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A study on abundance and diversity of insects in and around Sonai college campus of Ahilyanagar district in Maharashtra, India

Shaikh MohiuddinDOI: <https://www.doi.org/10.22271/j.ento.2025.v13.i6a.9622>**Abstract**

The study was conducted to explore abundance and diversity of insects in and around the college campus at Sonai, Ahilyanagar District of Maharashtra from June 2024 to August 2024. Insects are collected by different standard methods. The identification of insects was done by available literature with standard keys of identification, pictorial websites and internet search. A total of 6608 insect specimens were collected during this period. These insects include 40 species, belonging to 36 families under 11 orders. The study shows that order Hymenoptera was most dominant with 46.76%, followed by Diptera (9.39%), Coleoptera (8.48%), Orthoptera (7.14%), Lepidoptera (7%), Hemiptera (6.63%) and Zygentoma (5.64%). The least relative percentage was Isoptera with 0.82%. The diversity of species shows that order Coleoptera was dominant with 8 families, followed by Lepidoptera and Hemiptera (5 families each), Orthoptera with 4 families, Hymenoptera, Diptera and Odonata (3 families each), Isoptera with 2 families and Mantodea, Dictyoptera and Zygentoma containing only 1 family each. This study is a preliminary research work and will be helpful to extend the work to observe seasonal changes of insect biodiversity in various regions.

Keywords: Abundance, Ahilyanagar, insects, Sonai college, species**Introduction**

Insects are the most diverse, largest and dominant group of living organisms on the earth. Due to vast diversity, insects play an important role in ecology, influence on agricultural and natural resources and human health. Insect biodiversity is found in all the natural resources including terrestrial, aerial and aquatic ecosystems. They possess an amazing diversity in size and the ability to fly permits them to run away from their enemies and settle in a new environment. Insects are highly responsive to environmental changes, including those resulting from anthropogenic activity to agriculture fields. The diversity of insect species represents an equivalent variety of adaptations to variable environmental conditions. Insects play a vital role in ecosystem function. They cycle nutrients, pollinate plants, disperse seeds, and maintain soil structure and fertility, control populations of other organisms, provide a major food source for other taxa (Majer, 1987)^[10]. Globally, an estimated 70% of crop plants are pollinated by insects. If this pollination service is lost, then there would be an adverse effect on food production and maintenance of biodiversity. Soil insect fauna is involved in biogeochemical processes and promotes nutrient availability; therefore soil insects are essential for ecosystem dynamics. Indian insects belong to 27 orders of which Coleoptera is most dominant with about 15,500 species. Butterflies and moths with about 15,000 species is another important group. These are followed by Hymenoptera (10,000 species), Diptera (6093 species) and Hemiptera (6500 species) (Varshney, 1998)^[24]. The book "Indian Insect Life" reported 25,700 species of insects from different parts of the country (Lefroy, 1909)^[9]. Insect diversity in different region of India shows a remarkable difference. The diversity is influenced by climatic and ecological factors such as temperature, rainfall and vegetation. The diversity in the Himalayan zone is mainly influenced by palaearctic factors, whereas the diversity in the desert zone is influenced by its extreme temperatures. The tropical humid zone like eastern Himalaya and Western Ghats has different species composition than that of island ecosystems, which harbors a great number of endemic species. Altogether, 5892 species belonging to 2382 genera under 261 families and 22 orders of insects have been reported from the state of Sikkim by (Chandra, 2011)^[6].

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In an intensive study made by Patel *et al.* (2015) ^[13] in Jabalpur Community Forest Reserve, a total of 774 individual of insects from 13 orders were recorded during the study. A preliminary study on abundance and diversity of insect fauna in Gulbarga District, Karnataka, India was conducted by Belamkar and Jadesh in 2012. A total of 11,318 insects from 6 orders, 26 families and 54 species were recorded. In India the research work of Qureshi *et al.* (2013) ^[17] in district Kupwara from Jammu and Kashmir State; Arya *et al.* (2014) ^[17] in and around Kumaun University, Nainital, Uttarakhand; Roopam Kulshrestha and Nita Jain (2016) ^[18] in and around College Campus of Jhalawar District of Rajasthan and Prerana Prakhar *et al.* (2021) ^[15] nearby locality of Raipur, Chhattisgarh have provided valuable information on various insects with reference to their diversity and abundance.

The main aim of this study is to collect and identify the insect species to know their diversity richness and abundance in and around the College Campus of Sonai, District Ahilyanagar in Maharashtra State, India. The aim was also to make awareness in the college students regarding insect fauna and importance of insects in the ecological system.

Materials and Methods

Study Area

In present investigation insects were collected in and around Mula Education Society's Arts, Commerce and Science College located in Sonai, a village of Ahilyanagar District of Maharashtra State, India. The college campus lies at the coordinates 19°23'16.2"N and 74°48'23.2"E with a lush green campus of 7 Acres. In the campus, there is large number of bushes, trees, flower plants, fruit plants with green vegetation in the form of grass lawns. The college campus is surrounded by crop plants like sugarcane, cotton, pomegranate, coconut and mango.

Methodology

The present study was carried out from June 2024 to August 2024 in and around the college campus. For the collection of insects following methods were used:

Sweep net method

Insects from the herb and shrubs were collected with sweep net. Sweep net with a long, tough handle and large collection bag was used. This method is vastly used to collect insects from ground layer vegetation. Insects collected by sweep net were temporarily transferred in polythene bags and carried in the laboratory, where these were killed with ethyl acetate. Later on insects were stretched, pinned and preserved in wooden boxes.

Pitfall traps method

Ants, beetles and other crawling insects can be collected easily by this method. The pitfall trap consists of a plastic or metal jar, buried in the ground. It is buried in such a way that the top of the jar was flush with the ground surface. The jar was filled with dishwashing soap and water up to 2 centimeter height, to prevent escape of insects. Collected insects were

dried in a wooden box, stretched and pinned, while some soft body insects were preserved in 70% ethanol.

Hand picking method

Insects present on leaf blades, dry leaves, flowers and ground stratum were hand-picked with fine forceps. These were transferred in killing bottles, then processed for pinning and preserved in wooden insect boxes in a dry condition.

Light trap method

The light trap works on the radiation produced by heated tungsten filament of visible light rich in yellow and red color, to collect insects that are drawn to light. These traps were installed near sugarcane and fruit plant fields. The collected insects were shifted to laboratory for preservation.

Photography and Identification

Specimens were photographed either in preserved form or alive in the field. Different cell phone cameras were used for photographing specimens. Some specimens were photographed using Nikon D5100 DSLR camera. Photographs were modified with Microsoft Paint and Photo App. The specimen were identified with the help of available literature providing standard key, illustration, picture guide, internet and Records of Zoological Survey of India.

Results

A total 6608 insect sample has been collected during 3 months from June 2024 to August 2024. Altogether 40 species of insects belonging to 36 families of 11 orders have been recorded (Table 1). According to total number of species, dominant order is Coleoptera (9 species) followed by Lepidoptera, Hemiptera and Hymenoptera (5 species each), Orthoptera and Diptera (4 species each), Odonata (3 species), Isoptera (2 species), Mantodea, Dictyoptera and Zygentoma (1 species each).

Among order Coleoptera, the family Tenebrionidae dominated with 2 species, family Coccinellidae, Dytiscidae, Scarabaeidae, Rutelinae, Meloidae, Carabidae and Chrysomelidae each contain only 1 species. Among order Lepidoptera, family Nymphalidae, Sphingidae, Erebididae, Pieridae and Crambidae shared only 1 species. The order Hemiptera has a total number of 5 species belonging to family Pyrrhocoridae, Aphididae, Pentatomidae, Delphacidae and Lygaeidae sharing 1 species each. Among order Hymenoptera, the family Vespidae and Formicidae contain 2 species each and Apidae shows only 1 species. The order Orthoptera contains 4 families namely Gryllotalpidae, Acrididae, Gryllidae and Locustidae carrying 1 species each. Among order Diptera, the family Tephritidae contains 2 species, whereas Syrphidae and Muscidae contain only 1 species. The order Odonata contains 3 families as Aeshnidae, Libellulidae and Coenagrionidae carrying only 1 species each of the family Termitidae and Rhinotermitidae. The orders Mantodea, Dictyoptera and Zygentoma, each contain only 1 species of the family Mantidae, Blattidae and Lepismatidae respectively.

Table 1: List of insects collected from Sonai College campus from June 2024 to August 2024

S.N.	Order	Family	Scientific Name	Common Name	No. of Insects	Relative Dominance
1	Coleoptera	Coccinellidae	<i>Coccinella septumpunctata</i>	Seven spot ladybird beetle	117	8.48%
2	Coleoptera	Dytiscidae	<i>Copelatus indicus</i>	Driving beetle	62	
3	Coleoptera	Rutelinae	<i>Anomala ruficapilla</i>	Leaf chafers beetle	23	
4	Coleoptera	Scarabaeidae	<i>Heliocorpus bucephalus</i>	Dung beetle	59	
5	Coleoptera	Tenebrionidae	<i>Tribolium castaneum</i>	Red rust flour beetle	18	
6	Coleoptera	Tenebrionidae	<i>Notocorax sp.</i>	Darking beetle	58	
7	Coleoptera	Meloidae	<i>Lytta auriculata</i>	Blister beetle	72	
8	Coleoptera	Carabidae	<i>Omphara sp.</i>	Ground beetle	125	
9	Coleoptera	Chrysomelidae	<i>Zygogramma bicolorata</i>	Parthenium beetle	26	
10	Lepidoptera	Numphalidae	<i>Danaus chrysippus</i>	Plain tiger butterfly	146	7.00%
11	Lepidoptera	Sphingidae	<i>Archerontia styx</i>	Death's head hawk moth	102	
12	Lepidoptera	Erebidae	<i>Spilosoma oblique</i>	Hairy caterpillar	86	
13	Lepidoptera	Pieridae	<i>Catopsilia pamona</i>	Common emigrant butterfly	98	
14	Lepidoptera	Crambidae	<i>Chilo partellus</i>	Stem borer	31	6.63%
15	Hemiptera	Pyrrhocoridae	<i>Dysdercus cingulatus</i>	Red cotton bug	258	
16	Hemiptera	Aphididae	<i>Lipaphis erysimi</i>	Mustard aphid/ Turnip aphid	63	
17	Hemiptera	Pentatomidae	<i>Halyomorpha halys</i>	Brown stink bug	72	
18	Hemiptera	Delphacidae	<i>Sogatella furcifera</i>	White backed plant hopper	31	
19	Hemiptera	Lygaeidae	<i>Oxycarenus hyalinipennis</i>	Cotton seed bug	14	46.76%
20	Hymenoptera	Apidae	<i>Apis indica</i>	Honeybee	327	
21	Hymenoptera	Formicidae	<i>Oecophylla smaragdina</i>	Asian weaver ant	987	
22	Hymenoptera	Formicidae	<i>Camponotus compressus</i>	Black ant	1300	
23	Hymenoptera	Vespidae	<i>Vespa tropica</i>	Greater banded hornet	114	
24	Hymenoptera	Vespidae	<i>Ropalidia marginata</i>	Paper wasp	362	7.14%
25	Orthoptera	Acrididae	<i>Schistocerca gregaria</i>	Desert locust	267	
26	Orthoptera	Gryllidae	<i>Grylloides sigillatus</i>	House cricket	42	
27	Orthoptera	Gryllotalpidae	<i>Gryllotalpa Africana</i>	African mole cricket	53	
28	Orthoptera	Locustidae	<i>Tettigonia viridissima</i>	Long horned grasshopper	110	9.39%
29	Diptera	Muscidae	<i>Musca domestica</i>	House fly	517	
30	Diptera	Syrphidae	<i>Syrphus ribesii</i>	Hover fly	23	
31	Diptera	Tephritidae	<i>Bactrocera cucurbitae</i>	Melon fly	11	
32	Diptera	Tephritidae	<i>Carpomyia vesuviana</i>	Ber fruit fly	69	
33	Odonata	Aeshnidae	<i>Anax junium</i>	Dragon fly	224	4.31%
34	Odonata	Libellulidae	<i>Pantala flavescens</i>	Glider fly	32	
35	Odonata	Coenagrionidae	<i>Nehalennia gracilis</i>	Narrow winged Damselfly	29	0.82%
36	Isoptera	Termitidae	<i>Macrotermes bellicosus</i>	Fungus growing termites	36	
37	Isoptera	Rhinotermitidae	<i>Coptotermes formosanus</i>	Formosan termite	18	2.16%
38	Dictyoptera	Blattidae	<i>Periplaneta Americana</i>	Cockroach	143	1.67%
39	Mantodea	Mantidae	<i>Mantis religiosa</i>	Praying mantis	110	5.64%
40	Zygentoma	Lepismatidae	<i>Lepisma saccharina</i>	Silver fish	373	

Discussion

A significant amount of the world's biodiversity is represented by the diversity of insects. Insects rule the agricultural fields. It is undeniable that insects significantly contribute to ecological prosperity and play a crucial role in agro-ecosystems. Vegetation is a major factor in the diversity and composition of insects, and any changes to the environment are likely to affect the distribution and relative abundance of insects (Patil *et al.*, 2016) ^[14]. The type of vegetation in a given area or habitat has a direct impact on the distribution of insects (Selvi and Dayana, 2015) ^[20]. The diversity of the entomofauna is highly influenced by weather factors. Temperature, precipitation and relative humidity are important meteorological elements that influence the seasonal activities of insects (Danks, 2006) ^[7].

This study highlights abundance of insect fauna in and around the college campus, comprising 6608 insect specimen belonging to 40 species and 36 families. The result show that Hymenoptera was most dominant order (46.76%) representing 3090 insect specimen of which 2287 belongs to family Formicidae with 2 species as *Camponotus compressus* and *Oecophylla smaragdina*, family Vespidae is represented by 2 species, namely *Vespa tropica* and *Ropalidia marginata*

and family Apidae is represented by the species *Apis indica*. Pioneer work on the order Hymenoptera of Indian region was made by Bingham (1897, 1903). Subsequent to this, some similar studies have been done by Aland *et al.* (2010) ^[21] on insect diversity of Western Ghats of Maharashtra; and Belamkar and Jadesh (2014) ^[2] in Gulbarga District of Karnataka.

Coleopterans commonly known as beetles constitutes the largest order of all animals. The major ecological impact of beetles results from their effects on green plants, their contribution to breakdown of plant and animal debris and their predatory activities. The present study reveals the presence of 9 species belonging to 8 families of Coleoptera. Amongst these families, the ground beetle belonging to genus *Omphara* count was 125 as a dominant. The sample collection of coleopteran includes different families as Carabidae, Chrysomelidae, Tenebrionidae, Coccinellidae, Dytiscidae, Rutelinae, Scarabaeidae and Meloidae. Similar results were observed by Gayatri Pawar *et al.* (2024) ^[8] at Mahadare Conservation Reserve in Satara District of Maharashtra.

Aphids and Bugs are mainly included in the order Hemiptera. In the present study 438 specimens collected, belongs to 5 species and 5 families of Hemiptera. These families include

Pyrhocoridae, Aphididae, Pentatomidae, Delphacidae and Lygaeidae. The similar work was done by Pande and Inamdar (2024)^[12] as a preliminary study of True Bugs in Ahilyanagar District of Maharashtra.

Lepidopterans are commonly called as Butterflies and Moths. Two pairs of brilliantly colored and well developed wings are found in many species. The various research works on Butterflies in India have been published by Betham (1892), Talbot (1939) and Wynter-Blyth (1957). In recent years Nikam and More (2016)^[11] found 7 families of order Lepidoptera from Jangamhatti area of Chandgad, Kolhapur District of Maharashtra. The work published by Wankhade and Bidwai (2022)^[26] on insect fauna during rainy season in the agricultural field of Karanja (Ghadge), District Wardha, Maharashtra shows presence of 8 families under order Lepidoptera. Puri *et al.* (2024)^[16] explored 5 families of Butterflies from Salekasa Tehsil of Gondia District, Maharashtra, India. The present study contributes 5 species belonging to 5 families from the college campus of Sonai village. In this study, the relative dominance of Lepidopterans accounts to be 7% of total collected specimens.

The order Orthoptera includes insects like grasshoppers, locusts, crickets and mole crickets. Uvarov (1927)^[23] published the distributional records of Indian Acrididae. In recent publications, Rupesh Yadav *et al.* (2022)^[19] found 5 families of order Orthoptera in some selected areas of Indapur and Phaltan Tehsil of Maharashtra. This study shows 4 species belonging to 4 families of the insect specimen collected from the campus. The relative abundance percentage aggregates to 7.14% of the total number of collected insects. The relative dominance of Diptera is measured to be 9.39% from the collected specimen. The order Zygentoma accounts to be 5.64%, whereas Odonata is 4.31% of the total count. Isoptera, Mantodea and Dictyoptera show minimum number of insects in the total count of collected specimen. The data revealed from above study, shows that the college campus of Sonai has a rich insect diversity. This may be due to variety of bushed, flower and fruit plants in the area, green vegetation and varied ecological conditions.

Conclusion

The present study depicts abundance and diversity of insects collected in and around the Sonai college campus. It concludes that, the study area has a rich insect diversity. The study shows 40 different species belonging to 36 families of 11 orders of insects collected within 3 months of study. The diversity and abundance may be due to the healthy ecological environment and availability of their natural niche in the area. Since, the study of this kind is a preliminary attempt, focused only in and around the college campus, in future would help to extend the work on seasonal changes of insect biodiversity and cover more sampling area of Ahilyanagar District of Maharashtra State.

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