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Phytosociological analysis on Kamarajumetta Sacred Groves of Hukumpeta Mandal in Visakhapatnam District, Andhra Pradesh, India

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ABSTRACT

Phyto-sociological studies were conducted on Kamarajumetta sacred grove in Hukumpeta Mandal of Visakhapatnam District, for analysis of tree species diversity in the year 2017-2018. Local community initiations are more effective management system than the government management system for tree diversity conservation, in sacred groves of Visakhapatnam. In Kamarajumetta Sacred Groves are small in size and can act as starting points for any long term conservation plan of biodiversity. The communities have kept their faith and traditions linked to these mini nuclei of rich biodiversity in the landscape. Therefore, any conservation program can begin from local communities, by taking them into consideration as trustworthy awareness building factors.

Keywords: *Phytosociological analysis, Kamarajumetta sacred grove, Hukumpeta, Visakhapatnm district*

Introduction

India has an ancient tradition of conserving nature that goes right back to the pre-Vedic age. This tradition probably can be traced further back in time to food gathering societies, who venerated nature and the natural resources on which they depended for their existence.

There are a number of sacred groves all across India. The state of Andhra Pradesh, alone, has over 500 sacred groves (Anon, 1996), locally known as Pavithravanalu (Rao *et al.,* 2001). Most of the sacred groves reported from India are in the Western Ghats, North Eastern India and Central India Balasubramanyam and Induchoodan, 1996; Khumbongmayum *et al*., 2005a). Sacred groves have been reported in Meghalaya Tiwari *et al.,* 1998a; Jamir 2002, Law, 2002; Upadhaya, 2002; Mishra *et al*., 2004).

In the state of Andhra Pradesh, there are more than 750 sacred groves in 23 districts most of them situated in Chittoor, Adilabad, Kurnool, Kadapa, Ananthapur and Nellore districts (WWF, 1996). However, there is a scarcity of information on the extent of sacred groves precisely distributed in the eastern ghat region of the state.

A few species found in the sacred groves are also important keystone species, which maintain the biodiversity of the grove. In many cases, they represent the remnant near natural vegetation. They also serve as a seed source through dispersal by birds. They are also an important refuge for rare and endangered medicinal plants (Joshi and Gadgil, 1991).

The strands in the sacred groves were more diverse, had high basal area and showed fewer signs of disturbances than the Natural forest land. This supports the view that local communities afford better protection and management to sacred groves

(Ravi Prasad Rao, 1998). Biodiversity of Sacred groves is preserved in mostly undisturbed condition probably due to certain taboos and religious beliefs (Lakshmi Narayana and Venkaiah, 1998).

Study Area

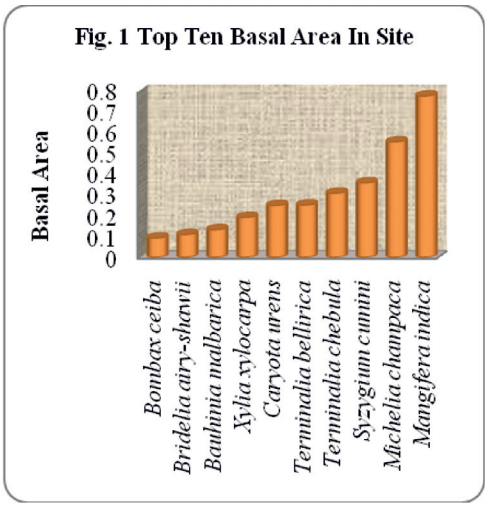
Kamarajumetta Sacred Grove is situated in Paderu forest range of Hukumpeta Mandal, Visakhapatnam District, Andhra Pradesh. It lies between 18°10′11.23" North latitude and 82°46′58.05" East longitude and the Elevation of the grove 926 M. Kamaraju is the local god of this grove. Annual jathara is celebrated in this grove by local people. The vegetation type is Dry deciduous with semi evergreen forest species.

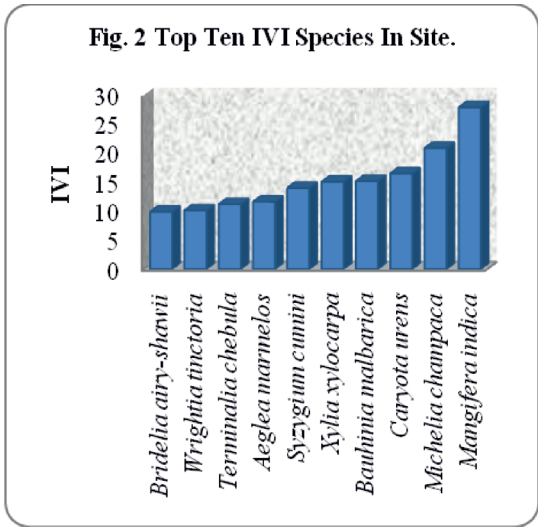
Methodology

Phytosociological studies were carried out during the years 2017 2018 at Hukumpeta Mandal, Kamarajumetta Sacred Grove, Visakhapatnam District, Andhra Pradesh. The following phytosociological parameters were undertaken for the study. Density, Relative Density, Frequency, Relative Frequency, Abundance, Relative Dominance, IVI (Importance Value Index). IVI is the sum total of Relative Density, Relative Dominance and Relative Frequency for a species were estimated using 10 randomly placed quadrats (10 × 10m^2) for trees. The diversity indices were calculated using the software PAST.

Results and Discussion

A total of 56 individuals belonging to 31 species, 29 genera and 20 families, 64 individuals were recorded in the 0.5 hactor site and the vegetation type is mixed deciduous vegetation. The most numerously represented genera were *Terminalia* 2 species. The total basal area is 4.05782941 m^2 ha^{-1}. Basal area and tree density are correlated against each other (Fig. 1), trees girth class wise density is more for the 121-150cm and >150cm girth interval. The stand density is more for middle class stemmed individuals (31-60cm) and (61-90cm), The IVI parameters are given (Table 1) and IVI of top ten species contributing 50% and their values shown in (Fig. 2). The predominant tree is *Mangifera indica* and *Michelia champaca* and dominant trees are *Caryota urens*, *Bauhinia malbarica*, *Xylia xylocarpa*, *Syzygium cumini*,





Aeglea marmelos and *Terminalia chebula*. The Shannon index is 3.324, Simpson's index is 0.96, Evenness is 0.8955 and Menhinick index is 3.875. Among the 20 observed families, Rubiaceae with 4 species, Anacardiaceae and Caesalpiniaceae with 3, Bombacaceae, Combretaceae, Euphorbiaceae and Rutaceae contributed with 2 species each.

A study in the Eastern Ghats of Andhra Pradesh indicated the following species as commonly found in the Sacred Groves such as neredu (*Syzygium jambolanum*), chintha (*Tamarindus indica*), mamidi (*Mangifera indica*), panasa (*Artocarpus integrifolia*), vepa (*Azadirachta indica*), gummidi (*Gmelina arborea*), ganuga (*Pongamia glabra*), sampange (*Michelia cham* paka), teku (*Tectona grandis*), Juvvi (*Ficus retusa*), medi (*Ficus glomerata),* raavi (*Ficus religiosa*) and marri (*Ficus benghalensis*). A large number of distinct local art forms and folk traditions are associated

Table 1. Important Value Index (Ivi) For Kamarajumetta Sacred Grove (Km)

S.No	Name of the Plants	Family	T1	T2	TNI	D	F	BA	RD	RF	RBA	IVI
1	*Aeglea marmelos*	Rutaceae	2	2	4	2	100	0.053588479	6.25	4.081632653	1.320619316	11.65225197
2	*Bauhinia malbarica*	Caesalpiniaceae	3	2	5	2.5	100	0.133529599	7.8125	4.081632653	3.290665662	15.18479831
3	*Bauhinia racemosa*	Caesalpiniaceae	2	0	2	1	50	0.025859325	3.125	2.040816327	0.63726989	5.803086216
4	*Bombax ceiba*	Bombacaceae	1	1	2	1	100	0.093133355	3.125	4.081632653	2.295152053	9.501784706
5	*Bridelia airy-shawii*	Euphorbiaceae	1	1	2	1	100	0.109770847	3.125	4.081632653	2.705161699	9.911794352
6	*Canthium dicoccum*	Rubiaceae	1	1	2	1	100	0.069334819	3.125	4.081632653	1.708667664	8.915300317
7	*Caryota urens*	Arecaceae	2	2	4	2	100	0.249657861	6.25	4.081632653	6.152497697	16.48413035
8	*Cassia fistula*	Caesalpiniaceae	2	0	2	1	50	0.040181413	3.125	2.040816327	0.990219374	6.156035701
9	*Ceiba pentandra*	Bombacaceae	1	1	2	1	100	0.060669955	3.125	4.081632653	1.495133207	8.70176586
10	*Dillenia pentagyna*	Dilleniaceae	1	0	1	0.5	50	0.079567155	1.5625	2.040816327	1.960830458	5.564146784
11	*Diospyros melanoxylon*	Ebenaceae	2	1	2	1	100	0.041064609	3.125	4.081632653	1.011984607	8.21861726
12	*Erythrina variegata*	Fabaceae	1	1	2	1	100	0.057686187	3.125	4.081632653	1.421602073	8.628234726
13	*Gmelina arborea*	Verbenaceae	1	0	1	0.5	50	0.047175366	1.5625	2.040816327	1.162576374	4.7658927
14	*Grewia tiliifolia*	Tiliaceae	1	1	2	1	100	0.081675684	3.125	4.081632653	2.01279245	9.219425103
15	*Hymenodictyon orixense*	Rubiaceae	1	1	2	1	100	0.067958307	3.125	4.081632653	1.674745292	8.881377945
16	*Lannea coromandelica*	Anacardiaceae	2	0	2	1	50	0.041064609	3.125	2.040816327	1.011984607	6.177800933
17	*Macaranga peltata*	Euphorbiaceae	1	1	2	1	100	0.030116168	3.125	4.081632653	0.742174324	7.948806977
18	*Mangifera indica*	Anacardiaceae	3	1	3	1.5	100	0.776559516	4.6875	4.081632653	19.13731302	27.90644567
19	*Meyna spinosa*	Rubiaceae	1	0	1	0.5	50	0.016112349	1.5625	2.040816327	0.39706817	4.000384497
20	*Michelia champaca*	Magnoliaceae	1	1	2	1	100	0.555609484	3.125	4.081632653	13.69228294	20.89891559
21	*Miliusa tomentosa*	Annonaceae	1	1	2	1	100	0.049729472	3.125	4.081632653	1.225519039	8.432151692
22	*Morinda pubescens*	Rubiaceae	2	0	2	1	100	0.060669955	3.125	4.081632653	1.495133207	8.70176586
23	*Naringi crenulata*	Rutaceae	1	0	1	0.5	50	0.015404201	1.5625	2.040816327	0.379616772	3.982933098
24	*Oroxylum indicum*	Bignoniaceae	1	0	1	0.5	50	0.02495226	1.5625	2.040816327	0.614916436	4.218232763
25	*Semecarpus anacardium*	Anacardiaceae	1	0	1	0.5	50	0.048408657	1.5625	2.040816327	1.192969248	4.796285575
26	*Soymida febrifuga*	Meliaceae	0	1	1	0.5	50	0.061616805	1.5625	2.040816327	1.518467111	5.121783437
27	*Syzygium cumini*	Myrtaceae	2	0	2	1	50	0.358450032	3.125	2.040816327	8.833541181	13.99935751
28	*Terminalia bellirica*	Combretaceae	1	0	1	0.5	50	0.252100573	1.5625	2.040816327	6.212695201	9.816011527
29	*Terminalia chebula*	Combretaceae	1	0	1	0.5	50	0.308792171	1.5625	2.040816327	7.609786903	11.21310323
30	*Wrightia tinctoria*	Apocynaceae	2	1	3	1.5	100	0.05542648	4.6875	4.081632653	1.365914493	10.13504715
31	*Xylia xylocarpa*	Mimosaceae	2	2	4	2	100	0.191963717	6.25	4.081632653	4.730699534	15.06233219
		Total	44	22	64	32	2450	4.05782941	100	100	100	300

TNI = Total Number of individuals IVI = Important Value Index D=Density F=Frequency

with the deities of sacred groves, and are an important cultural aspect closely associated with sacred traditions. The sacred groves offer manifold ecological benefits in conservation of biodiversity. The groves are often present in the vicinity of ponds, streams and springs which help in the meeting the water requirement of the local communities. The vegetative cover also facilitates recharging of aquifers.

Conclusion

The author emphasize that documenting the patterns of tree diversity and their distribution provides a good database, useful for the management measures in these forests. The religious and socio-cultural aspects associated with these groves express a rich cultural heritage. Many unique rituals, offerings and festivals are found associated with deities of such groves. The sacredness, religious beliefs and associated taboos helps in limited use and sustainable utilization of the resources within the grove.

The present large-scale tree diversity inventory provides baseline data for future investigations and is expected to be also useful for forest management and biodiversity conservation of Eastern Ghats of Visakhapatnam District.

Conflicts of Interest

The authors declare that there are no conflicts of interest regarding the publication of this work

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