

## Impact of anthropogenic activities on insect diversity of disturbed and undisturbed areas of Jhalawar district (Raj.)

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### Abstract

The study assessed the impact of anthropogenic activities on insect diversity and abundance of disturbed and undisturbed areas of Jhalawar district Rajasthan. The total number of species collected and identified were 63. The maximum number of species observed were of order Lepidoptera in the disturbed college campus of Jhalawar followed by Hymenoptera, Odonata, Hemiptera, Orthoptera, Dictyptera, Thysanura, Isoptera & Coleoptera. The total no species collected from undisturbed area was 19nos. The maximum number was of Lepidoptera followed by Coleoptera, Orthoptera, Odonata & Neuroptera. Insects are closely associated with our lives and affect the welfare of humanity in diverse ways.

Keywords- *Abundance, Disturbed, Undisturbed, diversity, anthropogenic*

### Introduction

Biodiversity simply means the diversities or variety of plants, animals, and other living things in a particular area. It is important because everything that lives in an ecosystem is part of our web of life, including humans.

Each species of vegetation and each creature has a place on earth and plays a vital role in the circle of life. Plants, animals, and insect species interact and depends upon one another for what each offer such as food, shelter, oxygen, and soil enrichment.

Insects comprises the largest group of organisms and are involved in various vital ecosystem services. The presence of insects enhances the beauty of nature and our surroundings despite the fact that some of them are harmful to man. Global changes are responsible for wide range of anthropogenic and natural environmental variation.

Jhalawar is in the south eastern part of the state. It was the capital of former princely state of the Jhalawar and is the administrative headquarter of Jhalawar district. Jhalawar was once called brijnagar and was known for its rich natural wealth of vibrant flora and fauna.

The present study emphasizes to investigate the diversity and abundance of insects with special reference to anthropogenic activities of that disturbed and undisturbed area.

### Material and methods

The two sites were selected for collection and observation were:

#### Site 1- College campus of Jhalawar

It was a large campus. It has garden and play ground. Vegetation of college campus comprises of various types of trees bushes and some medicinal plants in the botanical Garden. The campus is fully disturbed by movement of students, other human activities include -construction of new classrooms, regular cleaning etc.

#### Site 2- Jhiri area

It is hilly area and hills are covered with bushes and wild plants. We observed cattle grazing at the sometime. The base of hills had bamboo trees and a small temple.

Insects were collected by using different nets- sweeping, bait, picking etc. Twice in a year from sept-oct and in March -April in the year 2011-12. Identification of insects were done at MPUOA. Abundance of insects were also noted.

**Results and discussion**

**Site 1-** College campus of Jhalawar is disturbed site. The total number of insects identified was 63 belonging to 10orders 29 families and 50 species. The largest number of insects identified were of order lepidoptera dominating was *Lampides boetics* and *Terias hecape*.

Some methods used for increasing the biodiversity of garden environment (artificial nest, small ponds etc.) may be very effective. There is a positive effect of human- mediated disturbances on the Exotic richness in center Chile (Estay et. al. 2012).

S.NO.	INSECT IDENTIFIED			ABUNDANCE	
				(Approx. no. of insects)	
	ORDER	FAMILY	GENUS SPECIES	Feb- March 2011-12	Sept- Oct. 2011-12
1.	Lepidoptera	Pieridae	<i>Isias marianae</i> (Linnaeus)	22	15
2.	Lepidoptera	Pieridae	<i>Cataglyphis pyrenae</i>	8	5
3.	Lepidoptera	Pieridae	<i>Cataglyphis pomona</i>	30	23
4.	Lepidoptera	Pieridae	<i>Terias hecape</i> (Linnaeus)	184	155
5.	Lepidoptera	Pieridae	<i>Asoplosis asota</i> (Fabricius)	12	7
6.	Lepidoptera	Pieridae	<i>Isias laeta</i> (Boisduval)	16	14
7.	Lepidoptera	Pieridae	<i>Appias albina</i> (Boisduval)	22	18
8.	Lepidoptera	Nymphalidae	<i>Amata leonina</i>	27	26
9.	Lepidoptera	Nymphalidae	<i>Amata (Parnassia) diller</i> (Linnaeus)	15	13
10.	Lepidoptera	Nymphalidae	<i>Amata alboca</i>	18	15
11.	Lepidoptera	Nymphalidae	<i>Jarvisia orithya</i>	54	50
12.	Lepidoptera	Nymphalidae	<i>Danaus chrysippus</i> (Linnaeus)	42	35
13.	Lepidoptera	Nymphalidae	<i>Teichmia violae</i> (Fabricius)	32	30
14.	Lepidoptera	Nymphalidae	<i>Parnassius aglaia</i>	12	11
15.	Lepidoptera	Papilionidae	<i>Pachlopes aethiops</i>	11	9
16.	Lepidoptera	Papilionidae	<i>Papilio demoleus</i>	11	10
17.	Lepidoptera	Papilionidae	<i>Zethenia aganippe</i>	12	10
18.	Lepidoptera	Lycanidae	<i>Lampides boetics</i>	225	185
19.	Lepidoptera	Lycanidae	<i>Caroclypeus aglaia</i>	68	60
20.	Lepidoptera	Lycanidae	<i>Cantalar ruficornis</i>	5	4
21.	Lepidoptera	Arctidae	<i>Orebiais pulchella</i>	3	2
22.	Lepidoptera	Noctuidae	<i>Melicoprus zea</i>	5	4
23.	Odonata	Libellulidae	<i>Brachyopyga geminata</i>	14	12
24.	Odonata	Libellulidae	<i>Nesotritona intermedia</i> (Rambur)	4	3
25.	Odonata	Libellulidae	<i>Brachytriton castaneiventris</i> (Fabricius)	12	10
26.	Odonata	Libellulidae	<i>Orthetrum prasinum</i> (Rambur)	4	2
27.	Odonata	Libellulidae	<i>Orthetrum glaucum</i>	15	11
28.	Odonata	Libellulidae	<i>Orthetrum rubrum</i>	15	10

29.	Odonata	Libellulidae	<i>Orthetrum chrysis</i>	4	-
30.	Odonata	Libellulidae	<i>Crocothemis servilla</i>	11	9
31.	Odonata	Libellulidae	<i>Trithemis axon</i>	14	11
32.	Odonata	Coenagrionidae	<i>Coenagrion cornutum</i> (Fabricius)	13	10
33.	Odonata	Coenagrionidae	<i>Ischnura elegans</i>	17	11
34.	Hymenoptera	Apidae	<i>Xylocopa foveolata</i>	9	6
35.	Hymenoptera	Apidae	<i>Apis florea</i>	28-30	25-28
36.	Hymenoptera	Apidae	<i>Apis dorsata</i>	46	42
37.	Hymenoptera	Sphacidae	<i>Cerceris</i> sp.	26	21
38.	Hymenoptera	Sphacidae	<i>Lirus</i> sp.	92	88
39.	Hymenoptera	Vespidae	<i>Ropalidia</i> sp.	38	30
40.	Hymenoptera	Formicidae	<i>Ateneta</i> sp.	15	12
41.	Hemiptera	Psyllonidae	<i>Halya parva</i> (Ckapa)	22	18
42.	Hemiptera	Psyllonidae	<i>Erythrina fulva</i> (Thunberg)	56	50
43.	Hemiptera	Lygaeidae	<i>Spilostethus parvulus</i>	55	48
44.	Hemiptera	Reduviidae	<i>Acanthopis</i> sp.	24	20
45.	Hemiptera	Reduviidae	<i>Rhinocoris</i> sp.	46	40
46.	Diptera	Tabanidae	Unidentified	12	11
47.	Diptera	Stenonidae	Unidentified	18	15
48.	Diptera	Muscidae	<i>Musca domestica</i>	>100	>150
49.	Diptera	Drosophilidae	<i>Drosophila melanogaster</i>	51	58
50.	Diptera	Culicidae	<i>Anopheles</i> sp.	>125	>200
51.	Diptera	Culicidae	<i>Culex</i> sp.	>125	>200
52.	Diptera	Asilidae	Unidentified	>75	>100
53.	Orthoptera	Acrididae	<i>Catantops</i> sp.	18	15
54.	Orthoptera	Acrididae	<i>Acrida malabarica</i>	28	25
55.	Orthoptera	Tettigonidae	<i>Hemiteles pallidus</i>	16	14
56.	Orthoptera	Gryllidae	<i>Gryllus campestris</i>	37	33
57.	Orthoptera	Gryllidae	<i>Haemaphysalis</i>	32	29
58.	Orthoptera	Gryllidae	<i>Schistocerca gregaria</i>	22	19
59.	Diptera	Blattidae	<i>Periplaneta americana</i>	35	32
60.	Diptera	Muscidae	<i>Musca domestica</i>	0	0
61.	Thysanura	Lepismaetidae	<i>Lepisma saccharinum</i>	>50	>65
62.	Isopoda	Termitidae	<i>Prothionotus</i> sp.	>100	>100
63.	Coleoptera	Bugrestidae	<i>Chrysocoris chinensis</i>	0	2

**Site 2-** The Jhiri area (hilly area) was undisturbed by human activities except cattle grazing. The total number of insects identified were 19. The dominating was Hepidoptera followed by Odonatas of 3 orders 11 families. Here we observed few beetles which were not found in disturbed site.

Magagula and Nzima (2014) investigated that heterogenous agro ecosystems have the capacity to maintain high insect diversity despite alterations due to human activities.

Tak and Srivastava (2015) studied that anthropogenic pressures, holy rituals and tourism have adverse impact on the water quality which directly affect the diversity of insect fauna of the sacred lakes.

Jeevan et. al. (2013) carried out study on biodiversity of butterflies in Mandagadde of Shivamogga of Karnataka. Many butterfly species are strictly seasonal and prefer only a particular set of habitats and they are good indicators in terms of anthropogenic disturbances and habitat destruction. The richness and diversity of butterfly species is proportional to the food plant diversity, richness of flowers and intensity of rainfall. Unfortunately, butterflies are threatened by habitat destruction and fragmentation

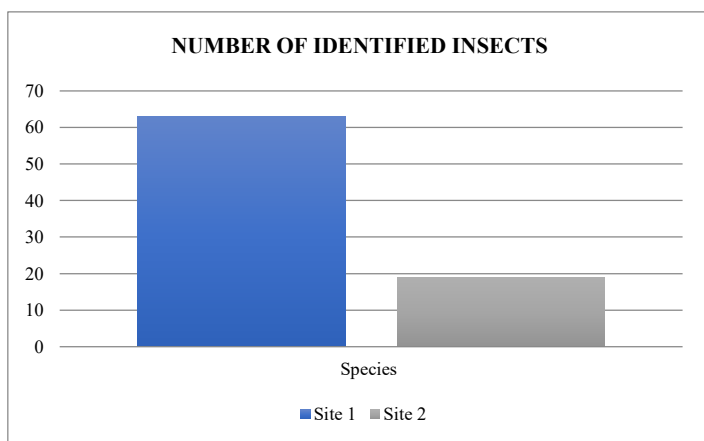
Sites / Anthropogenic Activity	Site 1: COLLEGE CAMPUS	Site 2: JHIRI AREA
1. Cattle grazing	★	★ ★ ★
2. People movement	★ ★ ★ ★ ★	★ ★
3. Vehicular movement	★ ★	-
4. Building construction	★ ★	★
5. Gardening/ plantation	★ ★ ★	★
6. Cutting of trees	★	★
7. Burning of garbage/ fuel	★ ★	-
8. Sweeping/ cleaning	★ ★	-
	17	08

The result showed that the disturbed area had more of Lepidoptera diversity than undisturbed area, the reason was that disturbed area (college campus) had more favourable habitat (patched of garden, botanical garden, and variety of plants in the campus). But the diversity of Coleopterous was less because of student’s movements and other anthropogenic activities (such as construction, vehicular movement, human activities).

Jaganmohan (2013) showed that domestic gardens may play a vital role in supporting urban insect biodiversity, despite their small size.

**Discussion**

Habitat loss and destruction, usually as a direct result of human activities and population growth, is a major force in the loss of species, population, and ecosystem. Michael J Sameats shows insects survival prior to human impact and early human impact on European landscapes.



S.NO.	ORDER	FAMILY	GENUS SPECIES	ABUNDANCE (Approx. no. of insects)	
				Feb- March 2011-12	Sept.- Oct. 2012-13
1.	Lepidoptera	Pieridae	<i>Terias hecabe (Limaeca)</i>	15	12
2.	Lepidoptera	Pieridae	<i>Catopsilia pomona</i>	05	04
3.	Lepidoptera	Nymphalidae	<i>Junonia leonias</i>	26	21
4.	Lepidoptera	Nymphalidae	<i>Junonia almana</i>	04	03
5.	Lepidoptera	Nymphalidae	<i>Junonia orithya</i>	05	04
6.	Lepidoptera	Nymphalidae	<i>Damans chrysippus (Linnaeus)</i>	10	08
7.	Lepidoptera	Papilionidae	<i>Papilio demoleus</i>	03	02
8.	Lepidoptera	Lycanidae	<i>Lampides boeticus</i>	22	19
9.	Odonata	Libellulidae	<i>Newothemis intermedia (Rambur)</i>	08	08
10.	Odonata	Libellulidae	<i>Brachythemis caustantata (Fabricius)</i>	06	05
11.	Odonata	Libellulidae	<i>Tritheimis awara</i>	07	06
12.	Coleoptera	Tenebrionidae	<i>Adesmia sp.</i>	12	15
13.	Coleoptera	Tenebrionidae	<i>Rhytinota sp.</i>	15	18
14.	Coleoptera	Carabidae	<i>Diplocheila sp.</i>	10	14
15.	Coleoptera	Meloidae	<i>Mylabris puslutata</i>	20	25
16.	Orthoptera	Acrididae	<i>Catantops sp.</i>	17	15
17.	Orthoptera	Acrididae	<i>Acrida exaltata</i>	28	24
18.	Orthoptera	Tettigonidae	<i>Hawertula pallisignata</i>	14	11
19.	Neuroptera	Myrmeloutidae	<i>Creoleon sp.</i>	16	13

**KEY:**

0-20% ★      21-40% ★★      41-60% ★★★  
 61-80% ★★★★      81-100% ★★★★★

Sites	No. of orders	No. of families	No. of genus	No. of species	Total abundance (2011-12)
SITE 1	10	29	52	50	4464
SITE 2	05	11	17	14	470

The table illustrates the comparative study of number of orders, families, genus and species; and total abundance of the years 2011-12 of the two sites.

Growth of human population is major factor affecting the environment. Almost all the environmental problems we face today can be traced back to the increase in population in the world. (Miller ,1992). The high standard of living that accompanies the increased production and consumption of goods is the major cause of pollution and environmental degradation (E.O. Wilson, 1994). Tamang (2010) observed 42 species of butterflies at butterfly park , Bannerghatta (Population was not very high .this may be due to change in climatic conditions or impact of human activities).

### Conclusion

Insect inhabit all habitat types and play major roles in the function and stability of terrestrial and aquatic ecosystems. There is no doubt that human activities have had a negative impact on biodiversity particularly since the industrial revolution. The destruction of habitat through agriculture and urban sprawl. Although this study is preliminary one, its results are important regarding micro habitat. We conclude that human activities are not always negative to habitat, it can be positive and for that we must focus more on development of patches of garden in disturbed areas. It shows urban green infra structure is used to improve the built environment and provide ecosystem services.

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