



E-ISSN: 2320-7078
P-ISSN: 2349-6800
JEZS 2016; 4(1): 474-478
© 2016 JEZS
Received: 26-11-2015
Accepted: 28-12-2015

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Diversity of ground dwelling insect fauna in the sacred groves of Purulia district, West Bengal

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Abstract

An attempt has been made to explore the ground dwelling insects from 53 sacred groves of Purulia district. Altogether, 29 species belonging to four orders and seven families were reported from these old-aged sacred groves. Of them, Orthoptera shares maximum number of species (14) followed by Hymenoptera (7), Dermaptera (4) and Coleoptera (4). High percentage of ground dwelling insect species diversity was observed in thick undergrowth (49%) followed by clear (27%) and thin (24%) undergrowth.

Keywords: Sacred groves, Purulia, undergrowth, soil dwelling insects.

1. Introduction

Soil is probably one of the most species-rich habitats of terrestrial ecosystems, considering the habitats like vertebrate faeces, decaying wood, epiphytic soils and forest/agricultural or domestic litter. The diversity of soil thus comprises of large number of terrestrial insects including many ground dwelling insects those are functionally important to the biodiversity. However, the healthy vegetal cover of Purulia is now present in some discrete patches as sacred groves due to massive deforestation that occurred in recent past. Sacred groves (SGs) are such repositories where the native/local fauna and flora are still found, as because hunting of animals and felling of trees inside the grove are restricted by traditional taboos and rules [7, 8]. So, it is essential to record them and understand their importance to prevent loss of biodiversity and ecological imbalance due to forest loss or degradation [6, 9]. Recently, few publications were made by Roy *et al.* and Mitra [10, 11] on the aerial insect diversity of the sacred groves of Hooghly and Bankura district. There are also several reports of some insects in West Bengal State Fauna Series from neighbouring district of Bankura by Saha [12], Srivastava [17] Tiwari *et al.* [18] and Shishodia *et al.* [15, 16]. But nothing has been reported on ground dwelling insects from the sacred groves in India and from Purulia district in particular. This paper documents the ground dwelling insect faunal diversity of 53 sacred groves of Purulia district along with their importance and role in ecosystem.

2. Material and methods

Purulia is 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). 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 53 SGs in 18 blocks of Purulia district, namely, Arsha, Baghmundi, Balarampur, Bandwan, Barabazar, Hura, Jhalda-I, Jhalda-II, Joypur, Kashipur, Manbazar-I, Manbazar-II, Neturia, Para, Pancha, Purulia-II, Raghunathpur-I, and Santuri. All the above said groves were surveyed during the period of July 2014 - June 2015.

Generally, collections were made in day time. Pit fall trap was used for ground dwelling insects. Hand picking method was also used in few cases. The identification was made in the laboratory of Zoological Survey of India, Kolkata. All these 53 sacred groves were categorized as thick (total forest floor vegetated), thin (scattered vegetation) and clear (no vegetation).

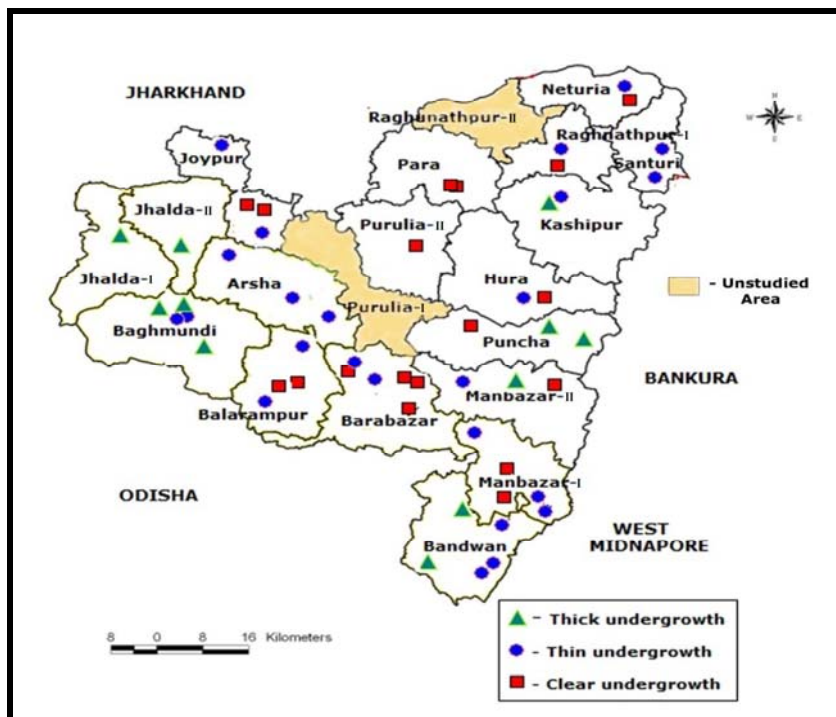


Fig 1: Map showing the study areas in different undergrowth

3. Results and Discussion

During the present study 53 SG's were surveyed from 18 blocks of Purulia district (Table.1). Out of the 18 blocks, the highest number of sacred groves were surveyed in Barabazar block (6), followed by Baghmundi (5), Bandwan (5),

Manbazar-II(5), Balarampur (4), Arsha (3), Joypur (3), Manbazar-I(3), Pancha (3), Hura (2), Kashipur (2), Neturia (2), Para (2), Raghunathpur-I(2), Santuri (2), Jhalda-I(1), Jhalda-II(1) and Purulia-II(1).

Table 1: List of Sacred groves with their undergrowth and entomofaunal diversity.

Sl.no.	SG's	Block	Undergrowth	Species	Family	Order
1.	Layek Para 1	Pancha	Thick	5	3	2
2.	Ratnadi 2	Pancha	Thick	4	4	3
3.	Majhihira	Manbazar-I	Thick	3	3	2
4.	Jihurbona	Kashipur	Thick	5	3	3
5.	Shyamnagar	Bandwan	Thick	3	2	2
6.	Pachapani	Bandwan	Thick	4	3	2
7.	Hatinada	Baghmundi	Thick	3	3	2
8.	Sonahara 3	Baghmundi	Thick	3	3	3
9.	Ushuldungri-1	Baghmundi	Thick	3	3	2
10.	Noyagarh	Jhalda-I	Thick	3	2	2
11.	Supuddi-2	Jhalda-II	Thick	4	3	2
12.	Kherat	Santuri	Thin	3	3	2
13.	Babugram	Raghunathpur I	Thin	4	3	2
14.	Kaliabali	Neturia	Thin	3	3	2
15.	Gosai Than (Punrra)	Manbazar-I	Thin	3	2	1
16.	Sindrathi	Manbazar - II	Thin	1	1	1
17.	Barakadam-2	Manbazar - II	Thin	3	2	2
18.	Kutni-3	Manbazar - II	Thin	1	1	1
19.	Panrasol	Kashipur	Thin	3	3	2
20.	Deulghata	Joypur	Thin	2	1	1
21.	Sidhi 3	Joypur	Thin	2	2	2
22.	Chamnigora	Hura	Thin	3	3	2
23.	Barabazar 1	Barabazar	Thin	2	2	2
24.	Bankati	Barabazar	Thin	2	2	2
25.	Kendrapara	Bandwan	Thin	3	2	2
26.	Udalbari	Bandwan	Thin	2	2	2
27.	Paharpur	Bandwan	Thin	2	2	2
28.	Bagandi Gar	Baghmundi	Thin	2	2	2
29.	Sahebdi	Baghmundi	Thin	3	2	1
30.	Kultnar new	Arsha	Thin	1	1	1
31.	Gurahata	Arsha	Thin	2	2	2
32.	Molinari	Arsha	Thin	3	3	2

33.	HedelBera	Balrampur	Thin	3	2	2
34.	MajhiKadaradi	Balrampur	Thin	3	2	2
35.	Salberia	Santuri	Thin	3	3	3
36.	Dimuriakuri	Raghunathpur I	Clear	3	3	3
37.	Barasini 1	Purulia II	Clear	3	3	3
38.	Pakbirra	Puncha	Clear	3	3	3
39.	Lipania 1	Para	Clear	2	2	1
40.	Rangamatiya 3	Para	Clear	2	2	1
41.	Gundhluvitya	Neturia	Clear	3	3	1
42.	Shimtoni	Manbazar - II	Clear	1	1	1
43.	Tipudi	Manbazar - II	Clear	2	1	1
44.	Makarkendi	Manbazar-I	Clear	2	2	1
45.	Garjoypur 6	Joypur	Clear	2	2	1
46.	Simultnar	Joypur	Clear	2	1	1
47.	Sugunibasa 2	Hura	Clear	3	3	2
48.	Amrabera 1	Barabazar	Clear	2	2	1
49.	Mednitang	Barabazar	Clear	3	2	1
50.	Kadampur	Barabazar	Clear	2	2	1
51.	Latpada 1	Barabazar	Clear	2	2	2
52.	Purnapari	Balrampur	Clear	2	1	1
53.	Ratan Di	Balrampur	Clear	1	1	1

Among the 53 scared groves, most of the SG's are found with thin (45%), followed by clear (34%) and thick undergrowth (21%) (Figure: 2). Among them, maximum number of SGs with thick undergrowth are found in Baghmundi block (3). Whereas, maximum number of SGs with thin under growth are found in Manbazar– II, Bandwan and Arsha block (3) and SGs with clear under growth found in only Barabazar block (4) (Table.1).

Of the 29 species belonging to 4 orders and 7 families of soil dwelling insects the order Orthoptera (14species) is found as the dominant group in these sacred groves, followed by Hymenoptera (7) [18], Dermaptera (4) [17] and Coleoptera (4) [12] (Table.2). Which are 48%, 24%, 14% and 14% of the total fauna respectively (Figure: 3).

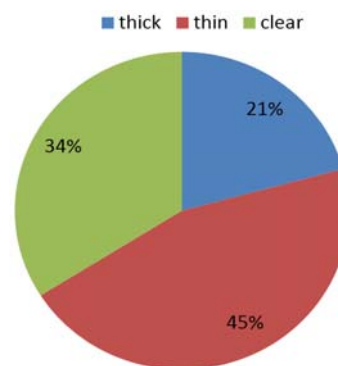


Fig 2: Sacred groves of 3 different category (Undergrowth-wise)

Table 2: List of insect species reported from different under growth

Serial No.	Species	Family	Order	Thick	Thin	Clear	Total
1	<i>Meranoplus bicolor</i> (Guérin)	Formicidae	Hymenoptera	+	+	-	2
2	<i>Camponotus sericeus</i> (Fabricius)	Formicidae	Hymenoptera	+	+	-	2
3	<i>Camponotus compressus</i> (Fabricius)	Formicidae	Hymenoptera	-	+	+	2
4	<i>Pheidole sp.</i>	Formicidae	Hymenoptera	+	-	+	2
5	<i>Paratrechina longicornis</i>	Formicidae	Hymenoptera	+	-	+	2
6	<i>Solenopsis geminata</i>	Formicidae	Hymenoptera	+	+	-	2
7	<i>Dorylus sp.</i>	Formicidae	Hymenoptera	+	-	-	1
8	<i>Ergatettix dorsifera</i> (Walker)	Tetrigidae	Orthoptera	-	+	+	2
9	<i>Ergatettix guntheri</i> Steinmann	Tetrigidae	Orthoptera	+	+	-	2
10	<i>Euparatettix histricus</i> (Stal)	Tetrigidae	Orthoptera	+	+	-	2
11	<i>Euparatettix personatus</i> (Bolivar)	Tetrigidae	Orthoptera	+	-	+	2
12	<i>Euparatettix tenuis</i> Hancock	Tetrigidae	Orthoptera	+	+	+	3
13	<i>Hedotettix costatus</i> Hancock	Tetrigidae	Orthoptera	+	+	+	3
14	<i>Hedotettix gracillis</i> (De Haan)	Tetrigidae	Orthoptera	+	-	+	2
15	<i>Gryllotalpa africana</i> Beauvois	Gryllidae	Orthoptera	+	+	-	2
16	<i>Teleogryllus mitratus</i> (Burmeister)	Gryllidae	Orthoptera	+	+	-	2
17	<i>Modicogryllus confirmatus</i> (Walker)	Gryllidae	Orthoptera	+	+	-	2
18	<i>Plebeiogryllus guttiventris</i> (Walker)	Gryllidae	Orthoptera	-	+	+	2
19	<i>Gryllodes sigillatus</i> (Walker)	Gryllidae	Orthoptera	+	+	+	3
20	<i>Pteronemobius concolor</i> (Walker)	Gryllidae	Orthoptera	+	+	-	2
21	<i>Gryllus sp.</i>	Gryllidae	Orthoptera	+	+	+	3
22	<i>Euborellia annulipes</i> (Lucas)	Anisolabididae	Dermaptera	+	+	+	3
23	<i>Euborellia compressa</i> (Borelli)	Anisolabididae	Dermaptera	-	-	+	1
24	<i>Nala lividipes</i> (Dufour)	Labiduridae	Dermaptera	+	+	+	3
25	<i>Labidura riparia</i> (Pallas)	Labiduridae	Dermaptera	+	+	+	3
26	<i>Pachytrachelus oblongus</i> (Dejean)	Carabidae	Coleoptera	-	+	+	2
27	<i>Anthia sexguttata</i> Fabricius	Carabidae	Coleoptera	+	+	+	3
28	<i>Onthophagus gazella</i> (Fabricius)	Scarabaeidae	Coleoptera	-	+	+	2
29	<i>Onthophagus sp.</i>	Scarabaeidae	Coleoptera	-	+	+	2

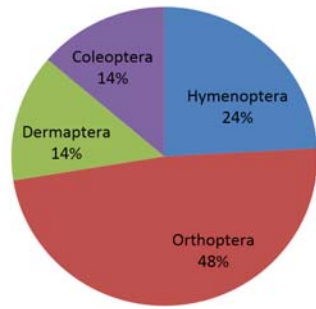


Fig 3: Percentage of species (Order-wise)

The order wise diversity (From the Table.1.) is found maximum (3 orders) in the sacred groves no.2 (thick), 4 (thick), 8 (thick), 35 (thin), 36 (clear), 37 (clear) and 38 (clear). Family-wise diversity is found maximum (4 families) only in the sacred grove no 2 (thick) and species-wise diversity reported maximum (5 species) in the sacred grove no 1 (thick) and 4 (thick). Four sacred groves (16, 18, 42 and 53) are found with a single species. Undergrowth of these groves is either thin or clear. The result also revealed that, the order Orthoptera is the predominant group in all the three types of undergrowth. The diversity of the other three orders (Hymenoptera, Dermaptera and Coleoptera) in thin and clear undergrowth is almost similar.

But the diversity of Coleoptera is found very less in thick undergrowth than Hymenoptera and Dermaptera (Figure: 4).

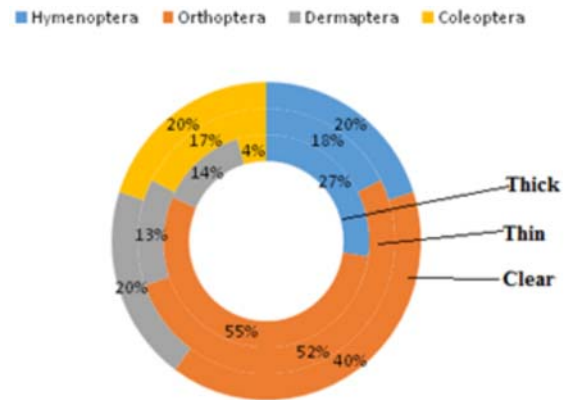


Fig 4: Distribution of species (Order-wise) in three types of undergrowth

Among the 7 families, Formicidae, Tetrigidae and Gryllidae are found maximum in the SGs with thick undergrowth whereas, family Gryllidae found maximum in thin undergrowth [16] and Tetrigidae in clear [15] (Figure: 5).

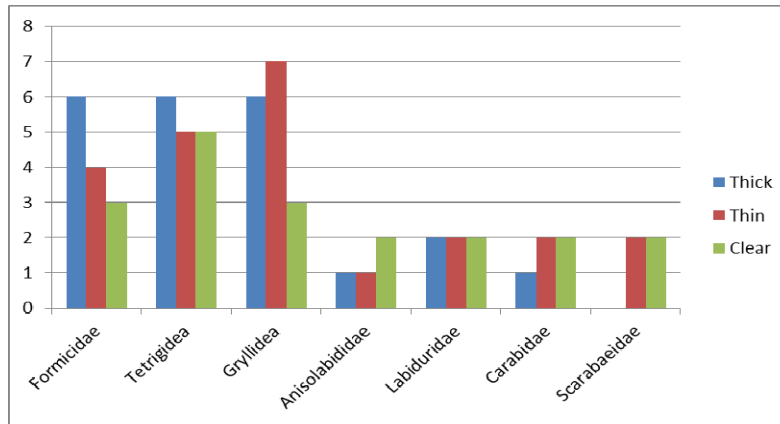


Fig 5: Family composition in three types of undergrowth

The species like, *Labidura riparia* (Pallas), *Pteronemobius concolor* (Walker), *Gryllodes sigillatus* (Walker), *Gryllotalpa africana* Beauvois, *Ergatettix guntheri* Steinmann are found as the predominant species in the SGs with thick undergrowth.

Whereas, *Anthia sexguttata* Fabricius in thin and *Onthophagus gazella* (Fabricius) are found dominant species in clear undergrowth (Figure: 6).

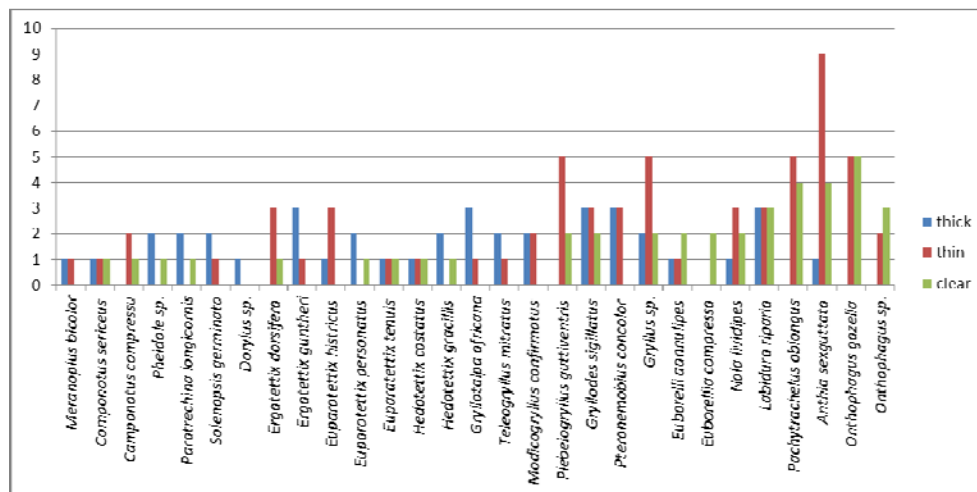


Fig 6: species composition in three types of undergrowth

Present day sacred groves are typical representation of isolated patches of native vegetation. The groves act as biodiversity protectors, as shelters of native insects, birds and mammals and also foraging places of the soil dwelling insects of the soil biota in maintaining ecosystem services^[13]. Invertebrates are an integral part of soil and are important in determining the suitability of soil for the sustainable production of healthy crops or trees^[1, 3]. These ground dwelling insect play an important role in breakdown of dung, carrion and leaf litter and therefore return nutrients to the soil. Faecal matter of insects is an essential component that contributes to the soil fertility^[2, 4].

Like other parts of the country, the diversity of the soil dwelling insects of the sacred groves of Purulia district was not studied properly. Therefore, no authentic data are available on the quantitative estimation of ecosystem services rendered by these insects. Order-wise diversity are found maximum in all the three categories of under growth, but the high percentage of species diversity (49%) (Figure: 7) is found only in the sacred groves with thick under growth. But during this survey most of the sacred groves are found either clear (34%) or thin (41%) which is really a threat to the biodiversity of sacred groves. Because, ground dwelling insects comprise a diverse, species-rich and dominant functional group, which depends (parts of their lives) on dead or dying wood or dead trees (standing or fallen), or wood-inhabiting fungi. The insects using the wood comprise a diverse fauna in terms of their nutritional ecology (Esseen *et al.* 1997)^[5]. On the other hand, dead wood is one of the most important substrates for maintaining biodiversity in forest ecosystems, and a substrate that is very negatively impacted by human activities^[14].

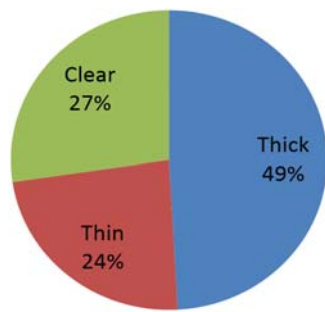


Fig 7: Species diversity in three types of undergrowth

Present study was made only in 53 sacred groves of Purulia district, which may be very small in numbers in comparison to reported sacred groves of this district. But this small study is the first report of soil dwelling insect fauna of the sacred groves of Purulia district and highlights the present scenario of the sacred groves of this semi-arid districts of West Bengal.

4. Acknowledgement

Authors are grateful to Academy of Biodiversity Conservation, West Bengal Biodiversity Board and West Bengal Forest Department for giving the opportunity to survey the sacred groves of Purulia district. Authors are grateful to the Director, Zoological Survey of India for helping in identification of fauna of the sacred groves. Authors are also thankful to Dr. Bulganin Mitra, Scientist C, Zoological Survey of India, Kolkata, for his valuable suggestions and constant support.

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