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ECOLOGICAL IMPORTANCE OF THE SACRED GROVES IN THE SEMI URBAN LANDSCAPE OF PALAKKAD

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ABSTRACT

Sacred Groves are small forest patches or part of the forest which are preserved in a region according to socio-religious practices of the local community. Kerala houses more than 2000 Sacred Groves or Kavus and their importance in nurturing local or regional biodiversity has already been documented. The current study has been initiated with an aim to understand the floral diversity and ecological importance of the Kavus in semi-urban landscape with an emphasis on issues like, how human intervention affects ecosystem, what are the major driving factors for change and possible mitigation measures. Palakkad, the bordering district between Tamil Nadu and Kerala has been chosen for the study. Eight Kavus have been selected based on field survey, available documents and interview with local people. Standard ecological sampling methods, observations and interaction with local stakeholders have been followed to collect primary level data. The preliminary level findings indicate that, Kavus support a good number of floral members as well as local ecological processes. However, prevailing disturbances e.g. shrinking area, temple centric activities, changing religious practices etc. have moderate to high impacts on the natural system. A suitable management strategy can be formulated once the analysis has been completed.

Key words*: Sacred Groves, Kavus*

INTRODUCTION

Sacred Groves are natural forest patches found in all parts of the world. Often these patches are associated with a deity, beliefs and taboos linked with it in the society, which, in fact, acted like a conserving shield for these virgin forests. Ramakrishnan (1998) points out that these patches have survived in spite of increasing population and associated changes. This naturally has attracted the interest of ecologists and sociologists. Chandrasekera (2011) records the attention received by these groves from different researchers like Gadgil and Vartak (1976), Tiwari et al (1998), Malhotra et al (2001), and Khan et al (2008). However, a thorough analysis of the studies indicates under representation of the certain aspects like, ecosystem services, landscape level importance, functional importance etc.

which require special attention in light of rapid land-use land cover change scenario (Ray et al 2014). In India the groves are located in a variety of habitats ranging from resource-rich forested landscapes such as Western Ghats and north-eastern part of the country to extremely resource poor desert conditions in western and central India. (Kushalappa et al 2005). Though it is difficult to tabulate the exact number of sacred groves, 100,000 to 150,000 sacred groves are there in the country (Malhotra, 1998).

In Kerala the sacred groves are known as *Kavus* and are either located very close to human settlements or even within the boundaries of the homesteads. If the presiding deity is 'Ayyappan' or 'Shiva' sometimes they are located in the hillocks or mountain ranges also. Balasubramanyan and Induchoodan (1996) estimated 761 important sacred groves in Kerala with floristic wealth of over 722 species belonging to 474 genera and 217 families. Structurally the vegetation of the sacred groves is typically of tropical evergreen forests in general (there were instances of semi-evergreen species becoming dominant also) with several tiers of trees, climbers, shrubs, and undergrowth. Jayarajan (2004) documents the role played by these kavus as refugia of animals and plants and documents Dr Janzen's (1988) argument that these small patches of wilderness act as bio diversity inocula amidst the man-modified tropical landscapes.

The present study concentrates on the groves located in the semi urban areas of Palakkad in Kerala. Palakkad is present in the border of Tamilnadu and Kerala and therefore becomes an important hub for commercial activities. Although an assessment of forest cover in the area has not shown many changes in the recent time periods (Table 1) the findings must be analysed in the light of plantations (both state funded and private).

Table 1: Temporal changes in forest cover

District	Geographical Area	2011 Assessment				Percent of GA	Change	Scrub
		Very Dense Forest	Mod. Dense Forest	Open Forest	Total			
Alappuzha	1,414	0	12	26	38	2.69	0	0
Ernakulam[TH]	2,407	12	298	385	695	28.87	-1	1
Idukki[TH]	5,019	350	2,159	1,421	3,930	78.30	-2	5
Kannur[TH]	2,966	21	351	269	641	21.61	0	0
Kasaragod[TH]	1,992	0	307	285	592	29.72	0	1
Kollam[TH]	2,491	75	632	623	1,330	53.39	-7	0
Kottayam	2,203	12	542	335	889	40.35	-6	1
Kozhikode[H]	2,344	32	288	271	591	25.21	0	0
Malappuram[TH]	3,550	144	406	659	1,209	34.06	-2	9
Palakkad[TH]	4,480	276	693	606	1,575	35.16	0	35
Pathanamthitta	2,642	144	1,147	464	1,755	66.43	-3	0
Thiruvananthapuram[TH]	2,192	55	824	470	1,349	61.54	-1	0
Thrissur	3,032	181	388	362	931	30.71	-2	5
Waynad[TH]	2,131	140	1,347	288	1,775	83.29	0	1
Grand Total	**38,863**	**1,442**	**9,394**	**6,464**	**17,300**	**44.52**	**-24**	**58**

This includes the state's own plantations of teak, cashew etc which are planted as an exercise to maintain the forest cover. A mono species dominant system is inferior with respect to its services compared to a multi species, diverse system.

Sacred Groves selected under this study have a size range of less than 1 ha to 11ha.Though the district is rapidly getting urbanised, these groves have withstood the ecological and

biological challenges posed by urbanisation and show noticeable diversity. However, very few studies touched upon the groves in semi-urban areas emphasizing their role in landscape heterogeneity maintenance.

OBJECTIVES

The objective of the present study is

1. To assess plant species diversity and their distribution in the selected groves.
2. To explore the functional spectra of plant assemblage.
3. Assessment of disturbance over the systems.
4. Present status and future management recommendations

METHODOLOGY

Study area: Eight *kavus* were selected based on field observation, documents and discussion with local stakeholders. Six *kavus* are under private ownership and two are under 'Devaswom' board. As mentioned, their area ranges from 0.64ha to 11 ha (Table 2). Two *kavus* have Devi as main deity, and three of them have serpent deity. One kavu has Ayyappa/ Sasthavu, one has Shiva and another has both Shiva and Vishnu as the main deities. Their rituals, poojas and festivals vary, making the selected set of sample a diverse one.

S.no	Name of the Kavu	Area (ha)	Presiding deity
1	Parukkancherry	3.3	Devi
2	Athippatamana	1.6	Serpent
3	Hariharakkunnu	2.4	Shiva,vishnu
4	Kavassery kavu	11	Devi
5	Ayyarmala	1	Ayyappan
6	Pathirikkunnu mana	1.6	Serpent
7	Mokshathu	2.02	Shiva
8	Karakkurissikudumba kavu	0.64	Serpent

Table 2: **Details of the kavus selected**

Sampling methods

1. **Plant species assessment:** Transect cum Quadrant method was followed to enumerate the plant species assemblage in the sacred groves. In each grove, 20 m X 20m tree quadrates with nested shrub (5m X 5m) and herb (1m X 1m) quadrates, were laid alternatively along the transect line. The height and girth of each tree within the plot was recorded and details of herbs and shrubs were also documented.
2. **Documentation of functional spectra:** Functional spectra of the plant assemblage were documented based on field

observation at different time periods as well as reviewing relevant literature.

3. **Assessment of disturbance:** A detail survey on disturbances was conducted across the studied groves. A total of 35 disturbance factors were recorded from which eight (8) have been short listed for further analysis. The chosen factors were area, distance from motor able road, encroachment, construction of permanent structure, unrestricted access, plantation, invasive species and lack of recognition.
   - Grove area was categorised in a scale of 1-3: 1= > 2 ha.; 2= ≤ 2 ha.;and 3= ≤ 1 ha.
   - Distance from motor able road was grouped again in a 3 point scale.1=1.5-2km, 2=1-1.5km,
   - 3= 0.5-1km.
   - Encroachment was given values as follows. 1= no encroachment, 2=<25% of encroachment
   - And 3=>25% encroachment.
   - The presence of temple or any other permanent structure (living facility, parking, resting place etc.) was categorised in 3 point scale: 1= no permanent structure, 2= only temple, and 3 = temple and other associated facilities.
   - Unrestricted access was codified into 1= presence of good fencing/gate facility, 2 = fencing/gate is in deactivated form and 3= no fencing/gate facility.
   - Plantation in and around grove area was documented as 1=no plantation, 2=plantation around the grove and 3=plantation inside the grove. Similarly, presence of invasive species was categorised as 1= no invasive species, 2= invasive species around grove, and 3= invasive species within the grove.
   - Based on discussion with stakeholders at various level, awareness or recognition of grove's importance was quantified as 1=peoples involvement in grove conservation and maintenance (protection/biodiversity maintenance) like 'kavu samrakshana samithies' etc 2=management board/development/government recognition and 3= no such initiatives from local stakeholders.

   The magnitude of disturbance was assessed by calculating relative disturbance measures for each grove. The calculation was done by dividing each grove's disturbance score by maximum disturbance score and expressed the value in percentage. Based on the relative disturbance score groves were categorised as low, moderate and highly disturbed.

RESULT

A total of 44 woody species, 33 shrubs species of shrubs and 59 species of herbs including grasses were documented from these groves. Apart from 27% of woody endemics, exotic or cultivated species were also reported from the study area (20%). The woody species density ranges from 205-450 trees/ha although higher girth members are less in number. In case of shrubs, many medicinal plants like *Rauvolfia serpentina*, *Sida acuta, Sida rhombifolia,* and *Lawsonia inermis* which are having medicinal properties were found. Two invasive species (6% of the total shrub members) viz. *Lantana camera* and *Chromolena odorata* have been reported from all eight kavus. The shrub density ranges from 650-1610 plants/ha. Among herbs *Chloris barbata* an exotic grass

was found in Parukkancherry kavu. Other than this all the identified herbs were native.

The functional diversity studies revealed 6 sub categories of inflorescences and 5 sub categories of fruits in these groves. The sampling data showed 58% of evergreen species and 42% of deciduous trees. It was also observed that all these groves have a minimum of two woody species in each of the quarter of the year in the flowering or fruiting mode. The disturbance analysis showed that Parukkancherry kavu is highly disturbed (disturbance score 75%) followed by Ayyarmala and Kavassery (disturbance score 66%). The least disturbance was observed in Athippatta mana (46%).(Figure-1).

DISCUSSION

The *kavus* under study shows a wide range of area starting from 0.64ha to 11 ha. The heterogeneous surroundings (e.g. agricultural field, plantation, built up areas, roads) represent diverse land use patterns in the area thus, exerts pressure on these vegetation patches. Moreover, change in ownership and attitude towards these worshipping places after the land reform act in Kerala, and the fluctuating politico-cultural environment contribute to the rapid loss of area for these kavus. However, a thorough study in this regard is required for any authentic conclusion, though the present scenario demands an initiative from the state administration to keep proper details of area occupied by these groves.

A detailed analysis about the flora shows that there are about 44 woody species including endemic, native and non-native members. 27% of the woody species are endemic, stressing an immediate attention from the stakeholders to conserve them. There are commercially important species like *Tectona grandis, Strychnos nuxvomica, Terminalia paniculata, Bridelia retusa, Lagerstroemia lanceolata,* and *Swietenia mahagony*. These clearly contribute to the economic importance in terms of services. The study also reveals that more than 80% of the plants found here are used in siddha, Ayurveda and tribal medicines (eg. *Vitex negundo, Sida rhombifolia).* These plants are collected by locals for ailments like chest infection and rheumatism. Though the collection as such does not cause any problems in the grove, this increases the number of people entering the groves. At the same time invasive species like *Chromolaena odorata* and *Lantana camera* are spotted in all kavus. This directly links with the disturbance present in the system.

As mentioned earlier an analysis of the functional diversity revealed diverse range of flowering and fruiting patterns which ensure a wide spectrum of pollinators and seed dispersers. It was also observed that all these groves have a minimum of two major woody species in each of the quarter of the year in the flowering or fruiting mode. This ensures an active biological system with insects, birds, and small animals visiting the grove as pollinators and seed dispersal agents. These vibrant ecosystems also help the neighbouring plantations and farms to prosper.

Studying the disturbance factors lead to many interlinked reasons and impacts in these groves. The closer the grove to a motorable road more was the disturbance. This is very clear in Parukkancherry kavu which has a tar road running across in the middle. When nearness to road poses the maximum threat, construction activities take a second position. The construction activities are minimum in Athippatta mana and this along with the longer distance from the main road makes the kavu the least disturbed one. In the same way, lack of any initiatives from the stakeholder's side, is also an important factor leading to disturbance, as most

of the issues which require immediate remedial measures are often neglected and allowed to grow into huge proportions (eg. Ayyar mala). Athippatta mana, Karakkurissi and Ayyar mala are surrounded by plantations of economically important crops like rubber, cashew etc. The plantation related activities are affecting the kavus to a larger extent causing the growth of exotic and invasive species inside the grove and also by polluting the premises of kavus with chemical and other wastes.

Though all the kavus under study are affected by all these disturbance factors, the ranking of disturbance factors will change under different situations and in different geographical areas. These eight disturbance issues are only the major ones, which make it very clear that, there are other multiple inter linked ecological, sociological and even political issues which also have to be considered while chalking out the management strategies. This study is only a miniscule addition to the giant volumes of write ups already published. But the study progresses with an expectation and hope that this can at least be a wakeup call to the world to preserve these irrecoverable virgin forest patches.

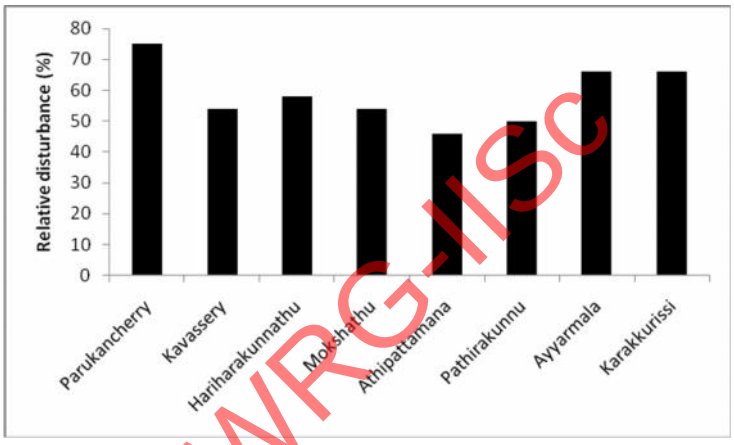

Fig 1. Relative disturbance profile of the studied sacred groves

Table 3: **Trees with details of Flowering**

S.no	Names of Trees	Flowering season	Types of inflorescence
1	*Ficus benghalensis*	June-September	syconium
2	*Stereospermum colais*	June-September	panicle
3	*Tectona grandis*	June-September	Cymose panicle
4	*Alstonia scholaris*	October-January	Paniculate cyme
5	*Pterocarpus marsupium*	October-January	panicle
6	*Santalumalbum*	October-January	cyme
7	*Ficus religiosa*	November-December	fig
8	*Butea monosperma*	February-May	raceme
9	*Strychnos nuxvomica*	February-May	cyme
10	*Ailanthus triphysa*	February-May	panicle
11	*Ficus microcarpa*	February-May	fig
12	*Holigarna arnottiana*	February-May	panicle
13	*Azadiracta indica*	February-May	panicle
14	*Pongamia pinnata*	February-May	raceme
15	*Mimusops elengi*	February-May	Solitary or in axillary fascicles

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