

**DIVERSITY OF INSECTS IN SAL (*SHOREA ROBUSTA*) FOREST
AT SELAQUI REGION, DEHRADUN (INDIA)****DR. DINESH KUMAR BHARDWAJ* AND KUMARI NEETU THAKUR***Department of Zoology, Dolphin (P.G) Institute of Biomedical and Natural Science, Dehradun(India)***ABSTRACT**

The study area is the "Selaqui" region of district Dehradun of the state of Uttarakhand in India. Dehradun is the capital of Uttarakhand and situated at the height in the foothills of 2073mm. It is located about 19 kms West-Northwest of capital city of Dehradun. Selaqui village is located at latitude 30.35' and longitude 77.94'. The area has forest land which is rich in the *Shorea robusta* trees. The insects were collected, pinned, spreading, dried and preserved. Total 30 insects species belonging to different orders viz. Lepidoptera, Hymenoptera, Orthoptera, Coleoptera, Isoptera Odonata, was identified during the study period i.e April-May 2014. Among all orders Coleoptera was dominated with 7 species with 36 no. of individuals. Lepidoptera was recorded with 6 species followed by Hemiptera with 5 species. Hymenoptera and Orthoptera with 4 species each. Diptera and Odonata with 2 and Dictyoptera and Isoptera with 1 species each. The diversity index was calculated by Shannon- Weiner Expression. In the present study, species diversity has been calculated, which is 1.380. This value shows high species diversity in the Sal forest.

KEYWORDS: Diversity, Insects, Sal Forest, *Shorea robusta***DR. DINESH KUMAR BHARDWAJ**Department of Zoology, Dolphin (P.G) Institute of Biomedical
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INTRODUCTION

Biodiversity is the variety and difference among living organisms from all sources, including terrestrial, marine, and other aquatic ecosystems complexes of which they are part. Biodiversity has led to increasing interests in assessing the diversity of insects and their relatives, because these groups are dominant in terrestrial and freshwater ecosystems and are valuable indicators of their health. Sal (*Shorea robusta*) is a dominant tree species in the Tarai (southern flat lowland) of Nepal. It is common up to 1000m. It is common up to 1000 m. Sal is a deciduous species and attains height up to 45 m. It is the main source of building timber and also as a fuel and fodder^[1]. Sal covers over 11 million in India, Nepal and Bangladesh^[2]. Sal is a handsome tree that grows up to 35 m tall and has a majestic, shining foliage. Sal (*Shorea robusta*) is a large sub deciduous tree. It has large leathery leaves and yellowish flowers. Sal (*Shorea robusta*) is the main tree species of Corbett and often grows as dense forest. Sal forests form an important wildlife habitat throughout northern and central India. Insects are major components of the biodiversity. Insects are dominant and the ancient group of animals on earth. Insects potentially represent over 90% of the differing Metazoan life forms on earth. The class Insecta are arranged in 31 orders. Four of these orders—the Coleoptera, Diptera, Hymenoptera, and Lepidoptera—accounts for 81% of all the described species of living insects. The beetles (order-Coleoptera) are in front, leading the next largest order, the Lepidoptera, by a factor of 2.3. The diversity and ecological importance of insects makes them very valuable for studies of biodiversity. Insects are both associated with natural objects, the plants, and the animals. Insects may serve the role of facilitator for inter-specific interaction in communities and ecosystems. Insects hold a vast of behavior, chemistry, form, and function that conservatively translates into an estimated \$57

billion per annum in ecological services to the United States, a value that does not include services provided by domesticated insects (e.g., honey bees) or their products^[3]. Insects are everywhere!! Insects are often encountered, at least with a little searching, in homes, yards, around building foundations, basements, crawl spaces, flower or vegetable gardens that are not heavily sprayed with pesticides, around lights at night. Near streams and lakes, abundant fields, parks, and forests. The majority of the insects are found specially in grassland, rain forests and deciduous forests.

MATERIALS AND METHODS

Two types of nets (aerial and sweeping) were used for insect collection. The aerial net was used for collecting flying insects. In the present study, aerial nets that were prepared entirely of white meshed material with light weight handles were used for effective collection. Sweep nets made of canvas with heavy handles were dragged through dense vegetation without being damaged. By using sweep net the random insects which were not seen easily were collected by sweeping the net through the vegetation. Grass-hoppers, moths and few Coleopterans were collected by this net. Insect collected with the help of Sweep net through small bushes, light trap and by hand picking. Insects that were collected were then killed in killing bottle by using Chloroform. The collected specimens were then brought to the laboratory, where they were transferred to spreading board and specimen was pinned and spreading on the spreading board. The specimens were dried in the oven. The spread specimens were then stored in well fumigated by naphthalene balls powder wooden boxes. The specimens were identified by using identification keys, specimens that were hard to identify were then taken to ZOOLOGICAL SURVEY OF INDIA.

Calculation of species diversity

Species diversity was calculated by Shannon and Weiner expression

$$H' = -\sum P_i \log P_i$$

Where H' is the species diversity index. Where (P_i) = proportion of total samples represented by species, divide no. of individuals of species by total no. of samples. Higher the no., the higher is the species diversity, i.e. high value of H would be representative of more diverse communities.

RESULTS

Total 180 Insects belonging to different orders viz Lepidoptera, Coeloptera, Orthoptera, Hymenoptera, Hemiptera, Diptera, Isoptera, Odonata, Dictyoptera were collected from sal forest in Selaqui region of Dehradun India (Table 2, 3). Among all the orders Coleoptera was dominated with 7 species and 36 number of individuals (Fig 1-6). The diversity index was calculated by Shannon Weiner Expression. In the present study, the diversity has been calculated, which is 1.380. Total no. of insects that were collected from the study

area are 180, from which order Coleoptera contains 36 no. of insects followed by order Orthoptera which contains 33 no. of insects, order Lepidoptera and Hymenoptera both contain 28 no. of insects, order Hemiptera contains total 20 no. of insects, which is followed by order Diptera and Isoptera which contains 13 and 12 no. of insects. The less no. of insects are reported from order Odonata and Dictyoptera which contains 6 and 4 no. of total insects (Table 1).

Table 1
Total collection of insects from each order

Order	Total collection
Coleoptera	35
Orthoptera	33
Lepidoptera	28
Hymenoptera	28
Hemiptera	20
Isoptera	12
Diptera	13
Odonata	6
Dictyoptera	4
Total	180

Table-2
Total species and percentage of Coleopteran collected from Sal forests

Order	Name of the family	Name of the species	No. of individuals	percentage
Lepidoptera	Nymphalidae	<i>Vanessa cardui</i>	4	2.2%
		<i>Euploea core</i>	3	1.67%
		<i>Coenonympha pamphilus</i>	5	2.78%
	Sphingidae	<i>Xylophanes tersa</i>	3	1.67%
		<i>Hippotion celerio</i>	3	1.67%
	Tortoridae	<i>Cydia pomella</i>	5	2.78%
Sessidae	<i>Aergeria culiciformis</i>	5	2.78%	
Hymenoptera	Apidae	<i>Apis mellifera</i>	6	3.33%
	Vespidae	<i>Vespula maculate</i>	11	6.11%
		<i>Ophion luteus</i>	4	2.2%
Formicidae	<i>Camponotus pennsylvani</i>	7	3.89%	
Orthoptera	Acrididae	<i>Chorthippus parallelus</i>	10	5.555%
		<i>Schistocera gregaria</i>	11	6.11%
	Gryllidae	<i>Acheta domesticus</i>	6	3.33%
	Tettigonidae	<i>Holochlora albida</i>	6	3.33%
Hemiptera	Pentatomidae	<i>Palomena parasina</i>	8	1.67%
		<i>Troilus luuridus</i>	5	2.78%
	Pyrrhocoridae	<i>Pyrrhocoris apterus</i>	7	3.89%
Dictyoptera	Mantadie	<i>Hirodula patelifera</i>	4	2.2%
Odonata	Libellulidae	<i>Sympatrum spp.</i>	6	3.33%
Coleoptera	Scarabidae	<i>Xytlotrupes giedion</i>	3	1.67%
		<i>Onthophagus gazelle Fabricusn</i>	7	3.89%
		<i>Schynige platte</i>	5	2.78%
		<i>Pelidnota punctata</i>	4	2.2%
		<i>Pentodon idiota</i>	3	1.67%
		<i>Coccinella septempuntata</i>	4	2.2%
	Coccinellidae			
Diptera	Tipulidea	<i>Nephrotoma crocata</i>	8	4.44%
		<i>Dolichopus urbanus</i>	5	2.78%
Isoptera	Rhinotermitidae	<i>Reticulitermes sp.</i>	12	6.67%

Table 3
Shannon Weiner species diversity index

Order	Name of family	Name of family	S(no. of individuals)	N(Total no. of sample)	Pi=S/N	LogPi	Pi x logPi
	Nymphalidae	<i>Vanessa cardui</i>	4	180	0.022	-1.66	-0.0365
		<i>Euploea core</i>	3	180	0.016	-1.795	-0.0287
		<i>Coenonympha pamphilus</i>	5	180	0.027	-1.568	-0.0423
	Sphingidae	<i>Xylophanes tersa</i>	3	180	0.016	-1.795	-0.0287

Lepidoptera		<i>Hippotion celerio</i>	3	180	0.016	-1.795	-0.0287
	Tortoridae	<i>Cydia pomella</i>	5	180	0.027	-1.568	-0.0423
	Sessidae	<i>Aegeria culiciformis</i>	5	180	0.027	-1.568	-0.0423
Hymenoptera	Apidae	<i>Apis mellifera</i>	6	180	0.033	-1.48	-0.0488
	Vespidae	<i>Vespula maculate</i>	11	180	0.061	-1.214	-0.0740
		<i>Ophion luteus</i>	4	180	0.022	-1.66	-0.0365
	Formicidae	<i>Camponotus pennsylvani</i>	7	180	0.038	-1.420	-0.0539
Orthoptera	Acrididae	<i>Chorthippus parallelus</i>	10	180	0.055	-1.259	-0.0712
		<i>Schistocera gregaria</i>	11	180	0.061	-1.214	-0.0740
	Gryllidae	<i>Acheta domesticus</i>	6	180	0.033	-1.48	-0.0488
	Tettigonidae	<i>Holochlora albida</i>	6	180	0.033	-1.48	-0.0488
Hemiptera	Pentatomidae	<i>Palomena parasina</i>	8	180	0.044	-1.356	-0.059
	Pentatomidae	<i>Troilus luridus</i>	5	180	0.027	-1.568	-0.0423
	Pyrrhocoridae	<i>Pyrrhocoris apterus</i>	7	180	0.038	-1.420	-0.0539
Dictyoptera	Mantadie	<i>Hirodula patelifera</i>	4	180	0.022	-1.66	-0.0365
Odonata		<i>Sympatrum spp.</i>	6	180	0.033	-1.48	-0.0488
	Scarabidae	<i>Xytlotrupes Gied ion</i>	3	180	0.016	-1.795	-0.0287
		<i>Onthophagusga</i>	7	180	0.038	-1.420	-0.0539

Coleoptera		zelle Fabricusn					
		Schynige platte	5	180	0.027	-1.568	-0.0423
		Pelidnota punctata	4	180	0.022	-1.66	0.0365
		Pentodon idiota	3	180	0.016	-1.795	-0.0287
	Coccinellidae	Coccinellasepte mpuntata	4	180	0.022	-1.66	-0.0365
		Coccinella transversalis	10	180	0.055	-1.259	-0.0712
Diptera	Tipulidea	Nephrotoma crocata	8	180	0.044	-1.356	-0.059
	Dolichopodinae	Dolichopus urbanus	5	180	0.027	-1.568	-0.0423
Isoptera			12	180	0.066	-1.176	-0.0776

Thus according to Shannon Weinner diversity index formula the species diversity index (H) is given as $H = -\sum p_i \text{Log} p_i = 1.380$

The pie structure of insects species in Sal Forests Selaquie region at Dehradun.

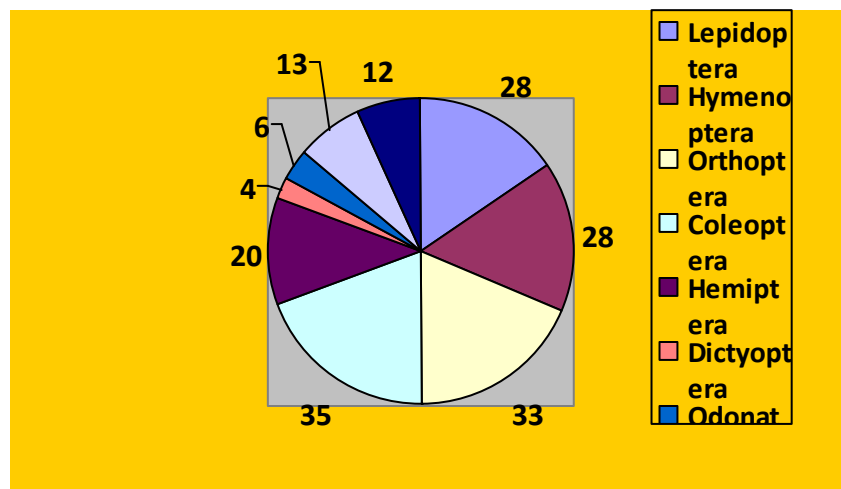


Figure 5
No. of individuals % of families of different orders

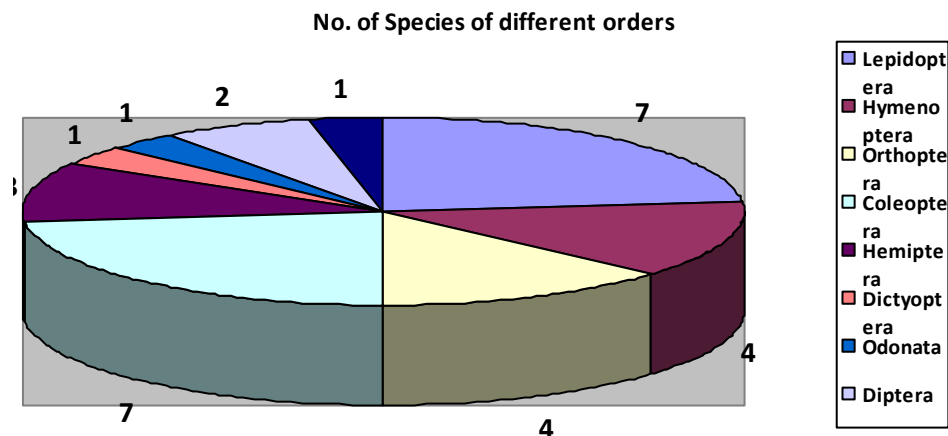


Figure 6
No. of Species of Different Order

DISCUSSION

Sal forest is rich of insect biodiversity. The sweet fragrance of Sal flowers attracts the varied groups of insects and also displays the diverse no. of species of different orders viz. Lepidoptera, Coleoptera, Hymenoptera, Orthoptera, Dipetera, Odonata, Hemiptera, Isoptera and Dictyoptera. The Sal Forest acts as a home of different insect species of the different orders. But the maximum number of insect species that was found in Sal forests are from order Coleoptera, Orthoptera and Lepidoptera in 5 hectares of sal forest (*Shorea robusts*) of Selaqui, Dehradun, India. In the present study four genera of Hymenoptera and seven species of Odonata was reported while Fourteen species of the Hymenoptera of six genera are reported from Rajaji National Park, Uttar Pradesh, India, and Seventeen species belonging to 4 families of order Oadanata which collected from Rajaji National Park^{[4][5]}. In the present study Orthoptera with 4 species, Lepidoptera with 7 species, Hemiptera, with 5 species and Diptera with 2 species were reported while similar result were reported^{[4][5]} and . The presence of all these species indicates that these forest tracts are rich and unique habitats that hold animal diversity that is typical of 'undisturbed tropical moist deciduous Sal

Forests'. Open cast mining activity, including the laying of roads, construction of several civil structures, movement of heavy vehicles, labour, firewood collection, etc. would cause disturbance these habitats. These activities can result in habitat fragmentation, population loss and cause local extinctions that would seriously affect the distribution of the insects and other Wildlife in the area⁽⁶⁾. In the present study, diversity has been calculated is 1.380. Which fall in the range of reported values (reported that wetlands had the maximum diversity (20) than in the forests (2.3), grassland(1.8) due the greatest species number and individual^{[7][8][9][10]}.

CONCLUSION

The presence of all these species indicates that these forest tracts are rich and unique habitats that hold animal diversity that is typical of 'undisturbed tropical moist deciduous Sal Forests'. Open cast mining activity including the laying of roads, construction of several civil structures, movement of heavy vehicles, labour, firewood collection, etc. would cause disturbance these habitats.

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