LICHEN DIVERSITY AND ITS DISTRIBUTION PATTERN IN TROPICAL DRY EVERGREEN FOREST OF GUINDY NATIONAL PARK (GNP), CHENNAI

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Introduction

Conservation agencies are interested in promoting and maintaining bio-diversity, based on rapidly measurable forest characteristics for effective implementation of protective measures (Neitlich and McCune, 1997). Large-scale data on lichens and environmental variables that determine their distribution are an integral component of many global conservation programs since lichens are very sensitive and widely accepted as indicators of air quality, biodiversity and climate change (McCune *et al.*, 1997); and such data are lacking from the Indian Tropics despite its megadiversity and escalating threats. Lichens are vital components of the ecosystem serving as substrates, shelter, food, nutrient cyclers, succession etc. (Gradstein, 1992). Hence the present study aims at a detailed analysis of lichen diversity and distribution, from a Tropical Dry Evergreen Forest in the coastal plain at the Guindy National Park (GNP), Chennai that is isolated due to the city development.

Study area

In 1910 GNP was established as a Reserve Forest, lies between 13° 0' 4" - 13° 1'N latitude to 80° 14' 3" - 80° 14' 4"E longitude, covers an area of 270 ha within Chennai. The topography is classified as Eastern Coastal Plain, with Coastal alluvium derived soils with a sub humid climate (Sehgal *et al.*, 1990). GNP receives ≅ 20 cm rain from the North-East monsoon during October-December, temperature ranges from 21° C (December-January) - 42° C (April-May).

GNP once covering an area of 500 ha has currently shrunk to 270 ha. The vegetation, known as the remnants of the Tropical Dry Evergreen Forest of the Coromandel Coast by Champion and Seth, 1963 reclassified as the *Albizia amara* -Boiv. community (Meher-Homji, 1973). The GNP contains 350 species of flowering plants (Santharam, 1992) with alien aggressive *Acacia auriculiformis*, *Prosopis juliflora*, *Antigonon leptopus*, and a large number of invertebrates and vertebrates. The sizable populations of blackbuck (*Antilope cervicapra*), and spotted deer (*Axis axis*) within GNP heavily depend on the vegetation (Shankar Raman *et al.*, 1995).

Material and Methods

Sites were selected in uniform stands and 50m x 20m = 1000m^2 quadrats (12 Nos) were laid within GNP. Each quadrat was subdivided in to 10m x 20m plots for convenient data collection. In each

plot the total no. of trees, shrubs and lianas (gbh ≥ 3 cm) were noted. All the stems were surveyed for lichens. On the basis of presence or absence of lichens up to the breast height, stems were classified as lichen bearing and non-lichen bearing. Tree data included species, height using graduated perches, girth at breast height and bark pH.

Lichens on the phorophytes were recorded at the breast height level or below using a 20cm x 20cm = 400cm^2 grid with 10 vertical and 10 horizontal wires. Data were collected on species diversity in an unit area, its frequency and abundance under each grid on the graph sheet and were coded with segments, tree number, lichen number and all the collected samples were also coded accordingly and binomials were identified.

The rarity and dominance were determined by the frequency of lichen species. The growth forms of all the recorded species were noted. The photobionts of all the lichens were isolated and identified up to genus level (Tschermak-Woess, 1989).

Data analysis

Field data were recorded in customised Microsoft Excel data sheets. For species diversity, Shannon and Simpson indices (Magurran, 1988) were calculated. Species-area curves were plotted using the program EstimateS (version 5 R.K. Colwell http// viceroy.eeb.uconn.edu/estimates), based on mean species accumulation curve after 100 times randomization of sample order. Regression models were tested using built in Data analysis tool kits. Clustering is a hierarchical agglomerative method for identifying groups of samples in a multivariate data set using species abundances measured on sample plots, to reveal compositionally similar species assemblages or communities has expanded rapidly and an integral component in recent similar lichen studies (Bruteig, 1993; Neitlich and McCune, 1997; Wolseley and Pryor, 1999). The Principal Co-Ordinate (PCO) analysis is used to arrange samples by similarity (Euclidean distance) based on agglomerative methods of ordination, and we have used SPSS (ver. 9) to carry out this analysis.

Binomials were identified using Awasthi (1989, 1991); Singh and Sinha (1994) and the collected specimens were deposited at the M.S. Swaminathan Research Foundation, Chennai.

Results and Discussion

Lichen diversity of Guindy National Park : A total of 31 lichens (Table 1) were recorded within GNP under 26 genera, 19 families and 9 Orders, from 219 phorophytes in a total sample of 264 out of which 235 trees, 27 shrubs and 2 lianas of ≥3 cm gbh, in the twelve 0.1 ha quadrats (Table 2), reflects a higher diversity/unit area, 2.58 species/ 0.1 ha, compared to a similar site at Southeastern Australia (open dry sclerophyll forest with a grassy understorey with 69 species with a diversity of 1.91 species/0.1ha (Pharo and Beattie, 1997).

In GNP, Order Lecanorales dominate with 14 species followed by Arthoniales (7). Five Orders have single species each. Out of 19 families of lichens, the largest family being Physciaceae with 6 species and 10 lichen families possess single species each.

Table 1

Lichens of Guindy National Park, Chennai

Species	Family	Order
Anthracoathecium ochrotropum Hampe ex A. Massal	Pyrenulaceae	Pyrenulales
Arthonia tumidula (Ach.) Ach.	Arthoniaceae	Arthoniales
Arthonia simplicascens Nyl.	Arthoniaceae	Arthoniales
Arthopyrenia alboatra (Krempelh.) Mull. Arg.	Arthopyreniaceae	Dothediales
Bacidia medialis (Tuck. In Nyl.) Zahlbr.	Bacidiaceae	Lecanorales
Bacidia phaeolomoides (Müll. Arg.) Zahlbr.	Bacidiaceae	Lecanorales
Buellia disciformis (Fr.) Mudd.	Physciaceae	Lecanorales
Catillaria intermixta (Nyl.) Arn.	Catillariaceae	Lecanorales
Catillaria sp.	Catillariaceae	Lecanorales
Chrysothrix candelaris (L.) Laundon	Chrysothricaceae	Arthoniales
Dirinaria consimilis (Stirton) Awas.	Physciaceae	Lecanorales
Dirinaria papillulifera (Nyl.) Awas.	Physciaceae	Lecanorales
Enterographa multiseptata R. Sant.	Roccellaceae	Arthoniales
Enterographa sp.	Roccellaceae	Arthoniales
Graphis scripta (L.) Ach.	Graphidaceae	Ostropales
Gyrostomum scyphuliferum (Ach.) Nyl.	Graphidaceae	Ostropales
Heterodermia diademata (Taylor) Awas.	Physciaceae	Lecanorales
Lecanora allophana (Ach) Roh.	Lecanoraceae	Lecanorales
Lecidea sp.	Lecideaceae	Lecanorales
Opegrapha leptoterodes Nyl.	Roccellaceae	Arthoniales
Parmotrema saccatilobum Nyl.	Parmeliaceae	Lecanorales
Phylliscum testudineum Nyl. Ex Mass	Lichinaceae	Lichinales
Physcia aipolia (Ehrh. In Humb.) Furnr	Physciaceae	Lecanorales
Porina interestes (Nyl.) Harm.	Trichotheliaceae	Trichotheliales
Pseudopyrenula subvelata (Nyl.) Müll. Arg.	Pyrenulaceae	Pyrenulales
Pyxine sp.	Physciaceae	Lecanorales
Roccella montagnei Bel. Emend. Awas.	Opegraphaceae	Arthonials
Strigula elegans (Fèe) Müll. Arg.	Strigulaceae	Ins. Sed., L
Tapellaria sp.	Ectolechiaceae	Lecanorales
Trypethelium eluteriae Spreng.	Trypetheliaceae	Pyrenulales
Verrucaria sp.	Verrucariaceae	Verrucariales

Comparable studies are not available from similar habitats within India. Compared to adjoining locations in Chennai, GNP showed a higher species richness. The sites, Madras Christian College harbours 16 species, Indian

Table 2

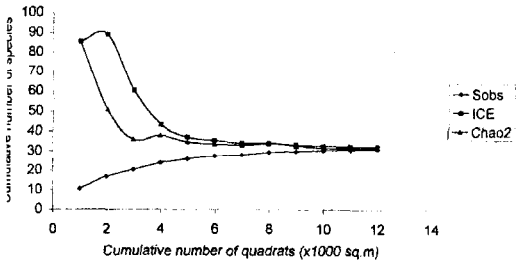
Results of diversity inventory of lichens in the twelve 0.1 ha quadrats of Tropical Dry Evergreen Forest (GNP), Chennai.

Variable	
Species Richness	31
Range of species/ 0.1 ha	1-22
No. of genera	26
Number of families	19
Number of orders	9
No. of substrates	3
No. of host species	28
Diversity indices :	
Shannon (H')	4.298
Simpson (D')	0.934
Evenness (J')	0.903

Institute of Technology with 17, Indira Gandhi Centre for Atomic Research with 16 and Vandalur with 5. The GNP harbours 59.6% of the total diversity recorded from this region. The high lichen diversity status of GNP compared to other locations can be attributed to the availability of number of lichen host trees (more corticolous species) and, the positive correlation between lichen diversity and host tree diversity providing ample proof to protect this habitat. Moreover the site is insular and away from the polluting sources; since lichens were found to be highly sensitive to air pollution and habitat modifications (Richardson, 1992).

Species-area curve : Species accumulation curves (Fig. 1), both the observed and the estimated, attained an asymptote at various scales. The best satisfied estimators (incidence-based coverage estimators (ICE and Chao 2) (Chazdon *et al.*, 1998) were plotted against the area sampled. These two estimators reached a stable value of 31 in the 10,000 m^2, and

Fig. 1



Species-area curve for lichens in twelve 0.1 ha quadrats in Tropical Dry Evergreen Forest at Guindy National Park, Chennai, showing the observed (Sobs) and the estimated incidence-based coverage estimator (ICE) and Chao 2 curves

the Species observed (Sobs) curve stabilized at the 9000 m^2 indicating that lichens were sparsely distributed within GNP. Similar lichen distribution patterns were also observed by Montfoort and Ek (1990) and Pharo and Beattie (1997).

Distribution of Lichen species (Table 3) : *Graphis scripta occur in 11 quadrats.* Three species were distributed in 9 quadrats and species *Arthopyrenia alboatra*, *Parmotrema saccatilobum*, *Strigula* sp., *Tapellaria* and *Verrucaria* sps occurred in one quadrat.

Only 219 individuals (comprising 28 species) possess lichens out of 264 trees/ shrubs/lianas (comprising 52 tree species) surveyed. Lichens species richness/ individual phorophyte (≥3 cm gbh) ranged from 1-7 with 8 phorophytes support single lichen species each. *Cassia siamea* supported 14 lichen species. The mean species diversity/host is 4.37. *Bacidia phaeolomoides* (44 colonies) occurred on 40.74% and *B. medialis* and *Graphis scripta* (42 colonies) on 37.03% phorophytes, 8 lichen species (< 4%) occur on a phorophyte (Table 4).

Table 3

Percentage frequency, Relative density and number of host species on which they occurred in the Tropical Dry Evergreen Forest in Guindy National Park, Chennai.

Lichens	% frequency	Relative density (%)	No. of Host species
Anthracoathecium ochrotropum	21.43	2.34	3
Arthonia simplicascens	21.43	3.13	1
Arthonia tumidula	64.29	2.34	8
Arthopyrenia alboatra	7.14	0.39	1
Bacidia medialis	64.29	4.69	10
Bacidia phaeolomoides	64.29	8.99	11
Buellia disciformis	42.86	2.34	3
Catillaria intermixta	21.43	2.73	2
Catillaria sp.	21.43	3.13	3
Chrysothrix candelaris	21.43	3.91	1
Dirinaria consimilis	42.86	3.13	2
Dirinaria papillulifera	42.86	3.13	2
Enterographa multiseptata	42.86	2.34	4
Enterographa sp.	21.43	2.34	6
Graphis scripta	78.57	9.38	10
Gyrostomum scyphuliferum	21.43	3.13	4
Heterodermia diademata	42.86	5.08	5
Lecanora allophana	42.86	3.52	6
Lecidea sp.	42.86	5.08	4
Opegrapha leptoterodes	21.43	2.73	3
Parmotrema saccatilobum	7.14	0.39	1
Phylliscum testudineum	21.43	0.39	1
Physcia aipolia	42.86	5.47	7
Porina interestes	42.86	7.03	6
Pseudopyrenula subvelata	21.43	3.13	1
Pyxine sp.	42.86	2.34	2
Roccella montagnei	21.43	3.52	2
Strigula elegans	7.14	0.78	1
Tapellaria sp.	7.14	0.39	1
Trypethelium eluteriae	21.43	2.34	5
Verrucaria sp.	7.14	0.39	1

Table 4

Lichen diversity on the hosts found in GNP

Host / Substratum	Lichens	No. of Lichen sp.
1	2	3
Acacia auriculiformis A. Cunn. Ex Benth	*Bacidia phaeolomoides, Graphis scripta* and *Lecanora allophana*	3
Acacia planiferons, W. & A.	*Physcia aipolia*	1
Annona squamosa L.	*Bacidia medialis, Heterodermia diademata*	2
Atalantia monophylla (L.) Corr. Serr.	*Porina interestes*	1
Azadirachta indica Adr. Juss.	*Opegrapha leptoterodes*	1
Borassus flabellifer L.	*Bacidia phaeolomoides, Dirinaria consimilis, Enterographa multiseptata, Roccella montagnei*	4
Carissa spinarum L.	*Heterodermia diademata*	1
Cassia fistula L.	*Arthonia tumidula, Arthopyrenia alboatra*, Bacidia medialis, Bacidia phaeolomoides, Enterographa* sp. *Graphis scripta, Gyrostomum scyphuliferum, Heterodermia diademata, Lecidea, Physcia aipolia, Pyxine* sp.	11
Cassia siamea Lam.	*Anthroacothecium ochrotropum, Arthonia tumidula, Bacidia phaeolomoides, Catillaria* Sp. *Chrysothrix candelairs*, Dirinaria consimilis, Enterographa multiseptata, Enterographa* sp. *Graphis scripta, Gyrostomum scyphuliferum, Lecanora allophana, Opegrapha, Physcia, Porina interestes*	14
Cassia roxburghii DC.	*Opegrapha leptoterodes*	1
Clausena dentata (Willd.) Roemer	*Arthonia tumidula, Bacidia medialis, Enterographa multiseptata, Enterographa* sp. *Graphis scripta, Porina interestes, Pseudopyrenula subvelata**	7
Ficus benghalensis L.	*Arthonia simplicascens*, Bacidia phaeolomoides*	2
Gymnema sylvestre (Retz.) R. Br. Ex Roemer & Schultes	*Bacidia medialis*	1

Contd...

1	2	3
Lannea coromandelica (Houtt.) Merr.	*Arthonia tumidula, Bacidia phaeolomoides, Dirinaria papillulifera, Enterographa multiseptata, Graphis scripta, Lecanora allophana, Roccella montagnei*	7
Lianas (unknown species)	*Anthroacothecium ochrotropum, Catillaria* sp., *Enterographa* sp. *Graphis scripta, Gyrostomum, Lecanora, Trypethelium eluteriae*	7
Madhuca longifolia (Koenig) Macbr.	*Bacidia phaeolomoides, Catillaria* sp., *Graphis scripta, Trypethelium eluteriae*	4
Mangifera indica Linn.	*Bacidia medialis, Catillaria intermixta, Strigula elegans**	2
Gmelina asiatica L.	*Bacidia medialis, Lecidea, Physcia aipolia*	3
Mimusops elengi Linn.	*Anthracoathecium ochrotropum, Enterographa* sp. *Porina interestes*	3
Morinda tinctorium Roxb. = *Morinda coreia* Buch. - Ham.	*Bacidia medialis, Bacidia phaeolomoides, Graphis scripta, Gyrostomum, Lecanora allophana*	5
Phoenix sylvestris (L.) Roxb.	*Buellia disciformis, Tapellaria* sp.*	2
Polyalthia longifolia (Sonn.) Thwaites	*Lecidea* sp.	1
Pongamia pinnata Pierre	*Arthonia tumidula, Bacidia medialis, Bacidia phaeolomoides, Buellia disciformis, Graphis scripta, Lecanora, Lecidea* sp., *Physcia aipolia, Trypethelium*	9
Pterocarpus santalinus L. f.	Sterile crust	1
Randia dumetorum (Retz.) Poiret	*Arthonia tumidula, Buellia disciformis, Heterodermia diademata, Physcia aipolia, Pyxine* sp. *& Trypethelium eluteriae*	6
Swietenia mahogani (L.) Jacq.	*Arthonia tumidula, Bacidia medialis, Bacidia phaeolomoides, Enterographa* sp. *& Porina interestes*	5
Syzygium cumini (L.) skeels	*Arthonia tumidula, Bacidia medialis, Bacidia phaeolomoides, Graphis scripta, Heterodermia diademata, parmotrema saccatilobum, Physcia aipolia*	7
Zizyphus oenophlia (L.)	*Catillaria intermixta, Dirinaria papillulifera, Trypethelium eluteriae*	3
On Bricks/Stones	*Phylliscum testudineum, Verrucaria*	2

Note: * Specific to a particular host tree

In terms of abundance, the individuals of the porophyte *Atlantia monophylla* possesses *Porina interestes* throughout the trunk, whereas *Chrysothrix candelaris* on *Borassus flabellifer* and *Arthopyrenia alboatra* on *Cassia fistula* were with a cover area less than 0.5 cm^2.

Dominance and rarity : The rarity and dominance of lichens were determined by the frequency (Table 5). They were classified as: very rare, rare, common, dominant and predominant, 35.5% species found to be very rare to rare, 29% common, 19.5% dominant and 16% predominant. *Bacidia phaeolomoides, Bacidia medialis, Graphis scripta, Heterodermia diademata* and *Porina interestes* were predominant and *Arthopyrenia alboatra, Parmotrema saccatilobum, Strigula elegans, Tapellaria* and *Verrucaria* spp. were very rare lichens.

Table 5

Dominance and rarity among lichens of GNP

Colony Class	Categories	Species
1 to 5	Very rare	5
6 to 20	Rare	6
21 to 50	Common	9
51 to 100	Dominant	6
> 101	Predominant	5
	Total	31

Table 6 reveals the increase of lichen species with decreasing trunk size; 39.34% of lichens on 3-10 cm followed by 37.70% on 11-20 cm girth classes. *Bacidia phaeolomoides* occurred on all the girth classes; *Bacidia medialis, Arthonia tumidula, Graphis scripta, Lecanora allophana,* and *Trypethelium eluteriae* on girth classes ranges from 3 to 30cm. *Buellia disciformis* and *Pseudopyrenula subvelata* specific to 3-10 cm; *Arthopyrenia alboatra* and *Parmotrema saccatilobum* specific to 11-20cm; *Arthonia simplicascens* specific to 51-60 cm.

Ordination of samples : Principal Co-Ordinate analysis (PCO) provides a convenient reference space within which to explore natural succession or community changes wrought by disturbances or human actions. If the distance between two points in an ordination space indicates their ecological dissimilarity, then movement within this space indicates compositional change. The PCO analysis

Table 6

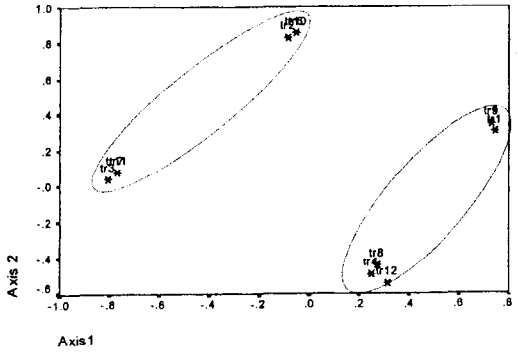
Lichen species richness, colonies (%), no. of individual host trees, and no. of host species on six tree girth classes in the Tropical Dry Evergreen Forest at GNP, Chennai.

Girth Class (cm)	No. of lichen species	No. of Colonies (%)	No. of individual host trees	No. of Host species
3-10	24	27.77	85	11
11-20	23	50.00	93	13
21-30	10	17.22	37	8
31-40	2	1.11	2	2
41-50	0	0.00	Nil	Nil
51-60	2	3.88	2	1

of lichen distribution from quadrats brought out four distinguishable clusters (Fig. 2), indicating the species assemblages. The distance between two clusters is based on similarity between them that is derived out of shared species.

The regression model between the tree density (x) and the lichen diversity (y), reveal a highly significant correlation (R^2 = 0.796, p<0.05%) with an estimator y = 0.7662x - 0.364 (Fig. 3), which is useful to determine the lichen diversity status of sites within GNP with varying density of vegetation.

Fig. 2



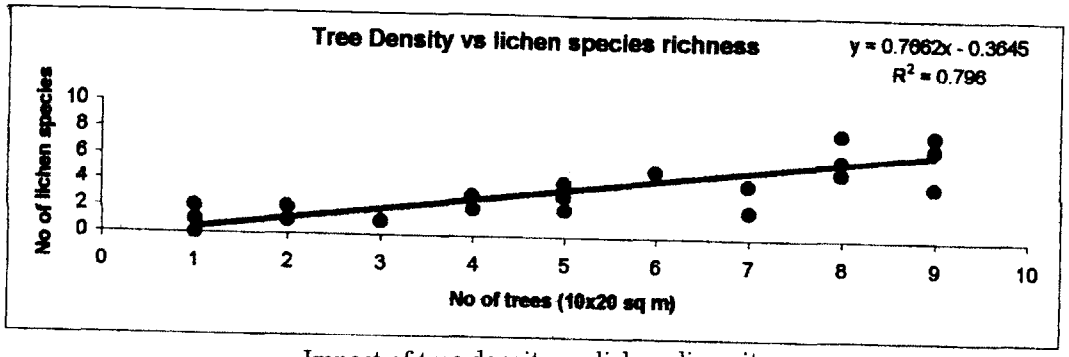
Princical co-ordinate analysis of lichen data of GNP

The regression model between the host tree diversity (x) and the lichen diversity (y), reveal a highly significant correlation (R^2 = 0.805 p<0.05%) with an estimator y = 1.0265x +0.5803 (Fig. 4). The soil, climate and topography of all four vegetation zones remain the same but vary in vegetation structure and microclimate. The impacts of vegetation structure were brought out by the agglomerative ordination method and regression analysis indicating the rapidly measurable site characteristics such as tree density and host tree diversity to assess the lichen diversity (Table 7).

Vegetation zones within GNP : Table 7 gives the vegetation zones in GNP and their characteristic features along with lichen diversity.

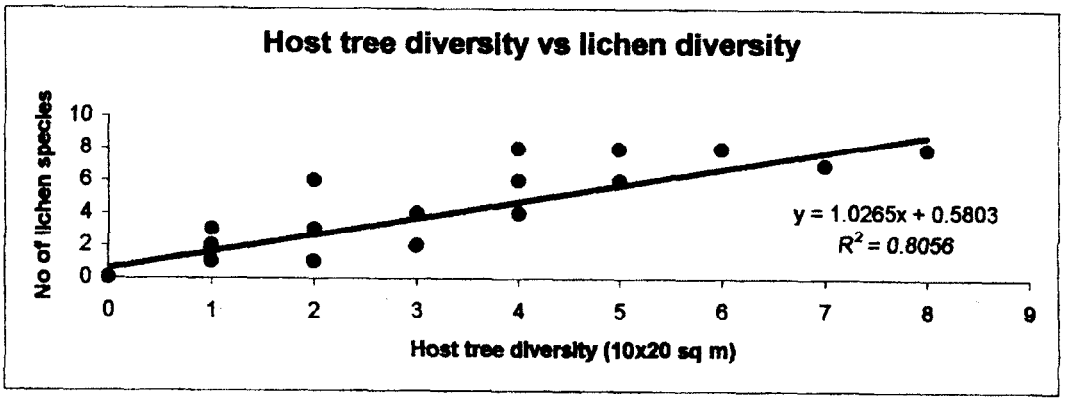
Lichen growth form distribution : Macrolichens dominate similar sites in Coastal Brazil (Marcelli, 1991) and Southeastern Australia (Pharo and Beattie, 1997) while 75% of lichens are crustose in GNP (Fig. 5), which can be attributed to the adaptation of these species to withstand long dry seasons (>6 months).

Fig. 3



Impact of tree density on lichen diversity

Fig. 4



Impact of host tree diversity on lichen diversity

Table 7

The vegetation zones and their characteristic features along with the lichen diversity.

Vegetation zone	Structure of vegetation	Tree density/ 100 m²	Total No. of trees	No. of Lichen bearing trees	Canopy over-lapping	Predominant tree species	Predominant lichen species	No. of Lichen species recorded	No. of colonies (%)
Veg-1	Thick	22.00	88	74	≥2	3, 6 & 7	B, E, F H & J	21	35.55
Veg-2	Partially open and thick	12.35	73	61	≤2	1,2 & 8	A, I & K	10	29.44
Veg-3	Open and thin vegetation	9.70	63	52	<2	4, 10 & 11	D & L	4	25.55
Veg-4	Thorny and shrubby	4.00	40	32	0-1	12,7 & 13	C, G & M	13	9.44
	Total		264	219					100

A - *Bacidia medialis*, B - *Bacidia phaeolomoides*, C - *Catillaria intermixta*, D - *Dirinaria consimilis*, E - *Graphis scripta*, F - *Gyrostomum scyphuliferum*, G - *Heterodermia diademata*, H - *Lecanora allophana*, I - *Physcia aipolia*, J - *Porina interestes*, K - *Pseudopyrenula subvelata*, L - *Roccella montagnei*, M - *Trypethelium eleutriae*

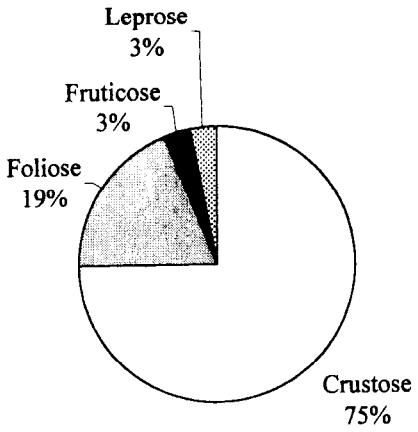
1 - *Acacia auriculiformis*, 2 - *Acacia planiferons*,3 - *Atlantia monophylla*,4 - *Borassus flabellifer*, 5 - *Carissa spinarum*, 6 - *Cassia fistula*, 7 - *Cassia siamea*, 8 - *Clausena dentata*, 9 - *Gmelina asiatica*, 10 - *Phoenix sylvestris*, 11 - *Pterocarpus santalinus*,12 - *Randia dumetorum*, 13 - *Ziziphus oenophilia*

Table 8

Lichen species substratum and their photobiont in GNP, Chennai

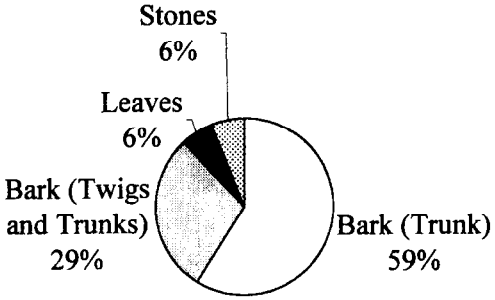
Species	Substratum	Photobiont
Anthracoathecium ochrotropum Hampe ex A. Massal	Bark	*Trentepohlia*
Arthonia tumidula (Ach.) Ach.	Bark	*Trentepohlia*
Arthonia simplicascens Nyl.	Bark	*Trentepohlia*
Arthopyrenia alboatra (Krempelh.) Mull. Arg.	Bark	*Trentepohlia*
Bacidia medialis (Tuck. In Nyl.) Zahlbr.	Bark, twig	*Trebouxia*
Bacidia phaeolomoides (Müll. Arg.) Zahlbr.	Bark, twig	*Trebouxia*
Buellia disciformis (Fr.) Mudd.	Bark	*Trebouxia*
Catillaria intermixta (Nyl.) Arn.	Bark	*Trebouxia*
Catillaria sp.	Bark, twig	*Trebouxia*
Chrysothrix candelaris (L.) Laundon	Bark	*Trebouxia*
Dirinaria consimilis (Stirton) Awas.	Bark	*Trebouxia*
Dirinaria papillulifera (Nyl.) Awas.	Bark	*Trebouxia*
Enterographa multiseptata R. Sant.	Bark	*Trentepohlia*
Enterographa sp.	Bark	*Trentepohlia*
Graphis scripta (L.) Ach.	Bark, twig	*Trentepohlia*
Gyrostomum scyphuliferum (Ach.) Nyl.	Bark	*Trentepohlia*
Heterodermia diademata (Taylor) Awas.	Bark, twig	*Trebouxia*
Lecanora allophana (Ach) Röh.	Bark, twig	*Trebouxia*
Lecidea sp.	Bark, twig	*Trebouxia*
Opegrapha leptoterodes Nyl.	Bark	*Trentepohlia*
Parmotrema saccatilobum Nyl.	Bark	*Trebouxia*
Phylliscum testudineum Nyl. Ex Mass	Brick	*Gleocapsa*
Physcia aipolia (Ehrh. In Humb.) Furnr	Bark	*Trebouxia*
Porina interestes (Nyl.) Harm.	Bark	*Trentepohlia*
Pseudopyrenula subvelata (Nyl.) Müll. Arg.	Bark, twig	*Trentepohlia*
Pyxine sp.	Bark	*Trebouxia*
Roccella montagnei Bel. Emend. Awas.	Bark	*Trentepohlia*
Strigula elegans (Fèe) Müll. Arg.	Leaf	Cephaleuros
Tapellaria sp.	Leaf	*Trebouxia*
Trypethelium eluteriae Spreng.	Bark	*Trentepohlia*
Verrucaria sp.	Stone	*Trebouxia*

Fig. 5



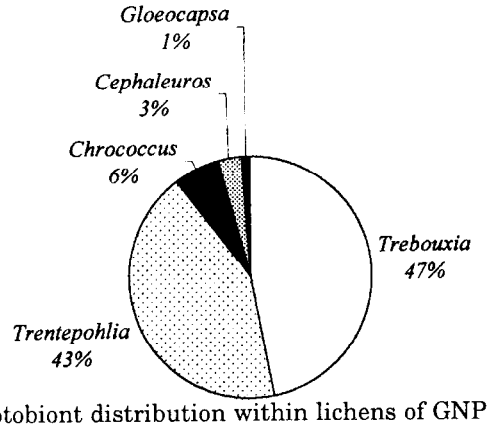
Growth form distribution of lichens within GNP

Fig. 6



Substrate preference of lichens of GNP

Fig. 7



Photobiont distribution within lichens of GNP

Substrate preference : Fig. 6 indicates the substrate preference of lichens within GNP. The trunks (59% of species) were found to be the most preferred habitats. The presence of *Strigula elegans* (on the leaves of *Mangifera indica*) indicate dry conditions, due to their subcuticular growth, an adaptation against water loss (Lücking, 2000). *Tapellaria* sp. (on fonds of *Phoenix sylvestris*) is indicative of coastal, (secondary) forest type, seasonality and microclimate (Lücking, 1997). These two species were confined to GNP with a narrow distribution.

Photobiont distribution within lichens of Guindy National Park : The lichens with photobiont (Fig. 7) *Trebouxia* (Chlorophyceae, Chlorococcales - 46%) dominate GNP followed by *Trentepohlia* (Trentepohliaceae, Trentepohliales - 42%). The sensitivity of the photobiont to temperature and drought is a critical factor for the survival of lichens. The photobiont *Trebouxia* is frequent in dry and open and *Trentepohlia* in moisture and closed plots, which confirms with similar species distribution observed by Wolseley and Aguirre-Hudson, 1997.

Conclusions

This study strengthens the argument of Upreti (1995) for establishing Biosphere Reserve etc. by harbouring 59.6% of the total lichen diversity recorded from this region with ecologically sensitive foliicolous and narrowly distributed species and serve as a refuge, providing compelling evidence to assign a high conservation priority to this site. It also provides information on rapidly measurable forest characteristics to develop implementable conservation strategies and a baseline for further research on monitoring and conservation.

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SUMMARY

Quantitative ecological data suggested the impact of key site characters on lichens within the Tropical Dry Evergreen Forest at GNP. Twelve quadrats (each of 0.1 ha) were inventoried for lichen species diversity and their relationship with prominent site characters such as vegetation structure, tree density and host tree diversity were analyzed at GNP, Chennai. A total no of 31 species of lichens were found under 26 genera in 19 families in 9 Fungal Orders, recorded from 219 individuals of phorophytes in a total sample of 264 out of which 235 trees, 27 shrubs and 2 lianas of ≥3 cm gbh. Strongest correlation emerged between tree density and host tree diversity on lichen distribution. Species like *Arthopyrenia alboatra*, *Parmotrema saccatilobum*, *Strigula elegans*, *Tapellaria* sp. and *Verrucaria* sp were found to be narrowly distributed in the park and specific to a single host.

गुइंडी राष्ट्रीय उपवन, चेन्नई के उष्ण शुष्क सदाहरित वन की कवाप्य विविधता और उनके वितरण की सज्जा

पी॰ बालाजी व जी॰एन हरिहरन्

सारांश

मात्रात्मक दृष्टि से लिए पारिस्थिकीय आंकड़े सुझाते हैं कि इस स्थल की मुख्य विशषताओं का गुंइडी राष्ट्रीय उपवन के उष्णा शुष्क सदाहरित वन में पाए जाने वाले कवाप्यों पर प्रभाव पड़ा है । गुइंडी राष्ट्रीय उपवन, चेन्नई के कव्यापों की जाति विविधता का पता लगाने के लिए बारह चतुष्कोणक (प्रत्येक 0.1 हेक्टे॰ का रखकर) बनाए गए, और मुख्य स्थल विशेषताओं जैसे वनस्पति संरचना, वृक्ष सघनता और पोषी वृक्ष विविधता के साथ उनके सम्बन्ध का विश्लेषण किया गया । 9 कवक गणों के 19 कुलों में आने वाली 26 प्रजातियों की कुल मिलाकर 31 जातियों के कवाप्य कुल 264 नमूनों में से 219 फोरोफायटों से आलेखित किए गए जिसमें सें 235 वृक्ष, 27 क्षुप और 2≥ सेमी वक्षोच्चता पर परिधि वाली कष्ठारोहियों के थे । वृक्ष धनत्व और पोषी वृक्षों की विविधतां का कवाप्य वितरण के साथ भारी सहसंबंध निकला । *आर्थोपायरेनिया एल्बोएट्रा, पार्मोट्रमा, सैक्कोटिलोबम, स्ट्रायगुला एलेगेंस, टेप्पेलेरिया* की जाति और *वेरूकेरिया* की जाति जैसी जातियां इस उपवन में बहुत कम वितरित होती पाई गई और वे एक ही पोषी के साथ विशिष्ट रहती मिली ।

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