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Present status of sacred groves in Southern and South-Western parts of the Purulia district of West Bengal, India: An inventory from eight administrative blocks

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Abstract
This study is an attempt to document the present status of the biodiversity of the sacred groves of Purulia district of state West Bengal in India along with their economic importance and ecosystem services to the local people. Present communication reports 73 species of insects, 35 species of birds and 47 species of plants from 36 sacred groves (ranging in between 87 Sq m 40,200 Sq m) under 8 blocks of the southern and south-western parts of Purulia. Moreover, other vertebrates like lizards and snakes, small mammals like five striped squirrel, mongoose, mus, rats *etc*. are also observed in these sacred groves. These field surveys mainly comprise observations, collections, documentation of the plants and animals diversity and informal discussion with the local communities.

Keywords: Sacred groves, Purulia, Biodiversity, Ecosystem services

1. Introduction
The community-protected forests are often associated with traditional regulations or rules such as taboos, totems and myths that deter human exploitation within the groves. These complex traditional rules have long preserved the integrity of sacred forests/groves and appear to have a crucial conservation role in maintaining local biodiversity in sacred groves.
Studies on sacred grove (SG) biodiversity have often prioritized higher groups of flora (*i.e.* angiosperms) whereas lower group members as well as faunal diversity are underrepresented. The floral diversity of the sacred groves of Purulia district have been well studied by[1],[2] who has also brought into light their present status and future prospects. The work of [3] on 18 sacred groves of Purulia advocated in favour of the very important role played by them in conservation of medicinal plants.
There are some scattered references on avifauna, insects, molluscs, reptiles and large mammals but detailed studies are yet to be done [5], [9]. From West Bengal [7], 1 species of Amphibia, 4 species of Reptiles, 21 species of birds and 8 species of Mammals from an urban sacred grove of Kolkata Metropolitan Region is documented. 64 species of Arthropods [11] are reported from some sacred trees of Serampore in Hoogly district. Recently, 52 species [8] of insects is documented from 31 sacred groves of Sonamukhi block in Bankura district. But nothing has been studied on the animal diversity of Purulia district except [4] have documented 25 animal species with their scientific and vernacular names, systematic position and uses.
The present communication reports faunal and floral composition of 36 sacred groves for the first time from the southern and south-western regions of Purulia district along with their economic and social importance.

2. Study area
Purulia the western most district of West Bengal geographically under Chota Nagpur plateau, located between 23° 42′ 00″ N to 22° 42′ 35″ N latitude and 86° 54′ 37″ E to 85° 49′ 25″ E longitude. Purulia has its boundaries at the east with the Midnapur and Bankura district of West Bengal, at the north with the Burdwan district of West Bengal and Dhanbad district of Bihar at the north west and south west with the Hazaribag, Ranchi and Singhbhum districts of Jharkhand (Figure:1) (http://bhuvan.nrsc.gov.in/bhuvan_links.php#) (visited on 27.11.2015). It consists of 20 blocks, covering 6259 sq km. As per report of the forest department total area under forest is 1, 15,226 hectare. Survey and collections were made from 36 SGs in 8 blocks of the southern and south-western regions of Purulia district, namely, Arsha, Jhalda-1, Manbazar-1, Barabazar, Balarampur, Manbazar-2, Bandwan and Baghmundi (Figure: 2). Ethnic groups of this region mostly belong to Bedias, Bedomajhis, Bhumijs, Bhunias, Birhores, Chikbaraiks, Karmalis, Koramudis, Loharas, Manhalis, Mundas, Oraons, Parharias, Sabars and Santhals.

3. Vegetation
The forests of Purulia district mostly exist in the inaccessible uplands of Ayodhya–Baghmundi and Dalma and some patches of the upper catchment areas of the Silai, Arkusha, Dwarakeswar and also the Kasai valley. The forests are rarely virgin in this area, but more often of secondary origin. Sal (*Shorea robusta*) the most prevalent tree species has a dense growth to compose the tropical dry deciduous type of forest. Sal is always a sacred tree of tribals and under its shade their deities are worshipped. Piasal *(Pterocarpus marsupium*) is prevalent in lower Hills. Mahua (*Madhuca indica*), Kend (*Diospyros exsculpta*), Palash (*Butea monosperma*) are another very important plants of this area. Sheora (*Glycosmis pentaphylla*) is another important plant that is less found out of sacred groves of this region.

4. Materials & Methods
Generally, collection was made in day time. Typical walk and counts were used to sample butterflies. Aerial catching by insect net was done in the sacred groves for other group of

insects. The identification was made in the laboratory of Zoological Survey of India, Kolkata. Spot identification of birds and mammals were done by the experts from Zoological Survey of India, Kolkata in consultation with the literature [6]. Plants were identified by the local and forest people. Herbarium sheets of the plants were also made and identified by the scientists of Botanical Survey of India, Kolkata.

5. Results & Discussion

Present communication reports 73 insect species belonging to six orders and twenty four families from 36 SGs in 8 blocks, namely, Arsha block (2), Jhalda-1 block (2), Manbazar-1 block (3), Barabazar block (4), Balarampur block (4),Manbazar-2 block (5), Bandwan block (7) and Baghmundi block (9) (Table:1). The area of these sacred groves range from small (87 Sq m) to large (40,200 Sq m) and covering altitude from 147.5 m to 602.9 m. All these sacred groves are lying in between 22° 54.409′ N to 23° 18.218′ N latitude & 86° 04.714′ E to 86° 35.590′ E longitude (Table:1).

These groves are mostly surrounded by or adjacent to cultivation land (50%), forest (36%), roadside (8%) and village (6%) (Figure: 3).

Among the 73 species of insects, the order Lepidoptera shares maximum number of species (30) followed by Coleoptera (15), Diptera (14), Orthoptera (7), Hemiptera (4) and Odonata (3) (Table.2). Altogether, 30 species of 7 families of the order Lepidoptera are reported during this survey. Of them, 2 species under 2 families are moths. Rest are butterflies (28 species under 5 families), designated as 'common' and 'generalist' and none of the species are threatened globally as per the IUCN Red List (2011). Among the 5 families, the family Nymphalidae share maximum number of species (16), followed by Papilionidae and Pieridae (4 species each), Lycaenidae (3) and Hesperidae (1). The order Coleoptera is the second largest group (15 species of 6 families) reported from these sacred groves. Of them, the family Scrabaeidae with 9 species is the dominant group of order Coleoptera, followed by Chrysomelidae (2), Carabidae, Cerambycidae, Coccinellidae and Tenibrionidae with 1 species each respectively. The third largest insect order reported from these sacred groves is Diptera (14 species of 5 families). Of them, the family Syrphidae shares 7 species, followed by Muscidae (4) and Rhiniidae, Stratiomyidae and Tabanidae with 1 species each respectively. The order Orthoptera (7 species) is the fourth largest group in relation to species diversity. Of them, the family Acrididae shares 4 species and Pyrgomorphidae only 3 species. Only 4 species of 3 families, namely, Pentatomidae (2 species), Alydidae (1) and Rhopalidae (1) of order Hemiptera are reported from 36 sacred groves. Moreover, 3 species of order Odonata under the family Libellulidae were also reported from these sacred groves (Table: 2).

Considering the ecosystem service of these insects, it can be said that, most of them are pollinators (49%), followed by pests (32%), decomposers (13%), predators (5%) and parasites (1%) (Figure: 4).

Moreover, a total of 35 species of birds under 25 families were also observed in these sacred groves. Of them, 4 species belong to the family Sturnidae, 3 species each belong to Columbidae and Muscicapidae families and 2 species each belong to Corvidae, Psittacidae and Pycnonotidae families (Table: 3). Rest of the families are represented with single species of bird. As per IUCN status (2011), all these species are in Least Concern (LC) category.

Dietary pattern of birds showed that, 43% are insectivorous, followed by omnivorous (28%), frugivorous (14%), carnivorous (6%), predators (6%) and 3% are nectar feeder/ pollinators (Figure: 5).

Floristic diversity of these sacred groves almost similar to typical floral composition of Purulia district. Sal (*Shorea robusta*) is found as dominant plant species of all the 36 sacred groves surveyed during this present study. Altogether, 47 species under 22 families of plants have been identified up to species level (Table: 4).

Among 47 species under 22 families of plant species reported and identified, 23 species (49%) are economically important for medicinal use, 9 species (19%) for edible fruits, 5 species (11%) for timber value and 3 species (7%) for ornamental value. Apart from this, 3 species (6%) are important for both edible and medicinal value, 3 species (6%) for both timber and medicinal and 1 species (2%) for both edible and timber value (Table: 4 & Figure: 6).

Conservation of sacred groves leads to conservation of native flora and fauna. Butterflies are recognized as focal species of conservation in several areas of the world [10]. These widely studied insects show significant ecological contributions in different ecosystems through herbivory and pollination services. Therefore, the dominancy of butterfly fauna of these sacred groves clearly indicates that the vegetation of these sacred groves is still in good condition. Moreover, they are the pollinating agents of many plant species.

The members of Diptera are mostly flower visitors/pollinators. Their diversity (14 species of 5 families) indicates the presence of good number of flowering plants in these sacred groves. The presence of phytophagous insect groups (Orthoptera, Hemiptera and some families of Coleoptera) indicate the availability of food resources and less anthropogenic disturbances in some of these sacred groves. Presences of 43% of insectivorous birds also support the rich insect diversity of these sacred groves. Sighting of 35 species local birds in 36 sacred groves also indicate less anthropogenic activities in these sacred groves. The present study also support the findings of [1], [2], [3] on floral diversity. Moreover, the indigenous communities settled in the area have good knowledge of their surrounding biodiversity. They also use a good number of biological resources in their culture; some of them provide their livelihood and food resources. Many of the bio resources are used in local system of medicines. Documentation of the local and indigenous knowledge of biodiversity is likely to be a good resource for biodiversity conservation. Sacred groves are such stable habitats for these important organisms. Fragmentation or degradation of these groves may result in biological imbalance as these species will be lost.

In conclusion, it can be said that, these islands like sacred groves are still conserving the local flora and fauna as small reservoirs of biodiversity within a matrix of human habitation. They are important not only as a prominent green space of the local area but also important as these provide value added free ecosystem services to the local community like, direct use value (production services, cultural services), indirect use value (pollination services) and non-use value (coexistence of plants and animals).

Therefore, conservation of sacred groves mean not only supporting the traditional rules but also mitigate or defer global warming, securing ecosystem services and also protecting indigenous flora and fauna of the concerned area.

5.1. Tables and Figures

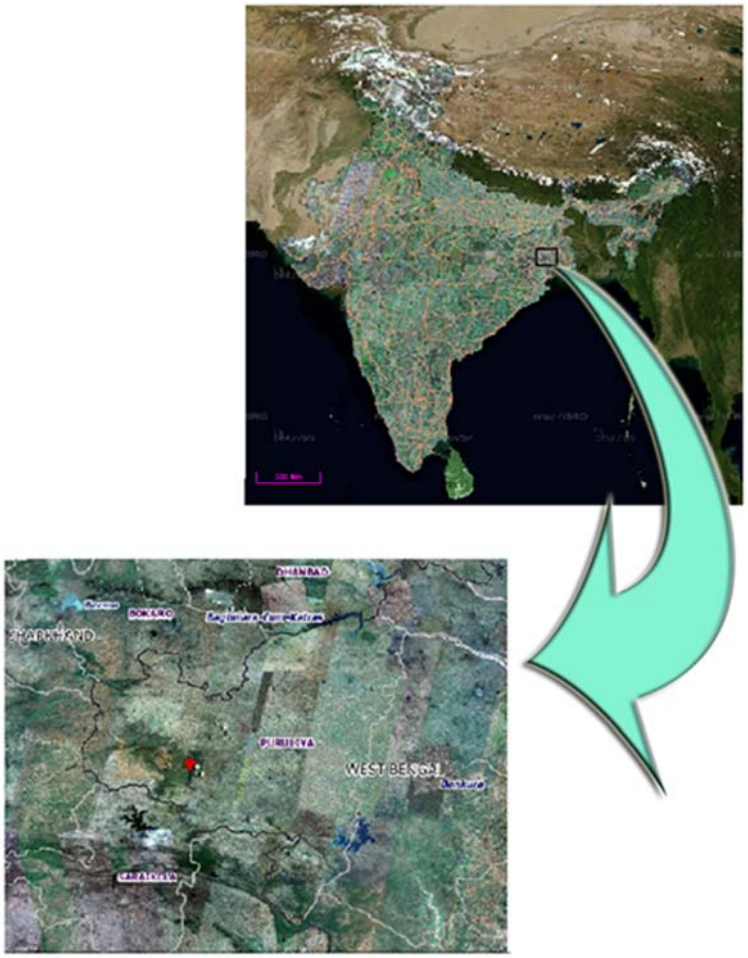

Fig 1: Map of India: West Bengal: Purulia

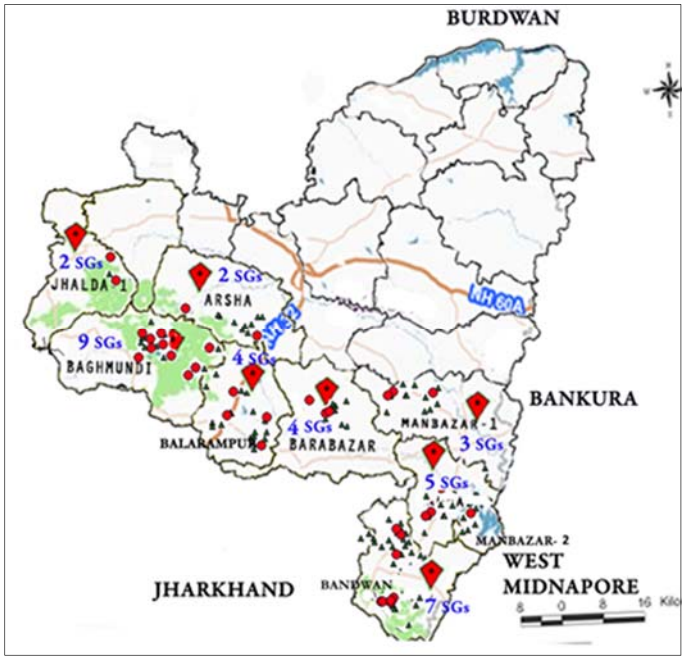

Fig 2: Map showing the study areas (RED DOTs)

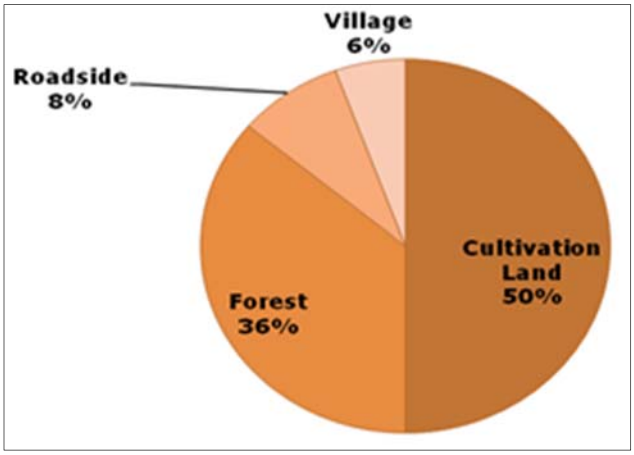

Fig 3: Showing the percentage (%) of sacred groves situated close to different land marks

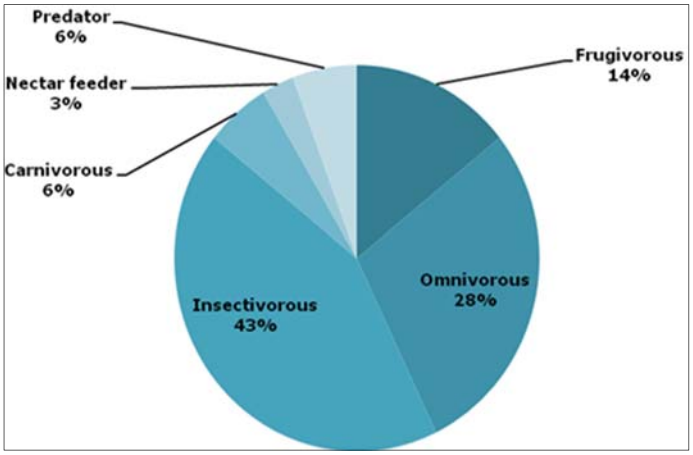

Fig 5: Showing the percentage (%) of the role of birds in ecosystem

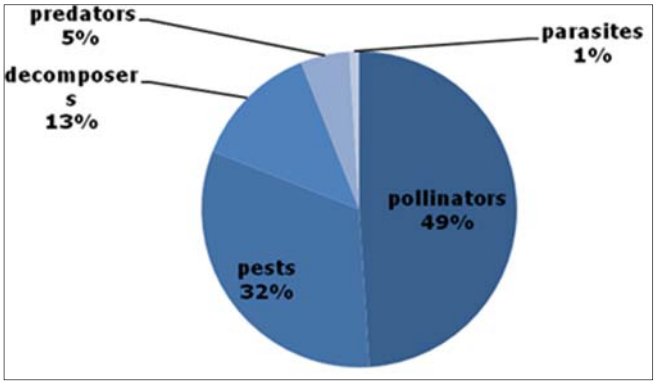

Fig 4: Biological role of insects in the sacred groves (%-wise).

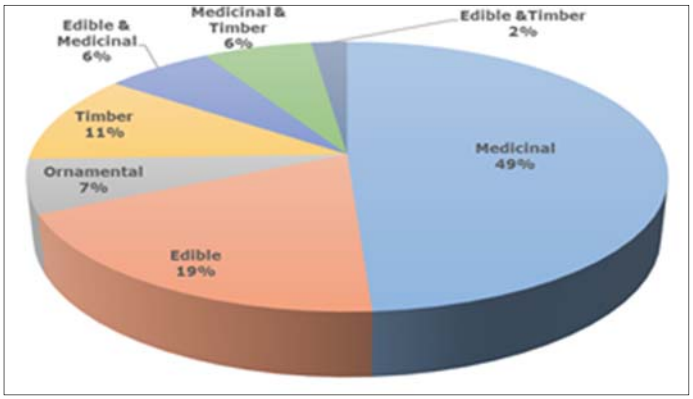

Fig 6: Showing the percentage (%) of the economic importance of the plants

Table 1: List of sacred groves surveyed, area and geographical position

S. No	SGs	Block	Area of SG's	Geographical Position/Altitude
1	Arsha	Arsha	734 sq m	23° 18.218′ N, 86° 11.556′ E / 230.7 m
2	Mohultnari	Arsha	2010 sq m	23° 15.035′ N, 86° 15.994′ E / 282.3 m
3	Bagandi Gar	Baghmundi	40,200 sq m	23° 12.896′ N, 86° 07.599′ E / 566.9 m
4	Banghutu	Baghmundi	2010 sq m	23° 12.487′ N, 86° 06.169′ E / 566.9 m
5	Bhuigora	Baghmundi	2680 sq m	23° 14.117′ N, 86° 05.165′ E / 587.65 m
6	Chhatrajara	Baghmundi	1600 sq m	23° 13.003′ N, 86° 11.420′ E / 423.7 m
7	Chotka Dungri	Baghmundi	670 sq m	23° 11.417′ N, 86° 04.714′ E / 307.8 m
8	Darubdi	Baghmundi	2680 sq m	23° 11.677′ N, 86° 08.465′ E / 602.9 m
9	Jhiling Tang -2	Baghmundi	1340 sq m	23° 13.487′ N, 86° 06.107′ E / 602.3 m
10	Sonahara 1	Baghmundi	1340 sq m	23° 14.145′ N, 86° 74.110′ E / 598.9 m
11	Usuldungri-1	Baghmundi	2575.2 sq m	23° 12.116′ N, 86° 10.636′ E / 558.4 m
12	Chhotagado - 2	Balrampur	3384.8 sq m	23° 06.201′ N, 86° 16.373′ E / 243.8 m
13	Hendelbera	Balrampur	6456.8 sq m	23° 12.899′ N, 86° 12.466′ E / 508.4 m
14	Majhi Kadam Di	Balrampur	87 sq m	23° 03.045′ N, 86° 15.687′ E / 256.6 m
15	Sardar Di	Balrampur	1341.2 sq m	23° 06.456′ N, 86° 11.696′ E / 262 m
16	Duarsini	Bandwan	4020 sq m	22° 35.816′ N, 86° 27.462′ E / 147.5 m
17	Gnudlubera-1	Bandwan	335 sq m	22° 46.365′ N, 86° 27.312′ E / 157 m
18	Gnudlubera-2	Bandwan	2680 sq m	22° 46.377′ N, 86° 27.445′ E / 185.9 m
19	Mahulbona-1	Bandwan	670 sq m	22° 51.640′ N, 86° 34.718′ E / 192 m
20	Pochapani-1	Bandwan	12680 sq m	22° 46.264′ N, 86° 28.429′ E / 190.2 m
21	Salidih-1	Bandwan	4020 sq m	22° 46.794′ N, 86° 28.689′ E / 164 m
22	Salidih-2	Bandwan	20,100 sq m	22° 46.520′ N, 86° 28.360′ E / 176.8 m
23	Amagara	Barabazar	343.8 sq m	23° 03.394′ N, 86° 19.922′ E / 237.7 m
24	Bankati	Barabazar	5784.4 sq m	23° 03.634′ N, 86° 20.340′ E / 239.9 m
25	Baradi	Barabazar	500.7 sq m	23° 04.844′ N, 86° 18.107′ E / 247 m
26	Gohamikocha -1	Barabazar	201 sq m	23° 00.761′ N, 86° 25.462′ E / 224.9 m
27	Barua kocha-1	Jhalda-1	254.7 sq m	23° 22.720′ N, 86° 01.106′ E / 326 m
28	Nowagarh	Jhalda-1	332.3 sq m	23° 20.081′ N, 86° 01.761′ E / 342.6 m

29	Punrra-1	Manbazar-1	134 sq m	23° 04.865′ N, 86° 29.490′ E /192.9 m
30	Hullum	Manbazar-1	670 sq m	23° 04.700′ N, 86° 34.077′ E /179.5 m
31	Jambani (Punrra)	Manbazar-1	134 sq m	23° 04.436′ N, 86° 28.806′ E / 204.8 m
32	Barakadam-2	Manbazar-2	3350 sq m	22° 53.818′ N, 86° 35.332′ E / 592 m
33	Jamunabad	Manbazar-2	670 sq m	23° 00.065′ N, 86° 32.425′ E / 317 m
34	Jhariadi	Manbazar-2	2680 sq m	22° 58.166′ N, 86° 33.164′ E / 203 m
35	Kallabera	Manbazar-2	3350 sq m	22° 56.290′ N, 86° 35.590′ E / 545 m
36	Pattapur	Manbazar-2	2000 sq m	22° 54.409′ N, 86° 34.767′ E / 567 m

Table 2: List of insect species reported from the sacred groves and their biological role

S. No	Species Name	Common Name	Family	Order	Role in Ecosystem
1.	*Anthia sexguttata* Fabricius	Six-spot ground beetle	Carabidae	Coleoptera	Phytophagus
2.	*Xylorhiza adusta* Wiedemann	Long horned beetle	Cerambycidae	Coleoptera	Stem borer
3.	*Altica* sp.	Leaf beetle	Chrysomelidae	Coleoptera	Phytophagus
4.	*Aspidomorpha miliaris* Fabricius	Tortoise beetle	Chrysomelidae	Coleoptera	Phytophagus
5.	*Adaliate traspilota* (Hope)	Lady Bird beetle	Coccinellidae	Coleoptera	Phytophagus / Pollen feeder
6.	*Onthophagus gazelle* (Fabricius, 1787)	Brown Dung beetle	Scarabaeidae	Coleoptera	Coprophagous
7.	*Onthophagus sp.*	Dung beetle	Scarabaeidae	Coleoptera	Coprophagous
8.	*Schizonycha* sp.	Chafer beetle	Scarabaeidae	Coleoptera	Phytophagous;leaves.
9.	*Apogonia* sp.	Chafer beetle	Scarabaeidae	Coleoptera	Phytophagous; leaves.
10.	*Protaetia aurichalcea* (Fabricius, 1775)	Fruit and Flower Chafer	Scarabaeidae	Coleoptera	Phytophagous,pollinator, nectar sap.
11.	*Anomala bengalensis* Blanchard, 1850	Scarab beetle	Scarabaeidae	Coleoptera	Phytophagous
12.	*Anomala biharensis* Arrow, 1917	Scarab beetle	Scarabaeidae	Coleoptera	Phytophagous
13.	*Adoretus lasiopygus* Burmeister, 1855	Scarab beetle	Scarabaeidae	Coleoptera	Phytophagous
14.	*Orphnus parvus* Wiedemann, 1823	Scarab beetle	Scarabaeidae	Coleoptera	Phytophagous
15.	*Alphitobius diaperinus* Panzer,1797	Darkling beetle	Tenebrionidae	Coleoptera	Feeds on egg and larvae of other insects, sometimes on animals also.
16.	*Musca (Musca) domestica* Linnaeus	House fly	Muscidae	Diptera	Saprophagus
17.	*Musca (Byomya) sorbens* Wiedemann	House fly	Muscidae	Diptera	Saprophagus
18.	*Neomyia lauta* (Wiedemann)	House fly	Muscidae	Diptera	Saprophagus
19.	*Stomoxy scalcitrans* (Linnaeus)	House fly	Muscidae	Diptera	Saprophagus
20.	*Strongyloneura* sp.	Blue bottle flies	Rhiniidae	Diptera	Saprophagus
21.	*Ptecticus longipennis* Wiedemann	Soldier fly	Stratiomyidae	Diptera	Decaying matter
22.	*Tabanus striatus* Fabricius	Horse fly	Tabanidae	Diptera	Sanguinivorus
23.	*Episyrphus balteatus* (DeGeer)	Hover flies	Syrphidae	Diptera	Pollinator
24.	*Ischiodon scutellaris* (Fabricius)	Hover flies	Syrphidae	Diptera	Pollinator
25.	*Eoseristalis cerealis* (Fabricius)	Hover flies	Syrphidae	Diptera	Pollinator
26.	*Eristalis tenax* (Linnaeus)	Hover flies	Syrphidae	Diptera	Pollinator
27.	*Mesembriu sbengalensis* (Wiedemann)	Hover flies	Syrphidae	Diptera	Pollinator
28.	*Phytomia errans* (Fabricius)	Hover flies	Syrphidae	Diptera	Pollinator
29.	*Asarkina (Asarkina) ericetorum* (Fabricius, 1782)	Hover flies	Syrphidae	Diptera	Pollinator
30.	*Tenosius proletarius* (Schaum)	Broad Headed Bug	Alydidae	Hemiptera	Phytophagus
31.	*Halys dentatus* (Fabricius)	Mulbery bug	Pentatomidae	Hemiptera	Phytophagus
32.	*Tolumnia latipes* (Dallas)	Stink Bug	Pentatomidae	Hemiptera	Phytophagus
33.	*Leptocoris augur* (Fabricius)	Scentless Plant Bug	Rhopalidae	Hemiptera	Phytophagus
34.	*Amata passalis* (Fabricius)	Tiger Moth	Arctidae	Lepidoptera	Pest
35.	*Glyphodes* sp.	Moth	Crambidae	Lepidoptera	Pest
36.	*Pelopidas mathias* Fabricius	Small Branded Swift	Hesperidae	Lepidoptera	Nectar feeder
37.	*Castalius rosimon* Fabricius	Common Pierrot	Lycaenidae	Lepidoptera	Nectar feeder
38.	*Polyommatus* sp.	Meadow Blue	Lycaenidae	Lepidoptera	Nectar feeder
39.	*Zizula hylax* Fabricius	Tiny Grass Blue	Lycaenidae	Lepidoptera	Nectar feeder
40.	*Symphae dranais* Foster	Baronet	Nymphalidae	Lepidoptera	Nectar feeder
41.	*Junonia atlites* Linnaeus	Grey Pansy	Nymphalidae	Lepidoptera	Nectar feeder
42.	*Junonia lemonias* Linnaeus	Lemon Pansy	Nymphalidae	Lepidoptera	Nectar feeder
43.	*Hypolimnas bolina* Linnaeus	Great Eggfly	Nymphalidae	Lepidoptera	Nectar feeder
44.	*Ypthima huebneri* Kirby	Common Four-ring	Nymphalidae	Lepidoptera	Nectar feeder
45.	*Charaxes athamas* Drury	Common Nawab	Nymphalidae	Lepidoptera	Nectar feeder
46.	*Acraea violae* Fabricius	Tawny Coster	Nymphalidae	Lepidoptera	Nectar feeder
47.	*Neptis hylas* Fabricius	Common Sailor	Nymphalidae	Lepidoptera	Nectar feeder

48.	*Melanitis leda* Linnaeus	Common Evening rown	Nymphalidae	Lepidoptera	Nectar feeder
49.	*Danaus genutia* (Cramer)	Striped Tiger	Nymphalidae	Lepidoptera	Nectar feeder
50.	*Danaus chrysippus* (Linnaeus)	Plain Tiger	Nymphalidae	Lepidoptera	Nectar feeder
51.	*Tirumala limniace* (Cramer)	Blue Tiger	Nymphalidae	Lepidoptera	Nectar feeder
52.	*Ariadne merione* (Cramer)	Common Castor	Nymphalidae	Lepidoptera	Nectar feeder
53.	*Euploea core* (Cramer)	Common Crow	Nymphalidae	Lepidoptera	Nectar feeder
54.	*Junonia almana* (Linnaeus)	Peacock Pansy	Nymphalidae	Lepidoptera	Nectar feeder
55.	*Junonia orithya* (Linnaeus)	Blue Pansy	Nymphalidae	Lepidoptera	Nectar feeder
56.	*Papilio polymnestor* Cramer	Blue Mormon	Papilionidae	Lepidoptera	Nectar feeder
57.	*Papilio clytia* (Linnaeus)	Common Mime	Papilionidae	Lepidoptera	Nectar feeder
58.	*Papilio polytes* Linnaeus	Common Mormon	Papilionidae	Lepidoptera	Nectar feeder
59.	*Papilio demoleus* Linnaeus	Lime Swallowtail	Papilionidae	Lepidoptera	Nectar feeder
60.	*Cepora nerissa* Fabricius	Common Gull	Pieridae	Lepidoptera	Nectar feeder
61.	*Catopsilia pomona* Fabricius	Common Emigrant	Pieridae	Lepidoptera	Nectar feeder
62.	*Pareronia hippia* Fabricius	Indian Wanderer	Pieridae	Lepidoptera	Nectar feeder
63.	*Eurema hecabe* (Linnaeus)	Common Grass Yellow	Pieridae	Lepidoptera	Nectar feeder
64.	*Brachythemis contaminate* (Fabricius)	Ditch Jewel	Libellulidae	Odonata	Predator
65.	*Diplacodes trivialis* (Rambur)	Ground Skimmer	Libellulidae	Odonata	Predator
66.	*Orthetrum sabina* (Drury)	Green Marsh Hawk	Libellulidae	Odonata	Predator
67.	*Acrida*sp.	Short-horned rasshopper	Acrididae	Orthoptera	Phytophagus
68.	*Oedaleus abruptus* (Thunberg)	Short-horned rasshopper	Acrididae	Orthoptera	Phytophagus
69.	*Trilophidia annulata* (Thunberg)	Short-horned rasshopper	Acrididae	Orthoptera	Phytophagus
70.	*Hieroglyphus banian* (Fabricius)	Rice grasshopper	Acrididae	Orthoptera	Phytophagus
71.	*Atractomorpha* sp.	Grasshopper	Pyrgomorphidae	Orthoptera	Phytophagus
72.	*Atractomorpha crenulata* (Fabricius)	Vegetable grasshopper	Pyrgomorphidae	Orthoptera	Phytophagus
73.	*Chrotogonus* (*Chrotogonus*) *trachypterus trachypterus* (Blanchard)	Surface grasshopper	Pyrgomorphidae	Orthoptera	Phytophagus

Table 3: List of bird species reported from the sacred groves

S. No.	Common Name	Scientific Name	Family	Role
1.	Alexandrine parakeet	*Psittacula eupatria* (Linnaeus, 1766)	Psittacidae	Frugivorous
2.	Asian pied starling	*Sturnus contra* Linnaeus, 1758	Sturnidae	Omnivorous
3.	Black Drongo	*Dicrurus adsimilis* (Vieillot, 1817)	Dicruridae	Insectivorous
4.	Black headed oriole	*Oriolus xanthornus* (Linnaeus, 1758)	Oriolidae	Frugivorous
5.	Brahminy starling	*Sturnus pagodarum* (Gmelin, 1789)	Sturnidae	Insectivorous
6.	Cattle egret	*Bubulcus ibis* (Linnaeus, 1758)	Ardeidae	Insectivorous
7.	Common Golden back woodpecker	*Dinopium javanens* (Ljungh, 1797)	Picidae	Insectivorous
8.	Common hoopoe	*Upupa epops* (Linnaeus, 1758)	Upupidae	Insectivorous
9.	Common Iora	*Aegithina tiphia* (Linnaeus, 1758)	Irenidae	Insectivorous
10.	Common myna	*Acridotheres tristis* (Linnaeus, 1766)	Sturnidae	Omnivorous
11.	Coppersmith barbet	*Megalaima haemacephala* (P.L.S.Muller,1776)	Capitonidae	Frugivorous
12.	Great egret	*Ardea alba* Linnaeus, 1758	Pelecaniformes	Insectivorous
13.	Greater coucal	*Centropus sinensis* (Stephens, 1815)	Cuculidae	Insectivorous
14.	Green bee-eater	*Merops orientalis* (Latham, 1801)	Meropidae	Insectivorous
15.	House Sparrow	*Passer domesticus* (Linnaeus, 1758)	Passeridae	Omnivorous
16.	Indian Pond heron	*Ardeola grayii* (Sykes,l832)	Ardeidae	Carnivorous
17.	Indian roller	*Coracias benghalensis* (Linnaeus, 1758)	Coraciidae	Insectivorous
18.	Jungle babbler	*Turdoides striatus* (Dumont, 1823)	Muscicapidae	Insectivorous
19.	Jungle crow/ Large billed crow	*Corvus macrorhynchos* Wagler, 1827	Corvidae	Omnivorous
20.	Jungle myna	*Acridotheres fuscus* (Wagler, 1827)	Sturnidae	Omnivorous
21.	Oriental magpie robin	*Copsychus saularis* (Linnaeus, 1758)	Muscicapidae	Omnivorous
22.	Paddy field pipit	*Anthus rufulus* Vieillot, 1818	Motacillidae	Insectivorous
23.	Purple sunbird	*Nectarinia asiatica* (Latham, 1790)	Nectariniidae	Nectar feeder
24.	Red jungle fowl	*Gallus gallus* (Linnaeus, 1758)	Phasianidae	Omnivorous
25.	Red throated Flycatcher	*Ficedula parva* (Bechstein, 1792)	Muscicapidae	Insectivorous
26.	Red vented bulbul	*Pycnonotus cafer* (Linnaeus, 1766)	Pycnonotidae	Insectivorous
27.	Red whiskered bulbul	*Pycnonotus jocosus* (Linnaeus, 1758)	Pycnonotidae	Insectivorous
28.	Rock pigeon	*Columba livia* Gmelin, 1789	Columbidae	Omnivorous
29.	Rose ringed parakeet	*Psittacula krameri* (Scopoli, 1769)	Psittacidae	Frugivorous

30.	Rufous tree pie	*Dendrocitta vagabunda* (Latham, 1790)	Corvidae	Omnivorous
31.	Shikra	*Accipiter badius* (Gmelin, 1788)	Accipitridae	Predator
32.	Spotted Dove	*Streptopelia chinensis* (Scopoli, 1786)	Columbidae	Omnivorous
33.	Spotted owlet	*Athene brama* (Temminck, 1821)	Strigidae	Predator
34.	White breasted kingfisher	*Halcyon smyrnensis* (Linnaeus, 1758)	Alcedinidae	Carnivorous
35.	Yellow footed green pigeon	*Treron phoenicoptera* (Latham, 1790)	Columbidae	Frugivorous

Table 4: List of plant species reported from the sacred groves and their use

S. No.	Scientific Name	Common Name	Family	Importance
1.	*Mangifera indica* Linn.	Aam	Anacardiaceae	Edible fruits and food value. (NTP)
2.	*Acacia auriculiformis* A. Cunn	Akashmani / Sonajhuri	Mimosaceae	Medicinal value. Timber value
3.	*Alangium salvifolium* (Linn. f.) Wang.	Akura	Alangiaceae	Medicinal value.
4.	*Ficus carica* Linn.	Anjir	Moraceae	Edible fruits. (NTP)
5.	*Terminalia arjuna* (Roxb.) Wight. & Arn.	Arjun	Combretaceae	Medicinal value.
6.	*Terminalia tomentosa* Wight & Arn.	Asan	Combretaceae	Timber value.
7.	*Ficus religiosa* Linn.	Aswatha	Moraceae	Sacred trees used in religious ceremonies. Medicinal value.
8.	*Terminalia bellirica* (Gaertn.) Roxb.	Bahara / Karu	Combretaceae	Fruits are used for medicinal purpose.
9.	*Flacourtia indica* (Burm. f.)	Baichi	Flacourtiaceae	Medicinal purpose
10.	*Aegle marmelos* (Linn.) Corr.	Bel	Rutaceae	Food value and Medicinal value.
11.	*Clerodendrum viscosum* Vent. Jard. Malm. T.	Bhant	Verbenaceae	Medicinal purpose
12.	*Semecarpus anacardium* Linn.f. Suppl.	Bhella	Anacardiaceae	Used in folk medicine.
13.	*Gardenia resinifera* Roth	Bhurru	Rubiaceae	Fruits eidible
14.	*Ficus benghalensis* Linn.	Bot	Moraceae	Shade tree and sacred tree, Medicinal value.
15.	*Morinda citrifolia* Linn.	Chaili	Rubiaceae	Medicinal purpose
16.	*Anogeissus latifolia* (DC.) Wall. ex Bedd.	Dhaw	Combretaceae	Timber value and medicinal value.
17.	*Ficus hispida* Roxb.	Dumur	Moraceae	Sacred trees, used in religious ceremonies.
18.	*Eucalyptus tereticornis* Smith.	Eucalyptus	Myrtaceae	Eucalyptus oil is readily steam distilled from the leaves and can be used for cleaning and as an industrial solvent, as an antiseptic.
19.	*Terminalia chebula* (Gaertn) Retz.	Hartaki	Combretaceae	The bark and fruit is used for tanning and dying. Used as local medicine.
20.	*Hibiscus rosa sinensis* Linn.	Jaba	Malvaceae	Ornamental but having medicinal properties.
21.	*Ficus racemosa* Linn.	Jag Dumur	Moraceae	Traditional medicines are prepared
22.	*Eugenia jambolana* Lamk.	Jam	Myrtaceae	Fruit is consumed.
23.	*Ricinus communis* Linn.	Jara	Euphorbiaceae	Medicinal purpose and non-timber value
24.	*Anthocephalus cadamba* (Roxb.) Mig.	Kadam	Rubiaceae	Medicinal plant.
25.	*Artocarpus heterophyllus* Lamk.	Kanthal	Moraceae	Fruit is edible and has good market value.
26.	*Adina cordifolia* (Roxb.) Hk. f. ex Bran.	Karam / Haldu	Rubiaceae	Medicinal purpose
27.	*Diospyros exsculpta* Roxb.	Kend	Ebenaceae	Timber value.
28.	*Phoenix sylvestris* (Linn.) Roxb.	Khejur	Arecaceae	Edible fruits and high food value.
29.	*Bridelia retusa* (Linn.) A. Juss.	Kosoi / Bhuas/Geio	Euphorbiaceae	Fruits edible, medicinal purpose
30.	*Zizyphus mauritiana* Lamk.	Kul	Rhamnaceae	Edible fruit, quite nutritious and rich in vitamin C.
31.	*Holarrhena antidysenterica* (Heyne ex Roth) A. DC.	Kurchi/ Karaya	Apocynaceae	Medicinal value.
32.	*Schleichera oleosa* (Lour.) Oken	Kusum	Sapindaceae	Fruits edible, timber value
33.	*Ixora arborea* Roxb. ex Smith	Lohajangi	Rubiaceae	Ornamental flower
34.	*Madhuca indica* Gmelin	Mahua	Sapotaceae	Medicinal value.
35.	*Pterocarpus marsupium* Roxb.	Murga/ Piasal	Papilionaceae	Medicinal value.
36.	*Azadirachta indica* A. Juss	Neem	Meliaceae	Medicinal value.
37.	*Butea monosperma* (Lamk.) Taub.	Palash	Papilionaceae	Fibre, Medicinal value.
38.	*Cleistanthus collinus* (Roxb.) Benth.	Parasi	Euphorbiaceae	Medicinal purpose
39.	*Psidium gujava* Linn.	Peyara	Myrtaceae	Edible fruits, leaves are used in folk medicine as a remedy for diarrhea.
40.	*Buchanania lanzan* Spreng.	Pial	Anacardiacae	Fruits are used as spice for cooking.
41.	*Shorea robusta* Gaertn. f.	Sal	Dipterocarpaceae	Timber value, It is used as an astringent in Ayurvedic medicine.

42.	*Glycosmis pentaphylla* auct. pl.	Sheora	Rutaceae	Ornamental and timber value. Medicinal value.
43.	*Lagerstroemia parviflora* Roxb.	Sidha	Lythraceae	Timber value.
44.	*Albizia lebbeck* (Linn.) Benth.	Siris	Minosaceae	Medicinal value.
45.	*Dalbergia sissoo* Roxb. ex DC.	Sisu	Papilionaceae	Timber value.
46.	*Tabernaemontana coronaria* (Jacq.) Willd.	Tagar	Apocynaceae	Ornamental.
47.	*Borassus flabellifer* Linn.	Tal	Arecaceae	Edible fruits. Fresh sap of palm has stimulant and antiphlegmatic properties.

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