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A preliminary study of insect diversity in Barnala City, Punjab, India

Renu BalaDOI: <https://dx.doi.org/10.22271/j.ento.2015.v3.i3g.9409>**Abstract**

The present study carried out to know the insect diversity in Barnala city of Punjab state of India, has been conducted during 2013-14. The study areas represent habitat conversion as well as homogenization associated with invasive plant species and fragmentation. Handpicking, sweep nets and pounding trays were used to capture insects. 13 orders, 42 families, and 54 species of insects were recorded. Lepidoptera and Coleoptera orders were found in abundance. Houseflies and house ants are more prevalent in number than the other species found. Anthropogenic activities impacted the diversity of insect orders as more insects were spotted in small gardens with more bare soil than on concrete pathways. The present study signifies that even small patches of habitat are important with respect to insect diversity on which our ecosystem depends.

Keywords: Anthropogenic activities, Barnala, diversity, habitat, insects**1. Introduction**

Insects, which have three pairs of jointed legs, are the most diversified group in terms of taxonomic diversity and ecological functions, having evolved to adapt to practically every sort of environment on land, in the air and water. The number of described insects is uncertain as there is no centrally organised database for life on Earth, and it is therefore unclear how many described species exist ^[1]. Phylum Arthropoda alone contains 12, 42, 40 species, accounting for almost 80% of the total number of species ^[1]. Insect diversity is an important aspect of the earth's ecosystem ^[2]. Apart from providing valuable products-silk and honey in particular, insects play critical roles in ecosystem functioning by pollinating plants, acting as natural/biological pest control agents, dispersing seeds, controlling populations of other organisms, serving as a major food source for other taxa, and acting as disease vectors for many other organisms, including humans. Some insect species are important indicators in ecosystem management ^[3] and the quality of the biotope ^[4]. Pollinating insects are crucial for the reproduction and survival of about 70% of angiosperm plant species ^[5]. The composition of insect populations varies dramatically throughout time and space ^[6]. Changes in land use, such as increased agriculture, habitat fragmentation, and alien species-invasion, have resulted in the extinction of species such as butterflies ^[7, 8], Bees ^[9], and bumblebees ^[10]. Species often face high extinction rates in fragmented habitats ^[11]. Several authors ^[12, 13, 14] have voiced great concern about the impact of their reduction on insect-pollinated crops.

The most influential factors responsible for the decline in diversity are habitat loss and degradation, pesticides, and climate change ^[15], although other factors include diseases, invasive species, and pollution. One of the primary land-use changes causing the worldwide insect decline seems to be urbanization because the size and physical arrangement of habitat patches play a fundamental role in determining the abundance and diversity of insects with respect to the importance of the spatial ecology of insects. In light of these facts, the present study has been undertaken to record the insect biodiversity in Barnala city of Punjab state of India characterized by fragmented and modified vegetation through the construction of buildings; transport networks, etc. apart from the noise of vehicles and dense population.

2. Materials and Methods

2.1. Location, constitution, and area: The location of *Barnala* is in Punjab state of India (N 30° 22' 46.704", E 75° 32' 46.0356") on the *map*. A survey was conducted to determine the

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variety of insects in the selected areas like houses, lawns, kitchens, kitchen gardens, and parks during 2013-2014.

2.2 Methods adopted for the study

2.2.1 Collection of insects

The insect collections were made in the early hours and evening hours because insects are usually active in the early hours of the day and some are found at night.

2.2.2 Methods of collection a) Insect collecting net

Insect collecting nets were used to collect active flying insects. Insects trapped in the insect collecting net were first killed by the vapour of the killing agent to facilitate collection.

Hand picking: Bark from the trees was collected by hand picking for insects like leaf miners. Soil arthropods were also collected by hand -picking. All insects were identified directly by visual search method followed by capture or photograph. Identification of captured or photographed insects has been done by using the identification keys of existing literature. Insect preservation was avoided.

Results and Discussion

54 insect species belonging to 13 orders and 42 families were recorded from different areas of Barnala city. Housefly and house ants were found to be very common and the most abundant insect species. Lepidoptera and Coleoptera have been found to be the most crowded orders. (Table 1, Plates 1).

'Butterflies' and 'moths' are popular names for lepidoptera. Various authors [16, 17, 18, 19] have published about Butterflies and Moths of India. Beetles (Order-Coleoptera) are pests of stored products and agricultural plants and target processed fibers, cereals, and wood product, as well as every part of living plants. Wood boring beetles and scavengers are beneficial for recycling and decomposing organic materials. Aphids and scale insects are biologically controlled by predatory species like lady beetles.

Other orders observed in the study area included Orthoptera, T hysanura, Mantodea, Blattodea, Isoptera, Odonata, and Dermoptera which have ecologically significant insects as indicator species. Insects forming social groups create a positive environmental impact. Insect colonies from three orders: Hymenoptera, Diptera, and Hemiptera were observed. The diversity of insects also depends on the availability of food and predator risk.

Some authors have done preliminary investigation on the diversity and abundance of the insect fauna in different parts of India. In a thorough investigation conducted on the campus of IIT Bombay, 302 different insect species from 14 orders were reported with Lepidoptera as the most prevalent insect order [20].

The present study clearly observed that even small areas available in urban and suburban regions, houses, lawns, kitchen gardens as well as parks are important with respect to insect diversity; though their number may have reduced.

Table 1: Diversity of insects in Barnala city, Punjab, India

S. No.	Common name	Scientific name	Order	Family	Source
1	American Cockroach	<i>Periplaneta americana</i>	Blattodea	Blattidae	Kitchen
2	Seven spot Lady Bird Beetle	<i>Coccinella septempunctata</i>	Coleoptera	Coccinellidae	Garden
3	Mealworms Darkling Beetle	<i>Tenebrio sp.</i>	Coleoptera	Tenebrionidae	House
	Flour Beetle/ Flour weevil	<i>Tribolium sp.</i>	Coleoptera	Tenebrionidae	House
4	Darkling Beetle	<i>Calosoma sp.</i>	Coleoptera	Carabidae	Lawn
5	Ground Beetle	<i>Pheropsophus sp</i>	Coleoptera	Carabidae Brachinini tribe	Garden
6	Black Beetle	<i>Amara aulica</i>	Coleoptera	Carabidae	House
7	Rice Weevil	<i>Sitophilus oryzae</i>	Coleoptera	Curculionidae	Garden
8	Drugstore Beetle	<i>Stegobium paniceum</i>	Coleoptera	Ptinidae	House
9	Blister Beetle	<i>Hycleus pustulata</i>	Coleoptera	Meloidae	House
10	Blue Milkweed Beetle	<i>Chrysochus cobaltinus</i>	Coleoptera	Chrysomelidae	House
11	Striped earwig	<i>Labidura riparia</i>	Dermoptera	Labiduridae	Road
12	Housefly	<i>Musca domestica</i>	Diptera	Muscidae	House
13	Fungus Gnat	<i>Bradysia sp.</i>	Diptera	Sciaridae	Plants
14	Mosquito	<i>Culex sp.</i>	Diptera	Culicidae	House
15	Mosquito	<i>Anopheles sp.</i>	Diptera	Culicidae	House
16	Mosquito	<i>Aedes sp.</i>	Diptera	Culicidae	House
17	False Stable fly	<i>Muscina stabulans</i>	Diptera	Muscidae	Plants
18	Pale Giant Horse Fly	<i>Tabanus bovinus</i>	Diptera	Tabanidae	Cattle house
19	Long-Legged Fly	<i>Condylostylus sp.</i>	Diptera	Dolichopodidae	Plant
20	Flesh Fly	<i>Sarcophaga haemorrhoidalis</i>	Diptera	Sarcophagidae	Flower
21	Bed Bug	<i>Cimex lectularis</i>	Hemiptera	Cimicidae	House
22	Brown citrus aphid	<i>Toxoptera citricida</i>	Hemiptera	Aphididae	House
23	Squash Bug	<i>Anasa tristis</i>	Hemiptera	Coreidae	Plant
24	Red Cotton Stainer	<i>Dysdercus cingulatus</i>	Hemiptera	Pyrrhocoridae	House
25	Brown marmorated stink bug	<i>Halyomorpha halys</i>	Hemiptera	Pentatomidea	Plant
26	Oriental Hornet	<i>Vespa orientalis</i>	Hymenoptera	Vespidae	Soil
27	Black-Yellow mud-dauber wasp	<i>Sceliphron caementarium</i>	Hymenoptera	Sphecidae	Mud
28	Honey bee	<i>Apis sp.</i>	Hymenoptera	Apidae	Plant
29	House Ant	<i>Tapinona sp</i>	Hymenoptera	Formicidae	House
30	Yellow Paper Wasp	<i>Polistes versicolor</i>	Hymenoptera	Vespidae	House
31	Common wasp	<i>Vespa vulgaris</i>	Hymenoptera	Vespidae	Tree
32	Termite	<i>Odontotermes sp.</i>	Isoptera	Termitidae	Roadside
33	Cabbage Butterfly	<i>Pieris brassicae</i>	Lepidoptera	Pieridae	Flower
34	IndianMeal Moth	<i>Plodia interpunctella</i>	Lepidoptera	Pyalidae	House

35	Pale Grass Blue Butterfly	<i>Pseudozizeeria maha</i>	Lepidoptera	Lycaenidae	Plant
36	Armyworm Moth	<i>Mythimna unipuncta</i>	Lepidoptera	Noctuidae	House
37	Indian Pioneer Butterfly	<i>Belenois aurota</i>	Lepidoptera	Pieridae	Flower
38	Mottled Emigrant Butterfly	<i>Catopsilia pyranthe</i>	Lepidoptera	Pieridae	House
39	Plain Tiger Butterfly	<i>Danaus chrysippus.</i>	Lepidoptera	Nymphalidae	Flower
40	Striated Hawk moth	<i>Hippotion rosetta</i>	Lepidoptera	Sphingidae	Lawn
41	Common Clothes moth	<i>Tineola bisselliella</i>	Lepidoptera	Tineidae	House
42	Grass Skipper	<i>Hesperiinae sp.</i>	Lepidoptera	Hesperiidae	Soil
43	Beet webworm moth	<i>Spoladea recurvalis</i>	Lepidoptera	Crambidae	Plant
44	Praying mantid	<i>Stagmomantis sp.</i>	Mantodea	Mantidae	Plant(Hedge)
45	Grass Praying mantis	<i>Schizocephala bicornis</i>	Mantodea	Mantidae	Plant
46	Dragonfly	<i>Anax imperator</i>	Odonata	Aeshnidae	Plant
47	Damsel Fly	<i>Ischnura aurora</i>	Odonata	Coenagrionidae	Plant
48	Ak Grasshopper	<i>Poekilocerus pictus</i>	Orthoptera	Pyrgomorphidae	Plant
50	Field Grasshopper	<i>Chorthippus brunneus</i>	Orthoptera	Acrididae	Plant
51	House Cricket	<i>Acheta domesticus</i>	Orthoptera	Gryllidae	House
52	Black Field Cricket	<i>Teleogryllus commodus</i>	Orthoptera	Gryllidae	Lawn
53	Leaf Insect	<i>Phyllium sp</i>	Phasmatodea	Phylliidae	Garden
54	Silver Fish	<i>Lepisma saccharina</i>	Zygentoma	Lepismatidae	House (in Books, newspapers etc.)



Plate 1a: (a) Lady bird beetle, (b) Housefly, (c) American cockroach, (d) Cabbage butterfly, (e) Indian cotton stainer, (f) Mud dauber, (g) Field cricket, (h) Squash bug, some insect species observed in selected areas of Barnala

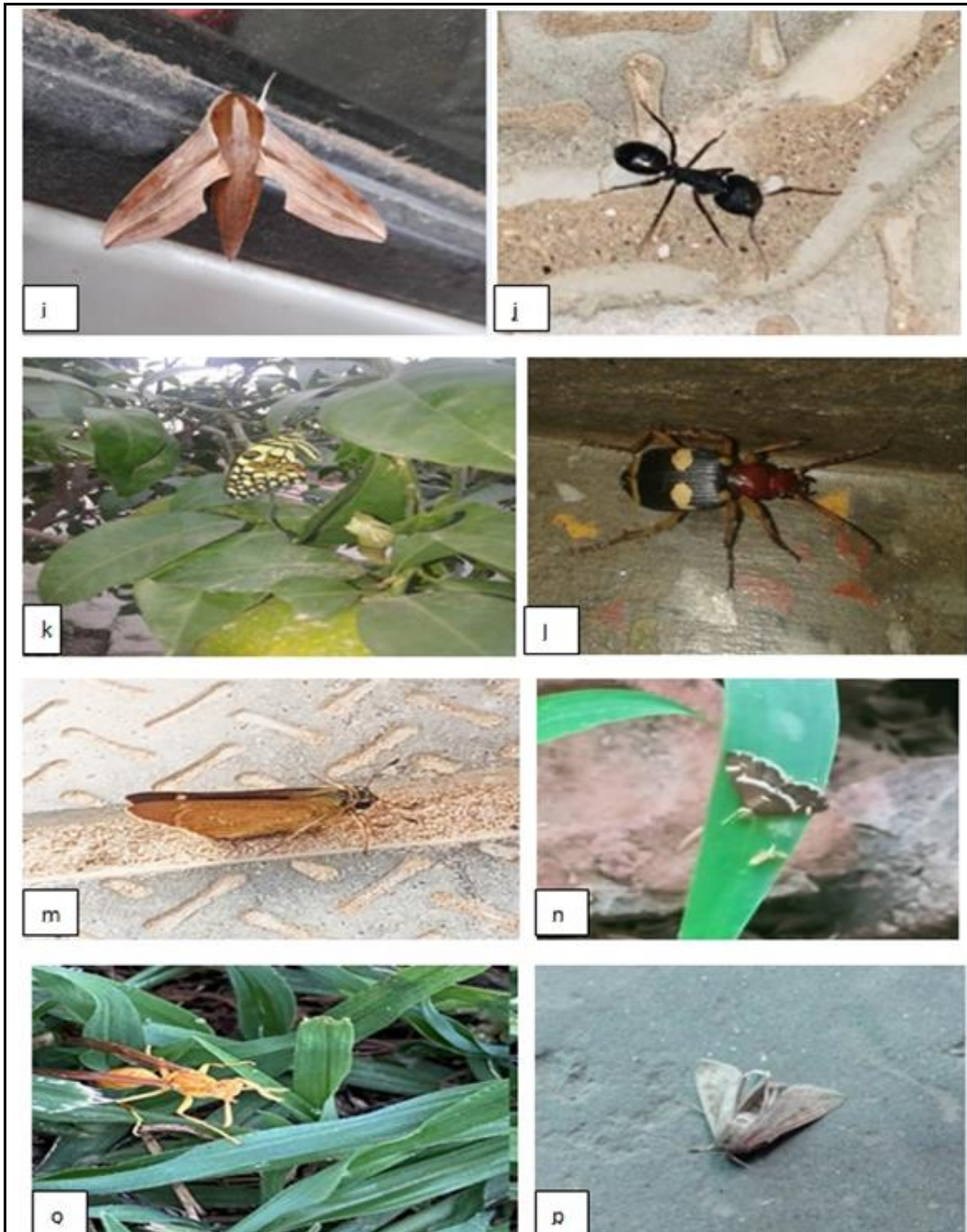


Plate 1a: (i) Striated hawkmoth, (j) Ant, (k) Indian pioneer butterfly, (l) Ground beetle, (m) Grass skipper, (n) Beet webworm moth, (o) Wasp, (p) Armyworm moth, some insect species observed in selected areas of Barnala

3. Conclusion

The present investigation to analyse the diversity of insects in Barnala city of Punjab is a preliminary study and the absolute numbers provided represent an underestimation of the entire diversity as many microhabitats are not sampled. Further investigations are essential for getting a detailed record of the diversity of insects and the development of standard monitoring procedures for assessing the environmental stability in this area. Although it is impossible to protect every insect, small careful consideration can make a small place, an important stopover for the smallest of the animals on which our ecosystem depends but the best strategy is to protect large tracts of land with vegetation to sustain rich insect diversity.

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