

Conservation and management of sacred groves in Kerala
(Project funded by the Biodiversity Cell, Department of Forests and Wildlife,
Government of Kerala)

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Abstract of Project Proposal

Project Number	KFRI RP 597/2010
Title	Conservation and management of sacred groves in Kerala
Objectives	a. To conduct an inventory in sacred groves selected by the Biodiversity Cell of Kerala Forest Department for documenting flora and fauna, and B. To prepare Management Plan for sacred groves selected by the Biodiversity Cell of Kerala Forest Department
Project period	April 2010 to April 2011
Funding Agency	Biodiversity Cell, Department of Forests and Wildlife, Government of Kerala
Principal Investigator	Dr. U.M. Chandrashekara

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1. EXECUTIVE SUMMARY

The Sacred grove concept is one of the strategies developed by many human societies to conserve biological resources using a traditional approach. Recognising the importance of sacred groves, both in terms of conservation of biodiversity and cultural diversity, and in view of the threats faced by the groves, the Government of India has launched a Scheme 'Protection and Conservation of Sacred groves' within its programme 'Intensification of Forest Management'. As a part of this Central Government sponsored Scheme, the Department of Forests and Wildlife, Government of Kerala (KFD) initiated the 'Protection and Conservation of Sacred Groves' project in Kerala. This scheme is coordinated and monitored by the Biodiversity Cell (BDC) of the KFD and implemented through respective Assistant Conservator of Forests (Social Forestry) of each District. The Assistant Conservator of Forests (ACFs of Social Forestry) invited applications from the owners of sacred groves within their Districts after giving wide publicity through media. An expert committee constituted by the BDC scrutinised the applications and selected the sacred groves to be supported. Initially, twenty eight sacred groves belonging to Devaswoms and Trusts were selected for support. The two tasks namely inventory of these sacred groves for documenting flora and fauna and preparation of Management Plan for each sacred grove have been assigned to the Kerala Forest Research Institute (KFRI). By conducting field visits and stakeholder meetings with local community and owners of the grove, KFRI documented the socio-cultural and ecological dimensions of sacred groves.

The study revealed that the total area of sacred groves ranged from 0.04 ha to 24.0 ha and in majority of the groves, area occupied by the vegetation was more than 76 per cent of total area of the grove. While most of the sacred groves were surrounded by the crop lands, some were bordered by highly degraded forest lands and barren lands. Many sacred groves held water resources in the form of ponds, streams or wells. These water bodies, in many sacred gloves played important ecological roles by providing water for organisms living in and around the groves. Mainly four major forest types, namely evergreen, semi-evergreen, moist deciduous and mangrove forests were seen among twenty-eight sacred groves and the forest patches showed different degrees of degradation. A total of 670 angiosperm species, 154 butterfly species and 122 bird species were recorded from these sacred groves. Among them,

133 angiosperm species, 5 butterfly species and 8 bird species were endemic. Though the inventory of angiosperms, birds and butterflies in sacred groves conducted through this study provided rather preliminary results it indicated directions along which we must work further to document and organise comprehensive programme of maintaining biodiversity. In this document, the need of a Sacred Grove Biodiversity Network (SGBN) of Kerala State as a broad programme of biodiversity monitoring is also projected.

The present study also highlighted the role of sacred groves in the religious and socio-cultural life the local people. Majority of the sacred groves are associated with female deities and devotees dedicated offerings, generally agricultural products, for the fulfilment of their wish. Festivals and performing arts related to different sacred groves were documented. Even though some restrictions existed, women participate in the traditional activities, conservation and day-to-day management of many sacred groves.

During the participatory appraisal meetings, the participants highlighted the fact that many sacred groves are now threatened. Among twelve major threats faced by sacred groves, dumpage of solid waste materials, trespassing, illegal collection and removal of small fallen timbers and other forest products were prominent. Altogether 26 management strategies were recognized for the conservation and protection of these sacred groves. Even though the social barrier is more appropriate, the study revealed that in the present day socio-cultural context, physical barriers such as fencing and compound wall are needed to protect sacred groves till the attitude of stakeholders towards sacred groves becomes positive. The participatory approach adopted in this project helped to prepare the budget estimates for grove-specific management activities. The KFRI prepared the Management Plan for each of the twenty eight sacred groves and submitted to the BDC. Among others, each Management Plan provides details of cultural and ecological significance of the grove, the contribution by the owner and the local community in the conservation efforts, institutional mechanism whereby all stakeholders lend their support to the conservation of the sacred grove, budget estimates for management activities and mechanisms for monitoring and evaluating the management activities. After scrutiny by the Expert Committee, the Management Plans have been forwarded by the BDC to the Government of India for financial support.

2. INTRODUCTION

Sacred groves are sanctified patches of forests protected by the strength of religious beliefs as abode of Gods and Goddesses. In India, in spite of increase in human population, sacred groves have survived under a variety of ecological situations (Ramakrishnan *et al.*, 1998). They received greater research attention from anthropological as well as biological conservation points of view (Gadgil and Vartak, 1976; Tiwari *et al.*, 1998; Malhotra *et al.*, 2001). These studies indicated that each sacred grove has its own cultural, biological and ecological dimensions.

Sacred groves form an important unit in the rural landscape of Kerala. Studies conducted in the State have already highlighted the fact that well conserved sacred groves of the State are comparable to the regional natural forests for various ecological attributes (Chand Basha, 1998; Chandrashekara and Sankar, 1998; Induchoodan, 1998). Many sacred groves of the State are also treasures of rare and endemic species (Mohan and Nair, 1981; Unnikrishnan, 1995; Induchoodan, 1998).

Being a biotype in a rural landscape, the sacred grove performs several ecological functions, which directly or indirectly help in the maintenance of ecosystem health of all interacting landscape units (Pushpangadan *et al.*, 1998). Sacred groves with their complex array of interaction influence the flora and fauna of the region as well as microclimate of the locality. Contributions of sacred groves to a village landscape in managing hydrological balance and availing the carbon credits under the Clean Development Mechanism (CDM) of Kyoto protocol have also been recognized by many workers. Sacred groves could help to compensate for carbon emissions of polluting industries. Thus, conservation and management of sacred groves offers economic benefits to the communities besides other ecosystem benefits. Recognizing the ecosystem services and biodiversity conservation values of sacred groves, the Department of Forest and Wildlife, Government of Kerala (KFD) has initiated several programmes to strengthen the institution of sacred groves. One such effort was to implement a project 'Protection and Conservation of Sacred Groves' under the Government of India sponsored scheme 'Intensification of Forest Management'. As a part of this project the Biodiversity Cell (BDC) of the KFD opted to identify a few sacred groves from each district of the State, prepare the management plans for these sacred groves by adopting a participatory approach and submit them to the

Government of India seeking financial support for the community involvement initiatives and eco-development activities envisaged in the management plans. As part of this Project, the task of inventory, documentation of flora and fauna and preparation of management plans for the sacred groves that are identified by the Biodiversity Cell and Social Forestry Wing of KFD was assigned to the Kerala Forest Research Institute. KFRI prepared the management plans for all sacred groves separately, in the format prescribed by the BDC and submitted them on 21.07.2010 to the Chief Conservator of Forests, BDC. The Management Plans, after scrutiny by the Expert Committee, have been forwarded to Government of India for financial support.

The Management Plan of each sacred grove contained two main sections namely-brief history and status of grove and the proposed management and action plan. Under the section `Brief history and status of grove` information such the legal status and ownership, details of location and extent, topography, flora, fauna, hydrology, water bodies, adjoining landscape units, cultural, spiritual and ecological significance and threats faced by the grove were provided. Under the Section `Proposed management and action plan`, vision and management activities, action plan, implementation schedule and budget details were provided. The present consolidated report has been prepared based on the information provided in these management plans prepared for all sacred groves.

3. SELECTION OF SACRED GROVES

As stated earlier, the programme `Protection and Conservation of Sacred Groves of Kerala` is instituted under the Biodiversity Cell (BDC) of the KFD and is to be implemented through the Social Forestry Wing of KFD. In order to initiate this programme, with the request from the Biodiversity Cell, the Assistant Conservators of Forests (Social Forestry) invited applications within their respective districts from the sacred grove owners after giving wide publicity through media. The BDC constituted an Expert Committee to scrutinize the proposals and select the sacred groves to be supported. It was decided to initially support 28 sacred groves belonging to Devaswoms and Trusts. As per the procedure envisaged, the owners of the sacred grove entered into an agreement with the Kerala Forest Department and prepared and submitted the detailed management proposal to the Chief Conservator of Forests of BDC through the respective Assistant Conservators of Forests (Social Forestry).

Copies of the management proposal were made available to the Principal Investigator. After conducting the stakeholder meeting involving local community and owners of the grove, the management plans, in the format as approved by the BDC, were prepared for all 28 groves and submitted to the Chief Conservator of Forests of BDC.

The sacred groves that were selected by the BDC for programme implementation are listed in Table 1 and their locations are marked in Figure 1.

Table 1. Ownership and contact details of sacred groves

Sacred grove and acronym*	Ownership	Contact details
KASARAGOD (KS)		
Edayilekkadu Kavu (KS1)	Edayilekkadu Kavu Samrakshana Samithi	Secretary Edayilekkadu Sree Nagalaya Samrakshana Samithi Valiaparamba P.O.
Kammadam Kavv (KS2)	Malabar Devaswom Board	Chairman Board of Trustees Kammadam Shree Bhagavati Temple, Kammdam, Mandapam- 571 326
KANNUR (KN)		
Sree Deviot Kavv (KN1)	Sree Deviot Kavv Trustee Board	Secretary Sree Deviot Kavv Kshethra Committee, Kankal Village Allapadamba Panchayath Thalipparamba Taluk
Karimanal Chamundikkavv (KN2)	Malabar Devaswom Board	Secretary Karimanal Chamundikkavv Committee, Vayakkara Village Peringom Panchayat Taliparamba Taluk
Madai Kavv (KN3)	Malabar Devaswom Board	Executive Officer Chirakkal Kovilakam Devaswom Madayi Para P.O.,
Thekkumbad Thazhe Kavv (KN4)	Malabar Devaswom Board	Executive Officer Chirakkal Kovilakam Devaswom, Thekkumbad, Mattool Village
Sree Varikkarakkadavv Kavv (KN5)	Malabar Devaswom Board	Chairman Hereditary Trustee Board Perlath Sree Bhagavathi Temple Karivelloor, Perlam Panchayat Taliparamba Taluk

*, District abbreviation followed by a number is used as acronym of groves.

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Table 1 (cont'd). Ownership and contact details of sacred groves

Sacred grove and acronym*	Ownership	Contact details
WAYANAD (WA)		
Mani Kavu (WA1)	Malabar Devaswom Board	Executive Officer Mani Kavu Devaswom Committee Chaathupara P.O.
Valliyoorkavu (WA2)	Malabar Devaswom Board	Executive Officer Sree Valliyoorkavu Devaswom Committee, Arattuthara Payyampilly Village Mananthavadi Taluk
KOZHIKKODE (KZ)		
Muchukunnu Kotta Kavuvu (KZ1)	Muchukunnu Devaswom Trustee Board	Hereditary Trustee Muchukunnu Devaswom Trustee Board, Muchukunnu-673307 Koyilandi Taluk
Poyil Kavuvu (KZ2)	Malabar Devaswom Board	Executive Officer Poyil Kavuvu Devaswom Poyil, Koyilandi Taluk
Vallikkattu Kavuvu (KZ3)	Malabar Devaswom Board	Chairman Vallikkattu Kavuvu Management Committee, Edakkara
MALAPPURAM (MA)		
Karakkode Kavuvu (MA1)	Mannur Sree Ramananda Ashram, Karakkode	President Mannur Sree Ramananda Ashram, Karakkode, Vazhikkadavu P.O.
PALAKKAD (PL)		
Ayyappan Kavuvu (PL1)	Naduvilmadom Devaswom	Manager, Naduvilmadom Devaswom Thiruvallathur,
Kavassery Kavuvu (PL2)	Malabar Devaswom Board	Chairman, Parakkad Shree Bhagavathi Devaswom Board Kavassery- 678 543
THRISSUR (TS)		
Chendangottu Kavuvu (TS1)	Chendangottu Tharavadu Temple Trust	Secretary, Chendangottu Tharavadu Vaka Paambin Kavuvu, Chavakkad Block, Ward 11 Orumanayoor Panchayat,
Chukkath Kavuvu (TS2)	Nadathara Chukkath Temple Trust	Secretary, Chukkathu Muthappan Kshethra Paripalana Samithi, Ollukkara Block, Nadathara Panchayat
ERNAKULAM (ER)		
Aruvikkal Kavuvu (ER1)	Aruvikkal Sree Durga Devi Temple Trust	Secretary, Thekkan Maradi P.O., Moovattupuzha

*, District abbreviation followed by a number is used as acronym of groves.

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Table 1 (cont'd). Ownership and contact details of sacred groves

Sacred grove and acronym*	Ownership	Contact details
ERNAKULAM (ER)		
Iringole Kavu (ER2)	Travancore Dewaswom Board	Secretary, Iringole Shree Bhagavati Kshethra Upadeshaka Samithi, Iringole P.O., Perumbavoor
KOTTAYAM (KT)		
Kalloor Appankavu (KT1)	Kalloorappan Kavusree Bhadra Trust	Chairman Kalloorappan Kavusree Bhadra Trust, Lakkattoor
Manimala Kavus (KT2)	Edumpanakuzhiyil Family Trust	Secretary Kerala Kshetra Samrakshana Samithe Reg. No. 799, Manimala
PATHANAMTHITTA (PT)		
Mannady Pazhayakavu (PT1)	Mannady Pazhayakavu Devi Temple Samrakshana Samithi	Secretary Mannady Pazhayakavu Devi Temple Samrakshana Samithi Kadampanadu, Manndai P.O. Adoor (via)
Valamchuzhi Kshethrakavu (PT2)	Valamchuzhi Devaswom	Secretary Valamchuzhi Devaswom Mallasserry Village, Pramadom Panchayat
ALAPPUZHA (AL)		
Vetticode Kavus (AL1)	Aadimoolam Vetticode Sree Nagarajaswami Temple Family Trust	Secretary Vetticode Sree Nagaraja Swamy Temple, Vetticode -690 503 Pallickkal
KOLLAM (KL)		
Valiaveetil Kshethrakavu (KL1)	Valiaveetil Sree Durga Kshethra Committee	Secretary, Valiaveetil Sree Durga Kshethra Committee, Thazhava
Pazhangala Kavus (KL2)	Pazhangala Sree Dharma Sastha Kshethra Committee	President, Pazhangala Sree Dharma Sastha Kshethra Committee, Nellila P.O.
THIRUVANANTHAPURAM (TV)		
Irinjayam Sarpa Kavus (TV1)	Irinjayam Sarpa Kavus Temple Committee	The Secretary Irinjayam Sarpa Kavus Temple Committee Nedumangad Taluk,
Thrikunnath Kavus (TV2)	Thrikunnathu Kavus Indiyalappan Temple Trust	The Secretary Thrikunnathu Kavus Indiyalappan Temple Trust Parippally, Chavancode,

*, District abbreviation followed by a number is used as acronym of groves.

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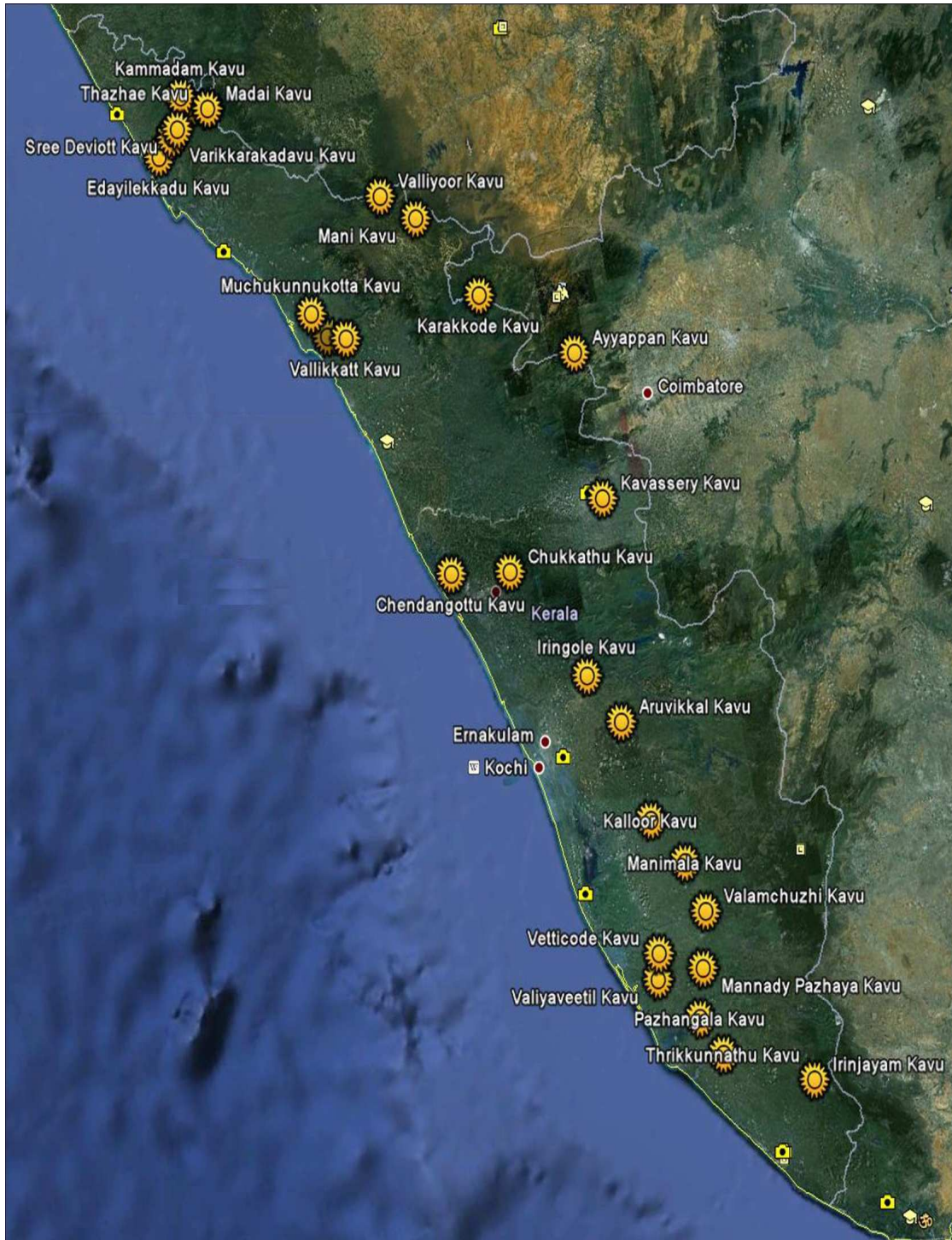


Figure 1. Imagery from Digital Globe Geo-eye showing the locations of sacred groves studied

In the following sections, a comprehensive account of the socio-cultural and ecological dimensions of these sacred groves, threats faced by the groves and management options identified are given. A prospective budget for supporting conservation and management activities of these groves is also provided.

4. SOCIO-CULTURAL DIMENSIONS OF SACRED GROVES

4.1. Size distribution of sacred groves

The total area of the sacred groves ranged from 0.04 ha (Manimala Kavvu) to 24.0 ha (Kammadam Kavvu) (Table 2). Out of 28 sacred groves, 11 had less than 1 ha area, six had 1.01 to 4.0 ha, eight each had 4.01 to 8.0 ha and 8.01 to 12.0 ha and the rest had more than 12.01 ha. In majority of the groves, area occupied by the vegetation was more than 76 per cent of total area of the grove.

Table 2. Total area and area with vegetation in sacred groves of Kerala.

Sl. No.	Sacred grove and acronym	Area (ha)	
		Total	With vegetation
1.	Edayilekkadu Kavvu (KS1)	4.25	4.00
2.	Kammadam Kavvu (KS2)	24.00	24.00
3.	Sree Deviot Kavvu (KN1)	18.00	18.00
4.	Karimanal Chamundikkavvu (KN2)	4.44	2.60
5.	Madai Kavvu (KN3)	4.00	3.00
6.	Thekkumbad Thazhe Kavvu (KN4)	7.50	6.50
7.	Sree Varikkarakkadavu Kavvu (KN5)	3.44	2.90
8.	Mani Kavvu (WA1)	11.10	6.00
9.	Valliyoore Kavvu (WA2)	11.93	4.50
10.	Muchukunnu Kotta Kavvu (KZ1)	3.80	2.60
11.	Poyil Kavvu (KZ2)	4.62	3.50
12.	Vallikkattu Kavvu (KZ3)	10.04	9.94
13.	Karakkode Kavvu (MA1)	1.20	0.40
14.	Ayyappan Kavvu (PL1)	0.084	0.068
15.	Kavassery Kavvu (PL2)	12.00	11.00
16.	Chendangotu Kavvu (TS1)	0.14	0.12
17.	Chukkath Kavvu (TS2)	0.13	0.10
18.	Aruvikkal Kavvu (ER1)	1.82	1.01
19.	Iringole Kavvu (ER2)	16.00	15.60
20.	Kalloor Appankavvu (KT1)	0.39	0.26
21.	Manimala Kavvu (KT2)	0.04	0.03
22.	Mannady Pazhayakavvu (PT1)	0.80	0.60
23.	Valamchuzhi Kshethrakavvu (PT2)	0.61	0.50
24.	Vetticode Kavvu (AL1)	2.50	0.30
25.	Valiaveetil Kshethrakavvu (KL1)	1.00	0.80
26.	Pazhangala Kavvu (KL2)	1.00	0.80
27.	Irinjayam Sarpa Kavvu (TV1)	0.61	0.40
28.	Thrikunnath Kavvu (TV2)	0.49	0.24

4.2. Ownership pattern and management of sacred groves

Out of 28 sacred groves discussed here, 11 are under the control of Devaswom Boards which manage them with the assistance of local committees. One sacred grove is the private property of a single family (Vetticode Kavvu) managed by a family trust. The

Karakkode Kavay is the property of an Ashram. On the other hand, 15 sacred groves belong to the group of families of one or more communities and area being managed by temple trusts, temple committees or trusty boards. Except for Vetticode Kavay, all other groves have separate committees for conservation and management of the vegetation. Such committees comprise of members belonging to different Hindu communities, occasionally with special privilege to certain of the communities.

4.3. Presiding and associated deities

A random literature search reveals that, by and large, a majority of the sacred groves are associated with female deities (Malhotra *et al.*, 2001). In the present study too, 16 of the groves were found associated with goddesses, while seven were associated with male deities (Shiva, Dharma Sastha, Ayyappa, Muthappa, Kallorappa) and the remaining six with serpent (Naga, Sarpa). Among female deities, Bhagavati was the most prominent (ten sacred groves) followed by Durga (four groves) and Chamundi (two groves).

Association of one sacred grove with several other groves, particularly during festival and other special occasions is reported from many sacred groves. For instance, Thazhekkavu is the associated sacred grove of Kammadam Kavay. Materials such as food grains, pooja items, oil for lamps etc. left after the festival or special functions in the main sacred grove are often distributed to its associated sacred groves for use. Such practices are seen in Kammadam Kavay and Sree Deviot Kavay and their associated sacred groves, Thazhekkavu and Kattu Modanthukkavu respectively.

Generally, there is a belief that some deities of associated sacred groves serve as the guards of the presiding deity of the main sacred grove. Chamundi, Gulikan and Vishnumoorthy are examples for such associated deities.

4.4. Stories related to origin and history of sacred groves

Most of the sacred groves have stories relating to their origin. Almost all sacred groves, according to these stories, originated by certain supernatural powers. Certain stories also reveal the links between sacred groves and historical events and personalities. Generally the name of a sacred grove may have close relation with a person, family, or certain character specific to the locality. For instance, a place where Karimanal Nair family established a deity became Karimanal Chamundikkavu. In

some cases, sacred groves received the name from families owning them (eg. Chendanghotu Tharavadu Kavu). Names of certain sacred groves are derived from the geographic features (Valamchuzhi Kshethrakavu) or associated vegetation (Vallikkattu Kavu).

4.5. Rituals, festivals and culture

In most of the sacred groves, particularly those in northern Kerala, the 'Kaliyattam' - a performing art, is staged every year during May to November in the natural environment of the groves. Kaliyattam is performed generally in the front yard of the temple, and thus surrounding vegetation is not disturbed. Different forms of 'theyyam' are involved in Kaliyattam. They include Bhagavathi, Chamundi, Kali, Vanadevatha, Nagarajan, Nagakanya, legendary personalities (eg. Illathamma in Kammadam Kavu), famous forefathers, ancient heroes, etc. There is a belief among the devotees that the performance of theyyam in the form of Vishnumoorthi and Bhagavathi will protect them from epidemic diseases and natural calamities. The theyyam Kalichan is believed to increase the animal wealth in the village while the performance of Aadivedan is said bring prosperity to the village as a whole. During performance, the theyyam listens to common man's problems and suggests suitable remedies. Obtaining holy blessings from the theyyam is the most valuable moment for the devotees. Thus, theyyam acts as counselor and advisor of the village.

Certain theyyams (eg. Kaikkolan theyyam in the Sree Deviot Kavu) are free to collect crops like banana, coconut, arecanut, pepper, etc. during festival period by going around the village from house to house. The collection is done by the helpers who accompany the theyyam during the performance. Farmers consider this as the reward they are giving to the deity for protecting their crops. This collection is referred to as 'ooradakkam', because collection is done throughout the village (ooru).

In the sacred groves, apart from Kaliyattam, several festivals are celebrated and rituals followed. During the Sankramana day of each month, the ritual, 'Kalasamvekkal' (offering sacred pots) is usual in most of the sacred groves. In Vetticode Kavu, Edayilekkadu Kavu and Irinjayam Sarpa Kavu where serpent is the major deity, 'Sarpabali' and 'Nagamootal' are important rituals. In the case of Kammadam Kavu, the temple complex is located about 1.5 km away from the sacred forest. Here, on the day previous to the festival, the priest goes to the sacred forest and offers a coconut to

the idol of Bhagavahti located under a tree so as to bring the 'goddess' to the temple and perform the poojas. In the early dawn of the festival day, the theyyam (Vishnumoorthi) goes alone to the forest and brings the coconut offered to the goddess and hands it over to the priest to perform rituals.

In almost all studied groves, pooram festival is celebrated annually during the months Vrischikam and Meenam. Another important festival in most of the sacred groves is 'Puthariyadintharam', being celebrated in the month of Thula. In this festival 'Avil' (pounded rice) made from the fresh harvest, and banana are distributed to the people as 'Prasadam'. In connection with the festival 'Marathukali', cultural activities and meeting of scholars, are organised to make the festival more attractive and popular. In majority of the sacred groves, special functions are arranged during festivals like 'Onam' and 'Vishu'.

4.6. Offerings

Devotees dedicate offerings for the fulfillment of their wish. Generally agricultural products are the major items of offerings; for instance, avil (pounded rice), malar (puffed rice), unakkalari (raw rice), tender coconut, coconut, banana, betel leaf, arecanut, flowers, gingelly oil, etc. For the blessings of serpents in the serpent groves, 'nooru' (a mixture of powders with turmeric and rice) and cow's milk are offered. In most of the sacred groves (eg., Sree Deviot Kavu), during the 'Sankramana' day of the month Kanni, farmers offer betel and arecanut and a bunch of freshly harvested paddy to the deity. This offering is to seek permission from the deity for harvesting the crop. Similarly, Niaraputharai festival is celebrated in these groves during the month of Tulam, the harvest season. Thus it is clear that in rural Kerala, sacred groves and agricultural systems are closely linked with each other.

Villagers pray to the deities of sacred groves for their health and family welfare. Even now young couples visit sacred groves (eg., Sree Deviot kavu and Kammadam Kavu) and pray deities to bless them with a healthy baby. Couples who have infertility problems, vow that they would call their child with god/goddess's name. This practice is common in Kammadam Kavu. Hence in northern Malabar, the name 'Kammadathi' is common among children. Thulabharam (offering certain items, mainly agricultural crops, fruits, vegetables etc., equal to body weight of the devotee) is another practice common in most of the sacred groves and is one of the major sources of income for sacred groves.

The practice of oath/vow taking is reported from sacred groves. For instance 'Penena' is one such practice in Karimanal Chamundikkavu, where the devotee confesses his guilt in front of the deity. The guilty will be taken to the grove and manjalkuri (a paste of turmeric and other holy plants) is applied on his forehead. After he confesses, he will be allowed to take bath in the pond of the grove (penekundu). He remains unconscious for some time after the bath and when regains his consciousness he is believed to be free from the guilt.

4.7. Sacred grove and women

Women are allowed to the temples in all the sacred groves studied. In general, if the temple (palliyara) is situated inside the forested area, women are permitted to enter the forested area. On the other hand, if palliyara is located outside the forest area of the grove, women are allowed only to the palliyara and not to the forested area. However, in Sree Devi Kavay, only women of Mavilar community are allowed to go to the bank of the stream flowing from the forest. In Kammadam Kavay, women are allowed except, on Tuesday and Friday, to go inside the forest up to a certain distance. Even though some restrictions exist, there are examples to highlight women's participation in the traditional activities, conservation and day-to-day management of sacred groves. For example, in Sree Devi Kavay, women of the Poduval community have the privilege to receive the Eswaran theyyam before the theyyam is performed. The Thekkumbad Thazhe Kavay is the only place in Kerala where women perform theyyam. There are women organizations like 'Mathruvedi', 'Sthruvedi' and 'Mathru committee' in Karakkode Kavay, Mani Kavay, Valliyoor Kavay etc. These organizations contribute much to the festivals and programmes related to the groves.

The sacred groves and their associated biodiversity are conserved mainly due to the belief of the people besides traditional rules, regulations and restrictions. The belief systems, which regulate or discourage the collection of materials from the sacred groves, contribute to their conservation. In all the 28 sacred groves studied, collection of any materials including medicinal plants is prohibited. Removal of dead and fallen trees, for the use within the grove has been reported in some groves. However, before doing so it should be ascertained from local astrologers (Kanisha) that such biomass removal shall not invite the wrath of the deity. It may be pointed out here that, even though limited biomass harvest is permissible, devotees normally stop harvesting if they see snake or hear some peculiar noise in the sacred grove.

5. ECOLOGICAL DIMENSIONS

5.1. Adjoining landscape

Among the 28 sacred groves, a majority are surrounded by crop lands. Eight groves (Edayilekkadu Kavay, Kavasseri Kavay, Madai Kavay, Mani Kavay, Muchukunnu Kotta Kavay, Valliyoor Kavay, Poyil Kavay, and Vetticode Kavay) are surrounded by coconut plantations and homesteads dominated by coconut. On the other hand, four sacred groves (Ayyappan Kavay, Thrikunnathu Kavay, Sri Varikkarakkadavu Kavay and Vallikkattu Kavay) are surrounded by coconut plantations and paddy fields. However, in the southern side of Ayyappan Kavay, the Shokanasini puzha flows, whereas homegardens and rocky hills also form the adjoining landscape units in Sri Varikkarakkadavu Kavay and Vallikkattu Kavay. While the Karimanal Chamundikkavay is surrounded by rubber and coconut plantations on three sides and rocky area on the other side, the Mannady Pazhayakavay is surrounded by coconut and arecanut gardens, homesteads and shops, and a monument of Velu Thampi Dalava, built near the Mannady temple in the eastern boundary of the kavay. Chendangotu Kavay and Chukkath Kavay are surrounded by homesteads dominated by cassava, rubber, coconut and vegetables. Three sides of Sree Deviot Kavay and Karakkode Kavay are covered by arecanut plantation and paddy fields and on the fourth side rubber plantations. Four groves namely, Irinjayam Sarpa Kavay, Kammadam Kavay, Pazhangala Kavay and Valiaveetil Kavay are surrounded by rubber estates on three sides and paddy fields on the other side. Iringole Kavay, Kalloor Kavay and Manimala Kavay are surrounded by landuses such as residences, paddy fields, homesteads and plantations of rubber and coconut. On the other hand, coffee and rubber plantations and highly degraded secondary forests, infested with exotic weeds, are the adjoining landscape units of Aruvikkal Kavay. Valamchuzhi Kavay is surrounded by Achenkovil River and the special feature of this kavay is that the river flows in a semicircular course around the Temple from west to east (valamchuli). On the other hand, the Thekkumbad Thazhe Kavay is located in an island bordered by Valapattanam River in the south, Pazhayangadi River in the east and backwater of the Arabian Sea in the west.

5.2. Water resource

Many sacred groves hold water sources in the form of ponds, streams or wells. For instance, in ten sacred groves (Vetticode Kavay, Iringole Kavay, Irinjayam Sarpa Kavay, Edayilekkadu Kavay, Muchukunnu Kotta Kavay, Poyil Kavay, Valiaveetil Kshethrakavay,

Madai Kavay, Thekkumbad Thazhe Kavay and Kavassery Kavay) fresh water ponds were seen. In fact, in Vetticode Kavay there are two ponds and both remain full in all seasons. As per the legend, the places from where Lord Parasurama removed soil for constructing the temple transformed as sacred ponds. There is a belief that by taking a dip in these ponds one would become free from all sorts of skin troubles and other diseases. The pond in Muchukunnu Kotta Kavay was constructed around 600 years ago by Shri Chathukuttan Nair of Manguttal Tharavadu of Muchukunnu. Iringole Kavay is associated with two fresh water ponds and people residing adjacent to the grove, believe that these water bodies, to a certain extent, meet the water needs of agricultural fields. In case of Kavassery Kavay, the devotees and people residing adjacent to the grove are using the pond water for their needs. Being covered with good vegetation, Poyil Kavay is helping to recharge ground water and a natural pond located in the kavay is called as 'Thirikuzhi'. However, this pond, according to local people, has dried recently and is unable now to store water round the year. Similarly, the perennial pond in Madai Kavay considered sacred and known as Vadakunda Parel is also almost dry now. The pond located inside the Thekkumbad Thazhe Kavay was the only source of fresh water near to the temple. However, due to silt accumulation and inflow of brackish water, the pond water cannot be used for temple rituals. The Kavay Committee of Edayilekkadu Kavay has dug a pond for the storage of water. However, due to silt accumulation and seepage the pond is unable to store enough water. The present status of the ponds of Irinjayam Sarpa Kavay and Valiaveetil Kshethrakavay is poor as they are heavily polluted with solid wastes.

Eight sacred groves (Kammadam Kavay, Sree Deviot Kavay, Sree Varikkarakkadavu Kavay, Aruvikkal Kavay, Vallikkattu Kavay, Karimanal Chamundikkavay, Thrikunnath Kavay, Mani Kavay) are associated with streams and among them two sacred groves (Kammadam Kavay, Sree Deviot Kavay) are watersheds of rivulets. These supply water to the down- stream paddy fields. On either side of these streams, profuse growth of species characteristic to a *Myristica* swamp and several rare and endangered ferns can be seen. A perennial stream that originates from the forested area of Vallikkattu Kavay drains into a holy pond (Theerthakkulam) located in front of the temple and then flows to agricultural lands bordering the sacred grove. Similarly, a perennial rivulet, Aruvikkal thodu, that originates from Aruvikkal Kavay is the source of water for downstream agricultural fields. A spring originates from Mani kavay - which falls

throughout the year on an idol of Lord Shiva, installed in the down-stream area and then flows to crop lands.

In three sacred groves (Valliyoor Kavu, Ayyappan Kavu and Chukkath Kavu) wells are present. In Vallilloor Kavu there are two wells and both are located in the non-forested land of the grove. On the other hand, the open well is the source of water in Ayyappan Kavu and Chukkath Kavu. Thus it is evident that one of the important ecological roles of sacred groves is to provide a more dependable source of water for organisms living in and around the sacred groves. When Manimala Kavu, Karakkode Kavu, Chendangotu Kavu and Ayyappan Kavu are situated on the bank of a river or rivulet, Valamchuzhi kavu is surrounded by Achenkovil River. In these cases, sacred groves may be playing an important role for recharging the rivulets and rivers.

5.3. Vegetation types of sacred groves

Mainly four major forest types, namely evergreen, semi-evergreen, moist deciduous and mangrove forests are seen among twenty eight sacred groves. While the forests of Kammadam Kavu and Sree Deviottu Kavu represent highland evergreen type associated with *Myristica* swamps, those of Poyil Kavu, Vallikkattu Kavu and Iringole Kavu represent lowland evergreen type. In 10 out of 28 sacred groves (Karimanal Chamundikkavu, Aruvikkal Kavu, Irinjayam Sarpa Kavu, Edayilekkadu Kavu, Thekkumbad Thazhe Kavu, Valiaveetil Kshethrakavu, Muchukunnu Kotta Kavu, Mani Kavu and Valliyoor Kavu) the forests are of semi-evergreen type. Except Karimanal Chamundikkavu which is a highland semi-evergreen forest, the remaining nine groves represent lowland semi-evergreen forests. In Thekkumbad Thazhe Kavu, both mangrove and semi-evergreen vegetation can be seen. While the forests of Valiaveetil Kshethrakavu and Pazhangala Kavu are partly degraded, those of Karimanal Chamundikkavu, Muchukunnu Kotta Kavu, Mani Kavu and Valliyoor Kavu are highly degraded.

The vegetation in Vetticode Kavu, Valamchuzhi Kshethrakavu, Thrikunnath Kavu, Madai Kavu, Sree Varikkarakkadavu Kavu, Kalloor Appankavu, Manimala Kavu, Karakkode Kavu, Ayyappan Kavu, Kavassery Kavu, Mannady Pazhayakavu, Chendangotu Kavu and Chukkath Kavu is dominated by tree species characteristic to the moist deciduous forest type. In majority of these sacred groves the understorey

vegetation is dominated by light demanding native or exotic weeds and climbers. Regeneration of tree species is also found to be poor.

5.4. Floristic composition

Floristic inventory was done in all 28 sacred groves. Each grove was visited two to three times during June-December 2010. Plants were identified with the help of floras (Gamble, 1928; Sivarajan and Mathew, 1996; Sisidharan, 2004). The status of rare, endemic, endangered or threatened species was checked with IUCN (1990) and Sasidharan (2004). A total of 670 angiosperm species belonging to 120 families were recorded (Appendix 1). These 670 species included 34 climbers, 157 herbs, 159 shrubs and 320 trees. The family having the maximum number of species (49) was Rubiaceae followed by Euphorbiaceae (38 species), Orchidaceae (24 species), Moraceae (22 species), Acanthaceae (21 species) and Fabaceae (21 species) (Table 3). Forty four families were represented each by single species.

Table 3. Number of species identified from different families in the sacred groves of Kerala.

Sl. No.	Family	No. of species	Sl. No.	Family	No. of species
1.	Rubiaceae	49	26.	Mimosaceae	9
2.	Euphorbiaceae	38	27.	Piperaceae	9
3.	Orchidaceae	24	28.	Vitaceae	9
4.	Moraceae	22	29.	Commelinaceae	8
5.	Acanthaceae	21	30.	Flacourtiaceae	8
6.	Fabaceae	21	31.	Lamiaceae	8
7.	Apocyanaceae	19	32.	Sterculiaceae	8
8.	Lauraceae	17	33.	Loganiaceae	7
9.	Caesalpinaceae	16	34.	Asclepiadaceae	6
10.	Rutaceae	16	35.	Celastraceae	6
11.	Myrtaceae	14	36.	Clusiaceae	6
12.	Verbanaceae	14	37.	Combretaceae	6
13.	Zingiberaceae	13	38.	Ebenaceae	6
14.	Anacardiaceae	12	39.	Menispermaceae	6
15.	Araceae	12	40.	Scrophulariaceae	6
16.	Convolvulaceae	12	41.	Tiliaceae	6
17.	Meliaceae	12	42.	Myristicaceae	5
18.	Poaceae	12	43.	Myrsinaceae	5
19.	Asteraceae	11	44.	Sapotaceae	5
20.	Arecaceae	10	45.	Urticaceae	5
21.	Malvaceae	10	46.	Dipterocarpaceae	4
22.	Olacaceae	10	47.	Liliaceae	4
23.	Sapindaceae	10	48.	Solanaceae	4
24.	Annonaceae	9	49.	Amaranthaceae	3
25.	Melastomataceae	9	50.	Connaraceae	3

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Table 3 (cont'd). Number of species identified from different families in the sacred groves of Kerala.

Sl. No.	Family	No. of species	Sl. No.	Family	No. of species
51.	Icacinaceae	3	86.	Boraginaceae	1
52.	Leeaceae	3	87.	Burseraceae	1
53.	Lythraceae	3	88.	Buxaceae	1
54.	Rhamnaceae	3	89.	Caricaceae	1
55.	Santalaceae	3	90.	Cochlospermaceae	1
56.	Ulmaceae	3	91.	Cornaceae	1
57.	Xanthophyllaceae	3	92.	Datisceae	1
58.	Alangiaceae	2	93.	Dichapetalaceae	1
59.	Araliaceae	2	94.	Dilleniaceae	1
60.	Balsaminaceae	2	95.	Dracaenaceae	1
61.	Bombacaceae	2	96.	Elaeagnaceae	1
62.	Capparaceae	2	97.	Erythroxylaceae	1
63.	Cucurbitaceae	2	98.	Flagellariaceae	1
64.	Cyperaceae	2	99.	Gesneriaceae	1
65.	Dioscoreaceae	2	100.	Hippocrateaceae	1
66.	Elaeocarpaceae	2	101.	Hypericaceae	1
67.	Eriocaulaceae	2	102.	Lecythidaceae	1
68.	Gnetaceae	2	103.	Lentibulariaceae	1
69.	Hypoxidaceae	2	104.	Magnoliaceae	1
70.	Lemnaceae	2	105.	Malpighiaceae	1
71.	Loranthaceae	2	106.	Moringaceae	1
72.	Oxalidaceae	2	107.	Musaceae	1
73.	Pandanaceae	2	108.	Nyctaginaceae	1
74.	Periplocaceae	2	109.	Nymphaeaceae	1
75.	Ranunculaceae	2	110.	Ochnaceae	1
76.	Rosaceae	2	111.	Onagraceae	1
77.	Simaroubaceae	2	112.	Opiliaceae	1
78.	Smilacaceae	2	113.	Passifloraceae	1
79.	Aloeaceae	1	114.	Rhizophoraceae	1
80.	Amaryllidaceae	1	115.	Sabiaceae	1
81.	Ancistrocladaceae	1	116.	Salvodoraceae	1
82.	Apiaceae	1	117.	Staphylaceae	1
83.	Aristolochiaceae	1	118.	Symplocaceae	1
84.	Begoniaceae	1	119.	Taccaceae	1
85.	Blechnaceae	1	120.	Violaceae	1

About 20% (133 species) of the total number of species recorded from the sacred groves were found to be endemic (Appendix 1). While 76 species were endemic to the southern Western Ghats, 37 were endemic to the Western Ghats and the remaining 21 were endemic to the peninsular India. Among species endemic to the Southern Western Ghats, *Ampelocissus indica* (Vitaceae), *Beilschmiedia wightii* (Lauraceae), *Vepris bilocularis* (Rutaceae) fell under rare category, *Anaphyllum wightii* (Araceae) and *Calamus brandisii* (Arecaceae) under threatened category and *Capparis*

shevaroyensis (Capparaceae), *Euonymus angulatus* (Celastraceae), *Holigarna beddomei* (Anacardiaceae) and *Pterospermum reticulatum* (Sterculiaceae) under vulnerable species category of IUCN. Similarly, among the species endemic to the Western Ghats *Holigarna grahamii* (Anacardiaceae) is rare while *Arenga wightii* (Arecaceae), *Belasynapsis vivipara* (Commelinaceae) and *Myristica malabarica* (Myristicaceae) are categorised as vulnerable.

Out of 120 families recorded 45 families have at least one endemic species (Table 4). Available publications (Nayar, 1997; Sasidharan, 2004; Irwin and Narasimhan, 2011) indicated that Rubiaceae, Acanthaceae, Balsaminaceae, Asclepiadaceae, Lamiaceae, Poaceae and Orchidaceae are the families rich in endemism in peninsular India. In the present study, Acanthaceae, Lauraceae, Rubiaceae and Orchidaceae were rich in endemic species (Table 4).

Table 4. Number of endemic species identified from different families

Sl. No.	Family	No. of endemic species	Sl. No.	Family	No. of endemic species
1.	Acanthaceae	12	24.	Meliaceae	2
2.	Lauraceae	11	25.	Myristicaceae	2
3.	Rubiaceae	10	26.	Piperaceae	2
4.	Orchidaceae	9	27.	Rutaceae	2
5.	Melastomataceae	6	28.	Apocynaceae	1
6.	Euphorbiaceae	6	29.	Araliaceae	1
7.	Anacardiaceae	5	30.	Asclpiadaceae	1
8.	Zingiberaceae	5	31.	Balsaminaceae	1
9.	Annonaceae	4	32.	Bombacaceae	1
10.	Arecaceae	4	33.	Capparaceae	1
11.	Oleaceae	4	34.	Connaraceae	1
12.	Araceae	3	35.	Flacourtiaceae	1
13.	Caesalpiniaceae	3	36.	Gesneriaceae	1
14.	Celastraceae	3	37.	Loranthaceae	1
15.	Dipterocarpaceae	3	38.	Olacaceae	1
16.	Ebenaceae	3	39.	Poaceae	1
17.	Moraceae	3	40.	Santalaceae	1
18.	Myrtaceae	3	41.	Sapotaceae	1
19.	Clusiaceae	2	42.	Sterculiaceae	1
20.	Commelianaceae	2	43.	Tiliaceae	1
21.	Fabaceae	2	44.	Verbenaceae	1
22.	Lamiaceae	2	45.	Vitaceae	1
23.	Lythraceae	2			

Total number of angiosperm species recorded in a sacred grove was least (21 species) in Chukkath Kavu and highest (185 species) in Iringole Kavu (Table 5). The mean

number of species per sacred grove was 81 with number of species in ten out of 28 sacred groves were more than the average.

Table 5. Number of species recorded from different sacred groves of Kerala

Sacred grove and acronym	Number of species				
	Herbs	Shrubs	Climbers	Trees	Total
Edayilekkadu Kavu (KS1)	14	38	12	71	135
Kammadam Kavu (KS2)	24	36	11	73	144
Sree Deviote Kavu (KN1)	31	36	14	71	152
Karimanal Chamundikkavu (KN2)	32	34	5	63	134
Madai Kavu (KN3)	24	17	6	43	90
Thekkumbad Thazhe Kavu (KN4)	5	6	3	12	26
Sree Varikkarakkadavu Kavu (KN5)	8	17	5	30	60
Mani Kavu (WA1)	5	9	6	42	62
Valliyoore Kavu (WA2)	15	24	8	73	120
Muchukunnu Kotta Kavu (KZ1)	12	5	2	44	63
Poyil Kavu (KZ2)	29	17	5	39	90
Vallikkattu Kavu (KZ3)	33	34	14	86	167
Karakkode Kavu (MA1)	11	8	1	25	45
Ayyappan Kavu (PL1)	11	6	2	20	39
Kavassery Kavu (PL2)	6	11	7	46	70
Chendangotu Kavu (TS1)	11	2	09	9	22
Chukkath Kavu (TS2)	6	3	1	11	21
Aruvikkal Kavu (ER1)	23	17	3	72	115
Iringole Kavu (ER2)	58	44	10	73	185
Vetticode Kavu (AL1)	5	8	1	38	52
Kalloor Appankavu (KT1)	7	8	5	20	40
Manimala Kavu (KT2)	12	10	2	34	58
Mannady Pazhayakavu (PT1)	13	14	3	27	57
Valamchuzhi Kshethrakavu (PT2)	12	14	4	25	55
Valiaveetil Kshethrakavu (KL1)	6	8	5	39	58
Pazhangala Kavu (KL2)	18	6	2	48	74
Irinjayam Sarpa Kavu (TV1)	14	15	4	40	73
Thrikunnath Kavu (TV2)	18	9	2	21	50

Plant species richness increased consistently with area under vegetation in the sacred grove ($R= 0.5781$; $P=0.01$). A positive species-area relationship indicated that species richness is a function of area of sacred grove, highlighting the importance of area under vegetation as one of the most important determinant of species richness in fragmented habitats like sacred groves. However, the total number of species occurring in a sacred grove does not reflect the quality of the forested area. For instance, in majority of sacred groves light demanding evergreen species were common (Table 6). However, quantitative studies are required to assess the contribution of primary and successional species to vegetation structure and

composition, regeneration patterns of successional species and in turn the dynamics of sacred grove.

Table 6. Some light demanding plants occurring in 14 or more than 14 sacred groves of Kerala

Species	Number of Sacred groves of occurrence
<i>Macaranga peltata</i>	20
<i>Alstonia scholaris</i>	18
<i>Elephantopus scaber</i>	17
<i>Mallotus philippensis</i>	17
<i>Strychnos nux-vomica</i>	17
<i>Anamirta cocculus</i>	16
<i>Antiaris toxicaria</i>	16
<i>Cinnamomum malabatum</i>	16
<i>Holigarna arnottiana</i>	16
<i>Abrus precatorius</i>	15
<i>Aporosa lindleyana</i>	15
<i>Artocarpus hirsutus</i>	15
<i>Leea indica</i>	15
<i>Curculigo orchioides</i>	14
<i>Briedelia scandens</i>	14
<i>Adenanthera pavonina</i>	14
<i>Grewia tiliifolia</i>	14
<i>Calycopteris floribunda</i>	14
<i>Zizyphus rugosa</i>	14

5.5. Butterflies in sacred groves

Butterflies constitute one of the common fauna of all habitat types, and because they are responsive to change, their diversity and abundance can reflect ecological trends in other segments of biodiversity (Furness and Greenwood, 1993). The butterfly diversity was studied by visiting the sacred groves two or three times during June-December 2010. The species were identified on the basis of field characters (Evans, 1932; Wynter-Blyth, 1982; Gaonkar, 1996). The entire area of the sacred grove was sampled by walking at a constant pace for about one to three hours in the morning. Inventory of butterflies in 27 sacred groves recorded a total of 154 species belonging to four families (Appendix 2). The family having the maximum number of species (58 species) was Nymphalidae followed by Papilionidae (36 species), Lycaenidae (35 species) and Hesperidae (27 species).

Out of 154 species, 54 species were found in 14 or more than 14 sacred groves (Table 7). Among them *Euploea core* was the most common species, with its occurrence

noticed in 24 groves. Five species, namely *Idea malabarica*, *Pachliopta pandiyana*, *Sarangesa purendra pandra*, *Troides minos* and *Zipoetis satis*, are the endemic to the Western Ghats. Among these *Troides minos* was recorded from a number of groves (22) than any other, followed by *Idea malabarica* (15 groves) (Appendix 2).

Table 7. List of butterflies recorded in 14 or more than 14 sacred groves of Kerala

Sl. No.	Species	Common Name	Number of sacred groves of occurrence
Family: Hesperidae			
1.	<i>Ampittia discorides</i>	Bush Hopper	17
2.	<i>Lambrix salsula</i>	Chestnut Bob	17
3.	<i>Borbo cinnara</i>	Rice Swift	15
4.	<i>Celaenorrhinus leucocera</i>	Common Spotted Flat	14
Family: Lycaenidae			
5.	<i>Jamides celeno aelianus</i>	Common Caerulean	18
6.	<i>Castalius rosimon</i>	Common Pierrot	17
7.	<i>Rathinda amor</i>	Monkey Puzzle	17
8.	<i>Caleta caleta desidia</i>	Angled Pierrot	16
9.	<i>Spindasis vulcanus</i>	Common Silver Line	14
Family: Nymphalidae			
10.	<i>Euploea core</i>	Common Crow	24
11.	<i>Melanitis leda leda</i>	Common Evening Brown	23
12.	<i>Acraea Violae</i>	Tawny Coster	22
13.	<i>Hypolimnas bolina</i>	Great Eggfly	22
14.	<i>Neptis hylas varmona</i>	Common Sailer	22
15.	<i>Cirrochora thais</i>	Tamil yeoman	21
16.	<i>Junonia atlites</i>	Gray Pansy	19
17.	<i>Phalanta phalantha</i>	Leopard Butterfly	19
18.	<i>Cupha erymanthis</i>	Rustic	18
19.	<i>Junonia lemonias</i>	Lemon Pansy	18
20.	<i>Mycalesis perseus typhlus</i>	Common Bush Brown	17
21.	<i>Tanaecia lepidea miyana</i>	Grey Count	17
22.	<i>Ypthima baldus</i>	Common Five Ring	17
23.	<i>Ariadne ariadne indica</i>	Indian Angled Castor	16
24.	<i>Danaus chrysippus</i>	Plain Tiger	16
25.	<i>Danaus genutia</i>	Common tiger	16
26.	<i>Junonia almana</i>	Peacock Pansy	16
27.	<i>Limenitis procris undifragus</i>	Commander	16
28.	<i>Tirumala limniace exoticus</i>	Blue Tiger	16
29.	<i>Euthalia aconthea meridionalis</i>	Baron	15
30.	<i>Idea malabarica</i>	Malabar Tree Nymph	15
31.	<i>Neptis jumbah</i>	Chestnut Streaked Sailer	15
32.	<i>Tirumala septentrionis</i>	Dark Blue Tiger	15
33.	<i>Ypthima huhebnri</i>	Common Four Ring	15
34.	<i>Orsotrioena medus mandata</i>	Nigger	14
35.	<i>Polyura athamas</i>	Common Nawab	14

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Table 7 (cont'd). List of Butterflies recorded in 14 or more than 14 sacred groves of Kerala.

Sl. No.	Species	Common Name	Number of sacred groves of occurrence
Family: Papilionidae			
36.	<i>Troides minos</i>	Southern Birdwing	22
37.	<i>Delias eucharis</i>	Common Jezebel	23
38.	<i>Pachliopta aristolochiae</i>	Common Rose	23
39.	<i>Pachliopta hector</i>	Crimson Rose	23
40.	<i>Papilio demoleus</i>	Lime butterfly	23
41.	<i>Graphium sarpedon terebon</i>	Common Blue bottle	22
42.	<i>Papilio polymnestor</i>	Blue Mormon	21
43.	<i>Leptosia nina</i>	Psyche	20
44.	<i>Papilio polytes</i>	Common Mormon	20
45.	<i>Anapheis aurota</i>	Caper White	19
46.	<i>Eurema hecabe simulata</i>	Common Grass Yellow	19
47.	<i>Papilio liomedon</i>	Malabar Banded Swallowtail	18
48.	<i>Catopsilia pomona</i>	Lemon Emigrant	17
49.	<i>Graphium agamemnon menides</i>	Tailed Jay	17
50.	<i>Hebomoia glaucippe australis</i>	Giant Orange Tip	17
51.	<i>Papilio paris tamilana</i>	Paris Peacock	16
52.	<i>Graphium doson</i>	Common Jay	15
53.	<i>Catopsilia pyranthe</i>	Mottled Emigrant	14
54.	<i>Parenonia valeria</i>	Common Wanderer	14

Total number of butterfly species recorded in a sacred grove was lowest (34 species) in Chukkath Kavau and highest in Vallikkattu Kavau (Table 8). The mean number of butterfly species per grove was 66 and in 10 out of 27 groves, the number of species was more than the average. In 21 groves one or more than one endemic species were observed.

The sacred groves with no endemic species recorded during the study period include Thekkumbad Thazhe Kavau, Kallloor Appankavau, Ayyappan Kavau, Kavassery Kavau, Chendangotu Kavau, Chukkath Kavau. No significant correlation between the number of butterfly species and area under vegetation in the sacred grove was noticed ($R=0.4354$; $P>0.05$).

Table 8. Number of butterfly species and endemic butterflies recorded from the sacred groves of Kerala

Sacred grove and acronym	Total number of butterfly species	Number and species of endemic butterflies	
Edayilekkadu Kavu (KS1)	109	3	<i>Idea malabarica</i> , <i>Troides minos</i> , <i>Zipoetis satis</i>
Kammadam Kavu (KS2)	77	3	<i>Idea malabarica</i> , <i>Troides minos</i> <i>Sarangesa purendra pandra</i>
Sree Deviott Kavu (KN1)	80	4	<i>Idea malabarica</i> , <i>Troides minos</i> , <i>Zipoetis satis</i> , <i>Sarangesa purendra pandra</i>
Karimanal Chamundikkavu (KN2)	63	1	<i>Idea malabarica</i>
Madai Kavv (KN3)	58	0	
Thekkumbad Thazhe Kavv (KN4)	62	1	<i>Troides minos</i>
Sree Varikkarakkadavu Kavv (KN5)	39	0	
Mani Kavv (WA1)	63	1	<i>Idea malabarica</i>
Valliyoor Kavv (WA2)	97	4	<i>Idea malabarica</i> , <i>Pachliopta pandiyana</i> , <i>Zipoetis satis</i> , <i>Sarangesa purendra pandra</i>
Muchukunnu Kotta Kavv (KZ1)	101	4	<i>Pachliopta pandiyana</i> , <i>Troides minos</i> , <i>Zipoetis satis</i> <i>Sarangesa purendra pandra</i>
Poyil Kavv (KZ2)	122	4	<i>Pachliopta pandiyana</i> , <i>Troides minos</i> , <i>Zipoetis satis</i> <i>Sarangesa purendra pandra</i>
Vallikkattu Kavv (KZ3)	47	1	<i>Idea malabarica</i>
Karakkode Kavv (MA1)	43	0	
Ayyappan Kavv (PL1)	43	0	
Kavassery Kavv (PL2)	50	1	<i>Troides minos</i>
Chendangotu Kavv (TS1)	34	0	
Chukkath Kavv (TS2)	39	1	<i>Troides minos</i>
Aruvikkal Kavv (ER1)	78	4	<i>Idea malabarica</i> , <i>Pachliopta pandiyana</i> , <i>Troides minos</i> , <i>Sarangesa purendra pandra</i> ,
Iringole Kavv (ER2)	95	3	<i>Sarangesa purendra pandra</i> , <i>Troides minos</i> , <i>Zipoetis satis</i>
Kalloor Appankavu (KT1)	46	1	<i>Troides minos</i>
Manimala Kavv (KT2)	51	1	<i>Troides minos</i>
Mannady Pazhayakavu (PT1)	51	3	<i>Idea malabarica</i> , <i>Troides minos</i> , <i>Sarangesa purendra pandra</i>
Valamchuzhi Kshethrakavu (PT2)	39	0	
Valiaveetil Kshethrakavu (KL1)	53	2	<i>Idea malabarica</i> , <i>Zipoetis satis</i>
Pazhangala Kavv (KL2)	108	3	<i>Idea malabarica</i> , <i>Troides minos</i> , <i>Sarangesa purendra pandra</i>
Irinjayam Sarpa Kavv (TV1)	36	1	<i>Troides minos</i>
Thrikunnath Kavv (TV2)	108	3	<i>Idea malabarica</i> , <i>Troides minos</i> <i>Sarangesa purendra pandra</i>

5.6. Birds in sacred groves

In terms of indicator organisms for biodiversity studies, birds are also an excellent choice. They are common to all habitats and generally easy to observe. Many species, both common and rare, can be easily and reliably identified in the field. Thus bird diversity was also studied by visiting the sacred groves two or three times during June-December 2010. During each visit, the entire area of the sacred grove was sampled by walking at a constant pace for about one to three hours in the morning. The encountered birds were identified as per Ali and Ripley (1983), while nomenclature was based on Inskipp *et al.* (1996).

A total of 122 species, with 8 endemic species, were recorded from 27 groves (Appendix 3). Of the 122 species, 34 were found in 14 or more than 14 groves (Table 9), the Common Myna being the most common species, noticed in 25 groves.

Table 9. List of birds recorded in 14 or more than 14 sacred groves of Kerala. (N= 27 sacred groves).

Sl. No.	Scientific name	Common Name	No. of groves of occurrence
1.	<i>Acridotheres tristis</i>	Common Myna	25
2.	<i>Orthotomus sutorius</i>	Common Tailorbird	24
3.	<i>Oriolus oriolus</i>	Eurasian Golden Oriole	23
4.	<i>Bubulcus ibis</i>	Cattle Egret	22
5.	<i>Copsychus saularis</i>	Oriental Magpie Robin	22
6.	<i>Dicrurus paradiseus</i>	Racket-tailed drongo	22
7.	<i>Haliastur indus</i>	Brahmini Kite	22
8.	<i>Phalacrocorax niger</i>	Little Cormorant	22
9.	<i>Pycnonotus cafer</i>	Red-vented Bulbul	22
10.	<i>Dendrocopos mahrattensis</i>	Yellow -Fronted Pied Woodpecker	20
11.	<i>Dinopium benghalense</i>	Black-rumped woodpecker	20
12.	<i>Cuculus micropternus</i>	Indian cuckoo	19
13.	<i>Lonchura kelaarti</i>	Black -Throated Munia	19
14.	<i>Lonchura mlacca</i>	Black-headed Munia	19
15.	<i>Terpsiphone paradisi</i>	Asian Paradise Flycatcher	19
16.	<i>Corvus splendens</i>	House Crow	18
17.	<i>Dinopium benghalense</i>	Lesser Golden-backed Woodpecker	18
18.	<i>Hemicircus canente</i>	Heart spotted woodpecker	18
19.	<i>Myiophonus horsfieldii</i>	Malabar Whistling Thrush	18
20.	<i>Nectarinia asiatica</i>	Purple Sunbird	18
21.	<i>Alcedo atthis</i>	Small Blue Kingfisher	17
22.	<i>Ardeola grayii</i>	Indian Pond Heron	17
23.	<i>Corvus macrorhynchos</i>	Jungle Crow	17
24.	<i>Cyornis tickelliae</i>	Tickell's Blue Flycatcher	17
25.	<i>Dendrocitta vagabunda</i>	Indian Treepie	16
26.	<i>Dicrurus macrocerus</i>	Black Drongo	16
27.	<i>Merops philippinus</i>	Blue-tailed Bee-eater	16

Table 9 (cont'd). List of birds recorded in 14 or more than 14 sacred groves of Kerala. (N= 27 sacred groves).

Sl. No.	Scientific name	Common Name	No. of groves of occurrence
28.	<i>Psittacula cyanocephala</i>	Plum-headed Parakeet	16
29.	<i>Acridotheres fuscus</i>	Jungle Myna	15
30.	<i>Accipiter badius</i>	Shikra	14
31.	<i>Dendrocitta vagabunda</i>	Rufous treepie	14
32.	<i>Megalaima haemacephala</i>	Crimson breasted barbet	14
33.	<i>Merops leschenaultia</i>	Chestnut-headed Bee-eater	14
34.	<i>Turdoides striatus</i>	Jungle Babbler	14

Among endemic species (Table 10), the Malabar Grey hornbill was seen in 11 groves, while Nilgiri Wood Pigeon was found only in Kammadam Kavau and Valliyoor Kavau.

Table 10. Distribution of endemic birds in the sacred groves of Kerala

Sl. No	Species	Common name	Number and code number of sacred groves* of occurrence
1.	<i>Columba elphinstonii</i>	Nilgiri Wood Pigeon	2 KS2, WA2
2.	<i>Eumyias albicaudata</i>	Nilgiri Flycatcher	7 ER1, ER2, KS2, KZ3, KN1, KN5, WA1
3.	<i>Ficedula nigrorufa</i>	Black-and-Orange Flycatcher	8 ER1, KS2, KZ1, KZ2, KZ3, KN1, KN4, WA1
4.	<i>Garrulx delesserti</i>	Wynad Lughingthrush	6 KS2, KZ2, KZ3, KN1, WA1, WA2
5.	<i>Nectarinia minima</i>	Small Sunbird	10 ER2, KS1, KS2, KN1, KN2, MA1, PL2, TS1, WA1, WA2
6.	<i>Ocyrceros griseus</i>	Malabar Grey Hornbill	11 ER1, KS1, KS2, KZ2, KZ3, KN1, KN2, MA1, PL2, WA1, WA2
7.	<i>Psittacula columboides</i>	Blue-winged Parakeet	5 ER1, KS2, KZ3, KN1, N4
8.	<i>Pycnonotus priocephalus</i>	Grey-headed Bulbul	8 ER1, ER2, KS1, KS2, KZ3, KN1, KN4, WA1

* Names of sacred groves are as in Table 8.

Total number of bird species recorded in a sacred grove was lowest (17 species) in Chendangotu Kavau and highest in Sree Deviot Kavau (87 species) (Table 11). In 12 groves, the number of species recorded was more than the average number of species recorded (46 species). In 15 groves, one or more than one endemic birds were noticed. Kammadam Kavau and Sree Deviot Kavau were rich in endemic species by harbouring eight and seven endemic species respectively. No significant correlation between the number of bird species and area under vegetation in the sacred grove was noticed ((R= 0.4832; P>0.05).

Table 11. Total number of bird species and endemic birds recorded from the sacred groves of Kerala

Sacred Grove and acronym	Number of species	Number and names of endemic birds
Edayilekkadu KavU (KS1)	25	3 <i>Nectarinia minima</i> , <i>Ocyrceros griseus</i> , <i>Pycnonotus priocephalus</i>
Kammadam kavU (KS2)	85	8 <i>Columba elphinstonii</i> , <i>Garrulx delesserti</i> , <i>Eumyias albicaudata</i> , <i>Ocyrceros griseus</i> , <i>Ficedula nigrorufa</i> , <i>Nectarinia minima</i> , <i>Psittacula columboides</i> , <i>Pycnonotus priocephalus</i>
Sree Deviot KavU (KN1)	87	7 <i>Eumyias albicaudata</i> , <i>Ficedula nigrorufa</i> , <i>Garrulx delesserti</i> , <i>Nectarinia minima</i> , <i>Ocyrceros griseus</i> , <i>Psittacula columboides</i> , <i>Pycnonotus priocephalus</i>
Karimanal ChamundikkavU (KN2)	33	2 <i>Nectarinia minima</i> , <i>Ocyrceros griseus</i>
Madai KavU (KN3)	30	0
Thekkumbad Thazhe KavU (KN4)	28	3 <i>Ficedula nigrorufa</i> , <i>sittacula columboides</i> , <i>Pycnonotus priocephalus</i>
Sree VarikkarakkadavU KavU (KN5)	41	1 <i>Eumyias albicaudata</i>
Mani KavU (WA1)	59	6 <i>Eumyias albicaudata</i> , <i>Ficedula nigrorufa</i> , <i>Garrulx delesserti</i> , <i>Nectarinia minima</i> , <i>Ocyrceros griseus</i> , <i>Pycnonotus priocephalus</i>
ValliyoOr KavU (WA2)	73	4 <i>Columba elphinstonii</i> , <i>Garrulx delesserti</i> , <i>Nectarinia minima</i> , <i>Ocyrceros griseus</i>
Muchukunnu Kotta KavU (KZ1)	30	1 <i>Ficedula nigrorufa</i>
Poyil KavU (KZ2)	33	3 <i>Ficedula nigrorufa</i> , <i>Garrulx delesserti</i> , <i>Ocyrceros griseus</i>
Vallikkattu KavU (KZ3)	78	6 <i>Eumyias albicaudata</i> , <i>Ficedula nigrorufa</i> , <i>Garrulx delesserti</i> , <i>Ocyrceros griseus</i> , <i>Psittacula columboides</i> , <i>Pycnonotus priocephalus</i>
Karakkode KavU (MA1)	60	2 <i>Nectarinia minima</i> , <i>Ocyrceros griseus</i>
Ayyappan KavU (PL1)	19	0
Kavassery KavU (PL2)	63	2 <i>Nectarinia minima</i> , <i>Ocyrceros griseus</i>
Chendangotu KavU (TS1)	17	0
Chukkath KavU (TS2)	48	0
Aruvikkal KavU (ER1)	74	5 <i>Eumyias albicaudata</i> , <i>Ficedula nigrorufa</i> , <i>Ocyrceros griseus</i> , <i>Psittacula columboides</i> , <i>Pycnonotus priocephalus</i>
Iringole KavU (ER2)	55	3 <i>Eumyias albicaudata</i> , <i>Nectarinia minima</i> , <i>Pycnonotus priocephalus</i>
Kalloor AppankavU (KT1)	26	0
Manimala KavU (KT2)	31	0
Mannady PazhayakavU (PT1)	39	0
Valamchuzhi KshethrakavU (PT2)	44	0
Valiaveetil KshethrakavU (KL1)	34	0
Pazhangala KavU (KL2)	40	0
Irinjayam Sarpa KavU (TV1)	48	0
Thrikunnath KavU (TV2)	46	0

6. THREATS TO SACRED GROVES

The present study demonstrated the fact that due to faiths, taboos and beliefs, over years, the local people have developed a strong affinity towards the temple and the forest of sacred groves. The local people in general also believe that their livelihood, security and prosperity are complementary to the blessings of the deity of the kavu. Even then, this ancient and widespread institution is showing signs of weakening in terms of both cultural and biological integrity in many parts of the State. The nature and extent of threats and pressures are in general grove-specific. The nature of threats reported from 28 sacred groves (Table 12) are grouped under three heads namely - those that lead to a) loss of forest land, b) degradation of forest land, and c) abuse of forest land.

Table 12. Nature of threats reported from sacred groves of Kerala

Threats	Sacred groves and acronyms*	
Loss of forest land		
Encroachment of sacred grove area	3	ER1,KS2, KN1
Erosion of forest fringe	2	KN4, PL1
Degradation of forest land		
Damage to established seedlings due to trampling	18	ER1, ER2, KS1, KS2, KZ1,KN1, KN2, KN5, KL1, KL2, KT1, KT2, MA1, PL2, PT2, TV1, TV2,WA1
Illegal collection and removal of biomass	10	ER2, KS1, KS2, KZ1, KZ2, KZ3, KN4, PL2, WA1,WA2
Grazing	2	MA1, PT2
Deposition of solid wastes that are floating in the river	1	KN4
Premature fall of trees	1	ER2
Poaching wild animals	1	KS2
Abuse of forest land		
Dumping solid wastes	16	ER2, KS1, KN2, KN3, KN5, KZ1,KL1, KL2, KT1, KT2, PL1, PL2, PT2, TV1, TV2, WA1
Illegal activities by anti social elements	3	ER2, KZ2,PL2
Increase in tourism activities	1	ER2

* Names of sacred groves are as in Table 11.

6.1. Loss of forest land of sacred groves

The loss of forest area of sacred groves can be due to encroachment or due to erosion of the fringe area of the forest. For instance, it is reported that the border area of the groves of Aruvikkal Kavu, Kammadam Kavu and Sree Deviot Kavu has been encroached by some farmers and has been transformed into some other land use systems. Lack of clear-cut boundary demarcation and a strong institutional setup to protect the sacred grove lands have responsible for the destruction of integrity of these sacred groves.

Thekkumbad Thazhe Kavu and Ayyappan Kavu are located on the river banks. Sparse vegetation and instability of the forest edge are leading to river bank erosion and in turn the loss of area under forest.

6.2. Degradation of forest land of sacred groves

Six major factors are identified for the degradation of forest lands of sacred groves (Table 12). Among them, damage by trespassing and trampling of understorey vegetation, particularly to the tree seedling population, followed by illegal biomass harvest are the major factors. In 18 out of 28 groves, wandering of people inside the forested land was found common. The severity of damage both to the seedling and saplings was found to be more during festival seasons as a large number of people walked inside the forest. The damage to seedlings led to poor regeneration of forest species and invasion of exotic weeds and light tolerant understorey plants.

There is a general belief that biomass should not be harvested from sacred groves. However, it is reported from ten sacred groves that the practice of illegal collection and removal of fire wood and small timbers was in vogue (Table 12). Even though, the quantity and frequency of biomass removal were relatively less, such activities need to be stopped for allowing the disturbed forest to undergo progressive succession. In the case of Thekkumbad Thazhe Kavu, illegal collection of pneumatophores for making bottle stoppers was reported. This sacred grove is located in an island having Valapattanam river on one side and Pazhayangadi River and backwaters of the Arabian sea on the remaining sides. The solid wastes that are floating in these water bodies come and settle in the mangrove area of the Grove and obstruct the establishment and growth of the seedlings of mangrove species.

In the southern part of Iringole Kavu, about 6-8 years back a large number of trees have fallen down leading to opening of the canopy and invasion of light demanding exotic weeds. This was mainly due to the loss of wind break adjacent to the grove. Earlier, lands adjacent to the southern part of the grove were occupied by mixed species farms and coconut farms. However, over the years many of these farms have been transformed into rubber plantations. In this process of land use change, the windbreak has been lost which led to natural tree fall inside the grove.

6.3. Abuse of forest land

In 16 out of 28 sacred groves (Table 12), one can see a large quantity of solid waste materials such as plastic bottles, carry bags, wrappers of food/ confectionary items, kitchen wastes and old cloths. The source of these solid wastes is primarily the shops and houses located around the grove. The visitors also discard the plastic materials such as water bottles, wrappers of food and confectionary items, carry bags etc. in the grove. Dumping of solid wastes, if not controlled, not only affects the serenity of the grove but also the ecological functions of the system.

Local people reported that often activities by antisocial elements can be seen in certain parts of the groves such as Iringole Kavu, Poyil Kavu and Kavassery Kavu. People also feel that they are unable to control or stop such activities because of the fear of confrontation or fight.

A considerable increase in number of visitors to Iringole Kavu was seen in recent years. A large number of visitors, instead of considering their visits as an eco-pilgrimage regarded it as pleasure trips. As a result, they did not give much importance to the sanctity of the grove and integrity of the forest ecosystem.

7. MANAGEMENT OPTIONS

Despite all the threats described above, the local people are maintaining the groves as a part of their culture. During the stakeholder meetings, the stakeholders opined that their sacred grove should remain as a community-conserved conservation area containing the rich biodiversity, ecological, traditional, cultural and social importance. They also viewed that their sacred grove should be a model grove for effective conservation of biological and cultural diversity through participation of all stakeholders to overcome all the existing threats and weaknesses. In this context,

grove-specific management options need to be identified and the objectives of such management activities should be to: a) ensure that all activities which adversely affect the conservation and management of forest vegetation of the sacred grove are effectively curtailed, and b) enhance the biodiversity and the ecological and cultural values of the grove. Considering these aspects, certain management options; both grove-specific or common, have been proposed, as discussed below.

7.1. Awareness creation activities

Regardless of whether the responsibility of management of sacred grove is rested with one or a few families or is fully assigned to a statutory agency for temple and sacred grove management, it is a fact that many stakeholders have an interest and role to play for ensuring effective management of such systems. To ensure the positive attitude of all stakeholder groups for sustainable management and conservation of sacred groves and also to uphold and sustain the cultural, biological and ecological values of sacred groves and transfer it to the coming generations, the awareness creation programmes need to be targeted at all stakeholder groups. Therefore, the main management option, applicable to all sacred groves, is organising awareness creation programme for different sections of people. The aim of each programme should be to disseminate information such as ecological, cultural, biological and social dimensions of groves and also ways and means by which different stakeholder groups can contribute for the conservation and management of groves. Apart from the scheduled awareness creation programmes, necessary support should be provided for the visits and camps by nearby colleges and schools to appreciate the multi-fold importance of sacred groves. During the management plan preparation meetings, the participants suggested the grove managers to constitute a sub-committee comprising teachers, representatives from youth clubs and NGOs to plan, co-ordinate and organize awareness campaigns.

It was also suggested, as part of awareness creation programme, to install display boards in each sacred grove. Cultural and ecological importance of sacred groves of Kerala in general and the given grove in particular, threats to groves, role and responsibilities of each stakeholder group in conserving and managing grove can be displayed in these boards. Similarly, some important plant species in the groves can be labelled to provide information such as local name, botanical name, family and conservation status. The expert committee constituted by the Biodiversity Cell

suggested that information that has to be displayed and dimension and quality of the display board should be decided by the Biodiversity Cell and communicated to the concerned officials of each grove. The grove managers should get display boards prepared and fixed in appropriate places, using the fund allocated for the purpose. It was also suggested that the Biodiversity Cell should take the help of local research and academic institutions to select the species to be labeled.

Another activity suggested was to prepare an information brochure on the kavu (containing information on location, extent, mythological and historical account, important species of plants and animals, ecological and socio-cultural importance, etc.). These brochures may be distributed free of cost to participants of the awareness programmes and sold at a nominal price to other visitors. This activity has been considered as an important activity for 23 groves.

7.2. Protective measures

During the stakeholder meetings organised in the sacred groves, the participants of many groves stressed the need of physical barriers to protect the sacred groves from encroachment, trespassing and forest degradation (Table 12). For instance, the participants of the meetings held at Edayilekkadu Kavu and Karakkode Kavu pointed out that the trespassing and soil erosion can be prevented only by constructing a mud wall or lateritic brick wall (2-3 feet tall) between the kavu and private agricultural lands. In the case of Valliyoor Kavu and Kavassery Kavu, the participants opted for chain-link fence around the groves to prevent trespassing, grazing, illegal collection of biomass and other activities which are affecting the ecological health of groves. On the other hand, for Iringole Kavu, the barbed wire fence was preferred to prevent trespassing, dumping of household and market wastes inside the grove and also illegal removal of biomass from the grove. Here, the barbed wire fence was preferred over other types fence as it does not affect the general view of the grove. However, to prevent encroachment of forest land of Kammadam Kavu, it was suggested that area should be declared as an ecologically fragile land and boundary demarcation structures (posts) should be constructed all around the kavu. In the case of Kammadam Kavu and Iringole Kavu, where the area under vegetation is considerably more, recruitment of watchers is becoming a necessity to prevent trespassing in the forest fringe, encroachment of the forest land, poaching of wild animals and collection of biomass. In Mani Kavu, establishment of a fire line all along the boundary of the

grove to protect forest from anthropogenic fire has been identified as the major management option.

7.3. Forest restoration measures

Due to anthropogenic disturbance and fragmentation, many sacred groves are showing different degrees of degradation. Thus, ecological restoration measures - the intentional activities that initiate or accelerate the recovery of sacred groves with respect to their health, integrity and sustainability are needed. The ecological restoration measures identified for groves are different. For instance, removal of climber and weeds, particularly exotic species, is identified as the major restoration activity in groves such as Kammadam Kavu, Karimalal Chamundikkavu, Edayilekkadu Kavu, Madai Kavu, Mani Kavu, Muchukunnu Kotta Kavu, Karakkode Kavu, Ayyappan Kavu, Kavassery Kavu, Valiyaveetil Kavu, Pazhangala Kavu, Irinjayam Sarpa Kavu and Thrikkunnath Kavu. Re-vegetation of disturbed areas, by reintroduction of species characteristic to the given grove, is another strategy for ecological restoration of Sri Varikkarakkadavu Kavu, Aruvikkal Kavu, Valamchuzhi kavu, Thrikkunnath Kavu and Kammadam Kavu. Enrichment planting around temples is also opted for Valliyoor kavu, Vettikode kavu, Chendangottu kavu and Chukkath Kavu. In Valliyoor Kavu, planting along the river bank was also proposed. Establishment of *Nakshathravanam* as an effort to re-vegetating the grove and catering to the understanding and beliefs of local people has been identified as the forest restoration activity in the Mani Kavu. During the meetings, the stakeholders also suggested that the *Nakshathravanam* can be developed in the grove by allowing devotees to plant and nurture trees of their birth star. In many groves, the local management committees are ready to raise seedlings locally with the technical know-how and financial assistance from the concerned departments. However, in some other groves, the committees are ready to plant seedlings that are supplied by the Social Forestry Wing of the Kerala Forest Department. In case of Karakkode Kavu and Vallikkattu Kavu, it was also proposed to construct a trek-path of about 1.5 to 2 m wide and about 400 m long, using laterite blocks to prevent trampling of seedlings growing inside the forest.

7.4. Measures for restoration of water bodies

In at least eight out of 28 sacred groves the existing water bodies need to be effectively managed for making them functional. For instance, in Poyil Kavu,

‘Thirikuzhi’ is a natural pond and regarded as a holy pond. In Thekkumbad Thazhe Kavu, a fresh water pond situated adjacent to the temple was the source of water for temple rituals. However, due to silt deposition and lack of management for several decades the ponds are unable to store water. Removal of silt and deepening are the suggested measures to make the ponds functional. A perennial pond known as Vadakunda Parel in Madai Kavu can be managed by de-silting and minor repair in order to make it as a good source of water, both for religious activities and supporting biological diversity in the Kavus. The ponds of many groves (eg. Vetticode Kavus, Muchukunnu Kotta Kavus and Iringole Kavus) are covered with algal bloom and partially filled with silt and debris. Thus cleaning, de-silting and repairing are suggested for their restoration. Devotees consider the pond situated in front of the Temple of Vallikkattu Kavus as a holy water tank (Theertha Kulam). However, the tank is now damaged and unable to store water. Thus it is proposed to repair the tank. Construction of a low-cost pond for rainwater harvesting and digging an open well, mainly to obtain water for irrigating the planted area of the groves were suggested for Karakkode Kavus and Sri Varikkarakkadavu Kavus. The open wells of Ayyappan Kavus and Chendangotu Kavus have to be repaired using laterite stones. A perennial rivulet (Aruvikkal Thodu) originates from Aruvikkal Kavus. In order to check run-off and store water in the Kavus, it is proposed to construct a check dam across the rivulet.

8. BUDGET PROPOSAL FOR MANAGEMENT OF SACRED GROVES

Realising the cultural, biological and ecological importance of sacred groves in Kerala and the threats faced by this ancient institution, the Kerala Forest Department (KFD) has initiated a number of activities. The Department also recognised the fact that for effective management of sacred groves, the local committees often need to be supported with financial assistance and incentives; however, such support should be for eco-development activities and community involvement incentives. With this background, the Biodiversity Cell of the Kerala Forest Department designed a scheme where the owners of sacred groves, with the help of local Assistant Conservator of Forests (Social Forestry Wing), can prepare the estimates for undertaking different management activities in their respective groves. The estimate duly approved by the competent officers in the Social Forestry Wing can be submitted to the Chief Conservator of Forests. Subsequently, based on stakeholder meetings with local

committees and owners and also based on the estimate submitted, the draft budget for management activities identified for each sacred grove has been prepared by the KFD, Kerala Forest Research Institute (KFRI) and local committees. An expert committee constituted by the KFD has scrutinised the proposals. The consolidated final budget estimate, approved by the expert committee, for forwarding to the Government of India to support under the scheme 'Intensification of Forest Management', is given in Table 13.

During the stakeholder meetings conducted in sacred groves, the participants stressed the need of physical barriers for protecting forest and water resources of many of the groves. However, the Government of India, under its scheme- **Protection and Conservation of Sacred Groves**, shall not provide any assistance for the structures like check dam, barbed wire fence, boundary demarcation posts, paths, soil retention wall and also for engaging protection watchers. This aspect has been discussed with the concerned sacred grove committees and suggested them to undertake such activities separately by mobilizing money and man-power locally. However, in the budget part of the management plan, provision has been made for bio-fencing.

It was also suggested in the management plans that the Biodiversity Cell of the Kerala Forest Department, which is the project implementing agency, should constitute a sub-committee to monitor the management activities on a regular basis. The committee should also have the mandate to give necessary input to the agency/ies for the successful completion of the activities envisaged in the Management Plan.

Table 13. Detailed total budget (Rs. in lakhs) for conservation and protection of selected sacred groves in Kerala

Sacred groves and their code names given in parentheses	Management activities				Monitoring and evaluation	Report preparation	Total (Rs. in lakhs)
	Awareness creation	Forest protective measures	Forest restoration measures	Water bodies restoration measures			
Vetticode Kavu (AL1)	1.46	0	0.10	1.00	0.25	0.10	2.91
Aruvikkal Kavu (ER1)	1.46	0	0.30	0	0.25	0.10	2.11
Iringole Kavu (ER2)	1.46	1.81	0	3.71	0.25	0.10	7.33
Edayilekkadu Kavu (KS1)	1.46	0	0.60	3.10	0.25	0.10	5.51
Kammadam (KS2)	1.46	0	2.64	1.14	0.25	0.10	5.59
Muchukunnu Kotta Kavu (KZ1)	1.46	0	1.25	0	0.25	0.10	3.06
Poyil Kavu (KZ2)	1.46	0	0	1.35	0.25	0.10	3.16
Vallikkattu Kavu (KZ3)	1.46	0	0.95	0.85	0.25	0.10	3.61
Valiaveetil Kshethrakavu (KL1)	0.44	0	0.22	0.22	0.15	0.06	1.09
Pazhangala Kavu (KL2)	0.44	0	0.22	0.22	0.15	0.06	1.09
Sree Deviott Kavu (KN1)	1.46	0	1.00	0	0.25	0.10	2.81
Karimanal Chamundikkavu (KN2)	1.46	0	0.95	0	0.25	0.10	2.76
Madai Kavu (KN3)	1.46	0	1.55	0.60	0.25	0.10	3.96
Thekkumbad Thazhe Kavu (KN4)	1.46	0	0	0.65	0.25	0.10	2.46
Sree Varikkarakkadavu Kavu (KN5)	1.46	0	2.19	6.6	0.25	0.10	10.6
Kalloor Appankavu (KT1)	0.19	0	0	0	0.15	0.05	0.39
Manimala Kavu (KT2)	0.19	0	0	0	0.15	0.05	0.39
Karakkode Kavu (MA1)	1.46	0.70	1.20	0.22	0.25	0.10	3.93
Ayyappan Kavu (PL1)	0.19	0	0.40	0.40	0.15	0.10	1.24
Kavassery Kavu (PL2)	0.59	0	0.80	0	0.15	0.10	1.64
Mannady Pazhayakavu (PT1)	0.51	0	0	0	0.25	0.10	0.86
Valamchuzhi Kshethrakavu (PT2)	0.51	0	0.30	0.46	0.25	0.10	1.62
Chendangotu Kavu (TS1)	0.24	0	0.03	0	0.15	0.05	0.47
Chukkath Kavu (TS2)	0.24	0	0.09	0	0.15	0.05	0.53
Irinjayam Sarpa Kavu (TV1)	0.44	0	0.44	0	0.15	0.06	1.09
Thrikunnath Kavu (TV2)	0.59	0	0.50	0	0.15	0.10	1.34
Mani Kavu (WA1)	1.46	0.30	1.30	0	0.25	0.10	3.41
Valliyoor Kavu (WA2)	1.46	0.55	0.6	0	0.25	0.10	2.96
Grand Total (Rs.)	27.93	3.36	17.63	20.52	6.00	2.48	77.92

9. CONCLUSIONS

The present overview indicates that sacred groves of Kerala represent community conserved biodiversity area with varied degree of ecological and socio-cultural dimensions. In this context, the efforts of both State and Central Government to launch schemes for conservation and management of sacred groves are commendable. These agencies have also recognised the fact that the sacred groves are facing threats of differing intensity and thus location-specific protection and conservation activities have to be undertaken. To identify location-specific conservation and management strategies for community conserved areas the best option is the preparation of management plan by adopting participatory approach. The participatory approach adopted in this project not only helped in the preparation of management plans for 28 sacred groves but also encouraged the custodians of sacred groves to initiate awareness campaigns. It may also be pointed out here that most sacred grove custodians worry that, the ancestral wisdom behind protection of the groves is no longer respected. Thus, they felt that the funding agencies should support them with physical support (boundary posts, compound wall, chain link or barb wire fence) to protect the groves. Even though the social barrier is more appropriate, the custodians of many groves are of the opinion that in the present day socio-cultural context, physical barriers such as fencing and compound wall are needed to protect sacred groves till the attitude of stakeholders towards sacred groves becomes positive.

It may also be noted that even as the social changes occur, the rejuvenation of cultural heritage - one of the important ecosystem services of sacred groves, can act to support the conservation and restoration of groves. Thus, processes of building institutions to strengthen the cultural heritage need to undertaken. It may also be pointed out here that the cultural heritage and forest vegetation are complementary to each other in determining ecosystem health of community-based biodiversity conservation institutions like sacred groves. Imbalance of these two components can severely affect all other ecosystem services. Therefore, in each sacred grove, a natural resource conservation committee should be constituted to protect and conserve forest and water bodies and also restore or enrich biodiversity.

Inventory of angiosperms, birds and butterflies in sacred groves conducted through this study rather provides preliminary results but they indicate directions along which

we must work further to document and organise comprehensive programme of maintaining biodiversity. However, the future biodiversity documentation programmes should encompass a broad range of representative organisms, including belowground flora and fauna. Furthermore, to promote the value of sacred grove for biodiversity conservation, there would be a need for proper scientific assessment of sacred groves to demonstrate their relevance to habitat and species protection. This should include state-wide inventories and the documentation of biodiversity status of sacred groves. In this context, it is suggested that a sacred grove biodiversity network (SGBN) of Kerala State may be built up as a broad programme of biodiversity monitoring.

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Appendix 1. List of angiosperm species recorded in the sacred groves of Kerala

Sl. No.	Species	Habit	Number of sacred groves of occurrence and acronym of the sacred groves	
			Number	Acronym of the sacred groves
ACANTHACEAE				
1.	<i>Acanthus ilicifolius</i>	S	1	KZ2
2.	<i>Asystasia gangetica</i>	S	1	KN2
3.	<i>Dipterachanthus prostratus</i>	H	1	KN3
4.	<i>Eranthemum capense</i>	S	1	KZ2
5.	<i>Gymnostachyum febrifugum</i> ^a	H	4	KS1, KS2, PT2, WA2
6.	<i>Gymnostachyum latifolium</i> ^b	S	4	KS1, KS2, TV2, WA2
7.	<i>Haplanthodes neilgherryensis</i> ^b	H	1	KN3
8.	<i>Justicia wynaadensis</i> ^a	S	2	ER2, PT2
9.	<i>Lepidagathis keralensis</i> ^c	H	2	KZ2, KZ3
10.	<i>Nilgiranthus barbatus</i> ^a	S	1	WA2
11.	<i>Peristrophe bicalyculata</i>	H	1	KN3
12.	<i>Peristrophe paniculata</i>	H	3	ER2, PT2, TV2
13.	<i>Rostellularia japonica</i>	H	1	KN2
14.	<i>Rungia parviflora</i>	H	9	ER1, KZ3, KN1, KN5, KT1, KT2, MA1, PL1, PT1
15.	<i>Strobilanthes barbatus</i> ^a	S	5	KS1, KS2, KN1, PT1, TV1
16.	<i>Strobilanthes foliosus</i> ^a	S	2	KS2, TV1
17.	<i>Strobilanthes gracilis</i> ^a	S	3	KS1, KS2, TV1
18.	<i>Strobilanthes heyneanus</i> ^a	S	2	KS2, TV1
19.	<i>Strobilanthes luridus</i> ^a	S	2	KS1, TV1
20.	<i>Strobilanthes micranthus</i> ^a	S	2	KS1, TV1
21.	<i>Thunbergia erecta</i>	S	1	ER2
ALANGIACEAE				
22.	<i>Alangium salvifolium</i>	T	2	KZ1, KN2
23.	<i>Alangium salvifolium</i> ssp. <i>hexapetalum</i>	S	2	ER2, KZ2
ALOEACEAE				
24.	<i>Aloe vera</i>	H	1	KZ2
AMARANTHACEAE				
25.	<i>Achyranthes aspera</i>	H	2	KN2, KN4
26.	<i>Achyranthes bidentata</i>	H	3	AL1, KN3, TV2
27.	<i>Aerva lanata</i>	H	1	KN2
28.	<i>Cyathula prostrata</i>	H	11	ER1, ER2, KZ1, KZ3, KL2, KN1, KN2, KN3, PL1, PT1, TS1
AMARYLLIDACEAE				
29.	<i>Crinum</i> sp.	H	2	KZ2, PT2
ANACARDIACEAE				
30.	<i>Anacardium occidentale</i>	T	2	AL1, KN3
31.	<i>Holigarna grahamii</i> ^b	T	2	KS1, WA2
32.	<i>Holigarna arnottiana</i> ^a	T	16	AL1, ER1, ER2, KS1, KS2, KZ1, KZ3, KL2, KN1, KN5, KT1, KT2, PT1, TV1, WA1, WA2
33.	<i>Holigarna beddomei</i> ^a	T	2	ER1, KZ3
34.	<i>Holigarna nigra</i> ^a	T	2	KS2, KZ2
35.	<i>Lannea coromandelica</i>	T	4	ER2, KZ3, KN1, KN3

The names of the sacred groves are as in Table 1. Plant name with superscript, a = endemic to the southern Western Ghats, b=endemic to the Western Ghats, c=endemic to the Peninsular India.

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Appendix 1 (cont'd). List of angiosperm species recorded in the sacred groves of Kerala

Sl. No.	Species	Habit	Number of sacred groves of occurrence and acronym of the sacred groves	
			Number	Acronym of the sacred groves
ANACARDIACEAE				
36.	<i>Lannea grandis</i>	T	1	TV1
37.	<i>Mangifera indica</i>	T	11	ER1, ER2, KS1, KS2, KZ3, KN1, KN2,KT2, PT2, TV1, WA2
38.	<i>Nothopegia colebrookeana</i>	T	1	ER2
39.	<i>Nothopegia</i> sp.	T	1	KS1
40.	<i>Nothopegia travancorica</i> ^a	T	3	ER2, KS1, PT2
41.	<i>Spondias pinnata</i>	T	2	KN2, PL2
ANCISTROCLADACEAE				
42.	<i>Ancistrocladus heyneanus</i>	C	4	KS1, KS2, KN1, WA2
ANNONACEAE				
43.	<i>Annona squamosa</i>	T	2	KZ2, KN2
44.	<i>Goniothalamus cardiopetalus</i> ^a	T	2	KZ3, WA2
45.	<i>Meiogyne pannosa</i> ^b	T	4	AL1, ER1, KS1, KN1
46.	<i>Meiogyne ramarowii</i> ^a	T	1	KZ2
47.	<i>Miliusa tomentosa</i>	T	7	ER1, KZ3, KL1, KN1, KN5, MA1, PL2
48.	<i>Polyalthia coffeoides</i>	T	2	KS2, WA2
49.	<i>Polyalthia fragrans</i> ^a	T	5	ER1, ER2, KS1, KS2, PL2
50.	<i>Polyalthia korintii</i>	S	2	KZ3, KN1
51.	<i>Uvaria narum</i>	S	4	ER2, KZ3, KN1, WA2
APIACEAE				
52.	<i>Centella asiatica</i>	H	1	ER2
APOCYANACEAE				
53.	<i>Parsonia spiralis</i>	S	1	KZ3
54.	<i>Wrightia tomentosa</i>	T	3	ER1, KL2, KN5
55.	<i>Aganosma cymosa</i>	C	4	KS1, KS2, KL1, WA2
56.	<i>Allamanda cathartica</i>	S	2	KN2, KN4
57.	<i>Alstonia scholaris</i>	T	18	AL1, ER1, ER2, KS2, KZ1, KZ3, KL2, KN2, KN3, KN4, KT1, KT2, PL1, PT1, TS1, TV1, TV2, WA2
58.	<i>Chonemorpha fragrans</i>	S	1	ER2
59.	<i>Holarrhena pubescens</i>	T	8	KZ1,KZ3, KL1, KL2,KN2, KN5, KT2, MA1
60.	<i>Hunteria zeylanica</i>	T	1	PL2
61.	<i>Ichnocarpus frutescens</i>	C	4	ER2, KZ3, KN1, KN2
62.	<i>Kammetia caryophyllata</i> ^a	S	1	ER2
63.	<i>Plumeria alba</i>	T	6	AL1, KZ1, KL2, KN2, KN3, PT2
64.	<i>Plumeria rubra</i>	T	3	AL1, PT2, TS1
65.	<i>Rauvolfia serpentina</i>	H	1	KN2
66.	<i>Tabernaemontana alternifolia</i>	T	11	ER2,KZ1, KZ3, KL1,KL2, KN1, KN2,KN3, KN5, PT1,WA1
67.	<i>Wrightia arborea</i>	T	1	ER2
68.	<i>Wrightia tinctoria</i>	T	5	KZ3, KN2, KN5, KT2, PT1

The names of the sacred groves are as in Table 1. Plant name with superscript, a = endemic to the southern Western Ghats, b=endemic to the Western Ghats, c=endemic to the Peninsular India.

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Appendix 1 (cont'd). List of angiosperm species recorded in the sacred groves of Kerala

Sl. No.	Species	Habit	Number of sacred groves of occurrence and acronym of the sacred groves	
			Number	Acronym of the sacred groves
ARACEAE				
69.	<i>Amorphophallus bulbifer</i>	H	4	KZ2, KL2, PT1, WA2
70.	<i>Amorphophallus commutatus</i>	H	2	ER2, KZ2
71.	<i>Amorphophallus nicolsonianus^a</i>	H	9	AL1, ER1, KZ2, KZ3, KN1, KN4, TV1, TV2, WA2
72.	<i>Amorphophalus paeoniifolius</i>	H	3	KN2, KT2, MA1
73.	<i>Anaphyllum wightii^a</i>	H	3	KZ2, KN4, TV1
74.	<i>Ariopsis peltata</i>	H	2	KL2, KN3
75.	<i>Arisaema leschenaultii</i>	H	1	WA2
76.	<i>Cryptocoryne spiralis</i>	H	4	ER1, KZ2, KN1, PT2
77.	<i>Pothos scandens</i>	H	12	KZ1, KZ3, KL2, KN1, KN5, KT1, KT2, MA1, PT1, TS1, TV1, WA2
78.	<i>Remusatia vivipara</i>	H	4	ER1, KZ3, KN1, WA2
79.	<i>Rhaphidophora pertusa</i>	S	3	ER1, KZ3, WA2
80.	<i>Theriophonum infaustum^a</i>	H	1	ER2
ARALIACEAE				
81.	<i>Schefflera racemosa^b</i>	T	2	KS1, WA1
82.	<i>Schefflera venulosa</i>	S	2	KS1, KS2
ARECACEAE				
83.	<i>Areca catechu</i>	T	1	KN2
84.	<i>Arenga wightii^b</i>	T	4	ER1, KZ2, KN4, WA2
85.	<i>Calamus brandisii^a</i>	C	1	WA2
86.	<i>Calamus gamblei^b</i>	C	1	WA2
87.	<i>Calamus rotang</i>	C	4	KZ3, KN1, KN4, PT2
88.	<i>Calamus thwaitesii</i>	C	4	KS2, KN1, TV1, WA2
89.	<i>Caryota urens</i>	T	10	AL1, ER1, ER2, KZ1, KZ3, KN3, MA1, PL2, PT1, WA2
90.	<i>Cocos nucifera</i>	T	1	KN2
91.	<i>Phoenix humilis</i>	T	1	WA1
92.	<i>Pinanga dicksonii^b</i>	T	4	KS1, KS2, KN3, WA2
ARISTOLOCHIACEAE				
93.	<i>Thottea siliquosa</i>	S	3	KS1, KS2, WA2
ASCLEPIADACEAE				
94.	<i>Calotropis gigantea</i>	S	1	KN2
95.	<i>Ceropegia candelabrum</i>	H	1	KZ3
96.	<i>Gynmema sylvestre</i>	S	2	KS2, KN3
97.	<i>Hoya pauciflora</i>	C	5	KS1, KS2, KL1, PL2, WA1
98.	<i>Hoya wightii^a</i>	S	2	KS1, KZ2
99.	<i>Tylophora asthmatica</i>	C	2	KZ3, KN1
ASTERACEAE				
100.	<i>Ageratum conyzoides</i>	H	6	ER2, KZ1, KZ2, KL2, KN1, KN3
101.	<i>Chromolaena odorata</i>	S	8	KZ1, KZ2, KL2, KN1, KN2, KN3, KN5, KT1
102.	<i>Eclibta alba</i>	H	1	KN2
103.	<i>Elephantopus scaber</i>	H	17	AL1, ER1, ER2, KS2, KZ1, KZ2, KZ3, KL2, KN2, KN5, KT1, KT2, MA1, PL1, PT1, TS1, TV1
104.	<i>Emilia sonchifolia</i>	H	10	ER1, KZ1, KZ3, KL2, KN1, KN5, KT2, PL1, PT1, TV1

The names of the sacred groves are as in Table 1. Plant name with superscript, a = endemic to the southern Western Ghats, b=endemic to the Western Ghats, c=endemic to the Peninsular India.

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Appendix 1 (cont'd). List of angiosperm species recorded in the sacred groves of Kerala

Sl. No.	Species	Habit	Number of sacred groves of occurrence and acronym of the sacred groves	
			Number	Acronym of the sacred groves
ASTERACEAE				
105.	<i>Mikania micrantha</i>	S	3	AL1, ER2, KZ2
106.	<i>Spilanthes calva</i>	H	1	ER2
107.	<i>Synedrella nodiflora</i>	H	2	ER2, KN3
108.	<i>Vernonia arborea</i>	T	1	KS2
109.	<i>Vernonia divergens</i>	S	1	KS1
110.	<i>Vernonia cinerea</i>	H	8	ER1, KZ1, KZ3, KL2, KN1, PT1, TS1, TV1
BALSAMINACEAE				
111.	<i>Impatiens chinensis</i> ^c	H	3	KZ1, KL2, KN2
112.	<i>Impatiens minor</i>	H	2	ER2, KZ1
BEGONIACEAE				
113.	<i>Begonia malabarica</i>	H	1	ER2
BIGNONIACEAE				
114.	<i>Oroxylum indicum</i>	T	1	PT2
115.	<i>Pajanelia longifolia</i>	T	2	ER2, TV2
116.	<i>Stereospermum colais</i>	T	3	KN2, TV1, WA1
117.	<i>Stereospermum personatum</i>	T	2	MA1, TV1
118.	<i>Stereospermum sp.</i>	T	2	KL1, TV1
BOMBACACEAE				
119.	<i>Bombax ceiba</i>	T	6	AL1, KL1, KL2, MA1, PL2, WA1
120.	<i>Cullenia exarillata</i> ^a	T	1	WA2
BORAGINACEAE				
121.	<i>Cordia obliqua</i>	T	3	KZ3, KN1, TV2
BURSERACEAE				
122.	<i>Canarium strictum</i>	T	2	KN1, WA2
BUXACEAE				
123.	<i>Sarcococca brevifolia</i>	S	2	TV1, WA2
CAESALPINIACEAE				
124.	<i>Acrocarpus fraxinifolius</i>	T	2	KZ2, WA2
125.	<i>Bauhinia malabarica</i>	T	1	KN2
126.	<i>Bauhinia racemosa</i>	T	3	KL1, MA1, WA1
127.	<i>Bauhinia tomentosa</i>	T	1	MA1
128.	<i>Caesalpinia bonduc</i>	S	2	TS2, WA2
129.	<i>Caesalpinia cucullata</i>	S	1	ER2
130.	<i>Cassia fistula</i>	T	3	KZ1, KL2, KT2
131.	<i>Cynometra travancorica</i> ^a	T	4	ER1, PL2, PT2, TS2
132.	<i>Delonix regia</i>	T	2	KL1, KN3
133.	<i>Humboldtia brunonis</i> ^a	T	2	KS1, KN1
134.	<i>Kingiodendron pinnatum</i> ^a	T	2	KS1, KN1
135.	<i>Peltophorum pterocarpum</i>	T	1	KN2
136.	<i>Saraca asoca</i>	T	3	ER2, KZ3, TV1
137.	<i>Senna occidentalis</i>	S	1	KN3
138.	<i>Senna tora</i>	S	1	ER2
139.	<i>Tamarindus indica</i>	T	4	AL1, ER2, KN2, PL1

The names of the sacred groves are as in Table 1. Plant name with superscript, a = endemic to the southern Western Ghats, b=endemic to the Western Ghats, c=endemic to the Peninsular India.

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Appendix 1 (cont'd). List of angiosperm species recorded in the sacred groves of Kerala

Sl. No.	Species	Habit	Number of sacred groves of occurrence and acronym of the sacred groves	
			Number	Acronym of the sacred groves
CAPPARACEAE				
140.	<i>Capparis shevaroyensis</i> ^a	S	2	KS1, KN3
141.	<i>Cleome viscosa</i>	H	3	ER2, KZ2, KN3
CARICACEAE				
142.	<i>Carica papaya</i>	H	2	ER2, KZ2
CELASTRACEAE				
143.	<i>Celastrus paniculatus</i>	S	3	KS1, KS2, PT2
144.	<i>Euonymus angulatus</i> ^a	S	2	PT2, WA2
145.	<i>Euonymus crenulatus</i> ^a	T	2	KS1, KS2
146.	<i>Lophopetalum wightianum</i>	S	3	KS2, KZ3, WA2
147.	<i>Losneriella arnottiana</i>	T	2	KS1, KS2
148.	<i>Microtropis stocksii</i> ^a	S	1	KS2
CLUSIACEAE				
149.	<i>Calophyllum inophyllum</i>	T	3	AL1, KS2, WA2
150.	<i>Calophyllum polyanthum</i>	T	2	KS1, KN1
151.	<i>Garcinia gummi-gutta</i>	T	5	AL1, ER2, KZ3, KT2, WA2
152.	<i>Garcinia morella</i>	T	2	KS1, WA2
153.	<i>Garcinia talbotii</i> ^b	T	2	ER1, KS1
154.	<i>Mesua ferrea</i> ^a	T	3	KS1, ER2, KS2
COCHLOSPERMACEAE				
155.	<i>Cochlospermum religiosum</i>	T	3	MA1, PT2, WA1
COMBRETACEAE				
156.	<i>Calycopteris floribunda</i>	C	12	ER2, KS2, KZ2, KZ3, KN2, KN3, KN5, KT1, KT2, PL1, PT1, TV1
157.	<i>Combretum latifolium</i>	S	1	ER2
158.	<i>Terminalia bellerica</i>	T	7	ER1, KZ3, KN2, KT2, MA1, WA1, WA2
159.	<i>Terminalia catappa</i>	T	2	KZ3, KN3
160.	<i>Terminalia elliptica</i>	T	4	ER1, KZ3, KT2, WA1
161.	<i>Terminalia paniculata</i>	T	12	ER1, KZ1, KZ3, KL2, KN2, KN3, KT1, KT2, MA1, PL1, TV1, WA1
COMMELINACEAE				
162.	<i>Belasynapsis vivipara</i> ^b	H	1	KS1
163.	<i>Commelina benghalensis</i>	H	3	KZ1, KL2, KN3
164.	<i>Commelina diffusa</i>	H	2	ER2, KN3
165.	<i>Cyanotis axillaris</i>	H	1	ER2
166.	<i>Cyanotis cristata</i>	H	2	ER2, KL2
167.	<i>Murdannia crocea</i> ^a	H	1	ER2
168.	<i>Murdannia japonica</i>	H	2	ER2, TV2
169.	<i>Murdannia simplex</i>	H	2	KZ2, KN2
CONNARACEAE				
170.	<i>Connarus sclerocarpus</i> ^a	S	1	ER2
171.	<i>Connarus monocarpus</i>	S	5	KS2, KZ3, KN1, PT2, TV2
172.	<i>Connarus paniculatus</i>	C	2	KS2, KZ3

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Appendix 1 (cont'd). List of angiosperm species recorded in the sacred groves of Kerala

Sl. No.	Species	Habit	Number of sacred groves of occurrence and acronym of the sacred groves	
			Number	Acronym of the sacred groves
CONVOLVULACEAE				
173.	<i>Merremia umbellata</i>	H	2	KN1, KZ3
174.	<i>Aniseia martinicensis</i>	H	2	KZ3, KN1
175.	<i>Argyrea nervosa</i>	S	1	KN3
176.	<i>Erycibe paniculata</i>	C	1	PT2
177.	<i>Evolvulus nummularis</i>	H	1	ER2
178.	<i>Ipomoea alba</i>	C	3	KS1, PL2, PT2
179.	<i>Ipomoea digitata</i>	C	1	KN1
180.	<i>Ipomoea mauritiana</i>	C	3	KZ2, KZ3, PT2
181.	<i>Ipomoea muricata</i>	C	3	KS1, KN1, PL2
182.	<i>Ipomoea nil</i>	C	1	KN3
183.	<i>Ipomoea obscura</i>	C	5	ER2, KZ2, KN1, KN5, TV2
184.	<i>Ipomoea pes-caprae</i>	H	2	ER2, KZ2
CORNACEAE				
185.	<i>Mastixia arborea</i> ^b	T	1	KZ3
CUCURBITACEAE				
186.	<i>Mukia maderaspatana</i>	C	3	ER2, KZ1, KN3
187.	<i>Trichosanthes tricuspidata</i>	C	1	KN3
CYPERACEAE				
188.	<i>Cyperus rotundus</i>	H	1	ER2
189.	<i>Hypolytrum nemorum</i>	H	5	KS1, KZ2, KZ3, PT2, TV2
DATISCAEAE				
190.	<i>Tetrameles nudiflora</i>	T	4	KS2, KT1, PL2, WA1
DICHAPETALACEAE				
191.	<i>Dichapetalum gelonioides</i>	S	3	KS1, KS2, WA2
DILLENACEAE				
192.	<i>Dillenia pentagyna</i>	T	10	ER1, KL1, KN1, KN2, KN5, KT1, MA1, PT1, WA1, WA2
DIOSCOREACEAE				
193.	<i>Dioscorea bulbifera</i>	S	8	ER1, KZ3, KN1, KN3, PT1, PT2, TV1, TV2
194.	<i>Dioscorea oppositifolia</i>	S	4	ER1, KT2, PL1, PT1
DIPTEROCARPACEAE				
195.	<i>Hopea parviflora</i> ^a	T	8	ER1, ER2, KS1, KS2, KZ3, KN1, TV1, WA2
196.	<i>Hopea ponga</i> ^b	T	10	AL1, ER2, KS1, KS2, KZ1, KZ3, KL2, KN1, TS2, WA2
197.	<i>Hopea utilis</i>	T	2	KZ3, PT2
198.	<i>Vateria indica</i>	T	8	AL1, ER1, ER2, KS1, KZ1, KZ3, KN1, WA2
DRACAENACEAE				
199.	<i>Dracaena terniflora</i>	S	2	KZ3, KT2
EBENACEAE				
200.	<i>Diospyros bourdillonii</i> ^a	T	6	ER1, KS1, KS2, KZ2, KN1, PL2
201.	<i>Diospyros buxifolia</i>	T	2	ER2, KZ3
202.	<i>Diospyros candolleana</i> ^b	T	2	KN1, KN3

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Appendix 1 (cont'd). List of angiosperm species recorded in the sacred groves of Kerala

Sl. No.	Species	Habit	Number of sacred groves of occurrence and acronym of the sacred groves	
			Number	Acronym of the sacred groves
EBENACEAE				
203.	<i>Diospyros malabarica</i>	T	5	KZ1, KZ3, KL2, KN1, WA2
204.	<i>Diospyros oocarpa</i>	T	3	AL1, KS1, KS2
205.	<i>Diospyros paniculata</i> ^b	T	2	KS1, TS2
ELAEAGNACEAE				
206.	<i>Elaeagnus kologa</i>	T	4	ER1, ER2, KZ2, PT2
207.	<i>Elaeocarpaceae</i>			
208.	<i>Elaeocarpus serratus</i>	T	4	KS1, KZ3, KN1, WA2
209.	<i>Elaeocarpus tuberculatus</i>	T	2	KS2, WA2
ERIOCAULACEAE				
210.	<i>Eriocaulon sp.</i>	H	1	KZ3
211.	<i>Scleria lithosperma</i>	H	1	KZ3
212.	<i>Ipomoea mauritiana</i>	C	3	KZ2, KZ3, PT2
213.	<i>Ipomoea muricata</i>	C	3	KS1, KN1, PL2
EUPHOBIACEAE				
214.	<i>Cleistanthus collinus</i>	T	2	KL2, MA1,
215.	<i>Agrostistachys borneensis</i>	T	3	KN4, TS2, WA2
216.	<i>Agrostistachys indica</i>	T	4	KS1, KS2, KN4, TV2
217.	<i>Antidesma acidum</i>	T	3	ER2, KZ2, TV2
218.	<i>Antidesma alexiteria</i>	T	1	KZ3
219.	<i>Antidesma montanum</i>	T	8	ER1, KZ2, KZ3, KN4, PL1, PL2, PT2, TV1
220.	<i>Aporosa acuminata</i>	T	1	ER2
221.	<i>Aporosa bourdillonii</i> ^a	T	3	AL1, ER1, KN4
222.	<i>Aporosa lindleyana</i>	T	15	ER1, KS1, KS2, KZ1, KZ3, KL1, KL2, KN1, KN5, KT1, KT2, PL2, TV1, WA1, WA2
223.	<i>Baccaurea courtallensis</i>	T	4	ER2, KS1, KS2, WA2
224.	<i>Bischofia javanica</i>	T	3	KN1, TV2, WA2
225.	<i>Breynia retusa</i>	S	2	ER2, KN2
226.	<i>Briedelia retusa</i>	T	4	KL1, KL2, KN2, MA1
227.	<i>Briedelia scandens</i>	S	14	ER1, ER2, KS1, KS2, KZ1, KL2, KN1, KN4, KT1, PL1, PL2, TV1, WA1, WA2
228.	<i>Croton caudatus</i>	S	1	KN3
229.	<i>Croton malabaricus</i> ^a	T	6	ER1, KS1, KL2, KN1, PL2, PT2
230.	<i>Cyclostemon confertiflorus</i>	T	1	KN2
231.	<i>Dimorphocalyx beddomei</i> ^a	T	1	ER1
232.	<i>Drypetes venusta</i> ^b	T	5	ER1, KS1, KN1, PL2, WA2
233.	<i>Excoecaria agallocha</i>	T	1	TS2
234.	<i>Excoecaria indica</i>	T	1	KZ2
235.	<i>Flueggea virosa</i>	T	2	KZ3, KN3
236.	<i>Glochidion velutinum</i>	T	2	KS2, TV2
237.	<i>Homonoia riparia</i>	S	2	KS2, PT2
238.	<i>Jatropha curcas</i>	S	1	KN2
239.	<i>Macaranga peltata</i>	T	20	AL1, ER1, ER2, KS1, KZ1, KZ3, KL1, KL2, KN2, KN3, KN5, KT1, KT2, PL1, PL2, PT1, TS1, TV1, WA1, WA2

The names of the sacred groves are as in Table 1. Plant name with superscript, a = endemic to the southern Western Ghats, b=endemic to the Western Ghats, c=endemic to the Peninsular India. ---cont'd---

Appendix 1 (cont'd). List of angiosperm species recorded in the sacred groves of Kerala

Sl. No.	Species	Habit	Number of sacred groves of occurrence and acronym of the sacred groves	
			Number	Acronym of the sacred groves
EUPHOBIACEAE				
240.	<i>Mallotus philippensis</i> ^c	T	17	ER1, ER2, KS1, KS2, KZ1, KZ3, KL1, KL2, KN1, KN2, KN3, KN5, KT1, KT2, PT1, TV1, WA1
241.	<i>Mallotus tetracoccus</i>	T	3	KZ3, PL2, WA1
242.	<i>Micrococca mercurialis</i>	H	1	KN3
243.	<i>Phyllanthus airy-shawii</i>	H	2	ER2, TV2
244.	<i>Phyllanthus amarus</i>	H	1	KN3
245.	<i>Phyllanthus debilis</i>	T	1	KN3
246.	<i>Phyllanthus urinaria</i>	H	4	ER2, KZ1, KL2, KN3
247.	<i>Putranjiva roxburghii</i>	T	2	ER2, PT2
248.	<i>Sapium insigne</i>	T	2	KZ3, TV1
249.	<i>Saurpus androgynus</i>	S	1	KN2
250.	<i>Tragia involucrata</i>	H	2	ER2, KN2
FABACEAE				
251.	<i>Abrus precatorius</i>	S	15	AL1, ER1, ER2, KS2, KZ2, KZ3, KN1, KN2, KN4, KT2, MA1, PL1, PT1, TV1, WA2
252.	<i>Butea monosperma</i>	T	2	KS2, TV1
253.	<i>Cajanus scarabaeoides</i>	S	2	KN4, PT2
254.	<i>Clitoria ternatea</i>	C	1	KN2
255.	<i>Crotalaria walkeri</i>	S	2	KS1, TS2
256.	<i>Dalbargia horrida var. horridaa</i>	S	7	ER2, KS2, KZ2, KZ3, KN1, KN3, PT2
257.	<i>Dalbergia latifolia</i>	T	7	KS1, KS2, KL1, KN2, KT2, MA1, WA1
258.	<i>Derris scandens</i>	C	3	ER1, KS1, WA2
259.	<i>Derris trifoliata</i>	S	3	KZ2, KN1, PL1
260.	<i>Desmodium gangeticum</i>	S	1	KN2
261.	<i>Desmodium heterocarpum</i>	S	1	WA2
262.	<i>Desmodium triflorum</i>	H	11	ER1, ER2, KN1, KN3, KT1, KT2, MA1, PT1, TS1, TV1, WA2
263.	<i>Erythrina stricta</i>	T	2	KZ1, KN3
264.	<i>Gliricidia sepium</i>	T	2	KL2, KN3
265.	<i>Mucuna pruriensa</i>	C	2	KZ2, KZ3
266.	<i>Pithecellobium gracile</i>	S	1	KN2
267.	<i>Pongamia pinnata</i>	T	7	ER1, ER2, KZ3, KL2, KN1, KN2, KN5
268.	<i>Pterocarpus marsupium</i>	T	4	KN2, PL1, PT2, WA1
269.	<i>Vigna sublobata</i>	C	1	KZ3
270.	<i>Zornia diphylla</i>	H	1	KN3
271.	<i>Zornia gibbosa</i>	H	2	KZ3, KN1
FLACOURTIACEAE				
272.	<i>Casearia ovata</i>	T	1	ER2
273.	<i>Casearia rubescens</i>	T	1	KZ3
274.	<i>Flacourtia indica</i>	T	3	KS1, KS2, WA1
275.	<i>Flacourtia montana</i> ^c	T	1	KZ2
276.	<i>Flucourtia indica</i>	T	1	KN3

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Appendix 1 (cont'd). List of angiosperm species recorded in the sacred groves of Kerala

Sl. No.	Species	Habit	Number of sacred groves of occurrence and acronym of the sacred groves	
			Number	Acronym of the sacred groves
FLACOURTIACEAE				
277.	<i>Hydnocarpus alpina</i>	T	7	ER1, KZ2, KZ3, KN5, KT1, PT1, WA2
278.	<i>Hydnocarpus laurifolia</i>	T	1	TV1
279.	<i>Hydnocarpus pentandra</i>	T	9	AL1, ER1, KS1, KS2, KN1,KN2, KT2, TS1, TV1
FLAGELLARIACEAE				
280.	<i>Flagellaria indica</i>	S	1	KZ2
GESNERIACEAE				
281.	<i>Aeschynanthus perrottetii</i> ^b	H	1	PL2
HIPPOCRATEACEAE				
282.	<i>Salacia reticulata</i>	S	3	KZ3, KN1, KT1
HYPERICACEAE				
283.	<i>Hypericum hookerianum</i>	H	1	KS1
HYPOXIDACEAE				
284.	<i>Curculigo orchioides</i>	H	14	ER1, KZ2, KZ3, KN2, KN3, KN5, KT1, KT2, MA1, PL1, PT1, TS1, TV1, WA2
285.	<i>Molineria trichocarpa</i>	H	1	ER2
ICACINACEAE				
286.	<i>Gomphandra polymorpha</i>	T	3	KS1, KZ2, WA2
287.	<i>Gomphandra tetrandra</i>	T	1	KS2
288.	<i>Sarcostigma kleinii</i>	S	5	AL1, ER2, KZ3, KN1, PT1
LAMIACEAE				
289.	<i>Colebrookea oppositifolia</i>	S	3	KS1, KS2, PL2
290.	<i>Leucas aspera</i>	H	4	AL1, ER2, KL2, KN2
291.	<i>Leucas eriostoma</i> ^c	S	1	KN2
292.	<i>Ocimum sanctum</i>	S	1	KN2
293.	<i>Plectranthus malabaricus</i>	H	1	KS1
294.	<i>Pogostemon benghalensis</i>	S	1	KS1
295.	<i>Pogostemon purpurascens</i> ^c	S	1	ER2
296.	<i>Scutellaria discolor</i>	H	1	KN2
LAURACEAE				
297.	<i>Actinodaphne bourdillonii</i> ^a	T	5	KZ1, KN4, PL2, PT2, TV2
298.	<i>Actinodaphne malabarica</i> ^a	T	4	ER1, KS2, PL2, WA2
299.	<i>Actinodaphne semicarpifolia</i>	T	2	KS1, KN1
300.	<i>Alseodaphne semecarpifolia</i> ^a	T	1	KN1
301.	<i>Beilschmiedia wightii</i> ^a	T	1	WA2
302.	<i>Cinnamomum malabatum</i> ^a	T	16	ER1, ER2, KS1, KS2, KZ1, KZ2, KZ3, KL2, KN1, KT1, KT2, PT1, TS1, TV1, WA1, WA2
303.	<i>Cinnamomum verum</i>	T	7	AL1, KZ2, KZ3, KL1, KN1, PL1, WA2
304.	<i>Cryptocarya wightiana</i>	T	1	TS2
305.	<i>Litsea bourdillonii</i> ^a	T	2	KS2, TV2
306.	<i>Litsea coriacea</i> ^c	T	1	ER2

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Appendix 1 (cont'd). List of angiosperm species recorded in the sacred groves of Kerala

Sl. No.	Species	Habit	Number of sacred groves of occurrence and acronym of the sacred groves	
			Number	Acronym of the sacred groves
LAURACEAE				
307.	<i>Litsea floribunda</i> ^b	T	1	KZ2
308.	<i>Litsea insignis</i> ^b	T	1	KS2
309.	<i>Litsea laevigata</i> ^a	T	5	ER1, KZ1, KL2, PL2, WA1
310.	<i>Litsea sp.</i>		1	KZ3
311.	<i>Litsea wightiana</i> ^a	T	1	WA2
312.	<i>Neolitsea scrobiculata</i>	T	3	KS2, KN1, PT2
313.	<i>Persea macrantha</i>	T	11	AL1, ER1, KS2, KZ1, KZ3, KL2, KN5, PL2, PT1, WA1, WA2
LECYTHIDACEAE				
314.	<i>Careya arborea</i>	T	9	ER1, KZ1, KZ3, KL1, KN2, MA1, PL1, WA1, WA2
LEEACEAE				
315.	<i>Leea crispa</i>	S	1	KN2
316.	<i>Leea indica</i>	T	15	AL1, ER1, ER2, KZ1, KZ3, KL2, KN1, KN2, KN5, KT1, KT2, MA1, PT1, TV1, WA2
317.	<i>Leea sambucina</i>	T	3	KS1, KS2, KL1
LEMNACEAE				
318.	<i>Lemna globosa</i>	H	3	KN1, PT2, TV2
319.	<i>Wolffia globosa</i>	H	2	ER1, KZ3
LENTIBULARIACEAE				
320.	<i>Utricularia graminifolia</i>	H	1	KZ3
LILIACEAE				
321.	<i>Asparagus racemosus</i>	S	12	AL1, ER1, ER2, KZ3, KN5, KT1, KT2, MA1, PL1, PT1, TV1, WA2
322.	<i>Gloriosa superba</i>	S	9	ER1, KS2, KZ3, KN1, KN5, KT1, KT2, MA1, PT1
323.	<i>Urginea indica</i>	H	2	KN1, KZ3
LINACEAE				
324.	<i>Hugonia mystax</i>	S	3	KZ3, KN1, KN3
LOGANIACEAE				
325.	<i>Fagraea ceylanica</i>	T	7	ER1, KZ2, KZ3, KL1, KT2, PT1, TV2
326.	<i>Strychnos aenea</i>	S	2	KS1, KN3
327.	<i>Strychnos cimamomea</i>	S	3	KS1, KS2, WA1
328.	<i>Strychnos colubrina</i>	S	1	ER2
329.	<i>Strychnos involucra</i>		3	KZ3, KT1, PT1
330.	<i>Strychnos nux-vomica</i>	T	17	AL1, ER1, ER2, KZ1, KZ3, KL2, KN1, KN2, KN3, KN5, KT2, MA1, PL1, PL2, PT1, TV1, WA1
331.	<i>Strychnos vanprukii</i>	S	2	AL1, KS2
LORANTHACEAE				
332.	<i>Dendrophthoe falcata</i> ^c	S	1	KS1
333.	<i>Helixanthera intermedia</i>	S	1	KS1

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Appendix 1 (cont'd). List of angiosperm species recorded in the sacred groves of Kerala

Sl. No.	Species	Habit	Number of sacred groves of occurrence and acronym of the sacred groves	
			Number	Acronym of the sacred groves
LYTHRACEAE				
334.	<i>Lagerstroemia lanceolata</i> ^b	T	4	KS1, KS2, KZ3, KT2
335.	<i>Lagerstroemia microcarpa</i> ^b	T	7	KL1, KN1, KN2, MA1, PL2, WA1, WA2
336.	<i>Lagerstroemia speciosa</i>	T	1	WA2
MAGNOLIACEAE				
337.	<i>Michelia champaca</i>	T	2	KZ3, KT2
MALPIGHIACEAE				
338.	<i>Hyptage madablotta</i>		4	KS1, KZ2,KN1,TV2
MALVACEAE				
339.	<i>Abelmoschus moschatus</i>	S	1	KN2
340.	<i>Hibiscus hispidissimus</i>	S	3	KZ2, KZ3, KN1
341.	<i>Hibiscus rosa-sinensis</i>	S	1	KN2
342.	<i>Hibiscus surattensis</i>	S	3	ER2, KN2, KN3
343.	<i>Sida alnifolia</i>	H	1	ER2
344.	<i>Sida cordifolia</i>	H	11	ER1, KZ3, KN1, KN5, KT1, KT2, MA1, PL1, PT1, TS1, TV1
345.	<i>Sida fryxellii</i>	S	2	KZ3, KN1
346.	<i>Sida rhombifolia</i>	S	1	KN2
347.	<i>Urena lobata</i>	S	1	KN2
348.	<i>Urena lobata ssp. sinuata</i>	S	2	ER2, KL2
MELASTOMATACEAE				
349.	<i>Melastoma malabathricum</i>	S	7	ER1, KZ2, KZ3, KN5, KT2, PT1, WA2
	<i>Memecylon depressum</i> ^a	T	2	KS2, WA2
350.	<i>Memecylon edule</i> ^c	S	6	KS1, KS2, KZ2, KL1, PL2, WA1
351.	<i>Memecylon malabaricum</i> ^a	T	1	KN3
352.	<i>Memecylon molestum</i> ^c	S	2	ER2, PT2
353.	<i>Memecylon randerianum</i> ^a	T	3	ER2, KZ3, PT2
354.	<i>Memecylon umbellatum</i>	T	12	AL1, ER1, KS1, KS2, KZ3, KN3, KN5, KT2, PL2, PT1, TV1, WA2
355.	<i>Osbeckia leschenaultiana</i>	S	4	KS1, KL1, PL2, WA1
356.	<i>Sonerila rheederi</i> ^a	H	1	KN2
MELIACEAE				
357.	<i>Aglaiia barberi</i>	T	2	KZ2, TS2
358.	<i>Aglaiia elaeagnoidea</i>	T	7	AL1, ER1, ER2, KZ3, KN1, KN3, WA2
359.	<i>Aglaiia lawii</i>	T	4	ER1, KS1, KS2, TV1
360.	<i>Aphanamixis polystachya</i>	T	2	ER1, PL2
361.	<i>Azadirachta indica</i>	T	2	KZ2, KN2
362.	<i>Chukrasia tabularis</i>	T	4	KZ2, KN1, TV2, WA2
363.	<i>Dysoxylum ficiforme</i>	T	3	ER1, PL2, KZ2
364.	<i>Dysoxylum malabaricum</i> ^a	T	2	KN1, WA2
365.	<i>Naregamia alata</i> ^c	H	5	KS2, KZ3, KN1, KN5, WA2
366.	<i>Swietenia macrophylla</i>	T	1	KT2
367.	<i>Toona ciliata</i>	T	1	WA2
368.	<i>Trichilia connaroides</i>	T	1	KZ2

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Appendix 1 (cont'd). List of angiosperm species recorded in the sacred groves of Kerala

Sl. No.	Species	Habit	Number of sacred groves of occurrence and acronym of the sacred groves	
			Number	Acronym of the sacred groves
MENISPERMACEAE				
369.	<i>Anamirta cocculus</i>	C	16	ER1, ER2, KS1, KS2, KZ3, KL1, KN1, KN4, KN5, KT1, KT2, MA1, PL2, PT1, TV1, WA2
370.	<i>Cyclia peltata</i>	C	9	KS1, KS2, KL1, KL2, KN1, KN2, KN3, PL2, WA1
371.	<i>Diploclisia glaucescens</i>	C	4	ER2, KZ3, KN5, KT1
372.	<i>Tiliacora acuminata</i>	S	3	KZ3, KN2, KN5
373.	<i>Tinospora cordifolia</i>	S	1	KN3
374.	<i>Tinospora malabarica</i>	S	4	KZ3, KN1, KN5, TS1
MIMOSACEAE				
375.	<i>Acacia caesia</i>	S	3	ER2,KS2,WA1
376.	<i>Acacia nilotica</i>	T	2	KN2, TV2
377.	<i>Adenantha pavonina</i>	T	14	AL1, ER1, ER2, KZ2, KZ3, KN1, KN2, KN3, KT2, PL1, PT1, PT2, TV2, WA2
378.	<i>Albizia chinensis</i>	T	6	ER1, KZ3, KN1, KN4, PL1, TV2
379.	<i>Albizia odoratissima</i>	H	6	KZ1, KZ2, KL1, PT2, WA1, WA2
380.	<i>Albizia procera</i>	T	1	TV1
381.	<i>Mimosa pudica</i>	H	2	KZ2, KN2
382.	<i>Samanea saman</i>	T	1	KN3
383.	<i>Xylia xylocarpa</i>	T	11	KS1, KZ1, KZ3, KL1, KL2, KN2, KN5, KT2, MA1, PL1, WA1
MORACEAE				
384.	<i>Antiaris toxicaria</i>	T	16	ER1, ER2, KS1, KS2, KZ1, KZ3, KL2, KN5, KT1, KT2, PL1, PT1, TS1, TV1, TV2, WA2
385.	<i>Artocarpus gomezianus</i>	T	1	KN4
386.	<i>Artocarpus heterophyllus</i>	T	6	AL1, ER2, KL2, KN2, PL1, WA2
387.	<i>Artocarpus hirsutus</i> ^a	T	15	AL1, ER1, ER2, KS1, KS2, KZ1, KZ3, KL2, KN1, KT2, PT1, TS1, TV1, WA1, WA2
388.	<i>Ficus hispida</i>	T	3	ER2, KZ1, KL2
389.	<i>Ficus amplissima</i>	T	1	ER2
390.	<i>Ficus asperrima</i>	T	2	KZ2, KN2
391.	<i>Ficus beddomei</i> ^b	T	1	KS2
392.	<i>Ficus benghalensis</i>	T	2	ER2, KT2
393.	<i>Ficus callosa</i>	T	3	ER2, KL2, WA1
394.	<i>Ficus drupacea</i> var. <i>pubescens</i>	T	2	ER2, PT2
395.	<i>Ficus exasperata</i>	T	1	KL1
396.	<i>Ficus hispida</i>	T	4	ER2, KZ2, KN2, KT2
397.	<i>Ficus microcarpa</i>	T	4	ER2, KZ2, KN1, PT2
398.	<i>Ficus nervosa</i>	T	2	KS2, KZ2
399.	<i>Ficus racemosa</i>	T	2	KL1, WA1
400.	<i>Ficus religiosa</i>	T	4	KZ2, KN2, KN3, KT2
401.	<i>Ficus</i> sp.	T	3	KS1, KZ2, KL1
402.	<i>Ficus tinctoria</i>	T	1	KN3
403.	<i>Ficus tsjahela</i>	T	6	ER1, ER2, KZ3, KN2, PT1, TS1

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Appendix 1 (cont'd). List of angiosperm species recorded in the sacred groves of Kerala

Sl. No.	Species	Habit	Number of sacred groves of occurrence and acronym of the sacred groves	
			Number	Acronym of the sacred groves
MORACEAE				
404.	<i>Ficus virens</i> ^c	T	1	KN5
405.	<i>Streblus asper</i>	T	5	AL1, ER2, KN2, KN5, TV1
MORINGACEAE				
406.	<i>Moringa oleifera</i>	T	1	KN2
MUSACEAE				
407.	<i>Musa paradisiaca</i>	H	1	KN2
MYRISTICACEAE				
408.	<i>Myristica attenuata</i>	T	1	TV1
409.	<i>Myristica dactyloides</i>	T	5	KS2, KZ1, KZ2, KL2, WA2
410.	<i>Myristica magnifica</i>	T	1	WA2
411.	<i>Knema attenuata</i> ^b	T	6	ER1, KS1, KS2, KZ3, TS2, WA2
412.	<i>Myristica malabarica</i> ^b	T	7	AL1, ER1, ER2, KS1, KS2, KZ3, WA2
MYRSINACEAE				
413.	<i>Ardisia pauciflora</i>	T	4	KS1, KS2, KL1, PL2
414.	<i>Ardisia solanacea</i>	T	4	KS1, KS2, KN1, WA1
415.	<i>Embelia tsjeriam-cottam</i>	S	5	ER1, KZ3, KN2, TV1, WA2
416.	<i>Maesa indica</i>	T	3	KS1, KS2, KZ2
417.	<i>Rapanea wightiana</i>	T	1	KS1
MYRTACEAE				
418.	<i>Eugenia bracteata</i>	T	2	KS1, KS2
419.	<i>Eugenia mooniana</i>	T	2	KS2, PL2
420.	<i>Syzygium caryophyllatum</i>	T	4	KZ3, KN1, KN5, WA2
421.	<i>Syzygium cumini</i>	T	4	ER2, KZ1, KN1, KN2
422.	<i>Syzygium gardneri</i>	T	1	KS1
423.	<i>Syzygium hemisphericum</i>	T	1	KS2
424.	<i>Syzygium heyneanum</i> ^c	T	2	KN1, PL2
425.	<i>Syzygium laetum</i> ^a	T	1	WA2
426.	<i>Syzygium lanceolatum</i>	T	3	KL1, KL2, PL1
427.	<i>Syzygium munronii</i>	T	1	WA2
428.	<i>Syzygium</i> sp.	T	1	KS1
429.	<i>Syzygium travancoricum</i> ^a	T	2	ER1, KZ3
430.	<i>Syzygium zeylanicum</i>	T	7	AL1, ER1, KS1, KZ3, KN1, KN5, KT2
431.	<i>Psidium guajava</i>	T	1	KN2
NYCTAGINACEAE				
432.	<i>Boerhaavia diffusa</i>	H	3	KZ2, KN2, KN4
NYMPHAEACEAE				
433.	<i>Nymphaea stellata</i>	H	1	KN2
OCHNACEAE				
434.	<i>Ochna zeylanica</i>	T	2	KN1, TV2
OLACACEAE				
435.	<i>Anacolosa densiflora</i> ^a	T	3	KN4, KT1, TV2
436.	<i>Strombosia ceylanica</i>	T	3	ER2, KZ3, PT1
OLEACEAE				
437.	<i>Chionanthus mala-elengi</i> ^c	T	3	AL1, KS2, KN1
438.	<i>Jasminum angustifolium</i>	S	1	ER2

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Appendix 1 (cont'd). List of angiosperm species recorded in the sacred groves of Kerala

Sl. No.	Species	Habit	Number of sacred groves of occurrence and acronym of the sacred groves	
			Number	Acronym of the sacred groves
OLEACEAE				
439.	<i>Jasminum malabaricum</i> ^b	S	7	ER1, KZ2, KZ3, KN1, KN3, KN5, WA2
440.	<i>Jasminum multiflorum</i>	S	1	KN2
441.	<i>Jasminum rottlerianuma</i>	S	2	KS1, PL2
442.	<i>Myxopyrum smilacifolium</i>	S	1	ER2
443.	<i>Olea dioica</i>	T	10	AL1, ER1, ER2, KZ1, KL1, KL2, KN1, KN3, PL2, WA1
444.	<i>Olea polygamaa</i>	T	5	KZ3, KN5, KT1, PT1, WA2
ONAGRACEAE				
445.	<i>Ludwigia octovalvis</i>	S	2	ER2, WA2
OPILIAEAE				
446.	<i>Cansjera rheedei</i>	T	3	ER2, KN1, TV2
ORCHIDACEAE				
447.	<i>Acampe praemorsa</i>	H	7	ER1, PL1, KN1, MA1, KT2, KZ3, WA2
448.	<i>Aerides crispa</i> ^b	H	9	ER1, KZ3, KT2, MA1, PT1, TS1, TS2, TV1, WA2
449.	<i>Bulbophyllum aureum</i> ^a	H	6	KS1, KS2, KL1, KN1, PL2, WA1
450.	<i>Bulbophyllum sterile</i> ^c	H	4	ER1, KN1, MA1, PL1
451.	<i>Cottonia peduncularis</i>	H	1	KS2
452.	<i>Dendrobium anamalayanum</i> ^a	H	2	KS1, PL2
453.	<i>Dendrobium haemoglossum</i>	H	3	KS1, KS2, KZ2
454.	<i>Dendrobium heyneanum</i> ^c	H	2	KS1, KS2
455.	<i>Dendrobium macrostachyum</i>	H	2	KS1, KS2
456.	<i>Dendrobium ovatum</i> ^c	H	4	KS1, KL1, PL2, WA1
457.	<i>Epidendrum tenuifolium</i>	H	2	KS2TV2
458.	<i>Gastrochilus flabelliformis</i> ^b	H	1	KS2
459.	<i>Geodorum densiflorum</i>	H	3	KN1, KZ2, TV2
460.	<i>Malaxis rheedei</i>	H	3	KS2, KN1, PT2
461.	<i>Malaxis versicolor</i>	H	1	KS2
462.	<i>Nervilia crocififormis</i>	H	2	KZ3, WA2
463.	<i>Nervilia infundibulifolia</i>	H	5	ER1, KZ3, KN1, TV1, WA2
464.	<i>Nervilia prainiana</i>	H	3	KS2, KN1, KN2
465.	<i>Oberonia santapauia</i>	H	2	KS2, KN1
466.	<i>Pholidota pallida</i>	H	1	KS2
467.	<i>Porpax reticulatab</i>	H	7	ER1, KS2, KZ3, KN1, KN5, MA1, TV1
468.	<i>Schoenorchis nivea</i>	H	1	KS2
469.	<i>Seidenfia rheedei</i>	H	2	ER2, KZ3
470.	<i>Zeuxine longilabris</i>	H	3	ER2, KS2, KN1
OXALIDACEAE				
471.	<i>Biophytum sensitivum</i> var. <i>candolleianum</i>	H	4	KS2, KZ1, KL2, KN2
472.	<i>Biophytum sensitivum</i> var. <i>sensitivum</i>	H	4	ER2, KZ2, KL2, KN3

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Appendix 1 (cont'd). List of angiosperm species recorded in the sacred groves of Kerala

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PANDANACEAE				
473.	<i>Pandanus furcatus</i>	T	2	WA1, WA2
474.	<i>Pandanus odoratissimus</i>	S	5	ER1, KZ3, KN1, KN5, WA2
PASSIFLORACEAE				
475.	<i>Passiflora foetida</i>	S	1	KN2
PERIPLOCACEAE				
476.	<i>Cryptolepis buchananii</i>	S	1	KN3
477.	<i>Hemidesmus indicus</i>	S	12	AL1, ER1, KZ3, KN1, KN2, KN5, KT1, KT2, MA1, PL1, PT1, TS1
PIPERACEAE				
478.	<i>Hackeria subpeltata</i>	S	1	WA2
479.	<i>Lepianthes umbellata</i>	S	1	KS1
480.	<i>Peperomia pellucida</i>	H	2	ER2, KS2
481.	<i>Peperomia tetraphylla</i>	H	5	KS1, KL1, PL2, TV2, WA1
482.	<i>Piper argyrophyllum</i>	S	3	KS1, KS2, TV2
483.	<i>Piper hymenophyllum</i>	S	6	KS1, KS2, KL1, KN1, PL2, WA1
484.	<i>Piper longum</i>	S	3	ER2, KN2, TV1
485.	<i>Piper nigrum</i> ^a	S	11	ER1, ER2, KS1, KS2, KZ3, KL1, KN1, KN2, KN5, MA1, PT1
486.	<i>Piper wightii</i> ^a	S	5	KS1, KS2, KL1, PT2, TV2
POACEAE				
487.	<i>Alloteropsis cimicina</i>	H	2	ER2, TS2
488.	<i>Axonopus compressus</i>	H	2	ER2, TV1
489.	<i>Brachiaria remota</i>	H	1	ER2
490.	<i>Centotheca lappacea</i>	H	2	ER2, TS2
491.	<i>Chrysopogon aciculatus</i>	H	3	ER2, KZ2, KN1
492.	<i>Cynadon dactylon</i>	H	1	KN2
493.	<i>Eleusine indica</i>	H	2	ER1, ER2
494.	<i>Ochlandra rheedii</i>	S	2	KS1, WA2
495.	<i>Ochlandra travancorica</i> ^b	S	1	WA2
496.	<i>Oplismenus aemuls</i>	H	1	KN3
497.	<i>Oplismenus compositus</i>	H	2	ER2, PT2
498.	<i>Oryza sativa</i>	H	1	ER2
RANUNCULACEAE				
499.	<i>Clematis smilacifolia</i>	S	6	KS1, KS2, KL1, KN1, PL2, WA1
500.	<i>Naravelia zeylanica</i>	S	13	AL1, ER1, ER2, KS2, KZ3, KN1, KN2, KN5, KT1, KT2, MA1, PT1, TV1
RHAMNACEAE				
501.	<i>Colubrina travancorica</i>	S	1	ER2
502.	<i>Zizyphus oenoplea</i>	C	9	ER2, KZ1, KZ3, KL2, KN1, KN2, KN3, KN5, PL1
503.	<i>Zizyphus rugosa</i>	S	11	ER1, ER2, KS1, KZ3, KL1, KN2, KN3, KN5, KT2, PL2, WA1
RHIZOPHORACEAE				
504.	<i>Carallia brachiata</i>	T	5	KZ2, KZ3, KN1, KN3, WA2

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Sl. No.	Species	Habit	Number of sacred groves of occurrence and acronym of the sacred groves	
			Number	Acronym of the sacred groves
ROSACEAE				
505.	<i>Prunus ceylanica</i>	T	3	ER1, KS2, KL1
506.	<i>Rosa damascene</i>	S	1	KN2
RUBIACEAE				
507.	<i>Anthocephalus cadamba</i>	T	1	KN2
508.	<i>Benkara malabarica</i>	T	2	KZ2, KN3
509.	<i>Canthium angustifolium</i>	S	2	KZ2, KN1
510.	<i>Canthium coromandelicum</i>	S	4	ER2, KZ1, KL2, KN1
511.	<i>Canthium dicoccum</i>	T	1	KN2
512.	<i>Canthium rheedei^c</i>	T	4	KS1, KS2, KL1, PL2
513.	<i>Catunaregam spinosa</i>	T	5	ER1, KZ1, KZ3, KL2, PL1
514.	<i>Chassalia curviflora</i>	H	3	ER2, KZ2, KN3
515.	<i>Coffea arabica</i>	S	3	ER1, ER2, TS2
516.	<i>Geophila reniformis</i>	H	1	KS2
517.	<i>Geophila repens</i>	H	12	ER1, ER2, KZ2, KZ3, KN2, KT1, KT2, PL1, PT1, TS1, TV1, TV2
518.	<i>Haldina cordifolia</i>	T	1	KN2
519.	<i>Hedyotis auricularia</i>	H	6	ER1, KZ2, KZ3, PT2, TS1, TV2
520.	<i>Hedyotis corymbosa</i>	H	2	KN3, TV2
521.	<i>Ixora brachiata^b</i>	T	6	ER1, ER2, KS2, KN3, PL2, TS1
522.	<i>Ixora coccinea</i>	S	9	AL1, KZ3, KN1, KN2, KN5, KT2, MA1, TV1, WA2
523.	<i>Ixora elongata^b</i>	S	3	KS1, KS2, KN1
524.	<i>Ixora lanceolaria</i>	S	1	ER2
525.	<i>Ixora nigricans</i>	T	10	ER1, ER2, KS2, KZ3, KN1, KN5, KT1, PL2, PT1, WA2
526.	<i>Ixora parviflora</i>	T	1	KN2
527.	<i>Lasianthus dichotomous</i>	S	2	KS1, KS2
528.	<i>Mitragyna parviflora</i>	T	1	KN2
529.	<i>Morinda tinctoria</i>	T	3	KL2, MA1, PL1
530.	<i>Morinda umbellata</i>	S	4	KZ3, KN1, KN5, PT1
531.	<i>Mussaenda bellila</i>	S	1	KN2
532.	<i>Mussaenda frondosa</i>	S	3	ER2, KZ3, KN1
533.	<i>Oldenlandia auricularia</i>	H	3	ER2, KN1, KN2
534.	<i>Oldenlandia corymbosa</i>	H	1	ER2
535.	<i>Ophiorrhiza brunonis^a</i>	H	1	ER2
536.	<i>Ophiorrhiza hirsutula</i>	S	1	KN2
537.	<i>Pavetta hispidula</i>	T	1	PL2
538.	<i>Pavetta indica</i>	T	9	AL1, ER1, ER2, KZ3, KN1, KN2, KN3, TV1, WA2
539.	<i>Pavetta tomentosa</i>	T	1	KN2
540.	<i>Pavetta zeylanica</i>	S	7	KS1, KS2, KZ3, KN1, KN5, PL2, PT2
541.	<i>Psilanthus travancorensis</i>	S	1	ER2
542.	<i>Psychotria anamalayana^a</i>	T	2	KS1, KS2
543.	<i>Psychotria elongata</i>	S	1	PL2
544.	<i>Psychotria flavida^a</i>	S	1	ER2
545.	<i>Psychotria macrocarpa^a</i>	S	3	ER1, KZ3, KN1

The names of the sacred groves are as in Table 1. Plant name with superscript, a = endemic to the southern Western Ghats, b=endemic to the Western Ghats, c=endemic to the Peninsular India.

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Appendix 1 (cont'd). List of angiosperm species recorded in the sacred groves of Kerala

Sl. No.	Species	Habit	Number of sacred groves of occurrence and acronym of the sacred groves	
			Number	Acronym of the sacred groves
RUBIACEAE				
546.	<i>Psychotria truncata</i> ^b	T	3	KS1, KS2, KL1
547.	<i>Psydrax travancorica</i> ^a	T	1	ER2
548.	<i>Psydrax umbellata</i>	T	2	KN3, KN5
549.	<i>Randia dumetorum</i>	T	1	KS1
550.	<i>Randia sp.</i>	R	1	KZ3
551.	<i>Randia spinosa</i>	T	2	KN1, PT2
552.	<i>Randia uliginosa</i>	T	4	KS1, KL1, KN1, PL2
553.	<i>Saprosma glomerata</i> ^b	S	4	KS1, KS2, PL2, TV1
554.	<i>Spermacoce ocymoides</i>	H	1	ER2
555.	<i>Spermacoce pusilla</i>	H	2	KN2, KL2
RUTACEAE				
556.	<i>Acronychia pedunculata</i>	T	8	ER1, KZ3, KL2, KN4, KN5, TS2, TV1, WA2
557.	<i>Aegle marmelos</i>	T	4	AL1, KL2, KN2, KN3
558.	<i>Atalantia racemosa</i>	T	6	KS1, KS2, KZ1, KL1, KL2, WA1
559.	<i>Atalantia wightii</i>	T	5	ER1, KZ2, KN2, PL2, PT2
560.	<i>Citrus medica</i>	T	1	KN2
561.	<i>Euodia lunu ankenda</i>	T	3	KZ1, KL2, WA2
562.	<i>Glycosmis arborea</i>	T	2	KN2, TS2
563.	<i>Glycosmis macrocarpa</i>	T	1	ER2
564.	<i>Glycosmis mauritiana</i>	S	1	KN3
565.	<i>Glycosmis pentaphylla</i>	T	7	KS1, KS2, KL2, KN1, KN2, KN3, PL2
566.	<i>Murraya paniculata</i>	T	5	KS1, KS2, KL1, PL2, WA1
567.	<i>Naringi crenulata</i>	T	4	KZ3, KL1, KN1, TV2
RUTACEAE				
568.	<i>Toddalia asiatica</i>	C	7	KS1, KZ3, KT1, PL2, PT1, TV1, WA1
569.	<i>Vepris bilocularisa</i>	T	1	ER2
570.	<i>Zanthoxylum ovalifolium</i>	T	1	KN2
571.	<i>Zanthoxylum rhetsa</i>	T	9	AL1, ER1, ER2, KZ1, KZ3, KL2, KN3,KN3, KN5, KT1, PL2, PT1
SABIACEAE				
572.	<i>Meliosma pinnata</i>	T	2	KZ1, WA2
SALVODORACEAE				
573.	<i>Azima tetraacantha</i>	S	1	KN4
SANTALACEAE				
574.	<i>Santalum album</i>	T	1	ER2
575.	<i>Scleropyrum pentandrum</i>	T	4	ER2, KS1, KS2, KN2
SAPINDACEAE				
576.	<i>Allophyllus cobbe</i>	T	7	ER1, ER2, KZ3, KN3, KT1, MA1, TV1
577.	<i>Cardiospermum halicacabum</i>	H	1	KN2
578.	<i>Dimocarpus longan</i>	T	5	ER1, KS1, KN1, PL2, WA2

The names of the sacred groves are as in Table 1. Plant name with superscript, a = endemic to the southern Western Ghats, b=endemic to the Western Ghats, c=endemic to the Peninsular India.

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Appendix 1 (cont'd). List of angiosperm species recorded in the sacred groves of Kerala

Sl. No.	Species	Habit	Number of sacred groves of occurrence and acronym of the sacred groves	
			Number	Acronym of the sacred groves
SAPINDACEAE				
579.	<i>Filicium decipiens</i>	T	1	KZ2
580.	<i>Harpullia arborea</i>	T	1	KZ2
581.	<i>Lepisanthes tetraphylla</i>	T	1	PL2
582.	<i>Lepisanthes umbrellatus</i>	T	1	KS2
583.	<i>Otonophelium stipulaceum</i>	T	2	KS1, PT2
584.	<i>Sapindus laurifolius</i>	T	6	KZ1, KL2, KN1, KN2, KN3, TV1
585.	<i>Sapindus trifoliata</i>	T	3	KL1, TV1, WA1
586.	<i>Schleichera oleosa</i>	T	7	AL1, KS2, KL1, KN1, KN2, KN3, WA1
SAPOTACEAE				
587.	<i>Chrysophyllum cainito</i>	T	2	ER2, KN1
588.	<i>Madhuca longifolia</i>	T	4	ER1, KZ3, KN1, WA2
589.	<i>Madhuca neriifolia</i>	T	3	KZ3, KN1, TV2
590.	<i>Mimusops elengi</i>	T	12	ER1, ER2, KZ1, KZ2, KZ3, KL2, KN1, KN3, KN5, KT2, PT2, TV1
591.	<i>Palaquium ellipticum</i>	T	1	KS1
SCROPHULARIACEAE				
592.	<i>Lindernia ciliata</i>	H	1	ER2
593.	<i>Lindernia crustacea</i>	H	2	ER2, KN3
594.	<i>Lindernia viscosa</i>	H	1	ER2
595.	<i>Lindernia serrata</i>	H	1	KN3
596.	<i>Scoparia dulcis</i>	H	3	KL2
597.	<i>Torenia bicolor</i>	H	1	ER2
SIMAROUBACEAE				
598.	<i>Ailanthus triphysa</i>	T	3	AL1, ER2, TS2
599.	<i>Quassia indica</i>	T	4	AL1, KZ1, KZ3, KN1
SMILACACEAE				
600.	<i>Smilax wightii</i>	S	3	KS1, KS2, KN5
601.	<i>Smilax zeylanica</i>	C	8	AL1, ER2, KS1, KS2, KL1, KN1, PL2, WA1
SOLANACEAE				
602.	<i>Capsicum frutescens</i>	H	2	KN2, TS2
603.	<i>Solanum nigrum</i>	H	1	KN2
604.	<i>Solanum surattense</i>	H	1	WA2
605.	<i>Solanum torvum</i>	S	1	KN2
STAPHYLACEAE				
606.	<i>Turpinia malabarica</i>	T	2	KS2, WA2
STERCULIACEAE				
607.	<i>Helictres isora</i>	T	8	KZ1, KZ3, KL2, KN2, KT1, PT1, PT2, TV1
608.	<i>Leptonychia caudata</i>	T	2	ER2, PT2
609.	<i>Pterospermum reticulatum</i> ^a	T	8	ER1, KS2, KZ3, KN2, KT2, PL2, PT1, TV1
610.	<i>Pterospermum rubiginosum</i> ^a	T	1	PL1
611.	<i>Pterygota alata</i>	T	1	KS1
612.	<i>Sterculia guttata</i>	T	10	ER1, ER2, KS2, KZ1, KZ3, KL1, KL2, KN2, KN3, TV1

The names of the sacred groves are as in Table 1. Plant name with superscript, a = endemic to the southern Western Ghats, b=endemic to the Western Ghats, c=endemic to the Peninsular India.

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Appendix 1 (cont'd). List of angiosperm species recorded in the sacred groves of Kerala

Sl. No.	Species	Habit	Number of sacred groves of occurrence and acronym of the sacred groves	
			Number	Acronym of the sacred groves
STERCULIACEAE				
613.	<i>Sterculia villosa</i>	T	1	TV1
614.	<i>Theobroma cacao</i>	T	1	ER2
SYMPLOCACEAE				
615.	<i>Symplocos racemosa</i> var <i>racemosa</i>	T	2	KS2, KN1
TACCACEAE				
616.	<i>Tacca pinnatifida</i>	H	1	KN1
TILIACEAE				
617.	<i>Corchorus aestuans</i>	H	2	ER2, TV2
618.	<i>Grewia tiliifolia</i>	T	14	ER1, KZ1, KZ3, KL1, KL2, KN2, KT1, KT2, MA1, PL1, PL2, PT1, WA1, WA2
619.	<i>Grewia umbellifera</i> ^b	C	3	ER2, KS1, WA1
620.	<i>Triumfetta rhomboidea</i>	S	1	MA1
621.	<i>Grewia microcos</i>	T	2	KZ2, KN1
622.	<i>Grewia nervosa</i>	T	2	KZ3, KN3
ULMACEAE				
623.	<i>Celtis philippensis</i> var. <i>wightii</i>	T	4	ER1, ER2, KN4, PL2
624.	<i>Holoptelea integrifolia</i>	T	5	ER1, ER2, KN5, MA1, WA1
625.	<i>Trema orientalis</i>	T	2	ER2, KN5
URTICACEAE				
626.	<i>Dendrocnide sinuata</i>	T	2	TV2, WA2
627.	<i>Elatostema lineolatum</i>	S	5	KS1, KS2, KL1, KN1, PT2
628.	<i>Laportea bulbifera</i>	H	1	ER2
629.	<i>Pellionia heyneana</i>	H	4	KS1, KS2, KL1, KN1
630.	<i>Pouzolzia zeylanica</i>	H	2	ER2, KN3
VERBANECEAE				
631.	<i>Premna latifolia</i>	T	2	KZ3, KN1
632.	<i>Callicarpa tomentosa</i>	T	6	KS1, KS2, KZ1, KZ3, KL1, KL2
633.	<i>Clerodendrum paniculatum</i>	S	2	ER2, KN2
634.	<i>Clerodendrum serratum</i>	S	3	ER2, KZ1, KL2
635.	<i>Clerodendrum viscosum</i>	T	4	KZ1, KZ2, KN2, WA1
636.	<i>Gmelina arborea</i>	T	1	KN3
637.	<i>Lantana camara</i>	S	5	KZ1, KL2, KN1, KN5, WA1
638.	<i>Premna coriacea</i>	T	2	KS1, KN1
639.	<i>Premna tomentosa</i>	T	1	KZ3
640.	<i>Tectona grandis</i>	T	5	ER2, KL1, KN2, MA1, PL1
641.	<i>Vitex altissima</i>	T	12	ER1, ER2, KS2, KZ1, KZ3, KL2, KN1, KN3, KN5, KT1, PL2, PT1
642.	<i>Vitex trifolia</i> var. <i>subtrisecta</i>	S	1	KZ3
643.	<i>Vitex trifolia</i>	S	1	KN1
644.	<i>Duranta repens</i>	S	2	KN2, TV2
VIOLACEAE				
645.	<i>Hybanthus enneaspermus</i>	H	1	KZ3

The names of the sacred groves are as in Table 1. Plant name with superscript, a = endemic to the southern Western Ghats, b=endemic to the Western Ghats, c=endemic to the Peninsular India.

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Appendix 1 (cont'd). List of angiosperm species recorded in the sacred groves of Kerala

Sl. No.	Species	Habit	Number of sacred groves of occurrence and acronym of the sacred groves	
			Number	Acronym of the sacred groves
VITACEAE				
646.	<i>Ampelocissus indica</i> ^a	S	2	ER2, PT2
647.	<i>Ampelocissus latifolia</i>	S	1	KN3
648.	<i>Cayratia pedata</i>	S	2	ER2, KN4
649.	<i>Cayratia trifolia</i>	C	6	ER1, KS2, KZ3, KN1, KN4, KT1
650.	<i>Cissus arnottiana</i>	S	2	KS2, WA2
651.	<i>Cissus discolor</i>	S	1	PT1
652.	<i>Cissus heyneana</i>	S	3	ER2, KZ2, TV2
653.	<i>Cissus latifolia</i>	S	2	ER2, KS2
654.	<i>Cissus trilobata</i>	S	5	KZ2, KZ3, KN1, PT2, TV2
XANTHOPHYLLACEAE				
655.	<i>Xanthophyllum arnottianum</i>	T	7	AL1, ER2, KS1, KS2, KN1, KT1, PL2
656.	<i>Xanthophyllum flavescens</i>	T	1	WA2
657.	<i>Xanthophyllum</i> sp.,		1	TV1
ZINGIBERACEAE				
658.	<i>Ammomum cannicarpum</i> ^b	H	2	KN4, PL1
659.	<i>Amomum pterocarpum</i>	H	4	KS2, KL1, PL2, WA1
660.	<i>Costus speciosus</i>	H	2	ER2, TV2
661.	<i>Curcuma amada</i>	H	2	KZ2, KN2
662.	<i>Curcuma aromatica</i>	H	1	ER2
663.	<i>Curcuma caesia</i>	H	2	ER2, KS2
664.	<i>Curcuma ecalcarata</i> ^b	H	2	ER2, PT1
665.	<i>Curcuma neilgherrensis</i> ^b	H	3	KZ2, KN2, TV2
666.	<i>Curcuma oligantha</i>	H	10	ER1, KS1, KZ2, KZ3, KL2, KT2, PL1, PT2, TS1, TV2
667.	<i>Curcuma oligantha</i> var. <i>lutea</i> ^a	H	6	ER1, KS1, KZ3, PT2, TS2, TV2
668.	<i>Curcuma</i> sp.	H	1	AL1
669.	<i>Elettaria cardamomum</i>	H	3	ER1, TV2, WA2
670.	<i>Globba sessiliflora</i>	H	2	ER2, TS2

The names of the sacred groves are as in Table 1. Plant name with superscript, a = endemic to the southern Western Ghats, b=endemic to the Western Ghats, c=endemic to the Peninsular India.

Appendix 2. List of butterfly species recorded in the sacred groves of Kerala

Sl. No.	Species	Common Name	Number of sacred groves of occurrence and acronym of the sacred groves	
	Family: HesperIIDae		Number	Acronym of the sacred groves
1.	<i>Ampittia discorides</i>	Bush Hopper	16	ER1,ER2,KS1,KS2, KZ3,KL1,KL2,KN1, KN2,KN3,KT2,PL1, PL2,PT1,WA1,WA2
2.	<i>Badamia exclamationis</i>	Brown Awl	8	KS1,KS2,KZ1,KZ2, KN3,KN4,PT1,WA2
3.	<i>Baracus vittatus</i>	Hedge Hopper	4	ER1,ER2,KZ2,KZ3,
4.	<i>Bibasis sena sena</i>	Orange Tail Awl	5	KS1,KZ2,KN1,WA1
5.	<i>Borbo cinnara</i>	Rice Swift	14	ER1,KS2,KZ1,KZ2, KZ3, KL2,KN1,KN3, KN5, KT2, PL1,PL2,WA1,WA2
6.	<i>Caprona procris</i>	Commander	4	ER1,ER2,KZ3,TV2
7.	<i>Celaenorrhinus ambareesa</i>	Malabar Spotted Flat	12	KS1,KS2,KL1,KL2,KN2,KN4 ,KT1,KT2,MA1,PT1,TS1,TS2
8.	<i>Celaenorrhinus leucocera</i>	Common Spotted Flat	14	ER1,ER2,KS2,KZ1,KZ2,KZ3, KN1,KN2, KN4, KN5, KT1, MA1,TS1,WA1
9.	<i>Gangara thyrsis thyrsis</i>	Giant Red Eye	13	ER1,ER2,KS2,KZ1,KZ2,KZ3, KN2,KN4,KN5, KT1, MA1, TS1,TS2
10.	<i>Hasora badra</i>	Common Awl	12	ER1,ER2,KS1,KS2,KZ1,KZ2, KZ3,KL2,KN1,KN3,WA1, WA2
11.	<i>Hasora chromus</i>	Common Banded Awl	12	ER1,KS2,KZ2,KZ3,KL1,KL2, KN2,KN3, KN4, KT2, PT1, WA2
12.	<i>Hasora taminatus</i>	White banded Awl	3	ER1,ER2,KZ3
13.	<i>Hasora taminatus</i>	White Banded Awl	8	ER1,ER2,KS1,KS2,KZ2,KZ3, KN1,WA1
14.	<i>Hasora vitta</i>	Plain Banded Awl	2	ER1,KZ3
15.	<i>Lambrix salsula</i>	Chestnut Bob	15	KS1,KS2,KZ1,KZ2,KZ3, KL1,KL2,KN1,KN3,KT2, PT1,TV1,TV2, WA1,WA2
16.	<i>Notocrypta curvifascia curvifascia</i>	Restricted Demon	8	KS1,KS2,KZ2,KZ3, KN1,KN3, WA1,WA2
17.	<i>Pelopidas Inathias</i>	Small Branded Swift	13	KS1,KS2,KZ1,KZ2,KZ3, KN1, KN3, KN4, KZ3, KN1, KN3, KN4, KN5, PL1, PL2,WA1,WA2
18.	<i>Pseudocoladenia dan</i>	Fulvous Pied Flat	11	KS1,KS2,KZ1,KZ2,KZ3, KN1, KN2, KN3,PT1, WA1,WA2
19.	<i>Psolos fuligo subfasciatus</i>	Coon	9	ER1,ER2,KS2,KZ2,KZ3, KN1,KN2,KN5,WA1
20.	<i>Sarangesa dasahara</i>	Common Small Flat	7	KZ1,KZ2,KZ3,KL2,KN1, KT2,WA1
21.	<i>Sarangesa purendra pandra *</i>	Spotted Small Flat	10	ER1,ER2,KS1,KZ1,KZ2,KZ3, KN1,KN2, PT1,WA1

The names of the sacred groves are as in Table 1.

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Appendix 2 (cont'd). List of butterfly species recorded in the sacred groves of Kerala

Sl. No.	Species	Common Name	Number of sacred groves of occurrence and acronym of the sacred groves	
	Family: HesperIIDae		Number	Acronym of the sacred groves
22.	<i>Spialia galba</i>	Indian Grizzled Skipper	9	KS1,KZ1,KZ2,KZ3,KN1,PL1,PL2,PT1,WA1
23.	<i>Suastus gremius</i>	Indian Palm Bob	6	ER1,KS1,KS2,KN2, PL1,PL2
24.	<i>Tagiades gana silvia</i>	Immaculate Snow Flat	12	ER1,ER2,KS1,KS2,KZ1,KZ3,KN1,KN2, KN4, KN5, PT1, WA1
25.	<i>Tagiades litigiosa</i>	Water Snow Flat	11	KS1,KS2,KZ2,KZ3,KN1,KN2,KN3,KN5, PT1, WA1,WA2
26.	<i>Taractrocera maevius sagara</i>	Common Grass Dart	5	KS1,KS2,KZ1,KZ2, KZ3
27.	<i>Telicota ancilla bambusae</i>	Dark Palm Dart	10	KS1,KS2,KZ2,KN1, KN2,KT1,MA1,TS1,TS2,WA1
	Family: Lycaenidae			
28.	<i>Abisara echerius prunosa</i>	Plum Judy	11	KS2,KZ1,KZ2,KZ3,KN1,KN2,KN3,KN4, KN5, WA1,WA2
29.	<i>Actolepis puspa felderi</i>	Common Hedge Blue	11	KS1,KS2,KZ2,KZ3,KL1,KN1, KN2,KN3, PT1,WA1,WA2
30.	<i>Arhopala atrax</i>	Indian Oakblue	9	ER1,ER2,KZ1,KZ2,KZ3,PT1,PT1,TV1,TV2
31.	<i>Arhopala pseudocentaurus</i>	Western Centaur Oak Blue	3	ER1,ER2,KZ2
32.	<i>Bindahara phocides</i>	The Plane	4	ER1,ER2,KZ2,KZ3
33.	<i>Caleta caleta desidia</i>	Angled Pierrot	16	KS2,KZ1,KZ2,KZ3,KL1,KL2,KN1,KN2,KN4, KN5, KT2, MA1,PT1,PT1,TV1,WA1
34.	<i>Castalius rosimon</i>	Common Pierrot	17	KS2,KZ1,KZ3,KL2,KN1,KN4,KN5,KT1,KT2, MA1, PL1, PL2, PT1,TS1,TS2,TV1,WA1
35.	<i>Catochrysops Strabo</i>	Forget-Me-Not	4	ER1,ER2,KZ1,KZ3
36.	<i>Cheritra freja</i>	Common Imperial	10	ER1,ER2,KS2,KZ2,KZ3,KN1,KN4,MA1, PT1,WA1
37.	<i>Curetis thetis</i>	Indian Sunbeam	11	ER1,ER2,KS1,KS2,KZ3,KL1,KN2,KN3, KN4,KN5,WA2
38.	<i>Discolampa ethion vavasanus</i>	Banded Blue Pierrot	8	ER1,ER2,KS1,KS2,KZ2,KZ3,KN2,KN5
39.	<i>Euchrysops cnejus</i>	Gram Blue	13	KS2,KZ1,KZ3,KN1,KN2,KN3,KN4,KN5,MA1,PL1,PL2,WA1,WA2
40.	<i>Everes lactrunus syntala</i>	Indian Cupid	2	PL1,PL2
41.	<i>Freyeria trochylus</i>	Grass Jewel	5	ER1,KZ2,KZ3,PL1,PL2
42.	<i>Iraota timoleon</i>	Silver Streak Blue	6	KS1,KZ2,KZ3,KN1,KN2,WA1
43.	<i>Jamides alecto</i>	Metallic Cerulean	5	KZ3,KT1,MA1,TS1,TS2
44.	<i>Jamides bochus</i>	Dark Cerulean	10	ER1,ER2,KS1,KZ1,KZ2,KN1,KN4,KN5,TV2,WA1
45.	<i>Jamides celeno aelianus</i>	Common Caerulean	18	ER1,ER2,KS1,KS2,KZ1,KZ2,KZ3,KN1,KN2,KN4,KT1,MA1,PL1, PL2, PT1,TS1,TS2,WA1

The names of the sacred groves are as in Table 1.

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Appendix 2 (cont'd). List of butterfly species recorded in the sacred groves of Kerala

Sl. No.	Species	Common Name	Number of sacred groves of occurrence and acronym of the sacred groves	
			Number	Acronym of the sacred groves
Family: Lycaenidae				
46.	<i>Lampides boeticus</i>	Pea Blue	10	ER1,ER2,KS1,KS2,KZ2,KZ3,KN1,KN2,KN4,WA1
47.	<i>Leptotes plinius</i>	Zebra Blue	10	KS1,KS2,KZ2,KZ3,KN1,KN2,KN4,KN5,PT1,WA1
48.	<i>Loxura atymnus</i>	Yamfly	9	ER1,ER2,KS2,KZ1,KZ3,KN1,KN3,WA1,WA2
49.	<i>Neopithecops zalmora dharmia</i>	Quaker	8	KS2,KZ1,KZ3,KN1,KN2,KN3,WA1,WA2
50.	<i>Prosotas nora</i>	Common Line Blue	6	KS1,KS2,KZ2,KZ3,KN1,WA1
51.	<i>Pseudozizeeria maha ossa</i>	Pale Grass Blue	10	KS2,KZ1,KZ2,KZ3,KN1,KN2,KN4,PL1,PL2,WA1
52.	<i>Rapala manea schistacea</i>	Slate Flash	8	KS1,KS2,KZ1,KZ2,KZ3,KN1,KN2,WA1
53.	<i>Rathinda amor</i>	Monkey Puzzle	17	ER1,KS1,KZ1,KZ2,KZ3,KL1,KL2,KN1,KN2,KN4,KT2,PL1,PL2,PT1,TV1,TV2,WA1
54.	<i>Spalgis epius epius</i>	Apefly	8	ER1,ER2,KS1,KZ2,KZ3,KL2,KN1,WA1
	<i>Spindasis vulcanus</i>	Common Silver Line	14	KZ1,KZ2,KZ3,KL1,KL2,KN1,KN3,KN4,KT2,PT1,TV1,TV2,WA1,WA2
55.	<i>Spindasis lohita lazularia</i>	Long Banded Silver Line	3	KN1,KN4,WA1
56.	<i>Surendra quercetorium bipalgiata</i>	Common Acacia Blue	3	KL2,KT2,PT1
57.	<i>Tajuria cippus</i>	Peacock Royal	8	ER1,ER2,KS1,KS2,KZ3,KN1,PT1,WA1
58.	<i>Talicauda nyseus</i>	Red Pierrot	9	KS1,KS2,KZ1,KZ2,KZ3,KN1,KN2,KN5,WA1
59.	<i>Thaduka multicaudata</i>	Many Tailed Oak Blue	7	KL2,KN1,KN2,KN3,KT2,WA1,WA2
60.	<i>Udara akasa</i>	White Hedge Blue	1	MA1
61.	<i>Zesius chrysomallus</i>	Red Spot	8	KS2,KZ1,KZ3,KN1,KN3,PT1,WA1,WA2
Family: Nymphalidae				
62.	<i>Acraea Viola</i>	Tawny Coster	22	ER1,ER2,KS1,KS2,KZ2,KZ3,KL1,KN1,KN2,KN4,KN5,KT1,KT2,MA1,PL1,PL2,PT1,TS1,TS2,TV1,TV2,WA1
63.	<i>Ariadne ariadne indica</i>	Indian Angled Castor	16	KS1,KS2,KZ1,KZ2,KZ3,KL1,KL2,KN1,KN2,KN4,KN5,KT2,PT1,TV1,TV2,WA1
64.	<i>Ariadne merione</i>	Common Castor	5	ER1,ER2,KZ3,PL1,PL2
65.	<i>Athyma perius</i>	Common Sergeant	9	KS1,KS2,KZ1,KZ3,KN1,KN2,KN4,KN5,WA1
66.	<i>Athyma ranga karwara</i>	Blackvein Sergeant	11	ER1,KS1,KS2,KZ3,KL1,KL2,KN2,KN3,KN5,PT1,WA2
67.	<i>Byblia ilithyia</i>	Spotted joker	5	ER1,ER2,KZ1,KZ2,KZ3

The names of the sacred groves are as in Table 1.

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Appendix 2 (cont'd). List of butterfly species recorded in the sacred groves of Kerala

Sl. No.	Species	Common Name	Number of sacred groves of occurrence and acronym of the sacred groves	
Family: Nymphalidae			Number	Acronym of the sacred groves
68.	<i>Cethosia nietneri</i>	Tamil Lacewing	2	ER1,ER2
69.	<i>Charaxes bernardus</i>	Tawny Rajah	7	KZ1,KL1,,KL2,KT2,PT1,TV1 TV2
70.	<i>Charaxes dolon</i>	Black Rajah	11	ER1,KS1,KS2,KZ2,KZ3,KL2, KN1,KN3, KT2,WA1,WA2
71.	<i>Cirrochora thais</i>	Tamil yeoman	21	ER1,KS1,KS2,KZ1,KZ2,KL1, KL2,KN1,KN2,KN3,KN5, KT1, KT2,MA1,PT1,TS1, TS2,TV1,TV2,WA1,WA2
72.	<i>Cupha erymanthis</i>	Rustic	18	ER1,ER2,KS1,KS2,KZ2,KZ3, KL1,KL2,KN1,KN3,KN4, KT2,MA1,PT1,TV1,TV2, WA1,WA2
73.	<i>Cynthia cardui</i>	Painted Lady	10	KS2,KZ2,KZ3,KN1,KN2, KN3,KN5,PT1,WA1,WA2
74.	<i>Danaus chrysippus</i>	Plain Tiger	16	ER1,ER2,KS1,KS2,KZ3,KL1, KN1,KN4,KT1,MA1,PL1, PL2,PT1,TS1,TV1,WA1
75.	<i>Danaus genutia</i>	Common tiger	16	KS2,KZ2,KZ3,KL1,KL2,KN1 KN2,KN4,KT2, MA1, PL1, PL2,PT1,TV1,TV2,WA1
76.	<i>Dophla evelina laudabilis</i>	Redspot Duke	13	KS1,KS2,KZ1,KZ2, KL1, KL2, KN1,KN2,KN3, KN4,KT2,WA1,WA2
77.	<i>Elymnias hypermnestra caudata</i>	Common Palmfly	13	ER1,ER2,KS1,KS2,KZ3,KN1, KN2,KN4,KT1,MA1,TS1, TS2,WA1
78.	<i>Euploea core</i>	Common Crow	24	ER1,ER2,KS1,KS2,KZ2,KZ3, KL1,KL2,KN1,KN2,KN3, KN5, KT1,KT2,MA1,PL1, PL2,PT1,TS1,TS2, TV1, TV2,WA1,WA2
79.	<i>Euploea klugii</i>	Brown King Crow	7	KS2,KZ2,KN1,KN2,KN3, WA1,WA2
80.	<i>Euploea sylvester coreta</i>	Double Branded Crow	3	ER1,KS1,KZ2
81.	<i>Euthalia aconthea meridionalis</i>	Baron	15	ER1,KS1,KZ1,KZ2,KL1,KL2, KN2,KN3, KT2, PL1, PL2, PT1,TV1,TV2,WA2
82.	<i>Euthalia lubentina</i>	Gaudy Baron	5	ER1,ER2,KZ1,KZ2,KZ3
83.	<i>Euthalia lubentina arasada</i>	Gaudy Baron	9	KS1,KS2,KZ1,KZ3, KN1,KN3,KN5,WA1,WA2
84.	<i>Hypolimnas bolina</i>	Great Eggfly	22	ER1,ER2,KS1,KS2,KZ1,KZ2, KZ3,KL1,KL2,KN1,KN2, KN4,KN5, KT1,KT2,MA1, PT1,TS1,TS2,TV1,TV2,WA1
85.	<i>Hypolimnas misippus</i>	Danaid Eggfly	9	KS1,KS2,KZ2,KZ3, KN2, KN3,KN5,MA1,WA2
86.	<i>Junonia atlites</i>	Gray Pansy	19	ER1,KS2,KZ1,KZ2,KZ3,KL2, KN2,KN3,KN5,KT1,KT2, MA1,PL1, PL2,PT1,TS1, TS2,TV2,WA2

The names of the sacred groves are as in Table 1.

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Appendix 2 (cont'd). List of butterfly species recorded in the sacred groves of Kerala

Sl. No.	Species	Common Name	Number of sacred groves of occurrence and acronym of the sacred groves	
Family: Nymphalidae			Number	Acronym of the sacred groves
87.	<i>Hypolimnas septentrionis</i>	Dark Blue Tiger	4	ER1,ER2,KZ1,KZ3
88.	<i>Idea malabarica</i> *	Malabar Tree Nymph	13	ER1,ER2,KS2,KZ1,KL1,KL2,KN1,KN2,KN3,PT1,TV1,WA1,WA2
89.	<i>Junonia almana</i>	Peacock Pansy	16	ER1,ER2,KS2,KZ1,KZ3,KL1,KN1,KN2,KN3,KN4,MA1,PL1,PL2,PT1,WA1,WA2
90.	<i>Junonia hierta</i>	Yellow Pansy	9	ER1,KS1,KS2,KZ2, KZ3,KN2, KN4,KN5,PT1
91.	<i>Junonia iphita pluvia</i>	Chocolate Pansy	12	ER1,ER2,KS1,KS2,KZ3,KL2,KN1,KN3, PL1, PL2, WA1,WA2,
92.	<i>Junonia lemonias</i>	Lemon Pansy	18	ER1,ER2,KS1,KS2,KZ1,KZ2, KZ3,KL1,KN1, KN2,KN5,KT1,MA1,PL1,PL2,TS1,TS2,WA1
93.	<i>Junonia orithya</i>	Blue Pansy	9	KS1,KS2,KZ2,KZ3,KN1,KN3,KN5,WA1,WA2
94.	<i>Kaniska canace</i>	Blue Admiral	11	ER1,ER2,KZ1,KZ2, KZ3, KL1, KL2,KT2,PT1,TV1,TV2
95.	<i>Lethe drypetes</i>	Tamil Tree Brown	2	ER1,MA1
96.	<i>Lethe europa ragalva</i>	Bamboo Tree Brown	12	ER1,KZ1,KZ2,KN1,KN2,KN3, KT1,MA1,TS1,TS2,WA1,WA2
97.	<i>Libythea lepita lepitoides</i>	Common Beak	8	KS1,KZ1,KZ2,KZ3,KN1,KN3,WA1,WA2
98.	<i>Limenitis procris undifragus</i>	Commander	16	ER1,ER2,KS1,KS2,KZ1,KZ2, KZ3,KL1, KN1,KN2,KN3,KN4,KN5,PT1,WA1,WA2
99.	<i>Melanitits leda leda</i>	Common Evening Brown	23	KS1,KZ1,KZ2,KZ3,KL1,KL2,KN1,KN2,KN3, KN4, KN5,KT1,KT2,MA1,PL1,PL2,PT1,TS1,TS2,TV1,TV2,WA1,WA2
100.	<i>Moduza procris</i>	Commander	1	MA1
101.	<i>Mycalesis mineus polydecta</i>	Dark-Brand Bush Brown	11	ER1,ER2,KS2,KZ1,KZ2,KZ3,KN1,KN5,PL1,PL2,WA1
102.	<i>Mycalesis patnia junonia</i>	Glad Eye Bush Brown	13	KS1,KS2,KZ1,KZ2,KZ3,KN1,KN2,KT1,MA1,PT1,TS1,TS2,WA1
103.	<i>Mycalesis perseus typhlus</i>	Common Bush Brown	17	ER1,ER2,KS1,KS2,KZ2,KZ3, KL1,KL2,KN3,KN4,KN5,KT2,PL1,PL2,PT1,TV1,WA2
104.	<i>Neptis hylas varmona</i>	Common Sailer	22	ER1,ER2,KS1,KS2,KZ1,KZ2, KZ3,KL1,KL2,KN1,KN2,KN4,KN5,KT1,KT2,MA1,PT1,TS1,TS2,TV1,TV2,WA1
105.	<i>Neptis jumbah</i>	Chestnut Streaked Sailer	15	ER1,ER2,KS1,KS2,KZ1,KZ3,KN1,KN2,KN3,KT1,MA1,TS1,TS2,WA1,WA2

The names of the sacred groves are as in Table 1.

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Appendix 2 (cont'd). List of butterfly species recorded in the sacred groves of Kerala

Sl. No.	Species	Common Name	Number of sacred groves of occurrence and acronym of the sacred groves	
			Number	Acronym of the sacred groves
Family: Nymphalidae				
106.	<i>Orsotrioena medus mandata</i>	Nigger	14	KS2,KZ1,KZ2,KZ3,KL2,KN1,KN2,KN3,KN4,KT2,PL1,PL2,WA1,WA2
107.	<i>Pantoporia hardonia</i>	Common Lascar	11	KS1,KS2,KZ2,KZ3,KN1,KN2,KN3,KN4,KN5,WA1,WA2
108.	<i>Parantica aglea aglea</i>	Glassy Blue Tiger	12	ER1,ER2,KS1,KS2,KZ1,KZ3,KN1,KN2,KN3,KN4,WA1,WA2
109.	<i>Parthenos sylvia</i>	Clipper	11	ER1,ER2,KS1,KS2,KZ2,KZ3,KN1,KN3,PT1,WA1,WA2
110.	<i>Phalanta phalantha</i>	Leopard Butterfly	19	ER1,ER2,KS1,KS2,KZ1,KZ2,KZ3,KL1,KL2,KN1,KN2,KN5,KT2,PL1,PL2,PT1,TV1,TV2,WA1
111.	<i>Polyura athamas</i>	Common Nawab	14	ER1,ER2,KS1,KS2,KZ1,KZ3,KL1,KL2,KN1,KN2,KT2,PT1,TV1,WA1
112.	<i>Tanaecia lepidea miyana</i>	Grey Count	17	ER1,ER2,KS1,KS2,KZ3,KL1,KL2,KN1,KT1,KT2,MA1,PT1,TS1,TS2,TV1,TV2,WA1
113.	<i>Tirumala limniace exoticus</i>	Blue Tiger	16	ER1,ER2,KS1,KS2,KZ1,KZ2,KZ3,KN1,KN5,KT1,MA1,PL1,PL2,TS1,TS2,WA1
114.	<i>Tirumala septentrionis</i>	Dark Blue Tiger	15	ER1,ER2,KS1,KS2,KN1,KN2,KN3,KN5,KT1,MA1,PT1,TS1,TS2,WA1,WA2
115.	<i>Vindula erota</i>	Cruiser	8	ER1,ER2,KS1,KS2,KZ3,KN3,KN5,WA2
116.	<i>Ypthima baldus</i>	Common Five Ring	17	ER1,ER2,KS1,KS2,KZ2,KZ3,KL1,KL2,KN1,KN2,KN3,KT2,PT1,TV1,TV2,WA1,WA2
117.	<i>Ypthima ceylonica</i>	Ceylon Four Ring	9	ER1,ER2,KS1,KS2,KN2,KN3,KN4,KN5,WA2
118.	<i>Ypthima huhebnieri</i>	Common Four Ring	15	ER1,ER2,KS1,KS2,KZ2,KZ3,KL1,KN1,KN2,KN5,PT1,PT1,TV1,TV2,WA1
119.	<i>Zipoetis satis</i>	Tamil Catseye	7*	ER1,KS1,KS2,KZ2,KZ3,KL2,KN2
Family: Papilionidae				
120.	<i>Anapheis aurota</i>	Caper White	19	ER1,ER2,KS2,KZ1,KZ3,KL2,KN1,KN2,KN3,KN4,KN5,KT1,MA1,PT1,TS1,TV1,TV2,WA1,WA2
121.	<i>Appias albina</i>	Chocolate Albatross	1	MA1
122.	<i>Appias indra</i>	Plain Puffin	5	ER1,ER2,KZ1,KZ2,KZ3
123.	<i>Appias lyncida latifasciata</i>	Common Albatross	13	ER1,ER2,KS1,KS2,KZ1,KZ2,KL1,KN1,KN2,KN3,PT1,WA1,WA2

The names of the sacred groves are as in Table 1.

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Appendix 2 (cont'd). List of butterfly species recorded in the sacred groves of Kerala

Sl. No.	Species	Common Name	Number of sacred groves of occurrence and acronym of the sacred groves	
	Family: Papilionidae		Number	Acronym of the sacred groves
124.	<i>Catopsilia pomona</i>	Lemon Emigrant	17	KS1,KS2,KZ2,KZ3, KN1, KN2, KN3,KN5,KT1,MA1, PL1,PL2,TS1,TS2,TV2,WA1, WA2
125.	<i>Catopsilia pyranthe</i>	Mottled Emigrant	14	ER1,ER2,KS1,KZ3,KL2,KN1 KN3,KN5,MA1,PL1,PL2, PT1,WA1,WA2
126.	<i>Cepora nerissa phryne</i>	Common Gull	13	ER1,KS2,KZ1,KZ3,KN1,KN2 KN5, KT1, MA1, PT1, TS1, TS2,WA1
127.	<i>Delias eucharis</i>	Common Jezebel	23	ER1,KS1,KS2,KZ1,KZ3,KL1, KL2,KN1,KN2,KN3,KN5, KT1,KT2,MA1,PL1,PL2,PT1, TS1,TS2,TV1,TV2,WA1, WA2
128.	<i>Eurema hecabe simulata</i>	Common Grass Yellow	19	ER1,ER2,KS1,KZ2,KZ3,KL2, KN1,KN2,KN4,KT1,KT2, MA1,PL1,PL2,PT1,TS1,TS2, TV1,WA1
129.	<i>Eurema blanda silhetana</i>	Three Spot Grass Yellow	12	ER1,ER2,KS1,KS2,KZ2,KZ3, KN1,KN4,PL1,PL2,TV2, WA1
130.	<i>Eurema brigitta rubella</i>	Small Yellow	7	KS2,KZ3,KL1,KN1,KN4,PT1, WA1
131.	<i>Eurema hecabe</i>	Common Grass Yellow	6	ER1,ER2,KZ2,KT1,MA1,TS1
132.	<i>Eurema laeta</i>	Spotless Grass Yellow	1	KZ3
133.	<i>Graphium agamemnon menides</i>	Tailed Jay	17	KS1,KS2,KZ2,KZ3, KL1, KL2, KN1,KN2, KN4, KN5, KT2,PL1,PL2,PT1,TV1,TV2, WA1
134.	<i>Graphium antiphates</i>	Five bar swordtail	4	ER1,ER2,KZ1,KZ2
135.	<i>Graphium doson</i>	Common Jay	15	ER1,ER2,KS1,KS2,KZ2,KN1, KN2,KN3, KN4, KN5, KT1, TS1,TS2,WA1,WA2
136.	<i>Graphium sarpedon teredon</i>	Common Blue bottle	22	ER1,ER2,KS1,KS2,KZ3,KL1, KL2,KN1,KN2,KN4,KN5, KT1,KT2,,MA1,PL1,PL2,PT1 TS1,TS2,TV1,TV2,WA1
	<i>Hebomoia glaucippe australis</i>	Giant Orange Tip	17	ER1,KS1,KS2,KZ1,KZ2,KZ3, KL1,KL2,KN1,KN2,KN3, KT2,PT1,TV1,TV2,WA1, WA2
137.	<i>Ixias pyrene</i>	Yellow Orange Tip	2	ER1,ER2
138.	<i>Leptosia nina</i>	Psyche	20	ER1,ER2,KS1,KS2,KZ3,KL1, KL2,KN1,KN2,KN5,KT1, KT2, MA1,PL1,PL2,PT1, TS1,TS2,TV1,WA1,

The names of the sacred groves are as in Table 1.

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Appendix 2 (cont'd). List of butterfly species recorded in the sacred groves of Kerala

Sl. No.	Species	Common Name	Number of sacred groves of occurrence and acronym of the sacred groves	
	Family: Papilionidae		Number	Acronym of the sacred groves
139.	<i>Pachliopta aristolochiae</i>	Common Rose	23	ER1,ER2,KS1,KS2,KZ1,KZ2, KZ3,KL1,KL2,KN1,KN4, KN5,KT1,KT2,MA1,PL1, PL2,PT1,TS1,TS2,TV1,TV2, WA1
140.	<i>Pachliopta hector</i>	Crimson Rose	23	ER1,ER2,KS1,KS2,KZ1,KZ2, KZ3,KL1,KL2,KN1,KN2, KN4,KN5,KT1,KT2,MA1, PL1,PL2,PT1,TS1,TV1,TV2, WA1
141.	<i>Pachliopta pandiyana</i> *	Malabar Rose	5	ER1,ER2,KZ1,KZ2,KZ3
142.	<i>Papilio buddha</i>	Buddha Peacock	8	KS1,KS2,KZ1,KZ3,KN1, KN4, KN5,WA1
143.	<i>Papilio clytia</i>	Common Mime	4	KT1,MA1,TS1,TS2
144.	<i>Papilio clytia</i>	Common Mime	11	ER1,ER2,KS1,KS2,KZ1,KZ3, KN1,KN3,KN4,WA1,WA2
145.	<i>Papilio demoleus</i>	Lime butterfly	23	KS1,KS2,KZ1,KZ2,KZ3,KL1, KL2,KN1,KN3,KN4,KN5, KT1,KT2,MA1,PL1,PL2, PT1,TS1,TS2,TV1,TV2,WA1, WA2
146.	<i>Papilio dravidarum</i>	Malabar raven	8	ER1,ER2,KS2,KZ1,KZ2,KZ3, KN1,WA1
147.	<i>Papilio helenus</i>	Red Helen	9	ER1,ER2,KS1,KS2,KZ2,KN1, KN4,KN5,WA1
148.	<i>Papilio liomedon</i>	Malabar Banded Swallowtail	18	KS1,KS2,KZ1,KZ2, KZ3, KL2, KN1,KN3, KN4, KN5, KT1,KT2,MA1,PT1,TS1,TS2, WA1,WA2
149.	<i>Papilio paris tamilana</i>	Paris Peacock	16	KS1,KS2,KZ1,KZ2,KZ3,KN1 KN2,KN3,KN4,KN5,KT1, MA1,TS1,TS2,WA1,WA2
150.	<i>Papilio polymnestor</i>	Blue Mormon	21	ER1,ER2,KS1,KS2,KZ2,KL1, KL2,KN1,KN2,KN3,KN4, KN5,KT2,MA1,PL1,PL2, PT1,TV1,TV2,WA1,WA2
151.	<i>Papilio polytes</i>	Common Mormon	20	ER1,ER2,KS1,KS2,KZ1,KZ2, KZ3,KL1,KN1,KN2,KN3, KN4,KN5,PL1,PL2,PT1, TV1,TV2,WA1,WA2
152.	<i>Parenonia valeria</i>	Common Wanderer	14	ER1,ER2,KS1,KS2,KZ1,KZ2, KZ3,KL2,KN1,KN5,KT2, PL1,PL2,WA1
153.	<i>Prioneris sita</i>	Painted Sawtooth	11	KS1,KS2,KZ1,KZ2,KZ3,KN1 KN2,KN3,KN4,WA1,WA2
154.	<i>Troides minos</i> *	Southern Birdwing	22	ER1,ER2,KS1,KS2,KZ2,KZ3, KL1,KL2,KN1,KN2,KN5, KT1,KT2,MA1,PL1,PL2, PT1,TS1,TS2,TV1,TV2,WA1

Appendix 3. List of birds recorded from sacred groves of Kerala

Sl. No.	Scientific Name	Common name	Number of sacred groves of occurrence and acronym of the sacred groves	
			Number	Acronym of the sacred groves
1.	<i>Accipiter badius</i>	Shikra	14	ER1,ER2,KS2,KZ1,KZ3,KN1,KN3,KN4,KN5,MA1,PL2,TV1,WA1,WA2
2.	<i>Acridotheres fuscus</i>	Jungle Myna	15	ER1,ER2,KS2,KZ1,KZ3,KN1,KN2,KN5,MA1,PL2,PT1,TS1,TV2,WA1,WA2
3.	<i>Acridotheres tristis</i>	Common Myna	25	ER1,ER2,KS2,KZ1,KZ2,KZ3,KL1,KL2,KN1,KN2,KN3,KN4,KN5,KT1,KT2,MA1,PL1,PL2,PT1,PT2,TS2,TV1,TV2,WA1,WA2
4.	<i>Aegithina tiphia</i>	Common Iora	2	KS1,KN1
5.	<i>Alcedo atthis</i>	Small Blue Kingfisher	17	ER1,ER2,KS2,KZ1,KZ3,KL1,KL2,KN1,KT1,KT2,MA1,PL2,T1,PT2,TV1,TV2,WA2
6.	<i>Anthus rufulus</i>	Paddyfield Pipit	11	ER1,ER2,KZ2,KZ3,KN1,KN2,KN3,KN5,PL1,WA1,WA2
7.	<i>Ardeola grayii</i>	Indian Pond Heron	17	ER1,KS2,KZ1,KZ2,KZ3,KL1,KL2,KN1,KN3,KN4,KN5,KT1,KT2,PT1,PT2,TV1,TV2
8.	<i>Batrachostomus moniliger</i>	Ceylon Frogmouth	1	KN1
9.	<i>Brachypteryx major</i>	White -Bellied Shortwing	2	PT2,TV1
10.	<i>Bubulcus ibis</i>	Cattle Egret	22	ER1,ER2,KS1,KS2,KZ1,KZ2,KZ3,KL1,KL2,KN1,KN2,KN4,KN5,KT1,KT2,MA1,PL2,PT1,PT2,TS1,WA1,WA2
11.	<i>Butorides striatus</i>	Little Green Heron	10	KS2,KN1,KN3,KN4,KN5,MA1,PL2,TS1,WA1,WA2
12.	<i>Cacomantis sonneratii</i>	Banded Bay Cuckoo	3	KS2,KN1,KN2
13.	<i>Caprimulgus Asiaticus latham</i>	Common Indian Nightjar	6	KS2,KZ3,MA1,PL2,WA1,WA2
14.	<i>Caprimulgus indicus</i>	Indian Jungle Nightjar	6	ER1,KS2,KZ3,PL1,TS2,WA2
15.	<i>Casmerodius Albus</i>	Large Egret	5	ER1, KZ3, KN1,KN4, WA1
16.	<i>Chalcophaps indica</i>	Emerald Dove	10	KS1,KS2,KZ2,KZ3,KL2,KN1,KN2,PT2,TV1,WA1
17.	<i>Chloropsis cochinchinensis</i>	Bluewinged leafbird	13	ER1,ER2,KL1,KL2,KT2,MA1,PL2,PT1,PT2,TV1,TV2,WA1,WA2
18.	<i>Columba elphinstonii (E)</i>	Nilgiri Wood Pigeon	2	KS2,WA2
19.	<i>Copsychus saularis</i>	Oriental Magpie Robin	22	ER1,ER2,KS1,KS2, KZ1, KZ2, KZ3, KL1,KL2, KN1,KN5,KT1,KT2,MA1,PL2,PT1,PT2,TS1,TV1,TV2,WA1,WA2
20.	<i>Copxychus Malabaricus</i>	White-Rumped Shama	9	KS2,KN1,MA1,PL2,PT1,PT2,TV1,TV2,WA2

The names of the sacred groves are as in Table 1.

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Appendix 3 (cont'd). List of birds recorded from sacred groves of Kerala

Sl. No.	Scientific Name	Common name	Number of sacred groves of occurrence and Acronym of the sacred groves	
			Number	Acronym of the sacred groves
21.	<i>Coracias benghalensis</i>	Indian Roller	8	ER1,ER2,KL1,KL2,KN1,KN5,KT1,KT2
22.	<i>Coracina melanoptera</i>	Black-headed Cuckoo-Shrike	6	ER1,KS2,KZ3,KN1,KN5,WA2
23.	<i>Corvus macrorhynchos</i>	Jungle Crow	17	ER1,ER2,KS1,KS2,KZ1,KZ3, KL2,KN1,KN2,KN4,KN5,MA1, PL2,PT2,TV1,WA1,WA2
24.	<i>Corvus splendens</i>	House Crow	18	KS1,KZ1,KZ2,KZ3,KN2,KN3, KN4,KT2,MA1,PL1,PL2,PT2, TS1,TS2,TV1,TV2,WA1,WA2
25.	<i>Cuculus micropternus</i>	Indian cuckoo	19	ER1,ER2,KS1,KS2,KZ3,KN1,KN2,KN3,KN4,KN5,MA1,PL1,PL2,PT1, PT2,TS1,TV1,TV2,WA1,WA2
26.	<i>Culicicapa ceylonensis</i>	Grey-headed Flycatcher	10	ER1,ER2,KS2,KZ2,KZ3,KN1,KN2,KN3,KN4,KN5,MA1,PL1,PL2,PT1,PT2,TV1,WA1
27.	<i>Cyornis rubeculoides</i>	Blue-throated Flycatcher	6	KS2,KZ1,KZ3,KN1,KN2,WA1
28.	<i>Cyornis tickelliae</i>	Tickell's Blue Flycatcher	17	ER1,ER2,KS2,KZ1,KZ3,KN1,KN2,KN3,KN5,MA1,PL1,PL2, PT1,TS2,TV2,WA1,WA2
29.	<i>Cypsiurus balasiensis</i>	Asian Palm Swift	1	KL1
30.	<i>Dendroanthus indicus</i>	Forest Wagtail	10	ER1,ER2,KS2,KZ1,KZ2,KZ3,KN1,KN2,KN3,WA2
31.	<i>Dendrocitta vagabunda</i>	Indian Treepie	16	ER1,ER2,KS2,KZ1,KZ2,KZ3,KN1,KN2,KN3,MA1,PL2,PT2,TV1,WA1,WA2
32.	<i>Dendrocitta vagabunda</i>	Rufous treepie	14	KZ3,KN1,KN2,KN3,KN4,KN5,MA1,PL1,PL2,PT1,PT2,TV1,TV2,WA2
33.	<i>Dendrocopus mahrattensis</i>	Yellow-Fronted Pied Woodpecker	20	ER1,ER2,KS1,KS2,KZ2,KZ3,KN1,KN2,KN3,KN4,KN5,MA1, PL1,PL2,PT2,TS2,TV1,TV2, WA1,WA2
34.	<i>Dendrocopus nanus</i>	Brown-capped Pygmy Woodpecker	5	ER1,ER2,KS2,KZ3,KN3
35.	<i>Dicaeum agile</i>	Thick-billed Flowerpecker	5	KS2,MA1,PL2,TV1,WA2
36.	<i>Dicaeum concolor</i>	Plain Flowerpecker	8	KS2,KZ1,KZ3,KN1,KN2,MA1,PL2,WA2
37.	<i>Dicaeum erythrorhynchos</i>	Tickell's Flowerpecker	5	KS2,KZ3,KN1,KN4,TS1
38.	<i>Dicrurus caerulescens</i>	White bellied drongo	7	ER1,KZ2,KN1,MA1,PL2,TS1,WA2
39.	<i>Dicrurus leucophaeus</i>	Ashy Drongo	4	KS2,KZ3,WA1,WA2
40.	<i>Dicrurus macrocerus</i>	Black Drongo	16	ER1,ER2,KL1,KL2,KN1,KN2,KN3,KN4,KN5,MA1,PL1,PL2,PT1,PT2, TS2,TV1,TV2,WA2
41.	<i>Dicrurus paradiseus</i>	Greater Racket-tailed Drongo	8	KS2,KZ1,KZ3,KN1,KN2,KN3,KN4,KN5,MA1,PL1,PL2,PT1,PT2, TV1,WA1

The names of the sacred groves are as in Table 1.

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Appendix 3 (cont'd). List of birds recorded from sacred groves of Kerala

Sl. No.	Scientific Name	Common name	Number of sacred groves of occurrence and code name of the sacred groves	
			Number	Sacred groves
42.	<i>Dicrurus paradiseus</i>	Racket-tailed drongo	22	ER1,ER2,KS2,KZ1,KZ2,KZ3, KL1,KL2,KN1,KN2,KN5,KT1, KT2,MA1,PL2,PT1,PT2,TS1,TV1, TV2,WA1,WA2
43.	<i>Dinopium benghalense</i>	Black-rumped woodpecker	20	ER1,ER2,KS1,KS2,KZ1,KZ2,KZ3 KL1,KN1,KN3,KN4,KN5,MA1, PL2,PT1,TS1,TV1,TV2,WA1, WA2
44.	<i>Dinopium benghalense</i>	Lesser Golden-backed Woodpecker	18	ER1,ER2,KS2,KZ3,KL1,KL2, KN1,KN4,KN5,KT1,KT2,PL1, PT1,PT2,TS2,TV1,TV2,WA1
45.	<i>Dinopium javense</i>	Common Golden-backed Woodpecker	13	ER1,ER2,KS2,KZ2, KZ3, KL1, KN1,KN2,KN3,KN4,KN5,PT1, TV2
46.	<i>Ducula aenea</i>	Green Imperial-Pigeon	1	KZ3
47.	<i>Egretta garzetta</i>	Little Egret	10	KS1,KS2,KN1,KN3,KN4,KN5, MA1,PL2,WA1,WA2
48.	<i>Eudynamis scolopacea</i>	Asian Koel	5	ER1,KS2,KZ3,KN1,KN4
49.	<i>Eumyias albicaudata</i> (E)	Nilgiri Flycatcher	7	ER1,ER2,KS2,KZ3,KN1,KN5, WA1
50.	<i>Ficedula nigrorufa</i> (E)	Black-and-Orange Flycatcher	8	ER1,KS2,KZ1,KZ2,KZ3,KN1, KN4,WA1
51.	<i>Galloperdix spadicea</i>	Malabar spurfowl	3	MA1,PL2,WA2
52.	<i>Gallus sonneratii</i>	Grey Junglefowl	12	ER1,KS1,KS2,KZ2,KZ3,KN1, KN2,KN3, KN4,KN5,PL2,WA2
53.	<i>Garrulx delesserti</i> (E)	Wynad Lughingthrush	6	KS2,KZ2,KZ3,KN1,WA1,WA2
54.	<i>Gracula indica</i>	Southern Hill-Myna	6	ER1,KS2,KZ3,KN1,KN2,WA1
55.	<i>Halcyon smyrnensis</i>	White-breasted Kingfisher	4	ER1,KS2,KZ3,KN1
56.	<i>Haliastur indus</i>	Brahmini Kite	22	ER1,ER2,KS1,KS2,KZ2,KZ3,KL1 KL2,KN1,KN2,KN3,KN4, KT1, KT2,MA1,PL2,PT1,PT2,TV1, TV2,WA1,WA2
57.	<i>Hemicircus canente</i>	Heart spotted woodpecker	18	ER1,ER2,KS2,KZ3,KL1,KL2, KN1,KN2,KN3,KN5,MA1,PL2, PT1,PT2,TV1,TV2,WA1,WA2
58.	<i>Hierococcyx varius</i>	Common hawk cuckoo	5	KN1,MA1,PL2,WA1,WA2
59.	<i>Hirundo rustica linnaeus</i>	Common Swallow	6	ER1,ER2,KZ3,KL1,PT1,TV2
60.	<i>Hypothymis azurea</i>	Black-naped Monarch-Flycatcher	7	ER1,ER2,,KZ1,KZ2,KZ3,KN1, WA2
61.	<i>Hypsipetes leucocephalus</i>	Black Bulbul	2	KZ3,WA1
62.	<i>Iole indica</i>	Yellow-browed Bulbul	7	ER1,KN1,KN4,PL1,TS2,WA1, WA2

The names of the sacred groves are as in Table 1.

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Appendix 3 (cont'd). List of birds recorded from sacred groves of Kerala

Sl. No.	Scientific Name	Common name	Number of sacred groves of occurrence and acronym of the sacred groves	
			Number	Acronym of the sacred groves
63.	<i>Lanius cristatus</i>	Brown Shrike	3	PL1,TS2, TV2
64.	<i>Lonchura kelaarti</i>	Black - Throated Munia	19	ER1,ER2, KS1,KS2,KZ2,KZ3, KN1, KN2,KN5,MA1,PL1,PL2, PT1, PT2,TS1,TS2, TV1, TV2, WA2
65.	<i>Lonchura mlacca</i>	Black-headed Munia	19	ER1,ER2,KS1,KS2,KZ2,KZ3, KL1,KL2,KN1,KN3,KN5,KT1, KT2,PT1,PT2,TS1,TV1,TV2,WA1
66.	<i>Lonchura striata</i>	White-rumped Munia	8	KZ3,KN1,MA1,PL1,PL2,TS2, WA1,WA2
67.	<i>Luscinia bunnea</i>	Indian Blue Robin	13	KS2,KN1,KN2,KN3, KN5, MA1, PL1,PL2,PT1,TS2,TV2,WA1, WA2
68.	<i>Megalaima haemacephala</i>	Crimson breasted barbet	14	KS2,KZ3,KL1,KL2,KN1,KT1, KT2,MA1,PL2,PT1,PT2,TV1, TV2,WA2
69.	<i>Megalaima viridis</i>	White cheeked barbet	13	ER1,KL1,KL2,KT1,KT2,MA1, PL2,PT1,PT2,TV1,TV2,WA1, WA2
70.	<i>Megalaima viridis</i>	White-cheeked Barbet	5	KS2,KZ3,KN1,TS1,WA2
71.	<i>Megalaima zeylanica</i>	Brown-headed Barbet	3	ER1,KZ1,KZ3
72.	<i>Merops leschenaultia</i>	Chestnut-headed Bee-eater	14	ER1,ER2,KS2,KZ2, KZ3, KL2, KN1, KN2, KT2,MA1,PL2,PT2, TV1,WA2
73.	<i>Merops orientalis</i>	Small Bee-eater	13	KS2,KL1,KL2,KN2, KN5, KT1, KT2,PL1,PT1,PT2,TS2,TV1,TV2
74.	<i>Merops philippinus</i>	Blue-tailed Bee-eater	16	ER1,ER2,KS1,KS2,KZ3,KL2,KN1 KN3,KN5,KT2,PL2,PT2,TS1, TV1 TV2,WA2
75.	<i>Monticola Solitarius</i>	Blue Rock Thrush	1	KS2
76.	<i>Motacilla cinerea</i>	Grey Wagtail	5	ER1,KS2,KZ3,KN1,KN3
77.	<i>Motacilla maderaspatensis</i>	Large Pied Wagtail	8	KL1,KL2,KT1,KT2, PT1,PT2, TV1,TV2
78.	<i>Muscicapa latirostris</i>	Asian Brown Flycatcher	8	ER1,ER2,KZ2,KZ3,KN1,MA1, PL2,WA2
79.	<i>Muscicapa muttui</i>	Brown-breasted Flycatcher	10	ER1,ER2,KZ2,KL2,KN1,KN5, PL2,PT2,TV1,WA1
80.	<i>Muscicapa ruficauda</i>	Rusty-tailed Flycatcher	2	KN1,WA1
81.	<i>Myiophonus horsfieldii</i>	Malabar Whistling Thrush	18	ER1,ER2,KS2,KZ1,KZ2,KZ3, KN1,KN2,KN4,KN5,MA1,PL2, PT1,PT2,TV1,TV2,WA1,WA2
82.	<i>Nectarinia asiatica</i>	Purple Sunbird	18	ER1,ER2,KS2,KZ1,KZ2,KL1,KL2 KN5,KT1,KT2,MA1,PL2,PT1, PT2,TS1,TV1,TV2,WA2
83.	<i>Nectarinia lotenia</i>	Loten's Sunbird	10	KZ3,KN1,KN3,MA1,PL2,PT1, PT2,TV1,TV2,WA2
84.	<i>Nectarinia minima</i> (E)	Small Sunbird	10	ER2,KS1,KS2,KN1,KN2,MA1, PL2,TS1,WA1,WA2

The names of the sacred groves are as in Table 1.

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Appendix 3 (cont'd). List of birds recorded from sacred groves of Kerala

Sl. No.	Scientific Name	Common name	Number of sacred groves of occurrence and Acronym of the sacred groves	
			Number	Acronym of the sacred groves
85.	<i>Nectarinia zeylonica</i>	Purple-rumped Sunbird	3	KS2,KZ3,WA1
86.	<i>Nycticorax nycticorax</i>	Black-crowned Night Heron	4	KS1,KS2,KN1,KN4
87.	<i>Nyctyornis athertoni</i>	Blue-bearded Bee-eater	6	ER1,KS2,KZ1,KZ3,KN1,KN3
88.	<i>Ocyrceros griseus</i> (E)	Malabar Grey Hornbill	11	ER1,KS1,KS2,KZ2, KZ3, KN1, KN2, MA1,PL2,WA1,WA2
89.	<i>Oriolus chinensis</i>	Black-naped Oriole	1	KS1
90.	<i>Oriolus oriolus</i>	Eurasian Golden Oriole	23	ER1,ER2,KS1,KS2, KZ1, KZ2, KZ3, KL1,KL2, KN1,KN2,KN3, KN5, MA1, PL1, PL2, PT1, PT2, TS2,TV1,TV2,WA1,WA2
91.	<i>Oriolus xanthornus</i>	Black-hooded oriole	11	KL1,KL2,KT1,KT2,MA1,PL2, PT1,PT2,TV1,TV2,WA2
92.	<i>Orthotomus sutorius</i>	Common Tailorbird	24	ER1,KS1,KS2,,KZ1,KZ2,KZ3, KL1,KL2,KN1,KN2,KN3,KN4, KN5,KT1,KT2,MA1, PL2,PT1, PT2,TS1,TV1,TV2,WA1,WA2
93.	<i>Pericrocotus cinnamomeus</i>	Small Minivet	10	ER1,KS2,KZ3,KN1,KN3,MA1, PL2,TS1,WA1,WA2
94.	<i>Pericrocotus flammeus</i>	Scarlet Minivet	9	ER1,ER2,KS2,KZ3,KN1,KN4, KN5,TV2,WA1
95.	<i>Phaenicophaeus viridirostris</i>	Blue-faced malkoha	10	ER1,ER2,KS2,KN1,KN2,KN3, KN4,MA1,PL2,WA2
96.	<i>Phaenicophaeus viridirostris</i>	Small Green-billed Malkoha	7	KS2,KN1,KN5,MA1,PL2,WA1, WA2
97.	<i>Phalacrocorax carbo</i>	Great Cormorant	7	ER1,ER2,KS2,KZ2,KZ3,KN1,TS1
98.	<i>Phalacrocorax niger</i>	Little Cormorant	22	ER1,ER2,KS1,KS2,KZ1,KZ2,KZ3 KL1,KL2,KN1,KN3,KN4,KN5, KT1,KT2,PT1,PT2,TS1,TV1,TV2, WA1WA2
99.	<i>Phylloscopus affinis</i>	Tickell's Leaf Warbler	5	ER1,ER2,KS2,KN1,KN2
100.	<i>Picus chlorolophus</i>	Small Yellow-naped Woodpecker	10	ER1,ER2,KS2,KZ3,KN1,MA1, PL1,PL2,WA1,WA2
101.	<i>Pitta brachyura</i>	Indian Pitta	11	ER1,ER2,KS2,KZ3,MA1,PL1, PL2,TS2,TV2,WA1,WA2
102.	<i>Psittacula columboides</i> (E)	Blue-winged Parakeet	5	ER1,KS2,KZ3, KN1, KN4
103.	<i>Psittacula cyanocephala</i>	Plum-headed Parakeet	16	ER1,ER2,KS2,KZ3,KL1,KL2, KN1,KT1,KT2,MA1,PL2,PT1, PT2,TV1,TV2,WA2
104.	<i>Pycnonotus cafer</i>	Red-vented Bulbul	22	ER1,ER2,KS2,KZ3,KL1,KL2, KN1,KN3,KN5,KT1,KT2,MA1, PL1,PL2,PT1,PT2,TS1,TS2,TV1, TV2,WA1,WA2
105.	<i>Pycnonotus jocosus</i>	Red-whiskered Bulbul	7	ER1,ER2,KZ1,KN1,KN5,PL1,TS2

The names of the sacred groves are as in Table 1.

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Appendix 3 (cont'd). List of birds recorded from sacred groves of Kerala

Sl. No.	Scientific Name	Common name	Number of sacred groves of occurrence and Acronym of the sacred groves	
			Number	Acronym of the sacred groves
106.	<i>Pycnonotus melanicterus gularis</i>	Black-crested Bulbul	7	ER1,ER2,KS1,KN1,KN2,KN3,KN5
107.	<i>Pycnonotus priocephalus</i> (E)	Grey-headed Bulbul	8	ER1,ER2,KS1,KS2,KZ3,KN1,KN4,WA1
108.	<i>Rhopocichla aticeps</i>	Dark-fronted warbler	6	KL1,MA1,PL2,PT1,TV2,WA2
109.	<i>Rhopocichla atriceps</i>	Black-headed Babbler	3	KS2,KN1,TV1
110.	<i>Spilornis cheela</i>	Crested Serpent Eagle	13	ER1,ER2,KS1,KS2, KZ1, KZ2, KZ3,KN1,KN5,MA1,PL2,WA1,WA2
111.	<i>Streptopelia chinensis</i>	Spotted Dove	9	ER1,ER2,KS2,KZ3,KN2,MA1,PL2,TV2,WA2
112.	<i>Surniculus lugubris</i>	Drongo Cuckoo	1	KS2
113.	<i>Tephrodornis Pondicerianus</i>	Common Woodshrike	12	ER1,KL1,KL2,KT1,KT2,MA1,PL2,PT1,PT2,TV1,TV2,WA2
114.	<i>Terpsiphone paradisi</i>	Asian Paradise Flycatcher	19	ER1,ER2,KS2,KZ1,KZ3,KL1,KL2,KN4,KN5,KT1,KT2,MA1,PL2, MT1, PT2, TV1, TV2, WA1, WA2
115.	<i>Treron pompadora</i>	Pompadour green pigeon	3	MA1,PL2,WA2
116.	<i>Turdoides affinis</i>	White-headed Babbler	11	ER1,ER2,KS2,KL1,KL2,,KT1,KT2,PT1,PT2,TV1,TV2
117.	<i>Turdoides affinis</i>	Yellowbilled babbler	5	KN1,MA1,PL2,WA1,WA2
118.	<i>Turdoides striatus</i>	Jungle Babbler	14	ER1,ER2,KS2,KZ1,KZ3, KL2, KN1, KN5,MA1,PL2,PT2,TV1,WA1,WA2
119.	<i>Turdoides Subrufus</i>	Indian Rufous Babbler	8	KS2,KZ3,KN1,MA1,PL2,TV1,TV2,WA2
120.	<i>Zoonavena sylvatica</i>	White-rumped Needletail-Swift	1	KZ3
121.	<i>Zoothera citrina citrina</i>	Orange-headed Thrush	7	ER1,ER2,KS2,KN1,MA1,PL2,WA2
122.	<i>Zoothera citrina cyanotus</i>	White-throated Ground Thrush	4	KS2,KN1,KN2,WA1

The names of the sacred groves are as in Table 1.