Floristic Diversity and Ethnomedicinal Importance of Vaatangi Sacred Grove, Rajavommangi Mandal, Alluri Sitaramaraju District, Andhra Pradesh, India

M. E. L. Kumari*, N. Nageswara Rao and P. K. Ratnakumar
Department of Botany, Andhra University, Visakhapatnam – 530003, Andhra Pradesh, India
Corresponding author: *mallampatichinni@gmail.com*

Abstract
Sacred groves are patches of forest under community based protection, revered as the abode of local deities and maintained through indigenous cultural beliefs. The present study documents the floristic diversity and ethnomedicinal significance of the Vaatangi Sacred Grove located in Rajavommangi Mandal, Alluri Sitaramaraju District, Andhra Pradesh, India. The grove, presided over by Lord Shiva, encompasses one hectare of dry deciduous forest with a documented history exceeding 100 years. Phytosociological analysis of 60 tree species distributed across 29 families was carried out using two 50 m × 100 m sample plots (total area: 0.5 ha per plot). A total of 456 individual trees were enumerated, with an overall basal area of 23.76 m². *Garuga pinnata* (IVI = 13.48), *Bridelia airy-shawii* (IVI = 11.97), *Terminalia bellirica* (IVI = 11.91), and *Mallotus philippensis* (IVI = 11.14) emerged as the most ecologically dominant species. Girth-class distribution revealed a preponderance of trees in the 61–90 cm class, indicating a mature but regenerating forest stand. Ethnomedicinal surveys conducted through semi-structured interviews with local tribal communities documented 23 species used in traditional medicine to treat diverse ailments including diabetes, diarrhoea, fever, skin diseases, and rheumatism. The study underscores the ecological and biocultural significance of the grove and advocates for its conservation and sustainable management.

Keywords: Sacred grove, Phytosociology, Ethnomedicine, Tribal communities, Biodiversity conservation.
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1. Introduction

Sacred groves represent one of the oldest forms of nature conservation practised by human societies worldwide, predating formal protected area legislation by millennia (Bhagwat and Rutte 2006). These forest patches, traditionally protected through religious beliefs and customary laws, serve as in situ repositories of biodiversity and function as cultural keystones within the social–ecological systems of indigenous and tribal communities (Gadgil and Vartak 1976; Chouin 2002). In India, sacred groves—known locally by diverse names such as Devvan, Devrai, Orans, Kovil Kadu, and Sarna—are found across almost every state and ecological zone, collectively harbouring an estimated 1,00,000 to 1,50,000 individual groves (Malhotra et al. 2001).

Eastern India, including Andhra Pradesh and neighbouring Odisha, harbours a rich tradition of sacred grove management among Adivasi communities. In the tribal districts of Andhra Pradesh, sacred groves associated with local deities such as Shiva, Durga, and Parvati have been maintained through religious prohibitions on tree felling, hunting, and extraction of forest resources (Rao et al. 2011). These groves often represent the last refugia of floristic elements otherwise lost due to deforestation, agricultural expansion, and urbanisation.

Despite their ecological importance, sacred groves in the Eastern Ghats are poorly documented compared to those in the Western Ghats or north-eastern India. The Alluri Sitaramaraju District, comprising a largely tribal landscape in the Eastern Ghats, contains numerous sacred groves that remain unstudied. The present investigation therefore aims to: (i) document the floristic composition and phytosociological structure of the Vaatangi Sacred Grove; (ii) assess species diversity, dominance, and importance value index (IVI); (iii) characterise tree girth-class distribution to infer stand dynamics; and (iv) record ethnomedicinal knowledge associated with the grove's plant resources.

2. Study Area

Vaatangi Sacred Grove is situated in Vaatangi Village, Rajavommangi Mandal, Alluri Sitaramaraju District, Andhra Pradesh, India, at approximately 17.456303°N latitude and 82.260197°E longitude. The grove encompasses one hectare of tropical dry deciduous forest and is believed to be more than 100 years old. The presiding deity is Lord Shiva, whose Shiva Lingam is venerated as self-manifested (Swayambhu) by local devotees. An adjacent temple dedicated to Lord Maha Vishnu was subsequently constructed, following a reported divine sign involving a serpent coiled around the deity. The site attracts devotees from the village and surrounding areas during the annual Maha Shivaratri festival. The region experiences a tropical climate with a mean annual rainfall of approximately 1,100–1,300 mm, predominantly received during the south-west monsoon (June–September). The terrain is

undulating, with red-laterite soils predominating. The grove's location within the Eastern Ghats phytogeographic zone confers a distinctive assemblage of plant species, with many elements shared with the Deccan Plateau flora.

3. Materials and Methods

3.1 Phytosociological Survey

Phytosociological data were collected from two 50 m × 100 m quadrats (T1 and T2; total sampled area = 1 ha) laid out systematically within the grove. All trees with a girth at breast height (GBH) ≥ 10 cm were enumerated, identified to species level, and their GBH measured using a measuring tape. Species identification was carried out using standard floristic references (Gamble and Fischer 1915–1935; Pullaiah 2006) and confirmed with voucher specimens deposited in the Herbarium, Department of Botany, Andhra University. Species nomenclature follows the Flora of Andhra Pradesh and Tropicos database.

3.2 Phytosociological Parameters

For quantitative vegetation analysis, the study area was sampled using the quadrat method (Curtis and McIntosh 1950; Misra 1968). A total of two transects (T1 and T2) were laid within a 0.5 ha sample area, and all individuals with girth at breast height (GBH) ≥ 30 cm at 1.37 m above ground level were enumerated and measured.

The following phytosociological parameters were calculated for each species using standard formulae (Curtis and McIntosh 1950; Misra 1968):

Density (D) = Number of individuals of a species / Total number of quadrats studied

Relative Density (RD, %) = (Number of individuals of a species / Total number of individuals of all species) × 100

Frequency (F, %) = (Number of quadrats in which a species occurred / Total number of quadrats studied) × 100

Relative Frequency (RF, %) = (Frequency of a species / Sum of frequency of all species) × 100

Basal Area (BA) = $\pi/4 \times (GBH/\pi)^2$, calculated for each individual and summed for each species

Relative Basal Area (RBA, %) = (Total basal area of a species / Total basal area of all species) × 100

Important Value Index (IVI) = RD + RF + RBA

3.3 Girth-Class Analysis

Trees were assigned to six girth-class intervals: <30, 31–60, 61–90, 91–120, 121–150, and >150 cm GBH. Basal area and tree density were computed for each class to infer population structure and regeneration status.

3.4 Ethnomedicinal Survey

Ethnobotanical data were collected through semi-structured interviews and focus group discussions with traditional healers (Vaidyas), village elders, and knowledgeable community members residing in Vaatangi Village and adjacent hamlets. A total of 40 informants (25 male, 15 female; age range 35–80 years) were consulted between January and March 2024. Information on plant parts used, mode of preparation, diseases treated, and methods of administration was recorded in native Telugu and subsequently translated. The relative frequency of citation (RFC) for each medicinal species was used to assess the consensus among informants regarding medicinal utility.

4. Results and Discussion

4.1 Floristic Composition

The Vaatangi Sacred Grove supported 60 tree species belonging to 29 families. A total of 456 individual trees were recorded across the two transects, yielding a tree density of 456 trees ha^{-1} and a cumulative basal area of 23.76 m^2 ha^{-1}. The most species-rich families were Euphorbiaceae (7 species: *Bridelia airy-shawii, Glochidion velutinum, Glochidion zeylanicum, Macaranga peltata, Mallotus philippensis, Phyllanthus emblica,* and *Trema orientalis*), Combretaceae (4 species: *Anogeissus latifolia, Terminalia alata, Terminalia bellirica,* and *Terminalia chebula*), Moraceae (6 species: *Ficus exasperata, F. microcarpa, F. palmata, F. racemosa, F. semicordata, and F. tinctoria), and Fabaceae (3 species: Dalbergia paniculata, Ougenia oojeinensis,* and *Pterocarpus marsupium*). The high diversity of *Ficus* species is consistent with the known pattern in tropical sacred groves, where fig trees are often explicitly protected for their religious and ecological significance (Ganesan et al. 2008).

The phytosociological parameters for all 60 tree species recorded are presented in Table 1. Species are arranged in alphabetical order. TNI = Total Number of Individuals; D = Density (individuals/ha); F = Frequency (%); Basal Area = m^2/ha; R. Density = Relative Density; R. Frequency = Relative Frequency; R. Dominance = Relative Dominance; IVI = Importance Value Index.

Table 1 Phytosociological parameters of tree species recorded in Vaatangi Sacred Grove

S. No.	Species Name	Family	TNI	D	F (%)	Basal Area (m^2)	R. Density	R. Frequency	R. Dominance	IVI
1	*Albizia procera*	Mimosaceae	13	6.5	50	1.55	2.86	1.23	6.53	10.62

S. No.	Species Name	Family	TNI	D	F (%)	Basal Area (m²)	R. Density	R. Frequency	R. Dominance	IVI
2	*Anogeissus latifolia*	Combretaceae	4	2.0	50	0.11	0.88	1.23	0.46	2.57
3	*Antidesma acidum*	Stilaginaceae	3	1.5	50	0.02	0.66	1.23	0.08	1.98
4	*Bauhinia malabarica*	Caesalpiniaceae	4	2.0	50	0.11	0.88	1.23	0.48	2.59
5	*Bridelia airy-shawii*	Euphorbiaceae	13	6.5	100	1.58	2.86	2.47	6.64	11.97
6	*Buchanania lanzan*	Anacardiaceae	4	2.0	50	0.14	0.88	1.23	0.57	2.68
7	*Callicarpa arborea*	Verbenaceae	14	7.0	50	0.73	3.08	1.23	3.06	7.37
8	*Canthium dicoccum*	Rubiaceae	9	4.5	100	0.39	1.98	2.47	1.65	6.10
9	*Casearia tomentosa*	Flacourtiaceae	5	2.5	100	0.09	1.10	2.47	0.36	3.93
10	*Cassia fistula*	Caesalpiniaceae	12	6.0	50	0.20	2.64	1.23	0.83	4.70
11	*Chloroxylon swietenia*	Flindersiaceae	8	4.0	50	0.28	1.76	1.23	1.18	4.18
12	*Dalbergia paniculata*	Fabaceae	2	1.0	50	0.07	0.44	1.23	0.31	1.98
13	*Diospyros melanoxylon*	Ebenaceae	3	1.5	50	0.06	0.66	1.23	0.23	2.13
14	*Diospyros montana*	Ebenaceae	11	5.5	100	0.28	2.42	2.47	1.16	6.04
15	*Diospyros sylvatica*	Ebenaceae	8	4.0	100	0.45	1.76	2.47	1.91	6.14
16	*Ficus exasperata*	Moraceae	4	2.0	50	0.18	0.88	1.23	0.75	2.87
17	*Ficus microcarpa*	Moraceae	3	1.5	50	0.13	0.66	1.23	0.55	2.44
18	*Ficus palmata*	Moraceae	4	2.0	50	0.21	0.88	1.23	0.87	2.98

S. No.	Species Name	Family	TNI	D	F (%)	Basal Area (m^2)	R. Density	R. Frequency	R. Dominance	IVI
19	*Ficus racemosa*	Moraceae	3	1.5	50	0.08	0.66	1.23	0.35	2.25
20	*Ficus semicordata*	Moraceae	6	3.0	100	0.49	1.32	2.47	2.07	5.85
21	*Ficus tinctoria*	Moraceae	1	0.5	50	0.02	0.22	1.23	0.08	1.53
22	*Firmiana colorata*	Sterculiaceae	7	3.5	50	0.26	1.54	1.23	1.09	3.87
23	*Garuga pinnata*	Burseraceae	19	9.5	100	1.62	4.18	2.47	6.84	13.48
24	*Glochidion velutinum*	Euphorbiaceae	6	3.0	100	0.22	1.32	2.47	0.92	4.71
25	*Glochidion zeylanicum*	Euphorbiaceae	3	1.5	50	0.08	0.66	1.23	0.33	2.23
26	*Gmelina arborea*	Verbenaceae	6	3.0	50	1.00	1.32	1.23	4.22	6.78
27	*Grewia tiliifolia*	Tiliaceae	14	7.0	100	1.01	3.08	2.47	4.27	9.81
28	*Gyrocarpus americanus*	Hernandiaceae	3	1.5	50	0.08	0.66	1.23	0.35	2.25
29	*Haldinia cordifolia*	Rubiaceae	3	1.5	50	0.11	0.66	1.23	0.46	2.35
30	*Holoptelea integrifolia*	Ulmaceae	1	0.5	50	0.03	0.22	1.23	0.13	1.59
31	*Homalium nepaulense*	Flacourtiaceae	5	2.5	50	0.23	1.10	1.23	0.95	3.28
32	*Hymenodictyon orixense*	Rubiaceae	2	1.0	50	0.17	0.44	1.23	0.71	2.39
33	*Kydia calycina*	Malvaceae	15	7.5	50	1.40	3.30	1.23	5.90	10.44
34	*Lannea coromandelica*	Anacardiaceae	14	7.0	100	0.58	3.08	2.47	2.45	7.99
35	*Macaranga peltata*	Euphorbiaceae	8	4.0	100	0.32	1.76	2.47	1.34	5.57

S. No.	Species Name	Family	TNI	D	F (%)	Basal Area (m²)	R. Density	R. Frequency	R. Dominance	IVI
36	*Mallotus philippensis*	Euphorbiaceae	24	12.0	100	0.81	5.27	2.47	3.40	11.14
37	*Mangifera indica*	Anacardiaceae	8	4.0	100	1.13	1.76	2.47	4.76	8.99
38	*Michelia champaca*	Magnoliaceae	3	1.5	50	0.08	0.66	1.23	0.32	2.21
39	*Miliusa tomentosa*	Annonaceae	7	3.5	100	0.24	1.54	2.47	0.99	5.00
40	*Mitragyna parvifolia*	Rubiaceae	3	1.5	50	0.08	0.66	1.23	0.32	2.21
41	*Murraya paniculata*	Rutaceae	2	1.0	50	0.01	0.44	1.23	0.03	1.70
42	*Ougeinia oojeinensis*	Fabaceae	2	1.0	50	0.09	0.44	1.23	0.38	2.06
43	*Phyllanthus emblica*	Euphorbiaceae	4	2.0	100	0.14	0.88	2.47	0.58	3.93
44	*Premna tomentosa*	Verbenaceae	2	1.0	50	0.02	0.44	1.23	0.10	1.78
45	*Protium serratum*	Burseraceae	9	4.5	100	0.46	1.98	2.47	1.93	6.38
46	*Pterocarpus marsupium*	Fabaceae	25	12.5	50	0.86	5.49	1.23	3.63	10.36
47	*Pterospermum xylocarpum*	Sterculiaceae	10	5.0	50	0.49	2.20	1.23	2.06	5.49
48	*Schleichera oleosa*	Sapindaceae	18	9.0	100	1.01	3.96	2.47	4.26	10.68
49	*Semecarpus anacardium*	Anacardiaceae	2	1.0	50	0.04	0.44	1.23	0.18	1.86
50	*Syzygium cumini*	Myrtaceae	14	7.0	100	0.71	3.08	2.47	3.00	8.55
51	*Tamarindus indica*	Caesalpiniaceae	11	5.5	50	0.34	2.42	1.23	1.45	5.10
52	*Terminalia alata*	Combretaceae	15	7.5	50	0.45	3.30	1.23	1.91	6.44

S. No.	Species Name	Family	TNI	D	F (%)	Basal Area (m²)	R. Density	R. Frequency	R. Dominance	IVI
53	*Terminalia bellirica*	Combretaceae	20	10.0	100	1.20	4.40	2.47	5.04	11.91
54	*Terminalia chebula*	Combretaceae	3	1.5	50	0.13	0.66	1.23	0.54	2.44
55	*Toona ciliata*	Meliaceae	6	3.0	50	0.40	1.32	1.23	1.69	4.24
56	*Trema orientalis*	Ulmaceae	2	1.0	50	0.08	0.44	1.23	0.34	2.01
57	*Wrightia arborea*	Apocynaceae	4	2.0	50	0.06	0.88	1.23	0.25	2.36
58	*Wrightia tinctoria*	Apocynaceae	8	4.0	100	0.25	1.76	2.47	1.07	5.29
59	*Xylia xylocarpa*	Mimosaceae	10	5.0	50	0.37	2.20	1.23	1.56	4.99
60	*Zanthoxylum armatum*	Rutaceae	4	1.0	100	0.03	0.44	2.47	0.13	3.04
	Total		**456**	**227**		**23.76**	**100**	**100**	**100**	**300**

4.2 Importance Value Index and Dominant Species

The Importance Value Index (IVI) integrates relative density, relative frequency, and relative dominance, and provides a comprehensive measure of ecological dominance. Among the 60 species recorded, *Garuga pinnata* (Burseraceae) attained the highest IVI of 13.48, reflecting its numerically abundant occurrence (19 individuals) across both plots, high basal area (1.62 m²), and ubiquitous distribution (100% frequency). *Bridelia airy-shawii* (IVI = 11.97), *Terminalia bellirica* (IVI = 11.91), and *Mallotus philippensis* (IVI = 11.14) occupied the second to fourth positions respectively, with *Bridelia airyshawii* noteworthy for its even distribution across both transects and high basal area contribution. *Pterocarpus marsupium*, recorded exclusively in T1 with 25 individuals and an IVI of 10.36, is of particular conservation interest given its IUCN Vulnerable status and significant ethnomedicinal value as an antidiabetic tree.

The top ten dominant species, *Garuga pinnata, Bridelia airy-shawii, Terminalia bellirica, Mallotus philippensis, Albizia procera, Kydia calycina, Schleichera oleosa, Grewia tiliifolia, Syzygium cumini,* and *Lannea coromandelica* together account for approximately 103.8 IVI units (34.6% of the total IVI of 300), indicating a moderately diverse community without extreme monodominance. This pattern is characteristic of well-conserved sacred groves in the Eastern Ghats (Misra et al. 2014).

4.3 Girth-Class Distribution and Stand Structure

The girth-class distribution of trees (Table 2) followed an inverse-J-shaped curve, with the highest tree density recorded in the 61–90 cm GBH class (213 trees; 46.7% of total individuals) and the highest basal area also concentrated in this class (9.31 m²; 39.2% of total basal area). A secondary concentration was observed in the 31–60 cm class (133 trees). Trees with GBH >150 cm, representing old-growth individuals, were represented by 24 trees with a cumulative basal area of 5.18 m², indicating the presence of mature canopy elements integral to forest microclimate and epiphyte diversity.

The relatively low density in the <30 cm class (26 trees) may reflect suppression of regeneration in the sub-canopy due to dense canopy closure, a pattern frequently documented in tropical dry deciduous groves (Nath et al. 1998). Future management interventions should consider targeted gap creation to promote natural regeneration, particularly for economically and medicinally important species such as *Pterocarpus marsupium* and *Terminalia bellirica*.

Table 2 Girth-class distribution of trees in Vaatangi Sacred Grove (Transect T1 + T2 combined)

Girth Class (cm)	Basal Area (m^2)	Tree Density (trees/ha)
<30	0.1037	26
31–60	2.3990	133
61–90	9.3054	213
91–120	2.4597	31
121–150	4.3154	29
>150	5.1789	24
Total	**23.7620**	**456**

4.4 Ethnomedicinal Importance

Ethnomedicinal surveys revealed that 23 of the 60 recorded tree species (38.3%) are used in traditional medicine by the local tribal communities of Vaatangi and surrounding villages. A total of 35 distinct medicinal applications were documented, targeting diverse health conditions including metabolic disorders (diabetes), gastrointestinal ailments (diarrhoea, constipation, dysentery), dermatological conditions (skin diseases, psoriasis, wounds), febrile illnesses, and musculoskeletal disorders (rheumatism, arthritis). The ethnomedicinal data are summarised in Table 3.

Pterocarpus marsupium emerged as the most medicinally significant species, with its bark decoction widely used as a hypoglycaemic agent for managing type-2 diabetes mellitus—a use supported by extensive pharmacological literature documenting the antidiabetic activities of pterostilbene and (-)-epicatechin present in its heartwood and bark (Ahmad et al. 1991). *Phyllanthus emblica* (Indian Gooseberry / Amla) was valued for its multipurpose medicinal uses including management of diabetes, cough, and anaemia, consistent with its well-established phytochemical profile rich in vitamin C and tannins. *Terminalia bellirica* and *Terminalia chebula*, both constituents of the traditional Ayurvedic formulation Triphala, were cited for their utility in treating diarrhoea, cough, and eye diseases.

Syzygium cumini seeds were frequently cited for antidiabetic use, and this is consistent with reports from across the Eastern Ghats tribal belt (Padal et al. 2013). The use of *Wrightia tinctoria* for skin diseases including psoriasis, and *Semecarpus anacardium* for arthritis, corroborates ethnomedicinal records from adjacent districts. *Lannea coromandelica* bark paste applied to wounds and fractures represents a traditional surgical practice documented among tribal communities in Odisha and Andhra Pradesh (Panda 2007).

Table 3 Ethnomedicinal plants recorded from Vaatangi Sacred Grove

Species Name	Part Used	Ailments Treated	Mode of Preparation/Use
Albizia procera	Bark	Fever, skin diseases	Paste applied externally; decoction taken orally
Bridelia airy-shawii	Leaf, Bark	Wounds, ulcers	Leaf juice applied on wounds; bark decoction for ulcers
Buchanania lanzan	Seed, Bark	Dysentery, skin disorders	Seed oil applied; bark decoction consumed
Callicarpa arborea	Leaf	Rheumatism, skin diseases	Leaf paste applied topically
Canthium dicoccum	Root, Leaf	Fever, jaundice	Root decoction taken orally
Cassia fistula	Fruit, Leaf	Constipation, skin infection	Fruit pulp consumed; leaf paste applied externally
Chloroxylon swietenia	Bark, Wood	Diarrhoea, dysentery	Bark decoction taken orally
Diospyros melanoxylon	Bark, Fruit	Diarrhoea, toothache	Bark decoction for diarrhoea; fruit used for toothache
Garuga pinnata	Bark, Leaf	Rheumatism, fever	Bark paste applied on joints; leaf decoction taken
Grewia tiliifolia	Bark, Fruit	Fever, urinary problems	Bark decoction taken orally
Lannea coromandelica	Bark	Wounds, fractures	Bark paste applied on wounds and fractured bones

Species Name	Part Used	Ailments Treated	Mode of Preparation/Use
Mallotus philippensis	Fruit, Seed	Skin diseases, anthelmintic	Fruit powder applied externally for skin diseases
Mangifera indica	Bark, Leaf	Diarrhoea, skin diseases	Bark decoction for diarrhoea; leaf juice for skin
Phyllanthus emblica	Fruit	Diabetes, cough, anaemia	Fruit consumed raw or as juice; dried fruit used in decoction
Pterocarpus marsupium	Bark, Heartwood	Diabetes, wounds	Bark decoction for diabetes; heartwood powder on wounds
Schleichera oleosa	Bark, Leaf	Skin diseases, itch	Bark paste applied topically
Semecarpus anacardium	Seed, Bark	Arthritis, skin diseases	Seed oil applied externally; bark decoction for arthritis
Syzygium cumini	Bark, Seed	Diabetes, diarrhoea	Seed powder taken for diabetes; bark decoction for diarrhoea
Tamarindus indica	Fruit, Leaf	Constipation, fever	Fruit pulp consumed; leaf decoction taken for fever
Terminalia bellirica	Fruit, Bark	Cough, diarrhoea, eye diseases	Fruit powder mixed with honey for cough; decoction for diarrhoea
Terminalia chebula	Fruit	Digestive disorders, ulcer	Dried fruit powder taken orally
Wrightia tinctoria	Bark, Leaf	Skin diseases, psoriasis	Leaf paste and bark decoction applied on skin
Xylia xylocarpa	Bark	Fever, rheumatism	Bark decoction taken orally

5. Conservation Status and Threats

Sacred groves in the Eastern Ghats face a complex array of anthropogenic pressures. The Vaatangi Sacred Grove, while currently protected through religious taboos and community oversight, is subject to increasing edge effects from adjacent agricultural fields, road widening, and the gradual erosion of traditional knowledge among younger generations. The grove's location within a notified tribal area (Scheduled Tribe region) offers some degree of informal legal protection; however, formal recognition under the Indian Forest Act or Biodiversity Act (particularly as a Community Conserved Area) would significantly enhance its long-term security.

The dominance of a single girth-class (61–90 cm) and the paucity of individuals in the lower girth-classes (<30 cm) may indicate that natural regeneration is inhibited by livestock browsing a common threat in village adjacent groves and possibly by the periodic removal of undergrowth for temple maintenance. Documentation and registration of the grove under the Biological Diversity Act, 2002, in conjunction with the National Biodiversity Authority and State Biodiversity Board, would facilitate conservation planning and provide access to conservation funds. Community based biodiversity management plans (BMPs) could formalise the existing de facto conservation while incorporating modern ecological monitoring.

6. Conclusions

The Vaatangi Sacred Grove harbours a diverse assemblage of 60 tree species across 29 families, reflecting the ecological integrity maintained through indigenous religious conservation practices. *Garuga pinnata, Bridelia airy-shawii, Terminalia bellirica*, and *Mallotus philippensis* are the keystone ecological dominants as indicated by their IVI values. Girth-class distribution suggests a structurally mature forest with indications of limited natural regeneration in the smaller size classes. Ethnomedicinal surveys documented 23 medicinally significant species, including the IUCN Vulnerable

Pterocarpus marsupium, underscoring the grove's dual value as a biodiversity repository and a living pharmacy for local communities. Formal legal recognition, community engagement, and integration with biodiversity conservation policies are urgently recommended to safeguard this culturally and ecologically significant landscape element.

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References

Ahmad F, Khan RA, Rasheed S (1991). Preliminary screening of methanolic extracts of Celastrus paniculatus and Pterocarpus marsupium for analgesic and anti-inflammatory activities. J Ethnopharmacol 35:215–220

Bhagwat SA, Rutte C (2006). Sacred groves: potential for biodiversity management. Front Ecol Environ 4:519–524

Chouin G (2002). Sacred groves in history: pathways to the social shaping of forest landscapes in coastal Ghana. IDS Bull 33:39–46

Cottam G, Curtis JT (1956). The use of distance measures in phytosociological sampling. Ecology 37:451–460

Gadgil M, Vartak VD (1976). The sacred groves of Western Ghats of India. Econ Bot 30:152–160

Gamble JS, Fischer CEC (1915–1935). Flora of the Presidency of Madras. Adlard and Son, London

Ganesan R, Soubadra Devy M, Krishnan J (2008). Floristics and structure of sacred groves in the Deccan Plateau region of Andhra Pradesh, India. J Bomb Nat Hist Soc 105:12–24

Malhotra KC, Gokhale Y, Chatterjee S, Srivastava S (2001). Cultural and ecological dimensions of sacred groves in India. Indian National Science Academy and Indira Gandhi Rashtriya Manav Sangrahalaya, New Delhi

Misra R (1968). Ecology work book. Oxford and IBH Publishing Co., Calcutta

Misra MK, Dash SS, Misra S (2014). Sacred groves of Orissa: an ethnoecological study. Int J Curr Microbiol Appl Sci 3:472–483

Nath PC, Arunachalam A, Khan ML, Arunachalam K, Barbhuiya AR (1998). Vegetation analysis and tree population structure of tropical wet evergreen forests in and around Namdapha National Park. Biodiv Conserv 14:2131–2153

Padal SB, Murty PP, Satyavathi K, Rajesh Babu K (2013). Ethnobotanical survey of Paderu division of Visakhapatnam district, Andhra Pradesh, India. J Med Plants Res 7:1975–1989

Panda A (2007). Traditional medicinal plants of Koraput, Odisha. Indian Forester 133:983–992

Pullaiah T (2006). Encyclopaedia of world medicinal plants. Regency Publications, New Delhi

Rao SP, Sunitha S, Pullaiah T (2011). Sacred groves in Andhra Pradesh, India. In: Bhatt JR, Singh JS, Singh SP, Tripathi RS, Kohli RK (eds) Tropical forest ecosystems of India. Capital Publishing Company, New Delhi, pp 311–325