



## **Habitat Preference of Butterflies and Moths (Insecta: Lepidoptera) in Talwandi Sabo, Punjab**

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### **ABSTRACT**

*The present investigation was carried out at Talwandi Sabo, Punjab (India) during 2015-2017. During study period a total of 51 species belonging to 15 families were recorded from three selected studies sites (Agriculture field, Canal Side and University campus). The abundance of species was represented in terms of very common, common, occasional and rare. The maximum 41 and 45 species of lepidoptera species were recorded from canal side and university campus. Whereas only 15 species were collected from agriculture field. Hence, due to abundance of different flowering plants university campus was most preferable habitat for lepidoptera species.*

**Keywords:** Talwandi Sabo Lepidoptera, University campus, Habitat, Abundance

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### **INTRODUCTION**

The existing insect diversity is close to 30 million species. It is half of the all species on the planet earth [1 and 2]. The order Lepidoptera in class Insecta, is the second largest and most diverse [3]. In year 2001 and 2006, 74 species of butterflies were recorded from Punjab [4 and 5]. In 2009, 41 butterfly species belonging to 5 families were reported from Dholbaha Dam area in Punjab [6]. In year 2011, 36 species of butterflies was recorded from Mansa district. In this Nymphalidae, Pieridae and Lycaenidae were the most dominant [7]. Similarly in year 2015, 54 species of butterflies belonging to 37 genera, 7 families were reported from the forest strip extending along Sirhind canal mainline in Punjab [8]. However, information on the butterfly diversity of the various areas of Punjab is totally lacking [9]. There is continuous threat to the biodiversity due to habitat destruction, use of pesticides and illegal trade [10 and 11]. Moreover the literature survey reveals that, till now no habitat preference work on Lepidoptera was reported from Talwandi Sabo. Hence the present study was conducted on habitat preference of lepidoptera in Talwandi Sabo.

### **MATERIALS AND METHODS**

The studies were conducted in Talwandi Sabo, Punjab. The site is located at latitude 29°59'0" N and longitude 75°5'0" East, has semi-arid climate with wide variations of summer and winter temperatures. Study sites of Talwandi Sabo was categorized into: a. Agriculture fields, b. Canal Side c. University Campus area. Each study sites was visited twice per day in the morning from 7 A. M to 9 A. M and evening from 4 P. M to 6 P. M on the same day. Collection was done using sweep net and light trap. Agricultural fields were visited only in the morning hours which were solely spent on collection; labeling of those insects was done in laboratory. Lepidoptera collected from above sampling methods were separated from other insects. Sorting of lepidoptera was carried out into families using identification keys. The book of some south Indian Lepidoptera and Handbook on Diversity in some of the Indian Butterflies (Insecta: Lepidoptera) was referred for identification of butterflies [12 and 13].

#### **Data analysis**

Lepidoptera were categorizing into four groups for knowing their status in selected habitat. Those species which was observed 80-100% during survey days were categorized in Very common (VC) category, 60-80% = Common (C), 40-60% = Occasional (O) and 20-40% are categorized under Rare (R) group [14].

The following indices were estimated for collected data:

1. Shannon-Weiner index (H): The richness of species within community or habitats was calculated using Shannon-Weiner index (H) of alpha diversity index:

$$H = -\sum P_i \ln P_i$$

Where  $P_i = S/N$ ,  $S$  = Number of individuals of one species;  $N$  = total number of all individuals in the sample and  $\ln$  = natural logarithm. The higher value of  $H$ , greater is the uncertainty. This implies higher diversity and evenness of the community as biological community value of  $H$  does not exceed 5. It ranges from 4 (most diverse) to 0 (least diverse).

2. Equitability or Evenness ( $J$ ) refers to the pattern of distribution of the individuals between the species in a specific habitat. In our study this was done for all the four habitats. If  $H$  is the observed Shannon-Wiener index, the maximum value this could take is  $\log(S)$ , where  $S$  is the total number of species in the habitat. Therefore the index is:

$$J = H/\log(S)$$

This index is high if a community has many species and their abundances are evenly distributed; index is low if the species are few and their abundances are unevenly distributed.

## RESULTS AND DISCUSSION

In Talwandi Sabo, Agriculture area was selected to study the occurrence of Lepidoptera Species. From this area 15 Lepidoptera species were collected belonging to 10 different families. Out of these families, Noctuidae was having maximum i.e. 3 species. Out of these collected Lepidoptera species the 8 (53%) species was very common. Whereas 4 (27%) and 3 (20%) species were commonly and occasionally seen in agriculture fields of Talwandi Sabo (Table 2). In this area the moth species were mostly collected as compare to the butterfly species. This was because of irregular pesticide usage by farmers [15]. These Lepidoptera was mostly pest of many crops and these moths play very important role in agriculture pest [16, 17]. Most of the polyphagous moth pest is very common on many seasonal crops throughout the year. Although *Pieris brassicae* L., *Pieris rapae* L. (family Pieridae) *Papilio demoleus* L (family Papilionidae) was dominant species in agriculture field of Talwandi Sabo. Due to presence of bee boxes having bee hive the Wax Moth, *Achroia grisella* Fab was also collected from agriculture field. During 2016 the field survey were conducted in different agro-horticultural ecosystems of Chamaraja nagar district in Karnataka revealed the total 95 species of lepidoptera belonging to 5 families [18]. Similarly the studies in agricultural fields of Howrah district, West Bengal reported a total of 29 butterfly species belonging to 5 families [19]. 33 species of butterflies belongs to 23 genera and 4 families are reported from agriculture fields of Vadodara [20]. In 2002, 43 species of butterflies were reported from paddy field in Plakkad district of Kerala [21].

In Talwandi Sabo, Canal side (undisturbed area) were selected to study the occurrence of Lepidoptera Species. From this area 41 Lepidoptera species were collected belonging to 11 different families. Out of these families the maximum species were collected from family Nymphalidae (11 species). This was followed by Pieridae having 9 species. Families Sphingidae and Papilionidae was having 6 and 4 species respectively (Table 1). Out of these collected Lepidoptera species only 7 (17%) species was very common whereas 14 (34%) species was common. 12 (29%) and 8 (20%) Lepidoptera species were occasionally and rarely seen in canal side of Talwandi Sabo (Table 2). During 2015-2016 the canal side was having good vegetation for many Lepidoptera species. But due to cementing of canal the cleaning of vegetation was occurred in 2016-2017 which lead to decline in number of butterfly species. *Calotropis* sp. which served as host plant for Plain tiger *Danaus chrysippus* L. was very large in number due to which its population was very common. *Lantana camara* L., nectar resources for butterflies like *Belenois aurota* Fab. and *Utetheisa pulchella* L. was very common in this habitat.

The university campus selected as study site were having gardens, building as well as residential areas. 45 Lepidoptera species were collected belonging to 12 different families from this site. Out of these families the maximum species were collected from family Nymphalidae and Pieridae. This was followed by families Sphingidae, Papilionidae and Lycaenidae having 6, 4 and 3 species respectively (Table 1). Out of these collected Lepidoptera species only 5(11%) species was very common whereas 22(49%) species was common. 9(20%) was seen occasionally as well as rarely (Table 2). The presence of wide varieties of flower source throughout the year the populations of Lepidoptera species was more. The species *Cleora cornaria* Guenee, *Vanessa cardui* L., *Danaus chrysippus* L. and *Acherontia styx* Westwood was very common in this area. In India many authors reported the presence of lepidoptera diversity in university campus. 27 species of butterflies belonging to 8 families were reported in and around Kumaun University Nainital [22]. 49 species of butterflies belonging to 5 different families were reported from Sarojini Naidu

college campus, Kolkata, West Bangal [23]. 105 species of Butterflies was recorded from Kerala University campus of which Nymphalidae is most dominant family with highest number of species and individual [24]. 36 species of butterflies belong to 25 genera and five families from Karnataka university campus were reported, of which Nymphalidae and Pieridae was most dominant families [25]. In Assam, 96 species of butterflies belong to 68 genera and 5 families was reported from Assam University Campus [26]. The 45 species of butterflies belonging to five families were reported from Bhilai Maila Mahavidhyalya college campus [27]. Similarly 44 species of butterflies was reported from Regional Institute of Education campus, Bhubaneswar, in which Nymphalidae was dominant family [28].

Table 1: Lepidoptera species abundance in the selected Study site of Talwandi Sabo, Punjab

Family	Scientific Name	Common Name	Status		
			AF	CS	UC
Erebidae	<i>Utetheisa pulchella</i> L. 1758	Crimson-speckled flunkey	-	VC	C
	<i>Asota caricae</i> Fab. 1775	Tiger moth	-	O	O
	<i>Eudocima materna</i> L. 1767	Dot underwing moth	C	R	-
Gelechiidae	<i>Platyedra gossypiella</i> Saunders 1844	Pink bollworm	VC	C	C
Geometridae	<i>Cleora cornaria</i> Guenee 1857	Neem Semi-looper	-	VC	VC
	<i>Ascotis selenaria</i> Denis & Schiffermuller 1775	The Giant looper	-	O	R
Hesperiidae	<i>Pelopidas mathias</i> Fab. 1798	Black branded swift	VC	C	O
Nymphalidae	<i>Junonia/Preciso rythia</i> L. 1758	Blue pansy	-	VC	C
	<i>Junonia almanac</i> L. 1758	Peacock pansy	-	O	O
	<i>Acraea terpsicore</i> L. 1758	Tawny coster	-	C	C
	<i>Hypolimnas misippus</i> L. 1764	Danaid egg fly	-	C	C
	<i>Vanessa cardui</i> L. 1758	Painted lady	-	C	VC
	<i>Danaus chrysippus</i> L. 1758	Plain tiger	-	VC	VC
	<i>Argynnis castetsi</i> Oberthur 1891	Brush footed butterfly	-	O	O
	<i>Euploea core</i> Cram. 1780	Common Indian crow	-	C	C
	<i>Melanites leda</i> L. 1758	Common evening brown	O	O	C
	<i>Danaus genutia</i> Cram. 1779	Striped tiger	-	R	R
	<i>Tirumala linutiae</i> Cram. 1775	Blue tiger	-	R	R
Noctuidae	<i>Earias insulana</i> Boisduval 1833	Cotton spotted bollworm	VC	-	-
	<i>Helicoverpa armigera</i> Hub. 1808	American Cotton bollworm	VC	-	-
	<i>Spodoptera littoralis</i> Boisduval 1833	Tobacco caterpillar	C	-	-
Lycaenidae	<i>Chilades lajus</i> Cram. 1782	Lime blue	-	O	O
	<i>Lampides boeticus</i> L. 1767	Pea blue butterfly	C	-	C
	<i>Euchrysops cnejus</i> L. 1798	Gram blue	-	C	C
Papilionidae	<i>Graphium doson</i> C. & R. Felder 1864	Common jay	-	R	R
	<i>Papilio demoleus</i> L. 1758	Lemon butterfly	VC	C	C
	<i>Pachliopta aristolochiae</i> Fab. 1775	Common rose	-	O	C
	<i>Papilio polytes</i> L. 1758	Common Mormon	-	O	C
Pieridae	<i>Colotis etrida</i> Boisduval 1836	Little orange tip	-	C	C
	<i>Colotis amata</i> Fab. 1775	Small salmon arab butterfly	-	C	C
	<i>Delias eucharis</i> Drury 1773	Common jezebel	-	R	R
	<i>Catopsilia pomona</i> Fab. 1775	Lemon emigrant	-	C	C
	<i>Catopsilia pyranthe</i> L. 1758	Mottled emigrant	-	C	C
	<i>Hebomoia glaucippe</i> L. 1758	Great orange tip	-	C	C
	<i>Eurema hecabe</i> L. 1758	Large grass yellow	-	VC	C
	<i>Pieris rapae</i> L. 1758	Small cabbage white	VC	-	C
	<i>Pieris brassicae</i> L. 1758	Cabbage butterfly	VC	-	C
	<i>Belenois aurota</i> Fab. 1793	Pioneer white	-	VC	C
	<i>Pontia daplidice</i> L. 1758	Bath white	-	O	O
Crambidae	<i>Scirpophaga auriflua</i> Zeller 1863	Sugarcane Top borer	O	C	C
	<i>Diaphania indica</i> Saunders 1851	Cucumber moth	O	-	O
Pyalidae	<i>Achroia grisella</i> Fab. 1794	Lesser wax moth	C	-	-
Sphingidae	<i>Acherontia styx</i> Westwood 1847	Death's head hawk moth	-	VC	VC
	<i>Daphnis nerii</i> L. 1758	Army green moth	-	R	R
	<i>Agrius convolvuli</i> L. 1758	Convolvulus hawk moth	-	O	O
	<i>Hyles livornica</i> Esper 1780	Striped hawk moth	-	O	O
	<i>Nephele hespera</i> Fab. 1775	Crepuscular Hawk moth	-	O	R
	<i>Theretra clotho</i> Drury 1773	Hawk moth	-	R	R
Bombycidae	<i>Trilocha varians</i> F. Walker 1855	Ficus moth	-	-	VC
Saturniidae	<i>Antheraea pernyi</i> Guerin-Meneville 1855	Tussar moth	-	R	R
Yponomeutidae	<i>Plutella maculipennis</i> Curt. 1832	Diamond back moth	C	-	-

AF= Agriculture field, CS= Canal Side, UC= University Campus, VC= Very Common, C= Common, O= Occasional, R= Rare

Table 2: Status of Lepidoptera in selected study sites of Talwandi Sabo, Punjab

Status	No. of species			% of species		
	Agriculture Field	Canal Side	University Campus	Agriculture Field	Canal Side	University Campus
VC	8	7	5	53	17	11
C	4	14	22	27	34	49
O	3	12	9	20	29	20
R	0	8	9	0	20	20

Alpha diversity values were calculated to study the species diversity in the selected habitats of Talwandi Sabo (Table 3).

Table 3: Alpha diversity of Lepidoptera species in various habitats of Talwandi Sabo, Punjab

Habitats and diversity indices	Agriculture fields	Canal side	University Campus area
Shannon Weiner Diversity	2.72	3.70	3.84
Pielou's Evenness Index	0.69	0.93	0.97

It is clearly indicated that University campus area shows the highest species diversity as compared to that of other habitats of Talwandi Sabo. Canal area shows slightly less diversity as compared to that of University campus. Because of large number of flora present in these area as well as less amount of pesticides was utilized result in maximum number of lepidoptera species. The flora provides shelter and nectar for these Lepidoptera species. The abundance of butterflies is directly proportional to abundance of different flowering plants [29 and 25]. So, the present study helps in knowing the increase in human activity is directly associated with decrease in diversity [30]. This knowledge will be helpful for knowing preferable habitat for lepidoptera survival and this will defiantly going to increases its diversity.

## CONCLUSION

The biodiversity studies leads to the destined path of conservation. It measures species richness and species evenness in different habitat. Today due to threat from human beings and its related ambiguities, there is an urgent need of not only the in-depth research on diversity and habitat preference but also to induce it for conservation.

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