



E-ISSN: 2320-7078  
P-ISSN: 2349-6800  
JEZS 2016; 4(4): 243-247  
© 2016 JEZS  
Received: 04-05-2016  
Accepted: 05-06-2016

**Pawan Kumar**  
Himalayan Forest Research  
Institute Panthaghati Shimla,  
Himachal Pradesh, India

**Romila Devi**  
Himalayan Forest Research  
Institute Panthaghati Shimla,  
Himachal Pradesh, India

**VK Mattu**  
Sociobiology and Behavioural  
Ecology Research Laboratory,  
HPU, Shimla, Himachal  
Pradesh, India

## Diversity and abundance of Butterfly fauna (Insecta: Lepidoptera) of Subalpine area of Chanshal Valley of District Shimla (Himachal Pradesh)

**Pawan Kumar, Romila Devi, VK Mattu**

### Abstract

Butterflies have great economic, cultural and aesthetic value and are sensitive to fractional variation in climatic factors. During present investigation 29 species of butterflies belonging to 22 genera and 4 families were collected from Chanshal valley of Himachal Pradesh. Present study revealed that 10 species of butterflies belonging to family Nymphalidae, 9 Species from family Pieridae, 8 species from Lycaenidae and 2 species belonging to family Papilionidae were collected and identified. Percentage composition of each family revealed that family Nymphalidae most dominating one contribute about 34.48% followed by family Pieridae contribute about 31.03%, Lycaenidae 27.59% and Papilionidae 6.90%. Species diversity, evenness and species richness was calculated by Shannon-Weiner Diversity index, Evenness index and Margalef's index. Species diversity was found highest in Nymphalidae (1.96) and lowest in Family Papilionidae (0.6), evenness was highest in family Papilionidae (0.87) and lowest in Pieridae (0.77). Similarly species richness was highest in family Nymphalidae (4.74) and lowest in Papilionidae (1.18). Abundance was highest for Nymphalidae and lowest for Papilionidae. Thus the present study was the first attempt to study the butterfly diversity, distribution and abundance from this area.

**Keywords:** Butterflies, Species, Family, Chanshal valley, Himachal Pradesh

### 1. Introduction

Butterflies belong to the order Lepidoptera which are taxonomically and ecologically well-known<sup>[1]</sup>. And are regarded as good ecological indicators. The diversity and distribution of a particular species of butterfly is dependent not only on the geography of the area and the ability of the species to move around within it, but also on the ecological demands<sup>[2]</sup>. Butterflies have economic, cultural, aesthetic value and are also sensitive to fractional variation in various climatic factors. Butterflies are suitable for biodiversity studies, as the taxonomy, geographic distribution and status of many species are relatively well known. Butterflies generally regarded as one of the best taxonomically studied group of insects. India Host about 1,504 species of Butterfly fauna<sup>[3]</sup>. Butterflies are lovely and graceful insects provide economic and ecological benefits to the human society. In Mountain ecosystem distribution of butterfly species is determined by its habitat and climatic stability<sup>[4]</sup>. In the past few researchers have studies butterflies from Himalayan region<sup>[5, 6, 7, 8, 9]</sup>. Few researchers have studied butterflies from Shimla Hills<sup>[10]</sup>. published a list of 246 butterflies of Shimla Hills. Similarly<sup>[11]</sup> listed 294 species of butterflies from Shimla Hills. Keeping this in view the present study was conducted to study the diversity, abundance and distribution of butterfly fauna from Sub-Alpine Area of Chanshal valley of Himachal Pradesh. During present investigation 29 species of butterflies belonging to 22 genera and 4 families were collected and identified of which 10 species belonged to the family Nymphalidae, 9 Species to Pieridae, 8 species to Lycaenidae and 2 species to family Papilionidae. The present study was the first attempt to study the butterfly diversity and distribution from the selected study area.

### 2. Materials and Methods

**2.1: Study Site.** The present study was conducted during 2012-2015 from Chanshal valley of District Shimla which lies at 31°11'57.10" N and 77°59'26.20" E links the Dodra Kwar and Rohru in the Shimla District of the Himachal Pradesh. The Peak is about 4,520 metres (14,830

**Correspondence**  
**Pawan Kumar**  
Himalayan Forest Research  
Institute Panthaghati Shimla,  
Himachal Pradesh, India

ft) and thus highest peak in Shimla District. Chanshal valley is about 180 Kilometres from Shimla.



**Fig 1:** Satellite image showing GPS co-ordinates of Butterfly collection sites of Chanshal valley (Shimla)



**Fig 2:** Photograph of Collection Sites of Chanshal valley of Himachal Pradesh.

**2.2 Collection & Preservation of specimens**

An insect net was used in order to collect butterflies by Sweeping method. A net consisted of a nylon net bag attached to a metal ring, which holds the mouth of the open bag and a handle to which the metal ring was attached. A ring made up of thick wire 38 cm in diameter was used. The depth of the bag was 75 cm. Butterflies were removed gently after they became enclosed in the bag by a rapid twist of the handle [12]. The collected specimens were killed with the help of killing bottle, In this technique, cotton soaked with ethyl acetate was kept at the base of glass jar. In laboratory, butterflies were put in a relaxing chamber. All the specimens of butterflies were pinned

with different sizes white Nickel plated entomological pins (40× 0.38 mm) No. 2 according to the size of specimens. Butterflies were allowed to dry in desiccators for 2-3 weeks. The dried specimens were transferred to air tight insect boxes containing powdered naphthalene.

**2.3 Identification of butterflies**

Species of butterflies were identified from relevant literature [13, 14, 15, 16, 17, 18, 19, 20, 21, 22]. Some species was identified after their comparison with reference collection housed at Forest Research Institute (F.R.I.), Dehradun.

**2.4 Sampling of butterflies**

Based on the relative abundance estimates, the butterflies were categorized according to [23, 24, 25, 26] in five categories Abundant (>30%), Very Common (20-30%), Common (10-20%), Frequent (5-10%), Occasional (1-5%), Rare (<1%).

**2.5 Analyzing diversity**

**Shannon-Wiener diversity Index**

The species diversity will be calculated following Shannon-Wiener diversity Index (H) [27].

$$H = - \sum_{i=1}^S (Ni/N) \ln (Ni/N)$$

Where Ni = Number of individuals of species i and N= Total number of individuals of all the species.

**2.6 Evenness index**

Evenness Index was calculated as per Hill [28]. i. e.  $E = H / \ln S$  Where S= Total number of species, N= Total number of individuals of all the species, H = Index of diversity.

**2.7 Margalef's Index**

Margalef's index was used as a simple measure of species richness Margalef [29].

$$\text{Margalef's index} = (S-1) / \ln N$$

S = Total number of species

N = Total number of individual in sample

ln = Natural logarithm

**3. Results and Discussion**

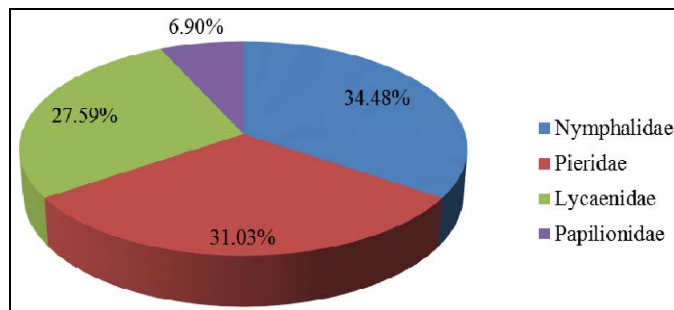
During present study a total of 29 Species of butterflies belonging to 22 Genera and 4 families were collected and identified (Table 1). Out of 29 species specimens of 10 species belonging to family Nymphalidae, 9 species from family Pieridae, 8 species from Lycaenidae and 2 species from Papilionidae were collected. Maximum number of species belonged to the Family Nymphalidae represented by 10 species (7 genera) followed by Pieridae 9 species (7genera) Lycaenidae 8 species (7 genera) Papilionidae 2 species (1 genera). As far as percent family composition is concerned the species belonged to the family Nymphalidae (34.48%) was the most dominant followed by family Pieridae (31.03%), Lycaenidae (27.59%) and Papilionidae (6.90%) (Fig.3). Analysis of species diversity of butterfly fauna revealed that the family Nymphalidae (1.96) was the highest followed by family Pieridae (1.70), Lycaenidae (1.65) and Papilionidae (0.6), Evenness was highest in family Papilionidae (0.87) followed by Nymphalidae (0.85), Lycaenidae (0.79) and lowest in Pieridae (0.77). Similarly species richness was highest in family Nymphalidae (4.74) followed by Pieridae (4.38), Lycaenidae (4.21) and Papilionidae (1.18) (Table 2). As far as the enlisting of different species in the Wildlife Protection Act, 1972 is concerned, 02 species are enlisted in the Act which is *Lampides boeticus* (Linnaeus) and *Papilio machaon* Men enlisted in Schedule II Part II. Based on relative abundance study on 29 species of butterflies, about 31.0% species were Abundant, 20.69% were Occasional, 17.24% were Common,13.79% were Frequent,10.34% were Very Common and 6.90% were documented Rare (Fig.4). Relative abundance was highest for the family Nymphalidae (10 species, 34.48%) followed by Pieridae, and lowest for Papilionidae (2 species, 6.90%). [30] Reported the 288 species of butterflies from Himachal Pradesh and has enlisted family Nymphalidae as the largest family with 56 species. Recently [31]. studied the diversity of 107 species of butterflies belonging to 73 genera

and 9 families from Himachal Pradesh.

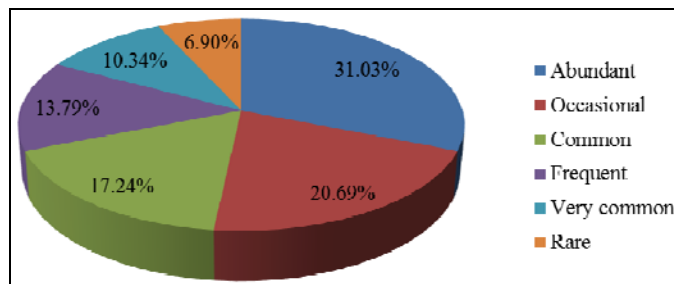
**Table 1:** Checklist of butterfly species collected from Chanshal valley of Himachal Pradesh.

S.No	Scientific name	Family	Occurrence
1.	<i>Papilio machaon</i> Menetries*	Papilionidae	VC
2.	<i>Papilio polyctor</i> Boisduval	Papilionidae	O
3.	<i>Eurema hecabe</i> (Linnaeus)	Pieridae	A
4.	<i>Eurema laeta</i> (Boisduval)	Pieridae	C
5.	<i>Colias fieldii</i> Menetries	Pieridae	A
6.	<i>Pieris brassicae</i> (Linnaeus)	Pieridae	A
7.	<i>Pieris canidia</i> (Sparrman)	Pieridae	A
8.	<i>Pontia daplidice</i> (Linnaeus)	Pieridae	C
9.	<i>Aporia agathaon</i> (Gray)	Pieridae	C
10.	<i>Delias belladonna</i> (Fabricius)	Pieridae	F
11.	<i>Belenois aurota</i> (Fabricius)	Pieridae	F
12.	<i>Lycaena phlaeas</i> (Linnaeus)	Lycaenidae	A
13.	<i>Lycaena pavana</i> Kollar	Lycaenidae	A
14.	<i>Heliophorus sena</i> Kollar	Lycaenidae	A
15.	<i>Lampides boeticus</i> (Linnaeus)*	Lycaenidae	R
16.	<i>Zizeeria karsandra</i> (Moore)	Lycaenidae	R
17.	<i>Oreolyce vardhana</i> (Moore)	Lycaenidae	VC
18.	<i>Celastrina huegelii</i> Moore	Lycaenidae	A
19.	<i>Aricia astrarche</i> Bergstrasser	Lycaenidae	O
20.	<i>Danaus chrysippus</i> (Linnaeus)	Nymphalidae	O
21.	<i>Fabriciana kamala</i> Moore	Nymphalidae	O
22.	<i>Issoria lathonia</i> (Linnaeus)	Nymphalidae	A
23.	<i>Vanessa indica</i> (Herbst)	Nymphalidae	C
24.	<i>Vanessa cardui</i> (Linnaeus)	Nymphalidae	C
25.	<i>Aglais cashmiriensis</i> (Kollar)	Nymphalidae	VC
26.	<i>Junonia orithiya</i> (Linnaeus)	Nymphalidae	F
27.	<i>Junonia lemonias</i> (Linnaeus)	Nymphalidae	O
28.	<i>Junonia iphita</i> (Cramer)	Nymphalidae	O
29.	<i>Aulocera padma</i> (Kollar)	Nymphalidae	F

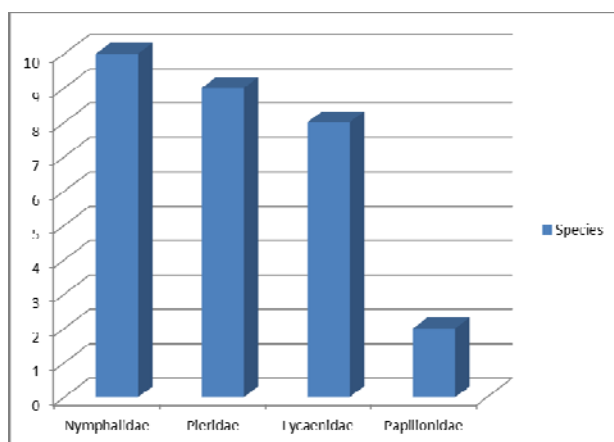
\*Listed in Wildlife (Protection) Act Schedule II Abundant (>30%), Very Common (20-30%), Common (10-20%), Frequent (5-10%), Occasional (1-5%), Rare (<1%).



**Fig 3:** Percentage composition of each family of butterflies



**Fig 4:** Percentage composition of status of butterflies species



**Fig 5:** Family wise composition of butterfly species

**Table 2:** Showing Shanon-Weiner Diversity index and Evenness index

Family	No. of species	Species Diversity	Species evenness	Species richness
Nymphalidae	10	1.96	0.85	4.74
Pieridae	9	1.70	0.77	4.38
Lycaenidae	8	1.65	0.79	4.21
Papilionidae	2	0.6	0.87	1.18

#### 4. Conclusion.

Thus the present study on diversity of butterfly is the first study of this type in the Sub-Alpine area of Chanshal valley of Himachal Pradesh. Due to the high altitude and adverse climatic condition Chanshal valley (4,520 meters) still has diverse flora and fauna as revealed during the present investigations. It was observed that butterfly species diversity was low in the present study sites which may be attributed to the biogeography and climatic conditions of the area. Therefore, it is suggested and recommended that the area under study and other such areas should be continuously surveyed and monitored to add new taxa to the existing biodiversity.

#### 5. Acknowledgements

The authors are grateful to the Ministry of Environment, Forests and Climate Change, GoI for financial assistance and also grateful to the Director, Himalayan Forest Research Institute (HFRI) for providing necessary research facilities.

#### 6. References

- Mihoci I, Hrsak V, Kucinic M, Micetic Stankovic V, Delic A, Tvrtkovic N. Butterfly diversity and biogeography on the Croatian karst mountain biokovo: Vertical distribution and preference for altitude and aspect. *European Journal of Entomology*. 2011; 108(4):623-633.doi: 10.14411/eje. 2011; 081
- Khan ZH, Raina RH, Dhar MA, Ramamurthy VV. Diversity and Distribution of Butterflies from Kashmir Himalayas. *Journal of insect science*. 2011; 24(1):45-55.
- Tiple AD. Butterflies of Vidarbha region Maharashtra, India; a review with and implication for conservation. *Journal of Threatened Taxa*. 2011; 3(1):1469-1477.
- Storch D, Konvicka M, Benes J, Martinkova J, Gaston KJ. Distribution patterns in Butterflies and birds of the Czech Republic: Separating effects of habitat and geographical position. *Journal of Biogeography*. 2003; 30:1195-1205.
- Mani MS. Butterflies of the Himalaya. Oxford & IBH Publication Co: Janpath, New Delhi.1986, 181.
- Mehta HS, Thakur MS, Sharma RM, Mattu VK. Butterflies of Pong dam wetland, Himachal Pradesh, India Bionotes. 2002; 4(2):37-38.
- Uniyal VP, Mathur PK. Diversity of butterflies in Great Himalayan National Park, Western Himalaya. *Indian Journal of Forestry*. 1998; 21(2):150-155.
- Thakur MS. Biosystematic and ecological studies on Butterflies from Himachal Pradesh, Ph.d thesis, Himachal Pradesh University, Shimla. 2007, 1-222.
- Kumar R. Biosystematic and ecological studies on Butterflies from Himachal Pradesh Ph.d thesis, Himachal Pradesh University Shimla. 2009, 1-288.
- Philippe de Rhe GWV. The butterflies of the Shimla Hills. *Journal Bombay Natural History Society*. 1931; 35:172-184, 415, 629-634.
- Wynter-blyth MA. A List of butterflies of the Shimla Hills. *Journal Bombay Natural History Society*. 1941-1947; 42:448; 43:672-673; 45; 256-257; 46; 735-736.
- Arora GS. Collection and Perseveration of animals: Lepidoptera. Zoological Survey India, Kolkata. 1990, 131-138.
- Evans WH. The identification of Indian butterflies, 2ndedn. Bombay Natural History Society: Bombay, 1932, 464.
- Evans WH. A Catalogue of the Hesperidae from Europe, Asia and Australia in the British Museum. Trustees of B.M., London: 1949, 502.
- Wynter-blyth MA. Butterflies of the Indian region, Bombay natural History society Bombay. 1957; 20:523-72.
- Haribal M. The Butterflies of Sikkim Himalaya and their Natural history. Sikkim nature conserve foundation (SNCF), Sikkim. 1992, 217.
- Rose HS, Walia VK. Inventory of Butterfly Diversity of Chandigarh. Bionotes. 2003; 5(3):58-60.
- Thakur MS, Mattu VK, Mehta HS. Studies on the butterflies of Sukhna and Catchement area in Chandigarh, India. *Journal of Entomological Research*. 2006; 30(2):175-178.
- Uniyal VP. Butterflies in Great Himalayan Conservation Landscape, Himachal Pradesh, Western Himalaya. *Entomon*. 2007; 32:119-127.
- Kehimkar I. The book of Indian butterflies. Bombay Natural History Society Mumbai, India. 2008, 1-497.
- Talbot G. The fauna of British India including Ceylon and Burma (Butterflies), Published by Taylor and Francis, London). 1939; 1(29-506):2
- Talbot G. The fauna of British India including Ceylon and Burma (Butterflies), (Published by Taylor and Francis, London). 1947; 2:(15-506):2
- Rajasekhar B. Butterflies of Loyola College Campus. *Blackbuck* Vol. VII, Nos.1991; 3, 4.
- Rajasekhar B. Observations on the vegetation of Guindy National Park. *Blackbuck*. 1992; 8:2.
- Rajasekhar B. Checklist to the birds of Guindy National Park. PUB. Of the Forest deptt. Of Tamilnadu, 1992.
- Rajasekhar B. A study on butterfly populations at Guindy national park, Madras. *Journal, Bombay Natural Hist. Society*. 1995; 92:275-276.
- Shannon CE, Wiener W. The Mathematical Theory of Communication. Univ. of Illinois Press. Urbana, U.S.A, 1949.
- Hill MO. Diversity and its evenness, a unifying notation and its consequences. *Ecology*. 1973; 54:427-432.
- Margalef's R. Temporal succession and spatial

- heterogeneity in phytoplankton. In: Perspectives in Marine biology, Buzzati-Traverso (ed.), Univ. Calif. Press, Berkeley. 1970, 323-347.
30. Arora GS, Mehta HS, Walia VK. Fauna of Western Himalaya (Part 2) - Himachal Pradesh. (Published by the Director, Zoological Survey of India Kolkata). 2005; 1(359-16).
  31. Thakur MS. Studies on Lepidopteran (Rhopalocera: Butterfly) diversity in Himachal Pradesh of the Western Himalaya. Asian Journal of Animal Science. 2011, 198-202