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Research Article

FLORISTIC AND SOCIO-CULTURAL STUDIES OF THE SACRED GROVES OF THE DIMASA TRIBES OF DIMA HASAO DISTRICT, HAFLONG CIRCLE OF NORTH EAST INDIA

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A B S T R A C T

Sacred and traditional beliefs plays an significant role in conservation of biodiversity. Based on spiritual and cultural values, local communities in many parts of the world have conserved sacred forests or groves. This research studied 3 Sacred Groves (*Daikho*) in DimaHasao that are protected by the Dimasa community through their religious beliefs. 10 quadrats were taken from each sacred grove, i.e. (1x1)m for herbs, (5x5)m for shrubs was laid down randomly for vegetation analysis. Floristic analysis revealed that a total of 44 species belonging to 42 genera and 27 families were observed in the Sacred Grove. Total numbers of herb, shrub, climbers and fern species encountered in each Sacred Grove were 29, 10 and 6 respectively. The Simpson value index for dominance and Shannon Weiner Index of herbs and shrubs showed highest species diversity in site 1 and site 2.The data collected include information regarding the Sacred Groves and their associate deities, nearest human habitation and their floral diversity. A questionnaire was conducted in the nearby villages namely Nabdidaolaguphu (Site 1), Gerem (Site 2) and Longma (Site 3). Different deities are worshipped in different *Daikho* and each *Daikho* was named after the deities dwelling in respective Sacred Groves. Many taboos help in managing the natural resource of the Sacred Grove. But people's change in their attitude, human impact and erosion of religious beliefs have degraded Sacred Groves year after year. So, supporting traditional culture, existing local community management of resources and creating awareness among the communities is highly recommended.

INTRODUCTION

Biological diversity and its values are diminishing day by day at a large scale and human understanding to this is just a bigining. Deforestation has been a global impact for species extinction, loss of renewable resources and loss of ecosystem services (Butler, 2010). People are provided with food, medicine and livelihood from forest and it also helps in maintaining indigenous culture (Pei, *et al*., 2009). Many ecologists started to give importance to how a traditional person uses the natural resources without destroying them. Humans from different societies have found out different ways of dealing with nature. In remote areas ethnic groups have culture to have a sacred place or saved site. The conservation of this rapidly diminishing pool of experience, a kind of cultural diversity is as the conservation of biological diversity (Ramakrishnan, 1996). There are many traditional way of conserving and protecting the biodiversity and sacred group is one such example of traditional practices.

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The cultural, religious beliefs and taboos that deities reside in this forest are the reasons why forests are left undisturbed by the local peoples which give a home to rich biodiversity and are protected by the indigenous people.

Sacred Groves in North-East India

In North-East India patches of forest near the villages have been declared as Sacred Grove and protected by the religious and cultural beliefs since age old by the tribal communities. Large number of sacred groves has been reported in the states of Meghalaya, Manipur, Karbi-Anglong and Dima Hasao districts of Assam (Tripathi, 2001). A few of the sacred groves were managed by Lamas and Mompa tribe in Arunachal Pradesh which are attached to the Buddhists monasteries and they are called Gompa Forest Areas (GFAs). 58 GFAs were reported from West Kameng and Tawang district of Arunachal Pradesh (Malhotra *et al.,* 2001) and a few sacred groves from Lower Subansiri and Siang district of the state (Chatterjee *et al.,* 2000). Khan *et al.,* (2008) reported a total of 101 sacred groves from Arunachal Pradesh. KarbiAnglong district of Assam has about 40 sacred groves. In Dima Hasao district the number of sacred groves reported are 12 (Medhi and Kumar, 2013). Dimasa tribes in Dima Hasao called the sacred groves

as Daikho. In Manipur the existence of about 365 sacred groves have been reported (Devi, 2000). Tiwari *et al.,* (1998a) inventorised 79 sacred groves of Meghalaya. In Sikkim, 35 sacred groves have been reported that are either attached to the local monasteries or maintain by the village community. Sikkim revealed 241 species representing 183 genera under 84 families (Dash, 2005).

Sacred Grove in Dima Hasao District

Sacred Groves are locally known as *Daikho* in Dima Hasao district of Assam. There are 6 ancestral Gods *viz.*Sibarai, Aluraja, Naikuraja, Waa raja, Ganiyung-Braiyung and who are called Madai and the whole Dimasa land is under their jurisdiction. In earlier time the whole Dimasa land was divided into 12 religious *Daikhos*. These *Daikhos* are very important as the forest patches are conserved through the community participation for ethical aspects. Till today there are a total 12 *Daikhos* maintained by Dimasa community (Medhi and Kumar, 2013).

The present study is an attempt to understand the floristic diversity including its composition and degradation factors on overall floristic diversity of the selected 3 Sacred Groves. This study on the species composition and their biodiversity play an important role in assessing the ecological status of Sacred Groves in conserving the natural resources.

MATERIALS AND METHODS

Study area: The study was conducted in Damadi *Daikho* (Site 1), Misim *Daikho*(Site 2) and also in *Daikho* which is in Longma(Site 3) village in the DimaHasao district of Assam (Figure 1). The Damadi *Daikho* is located at a distance of 23 Km and Misim *Daikho* is located at a distance of 35 Km from the headquarter Haflong and *Daikho* is Longma is located at a distance of 16 km from Haflong slope.The climate is characterized by coolness, generally high humidity nearly all the year round and abundant rainfall. The cold season from December to February is followed by the season of thunder storms from March to May. Average annual rainfall is 3110.5mm. The minimum and maximum temperature during winter is 11^0C and 27^0C whereas the minimum and maximum temperature during summer is 24^0C and 33^0C respectively. The soil is acidic in nature with pH 5.60, 6.24 and 6.12 respectively.

Field Survey

***Data collection*:** The total area 1.49, 0.69, and 0.60 ha of Sacred Groves was divided into 10 quadrats of (1x1)m for herbs, (5x5)m for shrubs and climbers. The data was collected from last of November 2017 till May 2018.The specimens collected were identified with the help of Regional flora (Kanjilal *et al.,* 1939)

***Data analysis*:** The following phytosociological parameters were undertaken for the study. Density, Relative Density, Frequency, Relative Frequency, Abundance, Relative Abundance.

***Quantitative Assessment*:** The data were analysed for Simpson's Index and Shannon Weiner Index. Diversity indices provide important information about rarity and commonness of species in a community.

Simpson Index of Diversity: Simpson index is used to estimate the degree of dominance and mostly used to determine dominance between different populations. The Simpson's value of D varies from 0-1. If value tends towards 0 Diversity is infinite and if value is 1 diversity is less (Sheikh *et al.,* 2017).

***Species Dominance*:** It was calculated following the index by Simpson (1949):

Simpson's Index (D) = $1 - \frac{\sum ni(ni-1)}{N(N-1)}$,

Where: ni= total number of each individual species, N= Total no. of all the species.

The Shannon Weiner index (Shannon and Weiner 1949) is used to calculate the diversity of species:

Shannon Weiner index (H) = $\sum p_i \ln p_i$

Where, p_i =proportion of total sample belonging to i species and S= number of species.

Questionnaire Survey

A survey was conducted at the village level. The aim of the survey conducted was to investigate the increasing concern about degradation of Sacred Groves. The questionnaire were designed as to gather information about their perception of the grove, impact on their lives,its significance, their intimate spiritual relationship and dependence, how they feel about the degradation and changes (Pruthi and Burch Jr.2009). In each village both the male and female members were interviewed from various age groups. Nabdidaolaguphu village which is near to Damadi *Daikho*, Gerem village near Misim *Daikho* and Longma village near Longma Sacred Grove comprising of total population each 164, 131, and 90. Lobam Kemprai, priest of the Sacred Grove was also interviewed. Questionnaire was conducted at home, school with teacher and students also.

RESULTS

A total of 44 species belonging to 42 genera and 27 families were observed in the Sacred Groves (Table 2, 3, & 4). Out of 45 species 29 species ware herbs, 10 shrubs and 6 climbers and ferns. 11 species were common in all the three Sacred Groves. The density for *Acmella paniculata* (4.41) was highest in Site1. The frequency of *Acmella paniculata, Arisaema bockii* and *Commelina odorata* (2.64) species was found to be highest in site1. *Tetrastigma pubinerve* and *Oxalis corymbosa* species have highest abundance in Site 1. *Commelina communis* (2.98) has highest frequency, *Centella asiatica* and *Chromolaena odorata* has highest abundance and *Centella asiatica* (2.81) has the highest density in site 2.In site 3 *Solanum torvum*(7.14) has highest frequency and *Ageratum conyzoides* with highest abundance and *Commelina communis* (10.6) with highest density. The quantitative assessment was estimated in which Shannon Weiner in 3 Sacred Groves were 3.29, 3.18 and 2.99 for herbs, 1.97, 1.94 and 2.03 for shrubs, 1.64, 1.86 and 1.68 for climbers and ferns respectively (Table 1). The Simpson's index for three Sacred Groves are 0.4316, 0.0471 and 0.0585 for herbs, 0.1542, 0.1508 and 0.1373 for shrubs, 0.2077, 0.153 and 0.1927 for climbers and ferns respectively. Ethnobotanical importance of the Sacred Grove was also observed, various medicinal plants were assessed with the help of priest in the nearby village.

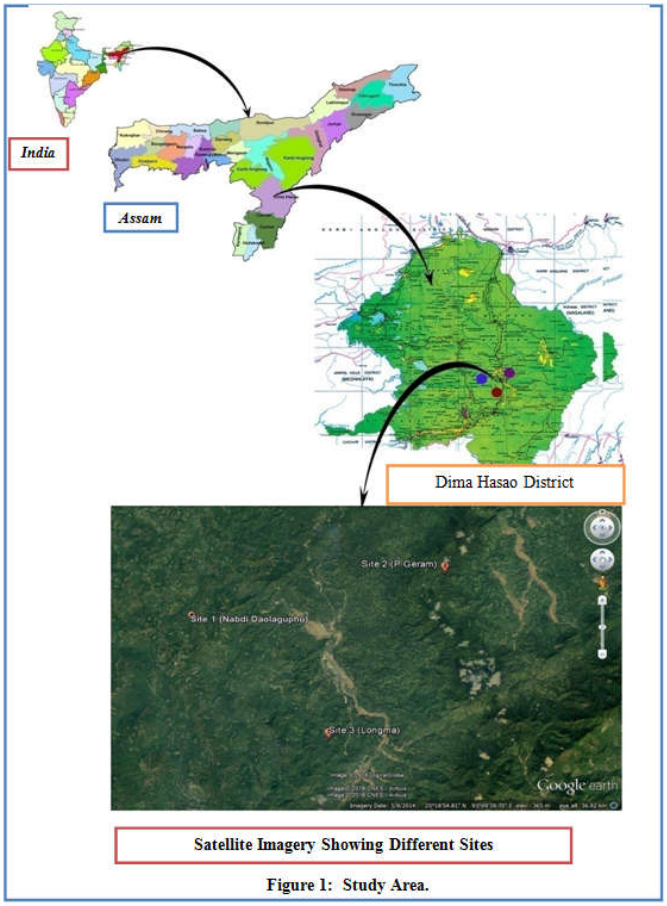

Figure 1: Study Area.

Photo Plates 1

A.*Cyperus cyperoides* (L)
B.*Eryngium foetidum* (L)
C.*Setaria palmifolia* (J.Koeing) Stapf
D.*Dichrocephala integrifolia* (L.f) Kuntz
E. *Polygonum chinense* (L)
F.*Achyranthes aspera* (L)

Photo Plates 2

G. *Alocaciama crorrhizos* (Schott)
H. *Polygonum chinense* (L)
I.*Lantana camara* (L)
J. *Solanum torvum* (Sw)
K. *Clerodendrum canescens* (L)
L. *Oxalis corniculata*(L).

Photo Plates 3

M. *Impatiens balsamina* (L)
P. *Sonchus oleraceus*(L)
N. *Merremia vitifolia*.
Q. *Acmella paniculata*(Walter) Rich
O. *Eupatorium colestinum* (L)
R.*Woodwardia Japonica* (Sm)

S. Interacting with priest in Longma1.
T. Worshipping deity in Damadi Daikho
U. Forest cleared for worshipping in Misim Daikho
V. Entrance gate of Damadi Daikho
W. Interacting with villagers in Nabdidaolaguphu village.
X. Buffalo pats found inside Damadi Daikho

Table 1 Ecological Diversity Indices and their Table comparison

Species	Simpson index	Evenness	Shannon index	Evenness
		Site-1		
Herbs	0.4316	0.0799	3.29	0.97
Shrubs	0.1542	0.7205	1.97	0.9
Climbers	0.2077	0.8023	1.64	0.92
		Site-2		
Herbs	0.0471	0.8157	3.18	0.98
Shrubs	0.1508	0.829	1.94	0.93
Climbers	0.153	0.934	1.86	0.96
		Site-3		
Herbs	0.0585	0.7119	2.99	0.95
Shrubs	0.1373	0.8092	2.03	0.92
Climbers	0.1927	0.8649	1.68	0.94

These medicinal plants can cure various diseases like skin disease, healing of wounds, snake bite, fever etc. This knowledge of the medicinal plants shows how indigenous peoples are closely related to the forest and its species. But due to various anthropogenic activities in and around the Secred Groves, which has affected the variability of species. So, there is an urgent need to know the importance of the Sacred Groves and the problems arising due to anthropogenic factors, in order to conserve/restore these vulnerable Sacred Groves.

DISCUSSION

As the study areas were near to the villages and no protection around the Sacred Groves, various disturbances and their effects on the normal growth of natural flora was found. Invasive species like *Chromolaena odorata* and *Mikania micrantha* are present inside the groves. Overgrowth of these species is a threat to other native species in the Sacred Grove. Conservation of habitat and ecosystem by means of protected area network, ecological restoration and sustainable resource management is very important for biodiversity conservation (Angermeir, 2000). It has been observed that the Sacred Groves are the examples of conservation carried out by the community but it's also been observed that more importance is given to the actual deities and religion beliefs than the forest. This has change ideas over time, which has led to degradation of the forests. Medhi and Kumar (2013) rediscovered 12 sacred groves that are preserved by the Dimasa community of North Cachar Hills of Northeast India. Beside they also added the plants that are considered sacred which are used in worshipping. They found out 34 plant species that are considered to be sacred by the Dimasa people. There is no other work found in the sacred groves of Dima Hasao. The study showed that the species diversity of site 1 was higher than the other two Sacred Groves.

Table 2 Herbs

S.No	Plant species	Family	DamadiDaikho			MisimDaikho			Longma-I Daikho		
			R.F	R.D	R.A	R.F	R.D	R.A	R.F	R.D	R.A
1	*Acalypha australis (L.)*	Euphorbiaceae	1.67	1.03	1.03	1.32	1.22	1.52	-	-	-
2	*Acmella paniculata*(Walter) Rich	Asteraceae	2.64	4.41	2.76	0.66	0.75	1.88	5.71	4.15	3.25
3	*Ageratum conyzoides*(Steud.1840)	Asteraceae	-	-	-	-	-	-	2.13	3.94	2.82
4	*Ageratum houstonianum*(Mill)	Astaraceae	2.31	3.57	2.55	-	-	-	2.85	6.92	10.85
5	*Alocacia macrorrhizos*(Schott)	Araceae	1.32	1.59	1.99	0.99	0.84	1.41	-	-	-
6	*Arisaema bockii*(Mart.)	Araceae	2.64	1.4	0.88	-	-	-	-	-	-
7	*Bidens pilosa*(L.)1753	Asteraceae	-	-	-	-	-	-	5.71	4.15	3.25
8	*Centella asiatica*(L.) Urban	Apiaceae	1.98	3.19	2.56	1.65	2.81	2.82	2.85	4.61	7.23
9	*Chinese dicliptera*(Juss)	Acanthaceae	1.98	1.31	0.01	0.66	0.18	0.47	-	-	-
10	*Colocasia esculenta*(L) Schott	Araceae	1.65	2.44	2.44	0.99	1.03	1.72	-	-	-
11	*Commelina communis* (L.)	Connelinaceae	2.64	3.57	2.23	2.98	1.59	0.88	5.71	10.6	8.32
12	*Conyza candensis*(L) Gonquist	Astaraceae	1.67	1.59	1.60	0.66	0.93	2.35	4.28	3.23	3.37
13	*Crassocephalum crepidiodes*(Bent.) S.M.	Astaraceae	1.98	1.78	1.48	2.31	2.16	1.54	-	-	-
14	*Cyperus cyperiodes* (L.)	Cyperaceae	-	-	-	-	-	-	4.28	5.31	5.54
15	*Dichrocephala integrifolia*(L.f) Kuntz	Astaraceae	-	-	-	-	-	-	5.71	3.23	2.53
16	*Eryngium foetidum*(L)	Apiaceae	-	-	-	-	-	-	4.28	0.92	0.96
17	*Eupatorium colestinum*	Astaraceae	1.67	1.97	1.97	0.66	0.65	1.64	-	-	-
18	*Hedyotischrysatrica* (palib.Merr.)	Rubiacae	1.98	1.59	1.33	1.32	1.12	1.41	-	-	-
19	*Impatiens balsamina* (L.)	Balsaminaceae	-	-	-	-	-	-	4.28	9.23	9.62
20	*Kyllenga brevifolia*(Rottb)	Cyperaceae	-	-	-	-	-	-	5.71	12	9.40
21	*Lindernia ruelliodes* (Colsm.) Pennelt	Lindernaceae	-	-	-	-	-	-	2.85	5.77	9.04
22	*Merremia vitifolia*(Dennot.ex End)	Convolvulaceae	2.31	2.53	1.81	1.32	1.97	2.46	-	-	-
23	*Oxalis corymbosa*(D.C)	Oxalidaceae	2.31	3.94	2.82	1.67	2.53	2.53	0.99	0.84	1.41
24	*Percinaria lapathifolia* (L.) Delarbre 1800	Polygonaceae	_	-	-	-	-	-	4.28	2.77	2.89
25	*Perilla frustescens* (L.) Britton	Lamiaceae	-	-	-	-	-	-	5.71	5.08	3.98
26	*Plantago asiatica* (L.)	Plantaginaceae	-	-	-	-	-	-	5.71	5.31	4.16
27	*Setaria palmifolia*(J.Koeing) Stapf	Poacae	-	-	-	1.32	1.03	1.29	1.65	1.03	1.034
28	*Sonchus oleraceus*(L.1753 not well 1831)	Asteraceae	2.31	1.22	0.87	0.33	0.18	0.94	-	-	-
29	*Zingeber mioga*(Thumb.) Roscoe	Zingiberaceae	-	-	-	-	-	-	4.28	4.15	4.34

R.F= Relative Frequency, R.D= Relative Dominance, R.A= Relative Abundance

Table 3 Shrubs

Plant species	Family	DamadiDaikho			MisimDaikho			Longma-I Daikho		
		R.F	R.D	R.A	R.F	R.D	R.A	R.F	R.D	R.A
30. *Alangium plantifolium* (Lam.)	Cornaceae	1.65	0.75	0.75	1.98	1.59	1.33	-	-	-
31. *Capsicum annum* (L.)	Solanaceae	0.66	1.87	0.47	-	-	-	0.99	0.37	0.62
32. *Chromolaena odorata*((L.) R.M.King&H.Rob.)	Asteraceae	1.98	3.19	2.66	1.32	2.25	2.82	7.14	1.84	1.59
33. *Clerodendrum canescens* (Wall. Ex Walp.)	Lamiaceae	2.31	1.5	1.07	1.98	1.31	1.09	-	-	-
34. *Clerodendrum japonicum* (Thunb.)	Lamiaceae	0.99	0.84	1.41	1.32	1.12	1.41	-	-	-
35 *Lantana camara* (L.)	Verbinaceae	0.99	1.4	2.35	1.65	2.25	2.25	1.32	1.97	2.46
36 *Lingustrum sinense (Lour.)*	Oleaceae	-	-	-	-	-	-	4.28	1.84	1.92
37 *Phyllanthus glaucus* (Wall. Ex Muell.Arg.)	Phyllantheae	2.31	1.5	1.072	0.66	0.28	0.70	-	-	-
38 *Solanum torvum* (Sw.)	Solonaceae	0.99	0.37	0.62	0.99	0.84	1.41	7.14	3.92	2.46
39 *Zanthoxylum avicennae* (Lam.)DC	Ruteceae	1.65	1.03	1.034	1.65	0.75	0.75	-	-	-

R.F= Relative Frequency, R.D= Relative Dominance, R.A= Relative Abundance

Table 4 Climbers and Ferns

Plant species	Family	DamadiDaikho			MisimDaikho			Longma-I Daikho		
		R.F	R.D	R.A	R.F	R.D	R.A	R.F	R.D	R.A
40 *Dioscorea bulbifera*(L)	Dioscoreaceae	1.32	1.22	1.52	1.67	1.97	1.97	-	-	-
41 *Polygonum chinense* (L.)	Polygonaceae	1.67	1.4	1.41	1.32	1.12	1.41	0.99	1.03	1.72
42 *Pueraria montania* (Lour.) Merr	Fabaceae	1.67	2.53	2.53	1.67	2.06	2.06	1.32	1.5	1.88
43 *Stemona tuberosa*(Lour)	Stemonaceae	0.66	0.93	2.35	0.66	0.65	1.64	-	-	-
44 *Tetrastigma pubinerve* (Merr. & Chun)	Vitaceae	2.31	3.94	2.82	1.98	1.78	1.48	-	-	-
45 *Woodwardia japonica*(Sm)	Blechnaceae	2.31	3	2.15	1.98	1.78	1.48	2.31	1.5	1.07

R.F= Relative Frequency, R.D= Relative Dominance, R.A= Relative Abundance

There was a sign of cattle grazing in site 1 and site 2 whereas there was no sign of grazing in site 3. During the study 44 species belonging to 42 genera and 27 families were found. Similar work was done by Sheikh *et al*., (2017) where a total of 12 species were recorded in Gwalior district of Madhya Pradesh. They found the values 0.73 for Simpson index and 1.59 for Shannon Weiner index. Panging and Sharma, (2017) reported 33 ethno medicinal plant species belonging to 26 families were found to use as traditional health care services by the village Mising community of Desangmukh (Gaon Panchayat), Sivasagar district of Assam. The indigenous plants were species commonly used for traditional method of healing. Also Khakhlary and Sharma, (2017) reported that species diversity of NTFPs in Garampani wildlife Sanctuary have rich in floral diversity. The Shannon-Wiener Index of Diversity (H′) among the different species, were 1.9579 (Herbs/Shrubs), 2.2701 (Ferns/Epiphytes/Climber) and 1.4974 (wild edible fruit), signifying that Ferns/Epiphytes/ Climber have high diversity value in comparison to (Herbs/Shrubs) and (wild edible fruit). Sukumaran *et al*., (2018) reported 102 species in 0.2 ha area of sacred forest of Kanyakumari district, Tamil Nadu. Sharma *et al*., (2016a) in three different sites in Raid-Marwet Region, Ri- Bhoi District, Meghalaya recorded 18 different NTFPs trees, 10 different herbs and 4 different shrubs providing provisioning ecosystem services to the community with species having both high diversity and high Importance value index in all the different sites under study. The findings of the present study on sacred grove DimaHasao is somehow similar to the sacred groves in other places. There is high diversity of herbs, climbers and ferns in Site 1 whereas shrub diversity was highest in site 3. This may be due to the absence of animal disturbances in Site 3, this findings is in close agreement with Sharma *et al*., (2016b). The present study reveals that due to loss of faith (Malhotra 2001) and increase in anthropogenic factors (Sharma *et al*., 2016c) the species diversity and species dominance may decrease, it was observed that Site 3 has few species with greater individual numbers in comparison to Site 1 and Site 2 these may be due to the presence of less invasive species and less worshipping practices.

CONCLUSION

The study reveals the strong management practices by local communities. During this study and interaction with the priest and the other aged person in the villages, their deep understanding of the local forest resources as a life giving support was clearly known. Sacred groves are protected and conserved through the religious belief and traditional cultural of the indigenous tribal communities all over the world (Malhotra *et.al*, 1997). But unfortunately the religious beliefs and taboos that were in the centre of sacred grove preservation are now fast eroding due to increase in human needs, change in social set up and change in belief system of the people due to modern system of education (Rao. 1996). It was observed that people worship in the sacred groves for the religious beliefs but ecological importance like ecosystem services, the greenery, the medicinal plants or animals present are not important. The study enlightens the urgent conservation of sacred grove. In addition it also provides information regarding the floral wealth of the sacred grove, facilitates the knowledge about its culture, social and ecological role. The Governmental or NGOs have to fund agencies to monitor the adverse changes in the sacred groves and suggest sustainable measures to conserve it. Sacred groves are declining in diversity and the reason could be lack in education about the importance of sacred groves. Thus, it should be highly recommended and suggested that there should be there should be conserving strategies for every sacred groves to protect our biodiversity. A thorough floristic survey of every sacred grove in DimaHasao should be done immediately for the further decline of Rare, endemic and endangered species. The State Government should promote sacred grove conservation area management committee to protect forest patch from further degradation. Survey of all the sacred groves in DimaHasao and marking their boundaries to prevent any kind of intrusion should be practiced as soon as possible.

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