



## Plant Biodiversity and Biocultural Perspectives of Two Sacred Groves in Cuddalore District of Tamil Nadu.

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### ABSTRACT

Floristic diversity of two sacred groves along the south east of coast of Tamil Nadu at Cuddalore district was studied. The two sacred groves, SK and B.M together measuring 4.1 ha accounted for 50 species belonging to 47 genera and 39 families were recorded and which is floristically significant. The number of woody species (girth at breast height (gbh)  $\leq 20$  was 37 in Senthirankillai Sacred Grove (SK) and 13 in Aiyandar grove at Anayankuppam (B.M). Based on the important value index (IVI) SK grove is in association with four species, *Atalantia monophylla*, *Borassus flabellifer*, *Lepisanthes tetraphylla* and *Pterospermum canescens* contribute significantly to the vegetation by virtue of their higher density. The SK grove represents the evergreen species dominating with 86%. The vegetation appears to be an assemblage of two layered trees with almost continuous canopy layer resembling tropical dry ever green forest (TDEF) was found there in SK. In B.M. the grove is a stand of medium sized trees without stratification. About one third of the population is of deciduous stems. The SK grove was unique with the presence of *Pandanus odoratissimus*, a taxon of swamp with stilt roots and *Salvadora persica* a halophilous species are significant for their rare occurrence, confined to the marshy part of the grove. The persistence of the grove until present time is a testimony to the sacred grove status.

**Key words:** Floristic diversity, Sacred Groves, Tropical dry ever green forest.

### Introduction

Ancient societies lived in total harmony with nature and they deemed it inalienable part of their existence. Such societies were called “Ecosystem people” (Dasman 1988) as they were truly conscious of their total dependence on nature and natural resources, and hence worshipped nature as God. Their reverential attitude towards the environment ensured the conservation of nature and natural resources through sustainable utilization. However, when degradative forces emerged and threatened to gain ascendancy, they ingeniously attached sacredness to the natural elements as a deterrent. And thus, was borne the concept of sacred more regulatory mechanisms were devised and woven into the tapestry of culture to ensure the compliance by the community (Ramakrishnan 1998).

Sacred sites such as woods, forests, rivers, streams, rocks, mountains, peaks and trees equated to ancestral spirits or deities are found throughout the world. Embedded in traditional cultural and religious belief systems, they provide a cultural identity to each community, besides contributing environmental conservation. More often than not they encourage high biodiversity within otherwise degraded environments (Bhagwat and Rutte 2006).

Sacred groves are patches of natural vegetation demarcated by ancient societies and protected on the basis of religious practices and cultural traditions. They exemplify the perceived interlink between man and his natural environment as well as his ecological prudence (Gadgil and Vartak 1975). Preserved over the course of many generations, sacred groves represent native vegetation in a natural or near-natural state and thus are rich in biodiversity.

Hughes and Chandran (1998) have surveyed the presence of sacred groves around the world and found them in Asia, Africa, Australia, America and Europe. Since then, they have been found in several countries, across all ancient cultures (Ramakrishnan et al. 1998). Utaki is a sacred tree stand dedicated to ancestors and Gods of Nature in Japan. There are several such sacred Utakis in Okinawa island of Japan. It is also the place of festivals and the people pray for good harvest, long life and safety. The Potato festival called “Ntsugamanigai” is the thanks giving festival for the bountiful harvest performed in the grove. ‘Shinto shrive’ is another type of grove in Japan (Ono 1996). There



are groves maintained by Christian - Orthodox countries in Greece, ancient tribal societies of tropical Africa (Ramakrishnan 1996; Michaloud and Dury 1998).

## **Belief system**

The society's interest in preservation of sacred groves have been institutionalized through various social and cultural mechanisms. The tribals, though illiterate and ignorant, scrupulously established traditional customs, rituals and ceremonies which, with the passage of time, concretized into their culture. Saxena et al. (1998) reviewed the cultural and religious perspectives associated with sacred groves. As mentioned earlier the behavioural patterns diversified into the different forms viz. beliefs, rites, rituals, myths, taboos, folklores and faith.

## **Conservation as religious perception**

Gadgil (1992) stated that ecological wisdom in taboos, symbols and cosmologies of traditional societies transmit the knowledge of conservation to the younger generation and help them to manage resources prudently. Despite their apparent irrationality, these religious restrictions may thus be highly rational ways of conserving resources. Taboos are the unwritten and orally transmitted community rules that govern human behaviour and prevent resource extraction. These community-owned controls shape social life, indirectly affect or even directly manage many components of the local ecosystem. Such constraints may play a major role locally for the conservation of natural resources. The fact that there are no artificial boundaries or fences for the groves is a point in proof; the belief system is the "social fencing" (Bhagwat and Rutte 2006).

## **Sacred Groves of Tamil Nadu**

In Tamil Nadu, almost every village has a sacred grove. These groves range in size from 1 acre to 500 acres. The sacred groves in Tamil Nadu are known as Koil Kadu, Swami Thopu or Swami Sholai. The deities associated with the groves are Aiyanar, Sastha, Muneeswaran, Karuppuswami, Vedappar, Andavar and Amman. A total of 1261 groves have been reported in Tamil Nadu. The groves are the repositories of medicinal plants. Sacred groves have been documented from Tamil Nadu. Sixty rare, endangered and threatened (RET) species from 40 families were identified from the sacred groves in Kanyakumari district, Tamil Nadu. Forty-two species were endemic to the Western Ghats (Warrier et al. 2023). A typical sacred grove ranges from clumps of few trees to few hectares in their size and are usually located in proximity to human settlements (Parthasarathy and Naveen Babu 2019).

In this paper two Sacred Groves in Cuddalore District of Tamil Nadu, South India, were identified and their belief system, traditional worship, survey the floristic richness of two groves selected for their appreciable vegetation after a preliminary survey, assess the phyto-sociology and stand structure quantitatively and vegetation profile based on analysis.

## **Methods**

One ha plots were laid in each grove and were subdivided into quadrats of 20 x 20m size for studying the vegetation. The subplots were laid out 5 m away from the margins, open areas and various temple structures to avoid edge effects.

Floristic composition of each grove was analysed during field visits spreaded over different seasons. Flowering twigs were collected and identified taxonomically using the publications of Gamble and Fischer (1915-1935), Henry *et al.* (1989) and Mathews (1988, 1991 and 1993). Only trees and lianas were enumerated systematically in each grove; though the herbaceous ground flora was not listed quadrat-wise, the most common ones were recorded.

Following Murphy and Lugo (1986), trees and lianas measuring  $\geq 20$  cm girth at breast height (gbh) were enumerated and the phytosociological parameters, viz. density, basal area (BA), biovolume (BV) were determined as per Cottam and Curtis (1956).

The important conceptual components of diversity include richness, evenness, dominance and rarity of species (Wilsey et al. 2005). These components are characterized by the way in which the



presence of each species is weighted by an aspect of importance such as abundance or biomass (Hill 1973; Magurran 2004). Species Importance Value Index (IVI) was computed by adding the Figures of relative density, relative frequency and relative basal area for that species for a maximum of 300. It gives the total picture or share of a species (SIV) in a community and can be estimated for family (FIV) too. Diversity indices also calculated such as Shannon-Wiener Index, Hill's diversity index ( $N$ ), Shannon maximum.

## Study area and sacred groves

The Coromandel coast of South India along the Bay of Bengal extends from Ramanathapuram in South of Tamil Nadu to Vishakapattinam in Andhra Pradesh State. This belt harbours several patches of dry ever green forest vegetation (Champion 1936; Mehar-Homji 1974), some of which are maintained as sacred groves (Parthasarathy and Karthikeyan 1997). The present study area is two sacred groves Senthirankillai Sacred Grove (Lat-  $11^{\circ} 30' 0.82''$  N Long.  $79^{\circ} 41' 43.7''$  E, Altitude-12 m) and Aiyandar grove at Anayankuppam (Lat.  $11^{\circ} 28' 31.6''$  N, Long.  $79^{\circ} 43' 9.7''$  E, Altitude- 5 m) Coromandel Coast of Cuddalore district of Tamil Nadu, South India.

### Satellite view of the grove



**Plate 1 Senthirankillai Sacred Grove (SK)  
Aiyandar grove at Anayankuppam (B.M)**

**Plate 2:**

Senthirankillai Sacred Grove (SK) dedicated to Muni Aiyandar and Nallanayagi measuring 3.04 ha is situated close to the village Senthirankillai (Plate1) just on other side of metal road running through the village. The presiding deities are housed in a small concrete temple ( $59.4\text{m}^2$ ). Inside the grove six minor deities are also installed as concrete/granite images (Agni Veeran, Uthandi Veeran, Vinayagar, Aiyandar, Muthiyal Ravuthar). The bridle path running through the grove is used only sparingly. However very famous annual festival called 'Lakshadeepam' (Lighting one lakh earthen lamps) in Tamil month of Thai (third Friday of the April month) brings people from far and near including migrants. The devotees line the bridle path and temple area with earthen lamps and light it together; the grand spectacle of illumination marks the end of ten day long annual festival. A perennial water canal ( $4400\text{m}^2$ ), runs around the grove which supports the vegetation. The grove is surrounded by groundnuts fields of and cashew nut plantations.

The second grove measuring 0.7 ha is dedicated to Aiyandar (near B.Mutlur (BM)). It is about 1 km away from the village Anayankuppam and is surrounded by agricultural fields (Plate2). The setting typically suits the 'Marudham' description in Sangam literature. The presiding deity housed in a concrete temple ( $27\text{m}^2$ ) with consorts Poorani and Porkalai. (Vinayagar, Ambal, Mutumuneeswaran. A small pond is located outside the grove ( $168\text{m}^2$ ) from which water is pumped for irrigating the surrounding field. The two groves are associated with regular worship patterns and annual festivals. Taboos and restrictions: axing of wood and collection of fallen trees and branches are banned. Public access is limited to ritualistic occasion and ceremonies only. Folklores eulogising the might of Gods are narrated by the villagers who acknowledge the erosion of belief systems over ages ( Praveen Kumar Cyril 1999).

## Results



In SK grove, there are 37 woody species belonging to 34 genera and 26 families. Of these 30 are trees (97%) and seven are lianas (3%). The grove has 27 evergreen species, six deciduous and four brevi-deciduous species (Table- 1). Four families Fabaceae, Loganiaceae, Rubiaceae, and Rutaceae are represented by three species each; Capparaceae and Sapindaceae have two each. Others have only one species for a family (Table 1). The evergreen species dominating with 86%.

### Phytosociology and community structure

The stand stem density is 1105 ha<sup>-1</sup>. Basal area value is 31.92 m<sup>2</sup>ha<sup>-1</sup> and biovolume 381.69 (Table 2). *Pterospermum canescens* and *Lepisanthes tetraphylla* in the top storey have only moderate IVI of 17.06 and 13.0 respectively (Table 2). Other dominant species of the sub-canopy layer are *Atalantia monophylla*, *Borassus flabellifer*, *Garcinia spicata* and *Glycosmis mauritiana*. These contribute to IVI, basal area and biovolume profiles significantly though they are short statured. The tall stems of *Borassus flabellifer* have more biovolume, while the stout *Atalantia monophylla* has more basal area (Table 2). There are 143 multistemmed individuals in seven species (Table 5).

**Table 1 : Woody Species at Muni Aiyanar and Nallanayagi grove in Senthirankillai**

No	Plant	Habit	Life form	Family
1	<i>Albezia lebbeck</i> Benth.	T	BD	Fabaceae-Mimosoideae
2	<i>Allophyllus serratus</i> (Roxb.)Kurz	T	E	Sapindaceae
3	<i>Atalantia monophylla</i> (L.)Correa	T	E	Rutaceae
4	<i>Azadirachta indica</i> A.Juss.	T	BD	Meliaceae
5	<i>Barringtonia acutangula</i> (L.) Gaertner	T	E	Barringtoniaceae
6	<i>Benkara malabarica</i> (Lam.) Tirven.	T	E	Rubiaceae
7	<i>Borassus flabellifer</i> L.	T	E	Arecaceae
8	<i>Cansjera rheedii</i> Gmel.	L	E	Opiliaceae
9	<i>Capparis rotundifolia</i> Rottl.	L	E	Capparaceae
10	<i>Capparis zeylanica</i> L	L	E	Capparaceae
11	<i>Chionanthus zeylanica</i> L.	T	E	Oleaceae
12	<i>Combretum albidum</i> G. Don .	L	D	Combretaceae
13	<i>Dalbergia latifolia</i> Roxb.	T	D	Fabaceae-Faboideae
14	<i>Derris ovalifolia</i> (Wight & Arn.) Benth.	L	E	Fabaceae-Faboideae
15	<i>Diospyros ebenum</i> J.Koenig ex Retz.	T	E	Ebenaceae
16	<i>Drypetes sepiaria</i> (Wight & Arn.) Pax & Hoffin.	T	E	Euphorbiaceae
17	<i>Ficus microcarpa</i> L.f.	T	E	Moraceae
18	<i>Flacourtia indica</i> (Burm.f.) Merr.	T	E	Flacourtiaceae
19	<i>Garcinia spicata</i> (Wight & Arn.) J.D.Hook.	T	E	Clusiaceae
20	<i>Glycosmis mauritiana</i> (Lam.) Tanaka	T	E	Rutaceae
21	<i>Grewia carpinifolia</i> Mast.	T	D	Tiliaceae
22	<i>Ixora pavetta</i> Andr.	T	E	Rubiaceae
23	<i>Lannea coromandelica</i> (Hout.) Merr.	T	E	Anacardiaceae
24	<i>Lepisanthes tetraphylla</i> (Vahl.)Radlk.	T	E	Sapindaceae
25	<i>Memecylon umbellatum</i> Burm.f.	T	E	Melastomataceae
26	<i>Pamburus missionis</i> (Wight) Swingle	T	E	Rutaceae
27	<i>Pavetta indica</i> L.	T	E	Rubiaceae
28	<i>Polyalthia korintii</i> (Dunal) Thw.	T	E	Annonaceae
29	<i>Pongamia pinnata</i> (L.) Pierre	T	E	Fabaceae- Faboideae
30	<i>Premna latifolia</i> Roxb.	T	D	Verbenaceae



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31	<i>Pterospermum canescens</i> Roxb.	T	BD	Sterculiaceae
32	<i>Reissantia indica</i> (Willd.) N.Halle	L	E	Celastraceae
33	<i>Streblus asper</i> Lour.	T	E	Moraceae
34	<i>Strychnos minor</i> Dennst.	L	E	Loganiaceae
35	<i>Strychnos nux-vomica</i> L.	T	D	Loganiaceae
36	<i>Strychnos potatorum</i> L.f.	T	D	Loganiaceae
37	<i>Syzigium cumini</i> (L.) Skeels	T	BD	Myrtaceae

**Habit:** T-Tree; L-Liana, **Life forms:** D-Deciduous; BD- Brevi-deciduous; E-Evergreen

The vegetation appears to be an assemblage of two layered trees with almost continuous canopy layer. The average tree height is 9.11 m where the girth is 53.59 cm. The upper storey consists of *Albezia lebbeck*, *Dalbergia latifolia*, *Ficus microcarpa*, *Lepisanthes tetraphylla*, *Polyalthia korintii*, *Pterospermum canescens* and *Syzigium cumini*. This layer ranges from 12-18m. Below this, a layer populated by *Atalantia monophylla*, *Benkara malabarica*, *Drypetes sepiaria*, *Garcinia spicata*, *Pamburus missionis* and *Streblus asper*. The dense shrub layer is dominated by *Memecylon umbellatum*.

Four species, *Atalantia monophylla*, *Borassus flabellifer*, *Lepisanthes tetraphylla* and *Pterospermum canescens* contribute significantly to the vegetation by virtue of their higher density and IVI (Table 2). The most populous *Memecylon umbellatum* is confined to lower ranges; *Lepisanthes tetraphylla* is concentrated more in higher height and girth classes, though a few trees are below six meters. The distribution of *Pterospermum canescens* also follows the same pattern. In contrast, *Atalantia monophylla* is well represented in lower ranges but not in two higher classes. Viewed together, the whole stand has fair representation in all classes

**Table 2: Phytosociology of woody species at Muni Aiyanar and Nallanayagi grove in Senthirankillai**

No	Plant	D	RD	Rdo	RF	IVI	BA (m <sup>2</sup> ha <sup>-1</sup> )	Bio vol. (m <sup>3</sup> ha <sup>-1</sup> )
1	<i>Albezia lebbeck</i>	10	0.90	2.20	2.76	5.87	0.70	20.89
2	<i>Allophyllus serratus</i>	3	0.27	0.12	0.55	0.94	0.04	0.25
3	<i>Atalantia monophylla</i>	115	10.41	5.87	4.42	20.69	1.86	14.66
4	<i>Azadirachta indica</i>	8	0.72	0.71	2.76	4.20	0.23	2.96
5	<i>Barringtonia acutangula</i>	5	0.45	0.22	0.55	1.23	0.07	0.63
6	<i>Benkara malabarica</i>	10	0.90	0.14	3.87	4.91	0.04	0.11
7	<i>Borassus flabellifer</i>	40	3.62	7.19	3.31	14.12	2.28	58.62
8	<i>Cansjera rheedii</i>	5	0.45	0.16	2.21	2.82	0.05	0.14
9	<i>Capparis rotundifolia</i>	4	0.36	0.13	2.21	2.70	0.04	0.14
10	<i>Capparis zeylanica</i>	3	0.27	0.09	0.55	0.92	0.03	0.12
11	<i>Chionanthus zeylanica</i>	16	1.45	1.65	2.76	5.86	0.52	0.70
12	<i>Combretum albidum</i>	4	0.36	0.08	1.66	2.10	0.03	0.22
13	<i>Dalbergia latifolia</i>	12	1.09	4.32	4.42	9.82	1.37	17.18
14	<i>Derris ovalifolia</i>	16	1.45	0.19	3.87	5.51	0.06	0.58
15	<i>Diospyros ebum</i>	1	0.09	0.20	0.55	0.84	0.06	0.72
16	<i>Drypetes sepiaria</i>	22	1.99	6.20	4.42	12.61	1.97	15.76
17	<i>Ficus microcarpa</i>	1	0.09	1.11	0.55	1.75	0.35	8.05
18	<i>Flacourtia indica</i>	10	0.90	0.31	3.87	5.09	0.10	0.60
19	<i>Garcinia spicata</i>	72	6.52	6.41	4.97	17.90	2.04	20.63



20	<i>Glycosmis mauritiana</i>	165	14.93	2.24	4.97	22.14	0.71	4.83
21	<i>Grewia carpinifolia</i>	5	0.45	0.29	2.21	2.95	0.09	0.69
22	<i>Ixora pavetta</i>	18	1.63	0.04	3.87	5.54	0.01	0.69
23	<i>Lannea coromandelica</i>	10	0.90	2.68	4.97	8.56	0.85	5.63
24	<i>Lepisanthes tetraphylla</i>	85	7.69	0.33	4.97	13.00	0.26	50.15
25	<i>Memecylon umbellatum</i>	328	29.68	38.99	5.52	74.20	12.39	26.07
26	<i>Pamburus missionis</i>	3	0.27	3.97	1.66	5.90	1.26	0.17
27	<i>Pavetta indica</i>	1	0.09	0.02	0.55	0.66	0.01	0.09
28	<i>Polyalthia korinti</i>	6	0.54	0.25	2.76	3.56	0.08	0.91
29	<i>Pongamia pinnata</i>	5	0.45	0.08	1.66	2.19	0.02	2.86
30	<i>Premna latifolia</i>	5	0.45	0.89	1.66	3.00	0.28	9.39
31	<i>Pterospermum canescens</i>	91	8.24	3.86	4.97	17.06	1.22	97.41
32	<i>Reissantia indica</i>	2	0.18	5.84	1.10	7.12	1.85	0.19
33	<i>Streblus asper</i>	4	0.36	0.06	2.21	2.63	0.02	3.30
34	<i>Strychnos minor</i>	4	0.36	0.35	1.10	1.81	0.11	0.10
35	<i>Strychnos nux-vomica</i>	10	0.90	0.03	2.76	3.69	0.01	3.77
36	<i>Strychnos potatorum</i>	4	0.36	2.40	2.21	4.97	0.76	3.00
37	<i>Syzigium cumini</i>	2	0.18	0.41	0.55	1.14	0.13	9.49
	<b>TOTAL</b>	<b>1105</b>	<b>100</b>	<b>100</b>	<b>100</b>	<b>300</b>	<b>31.92</b>	<b>381.69</b>

The SK grove shows Shannon index ( $H' = 2.48$ ) indicates appreciable richness of species. Simpson index dominance ( $1/D = 7.11$ ), Berger-Parker Dominance index ( $1/d = 3.36$ ) indicate the dominance of a few species, high diversity and multiple rare species. The Hills number  $H_1$  is 52.28. The Evenness index 2.61 is appreciable (Table 5).

**Table 3: Woody Species at Aiyanar grove in Anayankuppam**

No.	Plant	Habit	Life form	Family
1	<i>Atalantia monophylla</i> (L.)Correa	T	E	Rutaceae
2	<i>Azadirachta indica</i> A.Juss	T	BD	Meliaceae
3	<i>Borassus flabellifer</i> L.	T	E	Arecaceae
4	<i>Capparis zeylanica</i> L .	L	E	Capparaceae
5	<i>Casearia elliptica</i> Willd.	T	E	Flacourtiaceae
6	<i>Cordia dichotoma</i> G.Forst.	T	E	Boraginaceae
7	<i>Grewia carpinifolia</i> Mast.	T	D	Tiliaceae
8	<i>Lepisanthes tetraphylla</i> (Vahl.)Radlk.	T	E	Sapindaceae
9	<i>Pandanus odoratissimus</i> Roxb.	T	E	Pandanaceae
10	<i>Pongamia pinnata</i> (L.) Pierre	T	BD	Fabaceae-Faboideae
11	<i>Premna latifolia</i> Roxb.	T	D	Verbenaceae
12	<i>Salvadora persica</i> L.	T	E	Salvadoraceae
13	<i>Streblus asper</i> Lour.	T	E	Moraceae

**Habit:** T-Tree; L-Liana. **Life forms:** D-Deciduous; BD- Brevi-deciduous; E-Evergreen

In B.M Sacred grove There are 13 species representing 13 genera and 13 families. Of these, 12 are trees (99%) and only one liana (1%) (Table 3). Eight evergreens, three deciduous and two brevi-deciduous species are present. Familywise, all are represented by one species each (Table 3).

#### Phytosociology and community structure

The grove has a stand density of 71 in 0.2 ha of sample area; the stand measures a basal area of  $23.2 \text{ m}^2 \text{ ha}^{-1}$  and a biovolume of  $245.2 \text{ m}^3 \text{ ha}^{-1}$  if extrapolated to one hectare (Table 4). The stem density will be  $355 \text{ ha}^{-1}$ . Three taxa *Atalantia monophylla*, *Azadirachta indica* and *Pongamia pinnata*



dominate the grove. *Borassus flabellifer*, *Lepisanthes tetraphylla*, *Salvadora persica* and *Streblus asper* are co-dominants; all other species are represented by one or two individuals only (Table 4).

**Table 4: Phytosociology of woody species at Aiyandar grove in Anayankuppam**

NO.	Plant	D	RD	Rdo	Rf	IVI	BA (m <sup>2</sup> ha <sup>-1</sup> )	Bio vol. (m <sup>3</sup> ha <sup>-1</sup> )
1		20	28.17	3.33	12.50	44.00	0.15	0.6
2	<i>Azadirachta indica</i>	11	15.49	5.40	12.50	33.40	0.25	2.37
3	<i>Borassus flabellifer</i>	8	11.27	12.71	9.38	33.35	0.59	11.17
4	<i>Capparis zeylanica</i>	1	1.41	0.07	3.13	4.60	0.00	0.03
5	<i>Casearia elliptica</i>	1	1.41	0.84	3.13	5.37	0.04	0.5
6	<i>Cordia dichotoma</i>	1	1.41	3.33	3.13	7.86	0.15	1.38
7	<i>Grewia carpinifolia</i>	1	1.41	0.07	3.13	4.60	0.00	0.03
8	<i>Lepisanthes tetraphylla</i>	5	7.04	7.50	12.50	27.04	0.35	3.36
9	<i>Pandanus odoratissimus</i>	1	1.41	0.73	3.13	5.26	0.03	0.34
10	<i>Pongamia pinnata</i>	11	15.49	23.39	15.63	54.51	1.08	10.59
11	<i>Premna latifolia</i>	1	1.41	6.17	3.13	10.70	0.29	2.55
12	<i>Salvadora persica</i>	7	9.86	32.07	9.38	51.31	1.49	14
13	<i>Streblus asper</i>	3	4.23	4.40	9.38	18.00	0.20	2.12
	<b>TOTAL</b>	<b>71</b>	<b>100</b>	<b>100</b>	<b>100</b>	<b>300</b>	<b>4.64</b>	<b>49.04</b>

Since the grove is small the survey was limited to five plots only. Despite the smaller size of the grove, the species richness is appreciable Shannon (H') =2.09 and is dominated by species having fewer individuals of rarity which is indicated by Simpson index 1/D = 6.86 and the Berger-Parker dominance (1/d) is 3.55

(Table 5).

**Table 5: Comparing the Inventory of woody species comprising in SK& BM**

Variables	Number/ Value SK	Number/ Value B.M
Species richness	37	13
No of genera	34	13
No. of families	26	13
No. of tree species	30 (1067)	12 (70)
No. of liana species	7 (38)	01 (1)
No. of Evergreen species	27 (954)	08 (44)
No. of Deciduous species	06 (40)	03 (05)
No. of Brevi-decidu species	04 (111)	02 (22)
No. of Multistemmed individuals/species	143 (7)	19(6)
Average tree height (m)	9.11	6.7
Average tree girth (cm)	53.59	59.67
<b>Diversity indices</b>		
Shannon (H')	2.48	2.09
Simpson (1/D)	7.11	6.86
Evenness (E)	2.61	2.04
Berger-Parker dominance (1/d)	3.36	3.55
Hill's number <i>HO</i>	37	13



Hill's number	<i>H1</i>	52.28	29.41
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## Discussion

Sacred groves are patches of forest or tree clusters dedicated to local spirits or deities. Religious practices and cultural traditions have been spun around them to deter people from exploiting the biodiversity and to ensure the survival of the groves through the millennia (Ramakrishnan et al. 1998).

The present attempt, documenting the woody plant diversity and conservation gains of two groves in Cuddalore district of Tamil Nadu state has validated this new approach to a greater extent.

## Comparison of groves

The two groves were considered as coastal grove which is closer to the coast with in eight km. The soil which is an important ecological factor in determining the vegetation, it is hard and gravelly in texture overlain on the Cuddalore sandstone formations in layer in BM and sandy in SK. Hence, 'prima facie' the vegetation does not seem to be uniform in structure and composition.

The two Sacred groves, SK and B.M together measuring 4.1 ha accounted for 50 species belonging to 47 genera and 39 families which is floristically significant (Table 5). Though there were 50 woody species in these two groves, they were not uniformly and overlappingly distributed among the groves. Only seven species, viz. *Atalantia monophylla*, *Azadirachta indica*, *Borassus flabellifer*, *Capparis zeylanica*, *Lepisanthes tetraphylla*, *Pongamia pinnata*, *Premna latifolia* occurred in both groves. Certain other species were exclusive to each grove (Table 1&3). *Pamburus missionis* at SK grove is unique evergreen taxa, which seldom occur in wilderness but for Western Ghats about 400 km away, reported earlier in Kiliyalamman (KLM) Sacred grove (Ramanujam and Praveen Kumar Cyril 2003). Accordingly, 30 species in SK and six species in B.M were exclusive constituents. The SK grove were considered of select species when compare to B.M. Their diverse origin might be a reason for the dissimilarity in species composition. this differences in species composition might be due to soil characteristics as well (Murphy and Lugo 1986). In accord with this the habitat was clayey in B.M and sandy in SK.

A closer analysis of the data reveals that *Strychnos minor*, *Strychnos nux-vomica*, *Strychnos potatorum*, *Syzigium cumini*, *Polyalthia korinti* restricted to SK and five liana species present against only one in B.M (Table 1&3). The species density ranges from 13 in B.M and 37 at SK showing the species rich ness in SK, and B.M as highly eroded groove (Table 5). *Memecylon umbellatum* become dominant species with 328 individuals in SK and *Atalantia monophylla* as dominant in B, M with 20 numbers.

The SK grove has 27 evergreen species, six deciduous and four brevi-deciduous species (Table 5). Four families Fabaceae, Loganiaceae, Rubiaceae, and Rutaceae are represented by three species each; Capparaceae and Sapindaceae have two each. Others have only one species for a family (Table 1). The evergreen species dominating with 86%. While B.M harbors Eight evergreens, three deciduous and two brevi-deciduous species are present. Familywise, all are represented by one species each.

The stand stem density in SK is 1105 ha<sup>-1</sup>. Basal area value is 31.92 m<sup>2</sup>ha<sup>-1</sup> and biovolume 381.69 (Table 2). *Pterospermum canescens* and *Lepisanthes tetraphylla* in the top storey have only moderate IVI of 17.06 and 13.0 respectively (Table 2), whereas the B.M grove has a stand density of 71 in 0.2 ha of sample area; the stand measures a basal area of 23.2 m<sup>2</sup> ha<sup>-1</sup> and a biovolume of 245.2 m<sup>3</sup> ha<sup>-1</sup> if extrapolated to one hectare (Table 4). The stem density will be 355 ha<sup>-1</sup>. Three taxa *Atalantia monophylla*, *Azadirachta indica* and *Pongamia pinnata* dominate the grove. *Borassus flabellifer*, *Lepisanthes tetraphylla*, *Salvadora persica* and *Streblus asper* are co-dominants; all other species are represented by one or two individuals only (Table 4). SK shows Four species, *Atalantia monophylla*, *Borassus flabellifer*, *Lepisanthes tetraphylla* and *Pterospermum canescens* contribute significantly to the vegetation by virtue of their higher density and IVI, While in B.M three specie viz.s *Atalantia monophylla*, *Azadirachta indica*, *Pongamia pinnata* made significance with their high IVI value





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compared with other species (Table 5). The two sacred groves are a museum of giant trees, gene banks of economic species and refugia for rare and relict taxa besides serving spiritual retreats (Ramanujam 2000).

## **Concluding remarks**

The present attempt, documenting the woody plant diversity and conservation gains of two Sacred groves in Cuddalore district of Tamil Nadu state has validated this new approach to a greater extent. To conclude, the sacred groves have appreciable biodiversity and have high conservation values. However, in the modern world, the traditional role of sacred groves will inevitably fade away unless supplemented by new set of priorities for protection, particularly non – religious incentives. Educating the public on the ecological values, strengthening conservation education in educational institution and luring the stake-holders with economic rewards through Clean Development Mechanism (CDM) may be steps in the right direction. In the meantime, they may be conserved as community reserves under the Wild Life Act of 1972 or Biodiversity Heritage Sites (BHS) under the biodiversity act of 2002.

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## **References**

- Bhagwat, S. A. and Rutte, C. 2006. Sacred grove: potential for biodiversity management. *Front. Ecol. Environ.* 4: 519-524.
- Champion, H.G. 1936. A preliminary survey of the forest types of India and Burma. *Indian forest records* NS 1:1-36.
- Cottam, G. and Curtis, J.T. 1956. The use of distance measure in phytosociological sampling. *Ecology*. 37: 451-460
- Dasmann, 1988. Cited from Berkes F. 1989.
- Gadgil, M. and Vartak, V.D. 1976. The Sacred Groves of Western Ghats in India. *Econ. Bot.* 30: 152-160.
- Gadgil, M. 1992. Conserving biodiversity as if people matter: A case study from India, *Ambio*. 21: 266-270.
- Gamble, J.S. and Fisher, C.E.C. 1915 - 1935. *Flora of Presidency of Madras*, Vol. 1-3. Botanical Survey of India (reprint Ed. 1957), Kolkatta .
- Hill, M.O. 1973. Diversity and evenness : a unifying notation and its consequences. *Ecology*. 54: 427-432.
- Henry, A.N., Chithra, V. and Balakrishnan, N.P. 1989. *Flora of Tamil Nadu, India* (Series 1; Vol. 3) Bot. Surv. India. Southern Circle, Coimbatore.
- Hughes, J.D. and Chandran, M.D.S. 1998. Sacred Groves Around the Earth: An overview. In : *Conserving the Sacred for Biodiversity Management* (eds. Ramakrishnan, P.S., Saxena, K.G. and Chandra Shekera, U.M). Oxford IBH Publishing Co. Pvt. Ltd. New Delhi. Pp 69-86.
- Meher-Homji, V.M. 1974. On the origin of the Tropical Dry Evergreen Forest of South India. *J. Ecol. Environ. Sci.* 1: 19-39.
- Magurran, A. E. 2004. *Measuring Biological Diversity*, Blackwell Publishing, Oxford, U. K, P.256.
- Mathew, K.M. 1988. Further illustrations on the Flora of the Tamil Nadu Carnatic (Vol.4) The Rapinat Herbarium St. Joseph's College, Tiruchirapalli, India.
- Mathew, K.M. 1991. *An Excursion Flora of Tamil Nadu, India*, Oxford & IBH Publ.Co., New Delhi. India.
- Mathew, K.M. 1993. *The Flora of the Tamil Nadu Carnatic* (Vol.4) The Rapinat Herbarium St. Joseph's College, Tiruchirapalli, India
- Meher-Homji, V.M. 1974. On the origin of the Tropical Dry Evergreen Forest of South India. *J. Ecol.*



# PRANAV JOURNAL OF MULTIDISCIPLINARY

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Environ. Sci. I: 19-39.

Michaloud, G. and Dury, S. 1998. Sacred trees, groves, landscapes and related cultural situations may contribute to conservation and management in Africa. In: Ramakrishnan, P.S., Saxena, K.G. & Chandrashekhara, U.M. (eds.). *Conserving the sacred for biodiversity management*. Oxford & IBH Publishing, New Delhi. Pp. 129-143.

Murphy, P.G. and Lugo, A.E. 1986. Ecology of tropical dry forest. *Annual Review of Ecology and Systematics*, 17: 67-88.

Ono, S. 1962. *Shinto: The Kami Way*, Bridgeway Press, Tokyo, Japan

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 – 19083

Parthasarathy, N. Naveen Babu, K. 2019. Sacred Groves: Potential for Biodiversity and Bioresource Management DOI:10.1007/978-3-319-71065-5\_10-1 In book: *Life on Land* (pp.1-16) Publisher: Springer.

Praveen kumar, C. 1999. Plant Biodiversity and Biocultural Traditions of four Sacred Groves of Composite South Arcot District of Tamil Nadu. M. Phil. dissertation. Pondicherry University, Pondicherry.

Ramakrishnan, P.S. 1996. Conserving the sacred: from species to landscapes. *Nature and Resources*, UNESCO 32: 11-19

Ramakrishnan, P.S. Saxena, K.G. and Chandrashekhara, U.M. 1998. *Conserving the Sacred for Biodiversity Management*, UNESCO Vol., Oxford & IBH Publ., New Delhi, pp.480

Ramakrishnan, P.S. 1998. Conserving the Sacred: Epilogue. In: *Conserving the Sacred for Biodiversity Management* (eds. Ramakrishnan, P.S. Saxena, K.G. and Chandra Shekera, U.M.) Oxford IBH Publishing Co.Pvt.Ltd. New Delhi, pp. 457-458.

Ramanujam, M.P. 2000. Conservation of Environment and Human Rights: Sacred Groves in cultural connections to Biodiversity. *PRP Journal of Human Rights*, 4: 34-38.

Ramanujam, M.P. and Praveen kumar, C. 2003. Woody Species Diversity of four sacred groves in the Pondicherry region South India. *Biodiversity and Conservation*, 12: 289 – 299.

Saxena, K.G., Rao, K.S., and Maikhuri, R.K. 1998. Religious and Cultural Perspective of Biodiversity Conservation in India. A Review. In: *Conserving the Sacred for Biodiversity Management*. (edf. Ramakrishnan, P.S., Saxena, K.G. and Chandra Shekara, U.M). Oxford IBH Publishing Co. Pvt. Ltd., New Delhi. Pp. 153-162.

Warrier Kannan C. S , Rekha R. Warrier and Thangavel, V. 2023. Status of Sacred Groves in India: A Review, *Int. J. Environ. Clim. Change*, vol. 13, no. 8, pp. 170-181, DOI:10.9734/IJECC/2023/v13i81942

Wilsey, B.J., Chalcraft, D.R., Bowles, C. M. and Willig, M. R. 2005. Relationships among indices suggest that richness is an incomplete surrogate for grassland biodiversity. *Ecology* 86: 1178-1184.