate (Hubbell and Foster 1992).

## Materials and Methods:

### *Study Site:*

This study was carried out in Pachakumachi hill. The four sites were 7km away from each other. Krishkad Shola (KS), Thundu Shola (TS), Vattaparai Shola (VS) and Manalar Shola (MS) were the sites selected for our study. The study sites were situated in Western Ghats, Tamil Nadu, India lies between 9º 35´ to 9° 45´ N latitude and 77° 15´ to 77° 27´ E at an altitude of .1700 m. The annual rainfall of Pachakumachi hill was 2700 mm. The high temperature was noted in the month June (31.C and lower temperature in January (18. C). The humidity was 95%. The dominant fauna found in Pachakumachi were elephant, tiger, wild dog, bison and deer.

### *Field Methods*

Our plot 0.2 ha (100x 20 m) of largely mature phase forest was investigated in each of the four 'shola' forest sites. The plots were permanently marked and each subdivided into twenty 10x 10 m quadrats to facilitate quantitative biodiversity inventory. All trees with = 30 cm GBH were taken into account their girth was measured at 1.3 m. All trees were identified from their vegetative and reproductive features with the help of regional flora of Gamble and Fischer (1915-1938) and the field key of Pascal and Ramesh (1987). The diversity indices were calculated by using Biodiversity Pro Beta version (Mc Aleece 1997).

## Results

### *Species Richness and Diversity*

The diversity was present in the following order; KS> VS>TS>MS (Table 1). In the total 0.8 ha of study plot, 50 tree species were found. The number of species was high in KS, and lower number of species was marked in MS. The number of individuals was more in KS (556) and less number of individuals in MS (262) (Table 2).

### *Family Diversity*

Lauraceae was the largest family in all four sites. They were represented by large number of genera and species. Many families were represented by only one genus and one species, among them Verbenaceae was found in lesser number (9 individuals) (Table 3).

## Discussion

The results of our study go hand in hand with other studies from India on disturbance. The disturbed area has a low number of species and a low number of individuals. But VS (undisturbed) has low number of species when compared to TS (disturbed). But VS is supported

by diversity indices. Our results also go hand in hand with the results of Chittibabu & Parthasarathy (2000).

**Table1.** Diversity indices of four sites of Pachakumachi hills.

| **Variables** | **KS** | **TS** | **VS** | **MS** |
|---|---|---|---|---|
| Shannon | 2.55 | 2.44 | 2.52 | 2.26 |
| Simpson | 0.066 | 0.028 | 0.041 | 0.042 |
| Alpha | 11.71 | 37.59 | 16.99 | 13.48 |
| Berker | 0.18 | 0.14 | 0.13 | 0.23 |
| Hill H0 | 14.05 | 12.25 | 13.6 | 11 |
| Hill H1 | 52.22 | 50.01 | 56.66 | 37.73 |
| Hill H2 | 0.0022 | 0.0082 | 0.0042 | 0.002 |
| Margaleff | 11.92 | 12.20 | 9.81 | 9.53 |
| Mackintosh Distance (U) | 0.93 | 0.93 | 0.90 | 1.55 |
| Mackintosh Diversity (D) | 1.19 | 1.2631 | 1.22 | 1.19 |
| Mackintosh Evenness (E) | 1.14 | 1.13 | 1.16 | 1.12 |

**Table 2.** Population density of tree species ³ 30 cm GBH encountered in each 0.2 ha plot of sites KS, TS, VS and MS and in total 0.8 ha of tropical evergreen forest in Pachakumachi Hill.

| **S. No.** | **Species** | **KS** | **TS** | **VS** | **MS** |
|---|---|---|---|---|---|
| 1. | *Nothopegia vajarvelui* Ravikumar and Lakshmanan. | 8 | | | 11 |
| 2. | *N. beddomei* Gamble. | 12 | 9 | 13 | |
| 3. | *Miliusa wightiana* Hook f. | 23 | 10 | 17 | 11 |
| 4. | *S. racemosa* Harms. | 21 | 9 | 10 | 9 |
| 5. | *Bhesa indica* (Bedd) Ding.Hou | 20 | 9 | 25 | 5 |
| 6. | *V. monosis* C.B.Clarke. | 6 | 9 | 20 | 7 |
| 7. | *V. travancorica* Hook.f | 21 | 10 | 18 | 8 |
| 8. | *Diospyros angustifolia* (Miq) Loesterm. | 18 | 6 | 18 | 7 |
| 9. | *Cullenia exarillata* A. Robyns. | 40 | 7 | | |
| 10. | *D. ovalifolia* Wight. | 17 | 7 | 22 | 27 |

| | | | | | |
|---|---|---|---|---|---|
| 11. | *Elaeocarpus munronii* (Wt.) Masters. | 6 | | 13 | 6 |
| 12. | *E. serratus* Linn. | | 6 | 20 | 6 |
| 13. | *Agrostistachys meeboldii* Pax & Hoffm. | | 7 | 17 | 6 |
| 14. | *Croton lacciferus* Linn | 6 | 6 | 9 | 5 |
| 15. | *Glochidion malabaricum* Bedd. | 5 | 6 | 14 | 8 |
| 16. | *Mallotus albus* Muell. | 8 | 9 | | 7 |
| 17. | *M. tetracoccus* (Roxb) Kurz. | 16 | 8 | 12 | 9 |
| 18. | *Flacourtia montana* Graham. | 56 | 7 | 13 | |
| 19. | *Mesua ferrea* Linn | 35 | 14 | 15 | 15 |
| 20. | *Actinodaphne bourdillonii* Gamble. | 8 | 9 | 14 | 9 |
| 21. | *Alseodaphne semecarpifolia* Nees | | | 17 | 10 |
| 22. | *Cinnamomum malabatrum* (Burm.f.) Berchrh & Presl. | 8 | 8 | 13 | |
| 23. | *C. zeylanicum* Blume. | 14 | 9 | | 10 |
| 24. | *Litsea oleoides* (Meisner) Hook. f | 4 | 7 | 17 | 11 |
| 25. | *Neolitsea scrobiculata* (Meisner) Gamble. | 3 | 7 | 4 | 11 |
| 26. | *Persea macrantha* (Nees) Kosterm. | 7 | | | 9 |
| 27. | *Phoebe wightii* Meisner. | 2 | 9 | 9 | 8 |
| 28. | *Michelia nilagirica* Zenk. | | 8 | | 12 |
| 29. | *Trichilia connaroides* (Wt & Arn) Benth. | 19 | | 9 | |
| 30. | *Ficus tomentosa* Roxb. | 11 | 11 | | |
| 31. | *F. retusa* Linn. | 9 | 10 | 9 | |
| 32. | *Myristica dactyloides* Gaerbn. | 8 | 14 | | 8 |
| 33. | *Ardisia blatteri* Gamble | 10 | | 16 | |
| 34. | *Syzygium myhenrae* Gamble. | 10 | 7 | | |
| 35. | *S. sriganesanii* Ravikumar and Lakshmanan. | 4 | | | |
| 36. | *S. tamilnadensis* Radhakrishnan and Chitra | 12 | | 10 | |
| 37. | *S. zeylanicum* (L) Dc. var megamalayanum Ravikumar and Lakshmanan | 3 | 8 | | 11 |
| 38. | *Ochna obtusata* Dc. var obtusata | 7 | | 6 | |
| | | | | | |

| | | | | | |
|---|---|---|---|---|---|
| 39. | *Chionanthus ramiflora* Roxb. | 8 | | 4 | |
| 40. | *Ligustrum roxburgii* C.B. Clarke | 14 | 12 | | |
| 41. | *Pygeum wightianum* Bl. | 11 | | | |
| 42. | *Canthium neilgherrense* Wt. | | | 10 | |
| 43. | *Clausena indica* Oliver | 10 | | | |
| 44. | *Meliosma simplicifolia* (R) Walp. | | 13 | | 7 |
| 45. | *Turpinia malabarica* Gamble | | 10 | | |
| 46. | *Symplocos cochinchinesis* (Lour) Moore | 6 | 12 | | |
| 47. | *Gordonia obtusa* Wall. | | | 13 | |
| 48. | *Celtis tetrandra* Roxb. | 50 | | 25 | |
| 49. | *Debregeasia longifolia* (Burn.f) Weed | | 10 | | |
| 50. | *Callicarpa tomentosa* (L) Murray | | | | 9 |

**Table 3.** Genus, species and density of four sites.

| **Species** | **KS** | | | **TS** | | | **VS** | | | **MS** | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **G** | **S** | **Density** | **G** | **S** | **Density** | **G** | **S** | **Density** | **G** | **S** | **Density** |
| Anacardiaceae | 1 | 2 | 20 | 1 | 1 | 9 | 1 | 1 | 13 | 1 | 1 | 11 |
| Annonaceae | 1 | 1 | 23 | 1 | 1 | 10 | 1 | 1 | 17 | 1 | 1 | 11 |
| Araliaceae | 1 | 1 | 21 | 1 | 1 | 9 | 1 | 1 | 10 | 1 | 1 | 9 |
| Asteraceae | 1 | 2 | 27 | 1 | 2 | 19 | 1 | 2 | 38 | 1 | 2 | 15 |
| Bombacaceae | 1 | 1 | 40 | 1 | 1 | 7 | - | - | - | - | - | - |
| Celasteraceae | 1 | 1 | 20 | 1 | 1 | 9 | 1 | 1 | 25 | 1 | 1 | 5 |
| Ebenaceae | 1 | 2 | 35 | 1 | 2 | 13 | 1 | 2 | 40 | 1 | 6 | 34 |
| Elaeocarpaceae | 1 | 1 | 6 | 1 | 1 | 6 | 1 | 2 | 33 | 1 | 2 | 12 |
| Euphorbiaceae | 3 | 4 | 35 | 4 | 5 | 36 | 4 | 4 | 52 | 4 | 5 | 35 |
| Flacourtiaceae | 1 | 1 | 56 | 1 | 1 | 7 | 1 | 1 | 13 | - | - | - |
| Guttiferae | 1 | 1 | 35 | 1 | 1 | 14 | 1 | 1 | 15 | 1 | 1 | 15 |
| Lauraceae | 6 | 7 | 46 | 5 | 6 | 49 | 6 | 6 | 74 | 7 | 7 | 68 |
| Magnoliaceae | - | - | - | 1 | 1 | 8 | - | - | - | 1 | 1 | 12 |
| Meliaceae | 1 | 1 | 19 | - | - | - | 1 | 1 | 9 | - | - | - |
| Moraceae | 1 | 2 | 20 | 1 | 2 | 21 | 1 | 1 | 9 | - | - | - |
| Myristicaceae | 1 | 1 | 8 | 1 | 1 | 14 | - | - | - | 1 | 1 | 8 |
| Myrsinaceae | 1 | 1 | 10 | - | - | - | 1 | 1 | 16 | - | - | - |
| Myrtaceae | 1 | 4 | 29 | 1 | 2 | 15 | 1 | 1 | 10 | 1 | 1 | 11 |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ochnaceae | 1 | 1 | 7 | - | - | - | 1 | 1 | 6 | - | - | - |
| Oleaceae | 2 | 2 | 22 | 1 | 1 | 12 | 1 | 1 | 4 | - | - | - |
| Rosaceae | 1 | 1 | 11 | - | - | - | - | - | - | - | - | - |
| Rubiaceae | - | - | - | - | - | - | 1 | 1 | 10 | - | - | - |
| Rutaceae | 1 | 1 | 10 | - | - | - | - | - | - | - | - | - |
| Sabiaceae | - | - | - | 1 | 1 | 13 | - | - | - | 1 | 1 | 7 |
| Staphylocaceae | - | - | - | 1 | 1 | 10 | - | - | - | - | - | - |
| Symplocaceae | 1 | 1 | 6 | 1 | 1 | 12 | - | - | - | - | - | - |
| Ternstromaceae | - | - | - | - | - | - | 1 | 1 | 13 | - | - | - |
| Ulmaceae | 1 | 1 | 50 | - | - | - | 1 | 1 | 25 | - | - | - |
| Uriticaceae | - | - | - | 1 | 1 | 10 | - | - | - | - | - | - |
| Verbenaceae | - | - | - | - | - | - | - | - | - | 1 | 1 | 9 |
| **Total** | **31** | **40** | **556** | **28** | **34** | **303** | **28** | **31** | **432** | **24** | **28** | **262** |

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## References

Ayyapan N. and Parthasarathy N. 1999. Biodiversity inventory of trees in a large-scale permanent plot of tropical evergreen forest at Varagalaiar, Anamalais, Western Ghats, India. Biodiversity and Conservation 8: 1533- 1554

Chittibabu, C.V. & Parthasarathy, N. (2000) Attenuated tree species diversity in human-impacted tropical evergreen forest sites at Kolli hills, Eastern Ghats, India. *Biodiversity and Conservation*, 9, 1493- 1519.

Gamble J.S and Fischer C.E.C. (1915- 1935) Flora of the Presidency of Madras. Vols 1- 3. Adlard and Son, London.

Ganesh T. Ganesan R. Soubadra Devy M. Davidar P. and Bawa K.S. 1996. Assessment of plant biodiversity at a mid- elevation evergreen forest of Kalakad- Mundanthurai Tiger Reserve, Western Ghats, India. Current Sciences 71: 379- 391.

Ghate U. Joshi N.V. and Gadgil M. (1998) On the patterns of tree diversity in the Western Ghats of India. Current Science 75(6): 594- 602.

Hubbell S. P. and Foster R. B. (1992) Short- term dynamics of a neotropical forest: why ecological research matters to tropical conservation and management. Oikos 63: 48- 61.

Menon S., Pontius R.G. Jr, Rose J., Khan M.L. and Bawa K.S. (2001). Identifying conservation-priority areas in the tropics a land- use change modelling approach. Conservation Biology 15: 501- 512.

Myres N. (1984). The primary Source: Tropical Forests and Our Future. W. W. Norton, New York.

Parthasarathy N. (1999). Tree diversity and distribution in undisturbed and human- impacted sites of tropical weet evergreen forest in southern Western Ghats, India. Biodiverstiy and Conservation 8: 1365- 1381.

Parthasarathy N. and Karthikeyan R (1997). Plant Biodiversity inventory and conservation of two tropical dry evergreen forests on the coromandel coast, South India. Biodiversity and Conservation 6: 1063- 1083.

Pascal J.P. and Pelissier R. (1996). Structure and floristic composition of a tropical evergreen forest in southwest India. Journal of Tropical Ecology 12: 191- 214.

Sukumar R. Dattaraja H.S. Suresh H.S. Radhakrishnan J.V. Vasudeva R. Nirmala S. and Joshi N.V (1992) Long term monitering of vegetation in a tropical deciduous forest in Mudumalai, southern India. Current Science 62: 608-616.