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Assessment of Human Impact on a Sacred Grove in Jhargram District, West Bengal, India

Abstract **: The concept of sacred grove has long been interlinked with nature. Various cultural aspects such as religion, faith, traditional belief bring people closer to nature and the natural environment. In this regard, the floristic diversity of the *Orgonda Mahakal Bhairab* sacred grove in Jhargram district of West Bengal, India was investigated. Floristic analysis revealed that a total of 73 species belonging to 70 genera and 34 families were observed in the sacred grove. The questionnaire with local inhabitants on human impact of sacred grove biodiversity revealed that more urbanization, encroachment and modernization were the main causes for the loss of biodiversity.**

Keywords: Biodiversity conservation; Sacred grove; Socio-culture

The practice of dedicating trees and forests to deities is an antique ritual all over the world. Tree clusters or chunks of forest, protected by dedicating them to some deities and spirits, are known as sacred groves, and are preserved owing to socio-religious tags attached with them. They are relatively undisturbed forests where vegetation has been preserved in the name of local deities or inherited spirits, possibly for generations[1]. Despite a high degree of human intervention, the forest in the grove has been saved from logging and conversion to agricultural land. However, the resulting conservation of forests seems to be an unintended benefit of a conscious, may be century's old, decision to restrict the use of the sacred grove. The existing population doesn't seem to have set aside sacred groves with the explicit purpose of conservation. The sacred nature of groves coupled with other factors, such as economic utility, helps in ensuring that this forest stand is protected[2].

The small size and isolated location of the sacred grove limits the benefits that can be derived from their biodiversity conservation potential. A small patch has little or no forest-interior habitat that is immune to edge effects. The nature of the edge of the patch too affects habitat suitability and movement[3]. So, even small, 'isolated', sacred grove may be fertile grounds for plant and animal species and important for biodiversity conservation[4].

Restrictions on the use of resources play a key role in limiting human impact in the sacred grove. The grove is the common property of the whole village, but they are not 'free for all' property, and perhaps that is why, they have not yet been fallen prey to the 'tragedy of the commons'. Sacred grove, too, is governed by certain rules and regulations, which determine the nature of access this forest stand. i.e., a grove is associated with a particular village and only the residents of that village have access to the resources contained in the grove; restriction on logging, which prevents unconstrained use of the grove. Restrictions result in the controlled use of the sacred grove. The grove is not pristine entities; instead, they are part of the managed landscape. Sacred groves are host to a unique mix of cultural, religious, social and economic activities, and well integrated into the village life[5].

Materials and Methods : During the course of investigation for a period of five years (2012-2017), the entire sacred grove was surveyed in different seasons for the estimation of floral wealth and its role in conservation. Information about the existence, history, socio-religious rituals and values around the sacred grove were collected by direct intensive observation and interviews through PRA (Participatory Rural Appraisal) method. A brief floristic survey was carried out through "spot identification" basis. Form unknown plants, samples of plants with flowers or fruits were collected. After collection, the specimens were processed, preserved, poisoned and mounted on herbarium sheets following the standard and modern herbarium techniques[6]. Photographs were taken for some of the common, locally rare, endemic and valuable plant species in the sacred grove. The herbarium sheets were identified by matching with correctly annotated materials available at the Vidyasagar University Herbarium. Villagers' awareness as well as relevant literature[7-13] was studied regarding socio-cultural, ecological and economical values of plant species.

The Sacred Grove : The Orgonda Mahakal Bhairab sacred grove, popularly known as Bhairab than (named after the presiding deity of earthquake- *Mahakal Bhairab*; latitude 22º37′54.90′′- 22º37′53.97′′ N and longitude 86º49′53.74′′- 86º49′52.31′′E, average altitude 117 masl),

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was situated 1.5 km from Silda bus stop and on the right side of the metalloid road (Silda-Raipur), near Orgonda and outskirt of Biridanga village under Binpur II block. The abode of Mahakal Bhairab was located on a bare rugged field of red lateritic soil with clusters of woody tree and lianas along with few scattered herbaceous ground flora. The 800-year old grove was spread over 18-acre land and it seemed to be a bare or foundation of a incomplete temple (average 4.5 ft. high floor-base was made of red color sized blocks of stone) of folk god *Mahakal Bhairab*- a local forest deity worshipped mainly by *Panda Khatriya* (Fig. 1).

According to findings based on oral history, during the days of yore, the sacred grove was located deep inside the erstwhile impenetrable forest. It was said that the local forest-fringe *Santals* used to appease and worship the deity ward off evil spirits and lurking dangers of forest environs.

Socio-religious Function : In spite of the presence of presiding idol *Mahakal Bhairab*, a mass of vegetation had been conserved due to socio-religious impact. This was, in sharp contrast with the caste-based sacred grove of *Koras* and *Santals* with different tribal religious overtones, situated in and around the Orgonda and Biridanga villages. Since the present sacred grove was maintained and managed by the mainstream Hindu society, caste and creed did not play any role. Apart from the regular worship in everyday morning, the deity *Mahakal Bhairab* was worshipped in a grand scale thrice times in a year. The largest of these three major occasions was the worship held on the day of *ekadoshi* (after the day of *bijoya dashami* during *Durga Puja* in September-October) and three days spanned tribal fair "*Patabindhar mela*" was organised locally during the annual worship. Another major occasion of annual worship was *Makar Sankranti* or *Akhan* (middle of January or first day of the bengali month, Magh), when locally organized small village-level fairs were held. Last major occasion of annual worship was on the first day of *Ambubachi* (June-July). However, in these annual worships goat, fowl and pigeon were sacrificed. In spite of all annual worships, it was supposed promising to offer oblation on Tuesday and Saturday. In the worship offerings of sweet, fruits, flowers, leaf (*Aegle marmelos*) and incense sticks etc. were required. Folklore goes that worshipping the deity invites prosperity and well-being of the villages in general and devotees in particular[14]. People's general perception about the grove was that the sacred space helped villagers socialize and fosters solidarity among them.

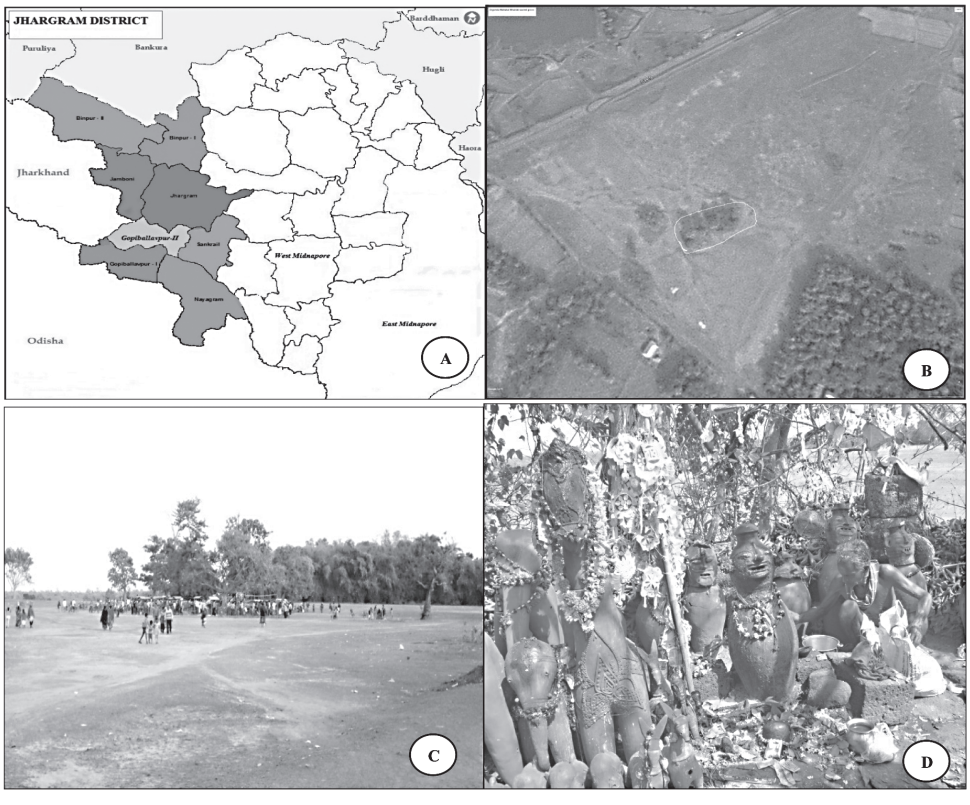

Fig. 1: Location of the study area (A: Jhargram district with Binpur II block, B: Google Earth image showing Orgonda Mahakal Bhairab sacred grove, C: Grove at the time of Makar festival, D: Priest worshipped the Deity Mahakal Bhairab).

Results and Discussion : Since the sacred grove was a fragment of the landscape containing plants and other forms of environmental features that were protected by human societies, it was of great ecological significance. The foremost ecological function was protection of biodiversity. Owing to continued protection offered on socio-religious grounds, the sacred grove provided most favorable environment congenial for plant seeds germination, growth and survival. The eight well represented families in species (≥ 3 species) quantity were: Fabaceae 7 (9.59%), Apocynaceae 6 (8.22%), Lamiaceae 6 (8.22%), Poaceae 6 (8.22%), Asteraceae 5 (6.85%),

TABLE 1: Analysis of angiospermic plant species of the *Orgonda Mahakal Bhairab* sacred grove.

Sl. No.	Family	Scientific Name	Vernacular Name	Habit	Importance (s) and Part(s) used
1.	**Acanthaceae**	*Andrographis paniculata* (Burm.f.) Nees	*Kalmegh*	H	**M:**Le,Ro,W
		Barleria prionitis L.	*Peetjhanti*	S	**M:**Le,Ro,Sb
2.	**Amaranthaceae**	*Achyranthes aspera* L.	*Apang*	H	**D:**W;**M:**W;**Sa:**W
		Aerva lanata (L.) Juss.	*Chaya*	H	**M:**Fr,Ro;**Sa:**W
		Amaranthus spinosus L.	*Kanta nate*	H	**M:**W
3.	**Annonaceae**	*Annona squamosa* L.	*Ata*	T	**E:**Fr;**I:**Le,Se;**M:**Fr,Le,Ro
4.	**Apocynaceae**	*Calotropis gigantea* (L.) Dryand.	*Akanda*	S	**Fi:**Ba,Se;**M:**Fl,La,Le,Rb,Ro;**Sa:**W
		Cascabela thevetia (L.) Lippold	*Kalke*	T	**M:**Fr,La,Le,Sb,Se;**Or:**Fl,W
		Hemidesmus indicus (L.) R. Br. ex Schult.	*Anantamul*	S	**M:**Ro
		Pergularia daemia (Forssk.) Chiov.	*Chagalbati*	C	**M:**La,Le,Se,W
		Tabernaemontana divaricata (L.) R.Br. ex Roem. & Schult.	*Tagar*	T	**M:**Ro,St;**Or:**Fl,W;**Sa:**Fl
		Vallaris solanacea (Roth) Kuntze	*Haparmali*	C	**M:**La,Le,Ro
5.	**Asteraceae**	*Ageratum conyzoides* (L.) L.	*Dochunti*	H	**M:**Le,Ro
		Chromolaena odorata (L.) R.M.King & H.Rob.	*Bhabri*	H	**I:**Le,St;**M:**W
		Elephantopus scaber L.	*Deshigajban*	H	**M:**Fl,Le,Ro
		Grangea maderaspatana (L.) Poir.	*Namuti*	H	**M:**Fl,Le
		Tridax procumbens (L.) L.	*Targanda*	H	**M:**Le,Ro
6.	**Boraginaceae**	*Heliotropium indicum* L.	*Hatisur*	H	M:W
7.	**Cactaceae**	*Cereus hexagonus* (L.) Mill.	*Manasa*	S	**M:**St
8.	**Capparaceae**	*Capparis zeylanica* L.	*Rohini*	C	**M:**Le,Ro,Se,St;**Or:**W
9.	**Convolvulaceae**	*Evolvulus alsinoides* (L.) L.	*Lata ghas*	H	**M:**W;**Sa:**W
10.	**Cornaceae**	*Alangium salvifolium* (L. f.) Wang.	*Akarh*	T	**E:**Fr;**M:**Fr,Le,Rb,Sb,Se;**Ti:**St
11.	**Ebenaceae**	*Diospyros melanoxylon* Roxb.	*Kendu*	T	**E:**Fr,Le;**Fo:**Le;**M:**Fr,Sb; **Oi:**Se; **Sa:**W;**Ta:**Sb;**Ti:**St
12.	**Euphorbiaceae**	*Acalypha indica* L.	*Muktajhuri*	H	**M:**W
		Croton bonplandianum Baill.	*Lankasira*	H	**M:**La,Le
		Euphorbia hirta L.	*Bara dudhe*	H	**M:**W
		Jatropha gossypifolia L.	*Lal bheranda*	S	**M:**La,Le,Se;**Oi:**Se
13.	**Fabaceae**	*Abrus precatorius* L.	*Lal Kunch*	C	**I:**Se;**M:**Se;**Or:**Se;**Sa:**Se
		Acacia auriculiformis Benth.	*Akashmani*	T	**Ta:**Fr,Sb,Se;**Ti:**St
		Caesalpinia bonduc (L.) Roxb.	*Natakaranj*	S	**M:**Le,Ro,Se
		Desmodium gangeticum DC.	*Salpani*	H	**M:**Ro
		Mimosa pudica L.	*Lajjabati*	C	**M:**Le,Ro
		Senna obtusifolia (L.) H.S.Irwin & Barneby	*Chakunda*	H	**M:**Le,Ro,Sb
		Senna sophera (L.) Roxb.	*Kalkasunda*	S	**I:**Fr,Le;**M:**Le,P,Se
14.	**Lamiaceae**	*Clerodendrum infortunatum* L.	*Ghetu*	S	**M:**Le,Ro
		Leonurus sibiricus L.	*Raktadron*	H	**M:**Fl,Le,Ro
		Leucas cephalotes (Roth) Spreng.	*Dronpuspa*	H	**M:**Fl,W;**Sa:**W
		Ocimum americanum L.	*Ban tulsi*	H	**M:**Le,Ro,Se;**Sa:**Le,W

TABLE 1: contd.....

Sl. No.	Family	Scientific Name	Vernacular Name	Habit	Importance (s) and Part(s) used
		Ocimum tenuiflorum L.	*Radha tulsi*	H	**M:**Le,St,W;**Sa:**Le,W
		Vitex negundo L.	*Nisinda*	S	**I:**Le,St;**M:**Fl,Fr,Le,Rb,Ro,Sb,Se
15.	**Lecythidaceae**	*Careya arborea* Roxb.	*Asta*	T	**M:**Fr,Le,Sb,Se;**Ti:**St
16.	**Loganiaceae**	*Strychnos nux-vomica* L.	*Kuchila*	T	**I:**Fr,Se;**M:**Fr,Le,Rb,Se;**Ti:**St
17.	**Malvaceae**	*Hibiscus rosa-sinensis* L.	*Jaba*	S	**M:**Fl,Le,Ro,Sb;**Sa:**Fl
		Pterospermum acerifolium (L.) Willd.	*Kanakchampa*	T	**E:**Fl;**M:**Fl,Le,Sb;**Sa:**W;**Ti:**St
		Sida cordifolia L.	*Barella*	S	**M:**Fr,Le,Ro,Se;**Fi:**Sb;**Fo:**Le
		Triumfetta rhomboidea Jacq.	*Ban okra*	S	**Fi:**Sb;**M:**Fl,Le,Ro,St
18.	**Meliaceae**	*Azadirachta indica* A. Juss.	*Neem*	T	**E:**Le;**I:**Fr,Le,Sb,Se;**M:**Fr,Le, Sb,Se,St;**Sa:**W;**Ta:**Sb;**Ti:**St
19.	**Menispermaceae**	*Tinospora sinensis* (Lour.) Merr.	*Padmagulancha*	C	**M:**W;**Sa:**W
20.	**Moraceae**	*Ficus benghalensis* L.	*Bat*	T	**E:**Fr;**Fi:**Ro;**Fo:**Le;**M:**Fr,La,Le, Ro,Sb,Se; **Or:**W;**Sa:**Le,W;**Ti:**St
		Streblus asper Lour.	*Saora*	T	**E:**Fr;**Fo:**Le;**M:**Fr,La,Le,Ro,Sb,Se; **Or:**W;**Sa:**Le,W;**Sb:**Ro;**Ti:**St
21.	**Nyctaginaceae**	*Boerhavia diffusa* L.	*Punarnaba*	H	**M:**Le,Ro,W
22.	**Oxalidaceae**	*Oxalis corniculata* L.	*Amrul*	H	**M:**Le,W
23.	**Phyllanthaceae**	*Phyllanthus fraternus* G.L.Webster	*Bhui amla*	H	**M:**W
		Phyllanthus virgatus G.Forst.	*Tanda meral*	H	**M:**W
24.	**Plantaginaceae**	*Scoparia dulcis* L.	*Ban dhane*	H	**M:**Le,Sb,Se,W
25.	**Rhamnaceae**	*Ventilago denticulata* Willd.	*Raktapita*	C	**D:**Rb,Sb;**M:**Fr,Rb,Sb;**Ti:**St
26.	**Rubiaceae**	*Haldina cordifolia* (Roxb.) Ridsdale	*Karam*	T	**Fo:**Le;**Sa:**W;**Ti:**St
		Oldenlandia corymbosa L.	*Phul lata*	H	**M:**Le,W
27.	**Rutaceae**	*Aegle marmelos* (L.) Corrêa	*Bel*	T	**D:**Fr;**E:**Fr,Le;**M:**Fr,Le;**Sa:**Fr,Le,W
28.	**Solanaceae**	*Datura stramonium* L.	*Sada dhutra*	S	**M:**Le,Ro,Se;**Sa:**Fl
		Solanum sisymbriifolium Lam.	*Sada kantikari*	H	**M:**Fr,Le,Ro
29.	**Verbenaceae**	*Lantana camara* L.	*Saibani lata*	S	**I:**Fr,Le,Sb;**M:**W;**Or:**W
		MONOCOTS			
30.	**Arecaceae**	*Phoenix sylvestris* (L.) Roxb.	*Khejur*	T	**E:**Fr;**M:**Fr;**Ti:**St
31.	**Cyperaceae**	*Cyperus rotundus* L.	*Mutha*	H	**Fo:**Le;**M:**Ro,Tu
		Rhynchospora colorata (L.) H.Pfeiff.	*Nirbish*	H	**Fo:**Le;**M:**Le,Rb,Ro,Se
32.	**Hypoxidaceae**	*Curculigo orchioides* Gaertn.	*Talmuli*	H	**M**:Ro
33.	**Orchidaceae**	*Vanda roxburghii (*Roxb.) Hook. ex G.Don	*Gachlata*	H	**M:**Fl,Le;**Or:**Fl,W
34.	**Poaceae**	*Chloris barbata* Sw.		H	**Fo:**Le
		Chrysopogon aciculatus (Retz.) Trin.	*Chorkanta*	H	**M:**Rh;**Sa:**Le
		Cymbopogon martini (Roxb.) W. Watson	*Gandhabena*	H	**Fo:**Le;**M:**Rh,W;**Oi:**Le,Rh
		Cynodon dactylon(L.) Pers.	*Durba ghas*	H	**Fo:**Le;**M:**Rh,W;**Sa:**Le,W
		Eleusine indica (L.) Gaertn.	*Pamarosa*	H	**Fo:**Le,St
		Eragrostis amabilis (L.) Wight & Arn.	*Phul ghas*	H	**Fo:**Le

Euphorbiaceae 4 (5.48%), Malvaceae 4 (5.48%) and Amaranthaceae 3 (4.11%) (Fig. 2). Acanthaceae, Cyperaceae, Moraceae, Phyllanthaceae, Plantaginaceae, Rubiaceae and Solanaceae comprised 2 (2.74%) species each. Another 19 families each carried only a single species (Table 1). Same type dominant families of sacred groves in India were observed by[1, 15-18] etc.

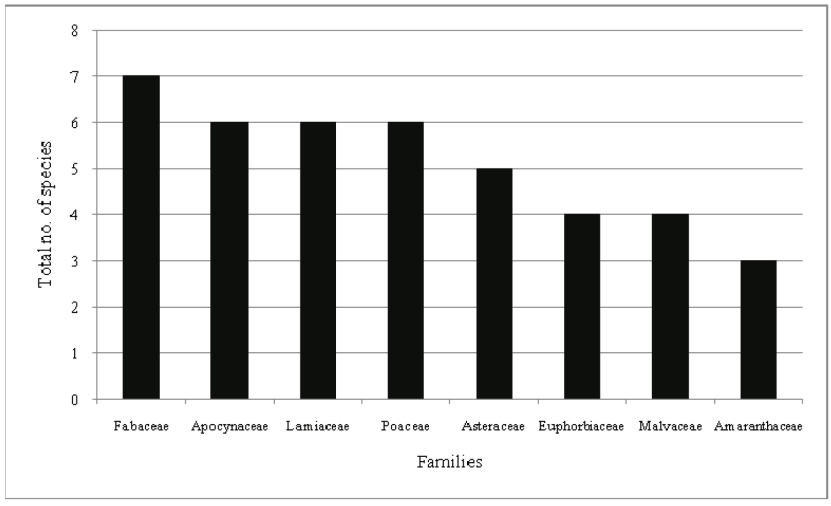

Fig. 2: Major contribution of families (e"3 species) in the sacred grove.

The eight dominant plant families encompassed more than 55% genera with descending numbers (≥3 species) were Apocynaceae 6 (8.57%), Fabaceae 6 (8.57%), Poaceae 6 (8.57%), Asteraceae 5 (7.14%), Lamiaceae 5 (7.14%), Euphorbiaceae 4 (5.71%), Malvaceae 4 (5.71%) and Amaranthaceae 3 (4.29%) (Table 1).

The three well represented genera containing 2 species were *Ocimum*, *Phyllanthus* and *Senna*. Another 68 species contained single genus respectively (Table 1).

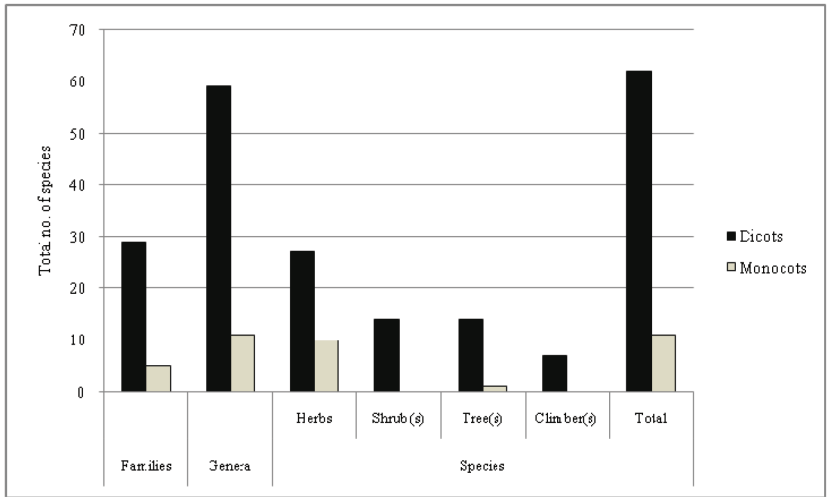

Fig. 3: Total angiosperm taxa in the sacred grove.

The present floristic study of the sacred grove showed that they harbored a total of 73 plant species [dicots 62 (84.93%) and monocots 11 (15.07%)] belonging to 70 genera [dicots 59 (84.29%) and monocots 11 (15.71%)] of 34 families [dicots 29 (85.29%) and monocots 5 (14.71%)]. Among these, 37 (50.68%) of the reported species were herbs. Other reported species were shrubs 14 (19.18%), trees 15 (20.55%) and climbers 7 (9.59%) respectively. Amongst the total dicots 62 (84.93%) and monocots 11 (15.07%), herbs, shrubs, trees and climbers represented 27, 14, 14, 7 and 10, 0, 1, 0 species respectively, representing 36.98%, 19.18%, 19.18%, 9.59% and 13.70%, 0%, 1.37%, 0% of the total species (Table 1, Fig. 3).

Major five herbaceous families were Poaceae 6 (8.22%), Asteraceae 5 (6.85%), Lamiaceae 4 (5.48%), Amaranthaceae 3(4.11%) and Euphorbiaceae 3 (4.11%) held above 55% of the total herb population. The four major less-woody shrub families were Malvaceae 3 (4.11%), Apocynaceae 2 (2.74%), Fabaceae 2 (2.74%) and Lamiaceae 2 (2.74%) and held above 64% of the total shrubs population. Apocynaceae 2 (2.74%) and Moraceae 2 (2.74%) were the two diversified families which contained above 26.67% of the total tree population. Another 11 families contained single tree species. The two speciose families included Apocynaceae 2 (2.74%), Fabaceae 2 (2.74%) clasp above 57% of the total liana population (Table 1).

The grove supported 12 timbers-yielding plant species and a good number of non-timber forest products, of which, 3 species produced dye, 9 species bore edible parts, 8 species had fodder value, 8 species had insecticidal properties, 64 species had medicinal properties, 7 species had ornamental value, 19 species had sacred value and 3 species were yielding tannin (Table-1). Since the present sacred grove was positioned in a tribal area dotted with forests, a good number of the conserved medicinal plants of the grove happened to be ethnomedicinal species of forest origin. Conservation of ethnomedicinal plant by

sacred grove of West Midnapur district was also reported by Bhakat and Sen [19].

The sacred grove, on account of its locational uniqueness, performed yet another ecological role. Being surrounded by households, playground and forests, and due to prevalence of near-wild environs typical of nearby forests, the sacred grove supported a good collection of wild animals which were often seen roaming in and around the area. These were lizards, snakes, mites and a dozen of birds. Moreover, a large number of unidentified insects that inhabited the grove make the area even richer in biodiversity.

Continued Conservation : Sacred grove had preserved biodiversity within their boundaries for a long time. Now it is under mild threat. It is in the ultimate interest of humanity as a whole to preserve at least the surviving bio-materials which had been safeguarded in this grove for a long time. For that, it is necessary to make society responsible for shielding the surviving sacred grove from further degradation. Conservation of biodiversity and maintenance of the eco-system is of overriding importance for the survival of human race itself. The sacred groves have been playing a role in that endeavor.

Conclusion : This study reveals that a number of valuable plant species were found in the sacred grove, which represents the traditional Indian way of *in-situ* conservation of biodiversity. It was also indicator of the rich vegetation that had existed around the area in the past and if conservation measures are not introduced in near future, there may be a great loss of plant diversity. Thus, there is ample scope for further research on plant diversity, community attributes, and natural regeneration. Detailed ethnobotanical surveys, biodiversity explorations, research and pooling data from such investigations will be very helpful in developing suitable measures for conserving precious plant wealth. Moreover, the grove and socio-religious practices centering on it act as a social institution where villagers and the local people not only exchange their cultural identity but also find community solidarity. Therefore, there is a great need to protect and conserve the sacred grove for our smooth survival.

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