

## DIVERSITY OF BUTTERFLIES IN AND AROUND AREAS OF DISTRICT HARIPUR, KHYBER PAKHTUNKHWA, PAKISTAN

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### ABSTRACT

Butterflies are sign of beauty known as insect of sun and play a significance role in the ecosystem by providing different ecological services. The study was conducted in Haripur KPK from March 2022 to June 2022. Samples were collected from gardens, fields, and nurseries of Haripur. The specimen was caught with the help of net then preserved in bottles containing alcohol in it then stretched on Styrofoam and were identified by using identification keys. During present study 108 specimen, 5 families (Pieridae, Papilionidae, Hesperidae, Nymphalidae, and Lycaenidae), 18 genera, and 23 species *Colias myrmidone*, *Nathalis iole*, *Helicanus charithonia*, *Junonia orithya*, *Papilio demoleas*, *Staphylus mazans*, *Callerebia nirmala*, *Ponita produdice*, *Colias eurytheme*, *Vanessa cardui*, *Danaus chrysippus*, *Ascia monuste*, *Papilio nianor*, *Celastrina huegeli*, *Pieris barassieae*, *Ypthima huebneri*, *Lycaena hyerbius*, *Lycaena phlaes*, *Pieris rapae*, *Papilio Polytes*, *pieris napi*, *Zizerria Karsandra*, *Pieris erate* were identified. Largest number of species was recorded in family Pieridae and Nymphalidae and least in number in family Hesperidae. Diversity was obtained by Simpson Diversity Index (SDI) revealed 83% difference while 17% similarities. Haripur city is the natural habitat of butterflies that's support breeding and survival of butterflies. Far rural and city areas should be explored. Genetic makeup of species of butterflies should be studied in future.

**KEYWORDS:** diversity; species abundance; family percentage, Haripur.

## 1. INTRODUCTION

Butterflies are commonly called as insects of the sun having attractive color and delicate appeal. Butterflies are regarded from centuries because of its display and beauty (NRCS, 2000). Butterflies are well studied group taxonomically and throughout the world received a reasonable amount of attention (Ghazoul, 2002).

The butterflies belong to single superfamily the Papilionoidea that is further divided into five families. In comparison with many other super families of insects they are identical by structure and behavior (Rrower and Zandt, 1958). More than 28,000 species of butterflies are present worldwide, about which 80 percent are present in tropical regions. About 301 butterflies species have been reported in Pakistan (Khan *et al.*, 2000, 2007; Naz *et. al.*, 2010). A butterfly during its life cycle goes through metamorphosis. In addition to bees and moths butterflies are consider as most efficient pollinators of flowers. They are involved in production of seeds, fruits and food crops therefore, they are important for the survival of other living organisms (Maheshwari, 2003).

Butterflies provide food for number of animals like amphibians, reptiles, birds etc and caterpillars offer an special meal for ants and scorpions ((Dickie, 2012). Larvae of some butterfly feed on harmful insect like aphids are prey of Hoverfly larvae (Ehrlich, 1984) so, caterpillars has important role in biological pest control. Butterflies are very sensitive to climatic change, such as loss of habitat, pollination that influences them to be more responsive. Therefore, large number of butterflies usually shows a healthier ecosystem (Shi and Luo *et al.*, 2009). Present study is designed to find out the distribution and diversity of butterflies that will help other researchers because of deforestation and climatic change.

## II. MATERIALS AND METHOD

### Study area

Haripur is the city in Hazara, Khyber Pakhtunkhwa Pakistan. Geographical coordination of Haripur is 335939 N (latitude) and 72560 E (longitude), and it is 1,710 ft. 520mi above the sea level. It is a plan area. The total area of the district Haripur is 1,725Km<sup>2</sup> (666mi<sup>2</sup>) in length.

### Collection and preservation

A study was carried out from February 2022 to July 2022. Butterflies were caught by the insect collecting net from 5 sites of Haripur areas (the University Campus Haripur, Sarkari Bagh, Sari Namait Khan, Parks and Nurseries). For killing, they had been put in bottle having cotton dip with alcohol. Butterfly specimen where later on stretched. They were pinned and their body parts were set on Styrofoam in the laboratory. Naphthalene balls were placed to keep them safe from pests.



**Figure: Collection and Preservation of Butterflies**

### **Identification**




The specimens of butterflies were identified by the help of Keys (Abbas *et al.*, 2002 and Munir *et al.*, 2008), available literature (Sabir *et al.*, 2000), entomologists on the bases of their colors and spots which are present on their wings upper and lower side and internet surfing on the basis of external structure.



### **Labeling**




Identified specimens were labeled with their scientific names and location of collection along with date were also captured by camera and were secure in the collection boxes. The data obtained were subjected to computer program Microsoft excel for analysis.




## **III. RESULTS**




108 butterfly specimens were collected during the present study. Upon identification, it revealed 5 families, 18 genus and 23 species. The families are Pieridae, Papilionidae, Nymphalidae, Hesperidae and Lycaenidae.

<p><b>Family:</b> Pieridae</p> <p><b>Genus:</b> Colias</p> <p><i>Colias myrmidone</i> (Esper, 1780)</p> <p><b>Distribution</b> It was previously recorded from Western Asia, southern Russia, Romania, jura mountains (ICUN, 2018).</p> <p><b>Remarks:</b> In present study it is recorded from fields of Bakka Gudwaliyn and Panian.</p>	<p><b>Danube Clouded Yellow butterfly (Plate-1)</b></p> 
<p><b>Family:</b> Pieridae</p> <p><b>Genus:</b> Nathalis</p> <p><i>Nathalis iole</i> (Boisduval, 1836)</p> <p><b>Distribution</b> <i>N. iole</i> is also reported in Mexico by (Jorge <i>et al.</i>, 2000; Scott 1986) and (Grath; tilden 1986; Sandy and Craig, 2020) in Florida.</p> <p><b>Remarks:</b> In current study it is recorded from nurseries of Darwesh, Sarisala and fields of Haripur.</p>	<p><b>Dainty Sulphur (Plate-2)</b></p> 
<p><b>Family:</b> Nymphalidae</p> <p><b>Genus:</b> Heliconius</p> <p><i>Heliconius charithonia</i> (Linnaeus, 1767)</p> <p><b>Distribution:</b> <i>Heliconius charithonia vazquezae</i> was recorded by (Ross <i>et al.</i>, 2001). In 1996 it was called as official butterfly for Florida state in the US. The species is mostly present in moist forests, tropical hammocks, fields or edges. (Beccaloni <i>et al.</i>, 2003).</p> <p><b>Remarks:</b> In current study it is recorded from garden of agriculture department of Haripur.</p>	<p><b>Zebra long Wing (Plate-3)</b></p> 



<p><b>Family:</b> Nymphalidae</p> <p><b>Genus:</b> Junonia</p> <p><i>Junonia orithya</i> (Linnaeus, 1758)</p> <p><b>Distribution</b> (Khan <i>et al.</i>, 2007; 2009) also confirmed present specie from district Bagh, Pakistan. (Pandhari, 1990) also reported same species from Central India. Same species was confirmed by (Khan <i>et al.</i>, 1990) from Muzaffrabad, AJK. (Perveen and Ahmad, 2012) reported from Kohat. Khan <i>et al.</i> (2007) confirmed from district Bhimber and Mirpur. (Naz <i>et al.</i>, 2001) also reported from Punjab Shivalik, India.</p> <p><b>Remarks</b> In present study it was recorded from fields of Bakka Gudwaliyn Kalopind and Panian.</p>	<p><b>Blue Pansy (Plate-4)</b></p> 
<p><b>Family:</b> Papilionidae</p> <p><b>Genus:</b> Papilio</p> <p><i>Papilio demoleus</i> (Linnaeus, 1758)</p> <p><b>Distribution</b> In Pakistan, it is reported from Lahore (Ahsan and Iqbal., 1975), Chitral (Leslic and Evans., 1903), Mansehra (Perveen and Fazal, 2013), Buner (Naz, 2001), Kohat (Perveen, 2012), Lower Swat and Malakand Agency (Inayatullah <i>et al.</i>, 2002) Rawalpindi and Islamabad (Iqbal, 1978) and Lahore (Ahsan and Iqbal., 1975). <i>P. demoleus</i> is the most commonly distributed worldwide. <i>P. demoleus</i> can be found in the Afghanistan, Middle East, the Indian Subcontinent, Australia, South China, Malaysia, Japan, Papua New Guinea, Thailand and Indonesia (Collins and Michael, 1985).</p> <p><b>Remarks</b> In the present study it is recorded from gardens sides of different localities of Haripur.</p>	<p><b>Lime Butterfly (Plate-5)</b></p> 





<p><b>Family:</b> Hesperidae</p> <p><b>Genus:</b> Staphylus</p> <p><i>Staphylus mazans</i> (Reakirt, 1867)</p> <p><b>Distribution</b> This specimen was identified as <i>S. mazans</i> by Freeman and also reported by Reakirt (1867).</p> <p><b>Remarks</b> In the present study it is recorded from garden of Sir karri Bagh of Haripur.</p>	<p><b>Mazans Scallop wing (Plate-6)</b></p> 
<p><b>Family:</b> Nymphalidae</p> <p><b>Genus:</b> Erebia</p> <p><i>Callerebia nimala</i> (Moore, 1865)</p> <p><b>Distribution</b> <i>Callerebi nirmala</i> is distributed in the Hamalayas, India (Varshney, 2015).</p> <p><b>Remarks</b> In present study it is recorded from garden of Sir karri Bagh and fields of Haripur.</p>	<p><b>Comma Argus (Plate-7)</b></p> 
<p><b>Family:</b> Pieridae</p> <p><b>Genus:</b> Pontia</p> <p><i>Pontia protodice</i> (Boisduval and Leconte, 1830)</p> <p><b>Distribution</b> Khan <i>et al.</i> (2004) also recorded the similar specie from district Bagh, AJK. (Shah <i>et al.</i>, 2001) reported from Kohat and (Naz <i>et al.</i>, 2001) from Buner, Pakistan. (Khan <i>et al.</i>, 2000) reported from Muzaffrabad, AJK (Iqbal, 1978) from districts Rawalpindi and Islamabad. (Khan <i>et al.</i>, 2007) recorded from district Bhimber, Kotli and Mirpur, AJK Pakistan.</p> <p><b>Remarks:</b>In present study it is recorded from fields and gardens of Sarisala, Sarkarri Bagh and Haripur city.</p>	<p><b>Checkered White (Plate-8)</b></p> 



<p><b>Family:</b> Pieridae</p> <p><b>Genus:</b> Colias</p> <p><i>Colias eurytheme</i> (Boisduval, 1852)</p> <p><b>Distribution</b> <i>Colias eurytheme</i> was recorded in southern Mexico and North America (Barb, 2013)</p> <p><b>Remarks</b> In present study it is recorded from fields and gardens of Sarisala, Sarkarri Bagh and Haripur city.</p>	<p><b>Orange Sulpher (Plate-9)</b></p> 
<p><b>Family:</b> Nymphalidae</p> <p><b>Genus:</b> Cynthia</p> <p><i>Vanessa cardui</i> (Linnaeus, 1758)</p> <p><b>Distribution</b> (Khan <i>et al.</i>, 2009) reported from Bagh, AJK, Pakistan, (Ahson and Iqbal, 1975) from Lahore and (Khan <i>et al.</i> 2004) reported from Muzaffrabad. (Abbas <i>et al.</i>, 2002) recorded from Skardu and (Khan <i>et al.</i>, 2007) from Mirpur and Kotli. (Naz <i>et al.</i>, 2001) recorded from Buner and (Iqbal, 1978) identified from Rawalpindi Islamabad. (Shields, 1974) discussed the same species migration.</p> <p><b>Remarks</b> In present study it is recorded from gardens of different areas of Haripur.</p>	<p><b>The Painted Lady (Plate-10)</b></p> 
<p><b>Family:</b> Nymphalidae</p> <p><b>Genus:</b> Danaus</p> <p><i>Dananus chrysippus</i> (Cramer, 1777)</p> <p><b>Distribution:</b> Khan <i>et al.</i> (2007) reported from Bagh, AJK Pakistan and (Pandharipande, 1990) reported from Central India. (Khan <i>et al.</i>, 2004) recorded from Muzaffrabad. (Naz <i>et al.</i>, 2001) from Lahore. Tayyab <i>et al.</i> (2006) from Bahawalpur, (Khan <i>et al.</i>, 2000) from Mirpur, Kotli and Bhimber. (Sharma and Joshi, 2009) reported from Punjab Shivalik, India.</p>	<p><b>Plain Tiger (Plate-11)</b></p> 

<p><b>Remarks:</b> In current study it is recorded from gardens of different areas of Haripur.</p>	
<p><b>Family:</b> Pieridae  <b>Genus:</b> <i>Ascia</i>  <i>Ascia monuste</i> (Linnaeus, 1764)  <b>Distribution</b> <i>A. Monuste</i> is now limited to the America. The potential distribution of the butterfly includes area of Asia, Africa, Europe and Oceania to some amount (Katja <i>et al.</i>, 2019).  <b>Remarks</b> In present study it is recorded from fields of all over the district Haripur</p>	<p><b>Chocolate Albatross (Plate-12)</b></p> 
<p><b>Family:</b> Papilionidae  <b>Genus:</b> <i>Papilio</i>  <i>Papilio bianor</i> (Cramer, 1777)  <b>Distribution</b> <i>P. bianor</i> has been in various areas of Pakistan, China, Kashmir, south India, Japan, Korea Thailand and Laos (Wu, 2001)  <b>Remarks</b> In present study it is collected from gardens of homes.</p>	<p><b>Common Peacock (Plate-13)</b></p> 
<p><b>Family:</b> Lycaenidae  <b>Genus:</b> <i>Cupido</i>  <i>Celastrine huegeli</i> (Moore, 1882)  <b>Distribution</b> <i>Celastrine huegeli</i> has been recorded in area of Kashmir, India, Hamalayas ranges (Evan, 1932).  <b>Remarks</b> In present study it is recorded from fields of Sakandar pur and Pindkhankhal.</p>	<p><b>Large Hedge Blue (Plate-14)</b></p> 



<p><b>Family</b>Pieridae</p> <p><b>Genus</b> Pieris</p> <p><i>Pieris brassicae</i> (Linnaeus, 1758)</p> <p><b>Distribution</b> <i>P. brassicae</i> was reported from KPK Ayubia, Abbottabad, Chitral, Buner, Kohat, Swat (Leslie and Evans, 1903; Roberts, 2001; Naz, 2001). It was also reported from Punjab Attock, Jhelum, Chakwa, Muree, Lahore and Rawalpindi Islamabad by (Ahsan and Iqbal, 1975; Iqbal, 1978; Shah et al 2016). Reported from Sindh (Roberts, 2001 Mal <i>et al.</i>, 2014). It was reported from Gilgit Baltistan, Sadpara, Skardu, Naltar, Shigar, Karmang, Deosai, Kachura, and Hunza (Abbas <i>et al.</i>, 2002; Smith <i>et al.</i>, 2007). It was also reported from Azad Kashmir, Mirpur, Muzaffarabad, Bhimber and Kotli (Khan <i>et al.</i>, 2007).</p> <p><b>Remarks</b> In present study it is recorded from fields of brassica all over Haripur district.</p>	<p><b>Large White (Plate-15)</b></p> 
<p><b>Family:</b> Nymphalidae</p> <p><b>Genus:</b> Ypthima</p> <p><i>Ypthima huebneri</i> (Kirby, 1871)</p> <p><b>Distribution</b> <i>Y. huebneri</i> was reported by Prabakaran <i>et al.</i>, 2014 and Atanu and Meitei, 2014 in India.</p> <p><b>Remarks</b> In current study it is recorded from fields of brassica all over Haripur district.</p>	<p><b>Common Four Rings (Plate-16)</b></p> 
<p><b>Family:</b> Lycaenidae</p> <p><b>Genus:</b> Zizeeria</p> <p><i>Zizeerikar Sandra</i> (Meitei 2014)</p>	<p><b>Dark Grass Blue (Plate-17)</b></p>

<p><b>Distribution</b> <i>Z. karsandara</i> was reported in himachal pradesh India (Saveena, 2015). <i>Z. karsandara</i> is very common in district cachra India (Atanu and Meitei, 2014).</p> <p><b>Remarks</b> In present study it is recorded from grassy areas of all over Haripur district.</p>	
<p><b>Family:</b> Nymphalidae</p> <p><b>Genus:</b> Pyronia</p> <p><i>Aargynnis hyperbius</i> (Linnaeus, 1763)</p> <p><b>Distribution</b> Mostly found in habitat of Himalayas, Punjab to Sikkim, China (Kunte,2022).</p> <p><b>Remarks</b> In present study it is recorded from gardens areas of Haripur.</p>	<p><b>Indian Fritillary (Plate-18)</b></p> 
<p><b>Family</b> Lycaenidae</p> <p><b>Genus</b> Lycaena</p> <p><i>Lycaena phlaeas</i> (Linnaeus, 1761)</p> <p><b>Distribution:</b> it was reported from Quetta by (Robert, 2001; Noor <i>et al.</i>, 2018). It was also reported from KPK Chitral, Kohistan, Peshawar, Swat, Malakand Agency, Buner, and Swat (Roberts, 2001: Naz <i>et al.</i>, 2001: Inayatullah <i>et al.</i>, 2002). Smith <i>et al.</i> (2007) reported from Japan.</p> <p><b>Remarks:</b> In present study it is recorded Gardens and fields areas of all over Haripur district.</p>	<p><b>Small Copper (Plate-19)</b></p> 
<p><b>Family:</b> Pieridae</p> <p><b>Genus:</b> Pieris</p> <p><i>Pieris rapae</i> (Linnaeus, 1758)</p> <p><b>Distribution:</b> From Europe, North Africa and Asia to Japan were introduced into Australia Canada and America (Higgins, 1970: Smith <i>et al.</i>, 2007: Shah <i>et al.</i>, 2016).</p>	<p><b>Small Cabbage White (Plate-20)</b></p> 

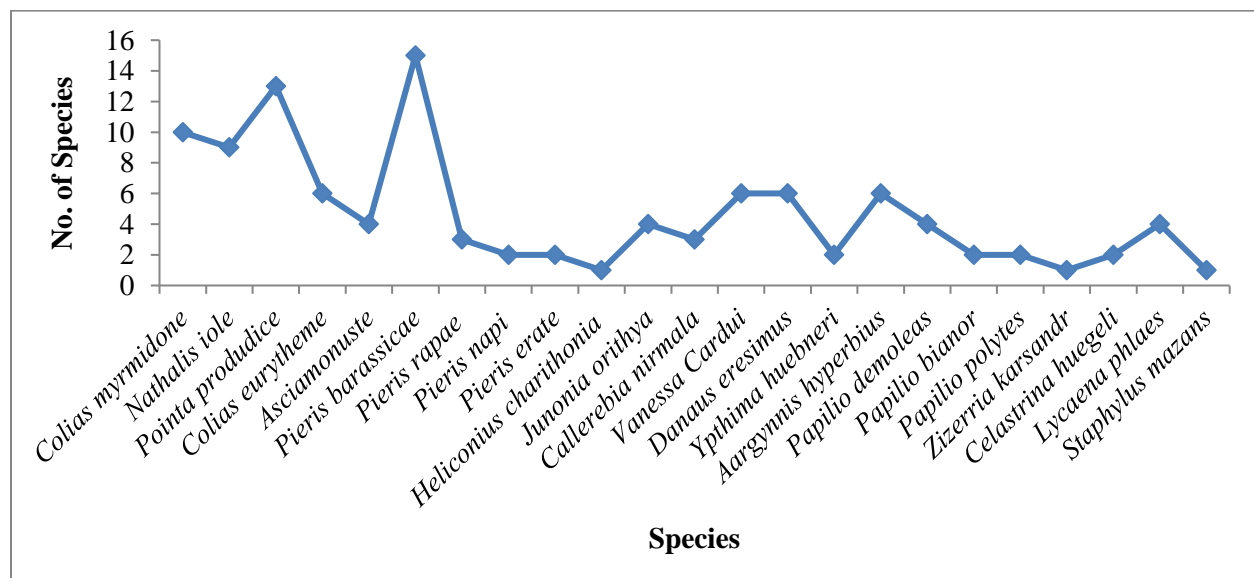
<p><b>Remarks:</b> In present study it is recorded in the fields areas Haripur.</p>	
<p><b>Family:</b> Papilionidae  <b>Genus:</b> Papilio  <i>Papilio polytes</i> (Cramer, 1775)  <b>Distribution:</b> Common Mormon was recorded by Tayyab <i>et al.</i> (2006) from Bahawalpur. (Perveen and Ahmad, 2012) recorded same species from Kohat. (Khan <i>et al.</i>, 2000; Rafi <i>et al.</i>, 2004) recorded from Islamabad and Rawalpindi. (Ahson and Iqbal, 1975) from Lahore and (Iqbal, 1978) from district Rawalpindi and Islamabad.  <b>Remarks:</b> In current study it is recorded Gardens and fields areas of all over Haripur district.</p>	<p><b>Common Mormon (Plate-21)</b></p> 
<p><b>Family:</b> Pieridae  <b>Genus:</b> Pieris  <i>Pieris napi</i> (Linnaeus, 1758)  <b>Distribution:</b> (Pandharipande, 1990) reported from Central India and (Tayyab <i>et al.</i>, 2006) from Bahawalpur. (Shah <i>et al.</i>, 2001; Perveen and Ahmad, 2012) reported from city of Kohat, Pakistan.  <b>Remarks:</b> In current it is recorded Gardens and fields areas of all over Haripur district.</p>	<p><b>Green Veined White (Plate-22)</b></p> 
<p><b>Family:</b> Pieridae  <b>Genus:</b> Colias  <i>Colias erate</i> (Esper, 1805)  <b>Distribution</b> In Pakistan <i>Colias erate</i> has been reported from Karmang, Skardu, Shigar Sadpara, and Kachura (Abbas <i>et al.</i>,</p>	<p><b>Indian Cabbage White (Plate-23)</b></p>

2002), Buner (Naz *et al.*, 2001), Chitral (Leslic and Evans, 1903) and Mirpur, Kotly and Bhimber AJK (Khan *et al.*, 2007).

**Remarks** In present study it is reported from gardens and fields areas of Haripur.

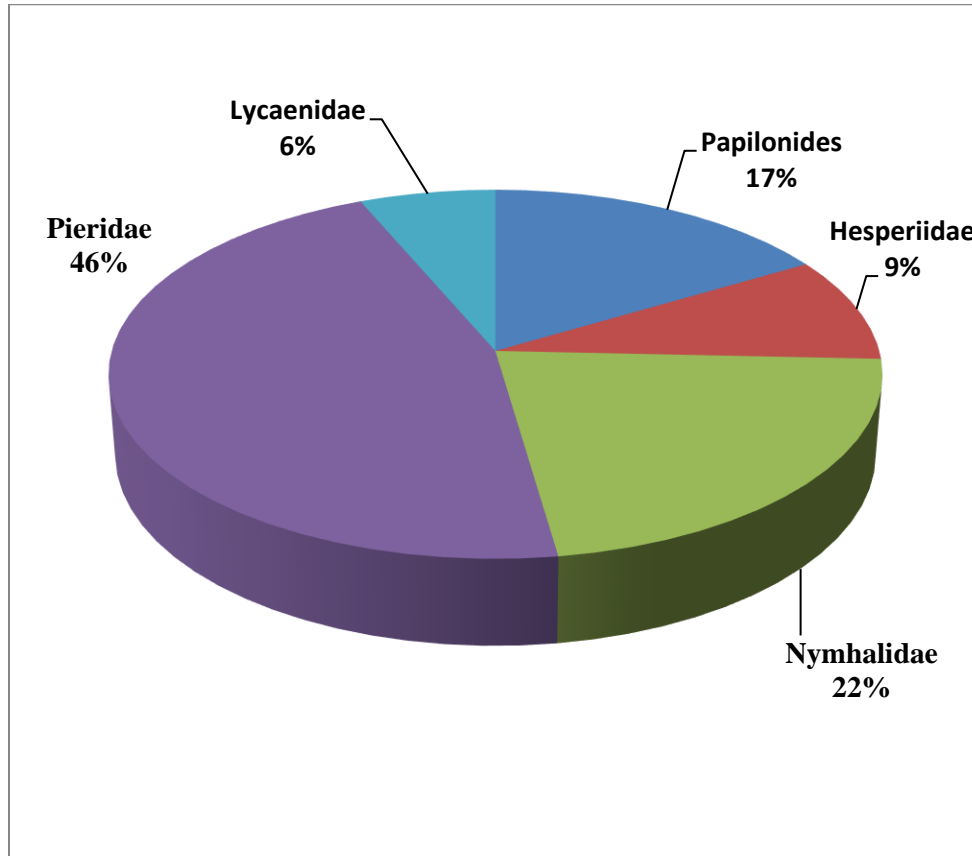


*Staphylus mazans*, *Zizerria Karsandra*, *Erebia epipsodea* has been first time reported in KPK Pakistan. *Pieris barassieae* was most abundant 15(13%), followed by *Ponita produdice* 13 (12%), followed by *Colias myrmidone* 10(9.2%) followed by *Nathalis iole* 9(8.3%), followed by *Colias eurytheme* 6 (5.5), followed by *Vanessa cardui* 6(5.5%), followed by *Danaus Chrysippus* 6 (5.5%), followed *Argynnis hyperbius* 6(5.5%), followed by *Junonia orithya* 4 (3.7%) followed by *Papilio demoleas* 4(3.7%) followed by *Ascia monuste* 4(3.7%) followed by *Lycaena phlaes* 4(3.7%) followed by *Papilio demoleas* 3 (2.7%) followed by *Pieris rapae* 3(2.7%) followed by *Papilio bianor* 2(1.8%) followed by *Celastrina huegeli* 2(1.8%) followed by *Ypthima huebneri* 2(1.8%), *Papilio Polytes* 2(1.8%) followed by *Pieris napi* 2 (1.8%) followed by *Pieris erate* 2(1.8%) followed by *Helicanus*1(0.9%) followed by *Staphylus mazans*1(0.9%) and *Zizerria Karsandra* 1(0.8%) (Figure 1).



**Figure-I: Species abundance of butterflies in and around areas of haripur**

Fig 2 show the percentage of diversity of butterfly families. Pieridae was the most abundant family 46% followed by Nymphalidae 24%, Papilionidae (16%), Hesperidae (9.8%). Lycaenidae (6.4%) (Nymphalidae > Papilionidae > Hesperidae > Lycaenidae).



**Figure-II: Percentage of butterflies in and around areas of haripur**

Figure 3 show the diversity of butterflies' species in different habitats (Fields, Nurseries, and Gardens). Diversity and number was high in gardens 68%, followed by field's area 23%, and lowest number of butterflies were collected from the Nurseries area 13%. Figure 4 shows the month wise distribution of butterflies species during the present study. Highest number of butterflies species were collected in the month of April 55.5%, followed by month of May 25.9%, and lowest number in the month of June 18.5%. April < May < June.

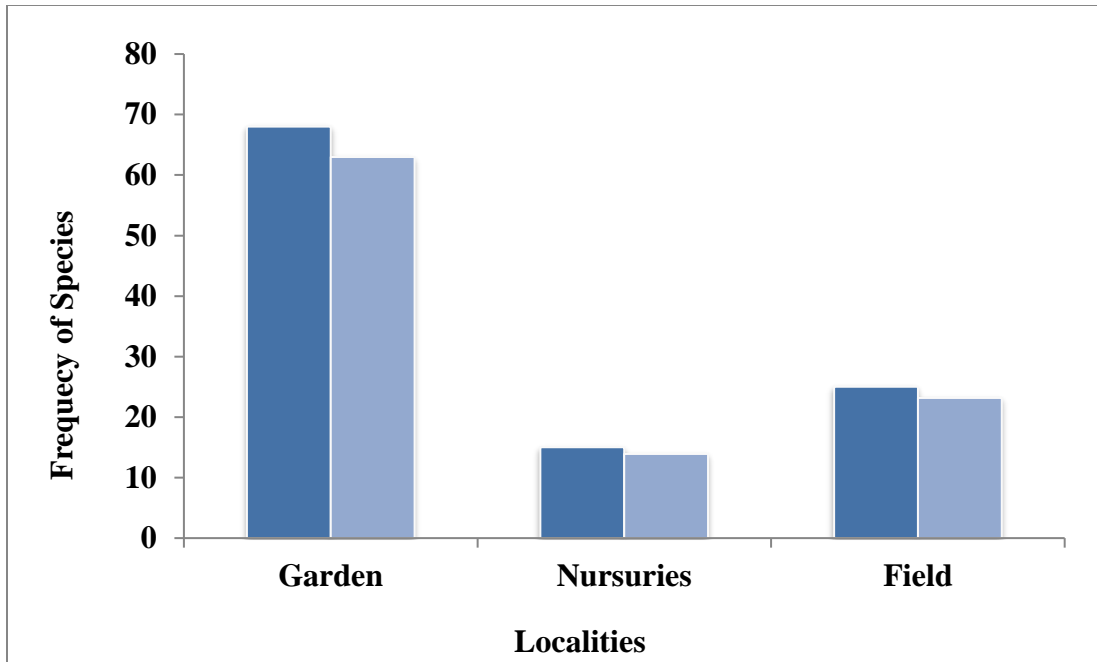


Figure-III: Butterflies diversity in different localities in and around areas of haripur

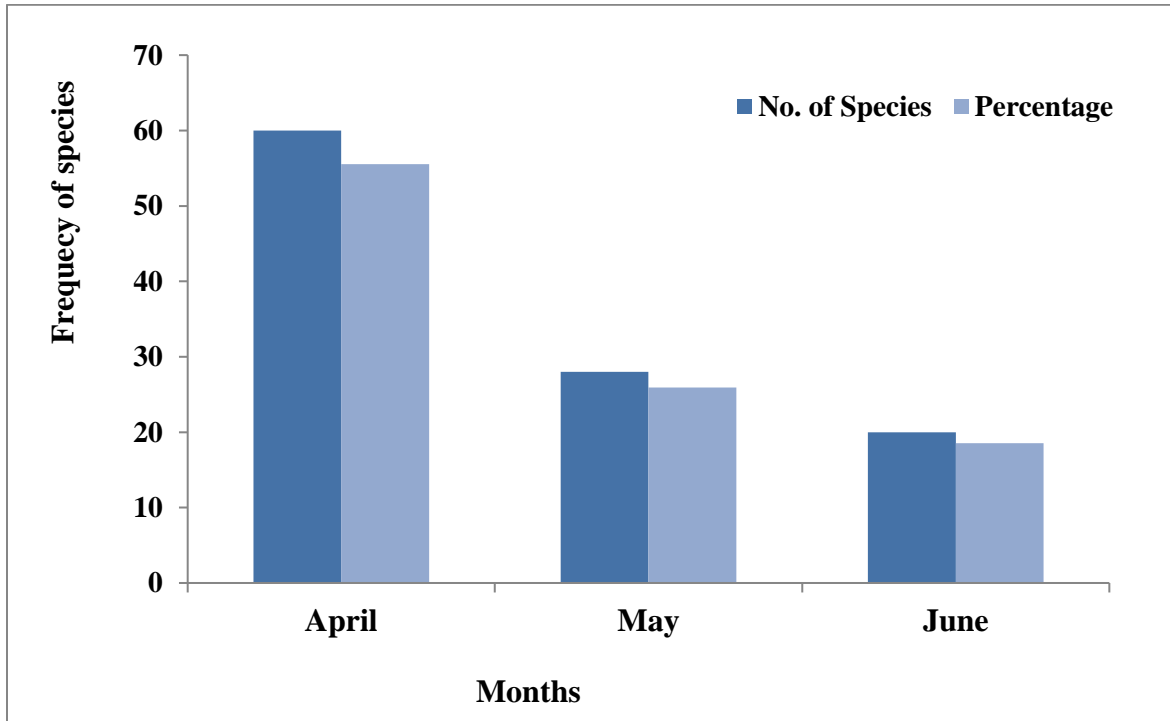


Figure-IV: Month wise distribution of butterflies in and around areas of Haripur

### Calculation of Simpson Diversity Index (SDI)

SDI of 0.83 mean there is a 83% chance that 2 individual selected randomly would be from a different species.  $1 - 0.83 = 0.17$  means that 17% chance that 2 individuals randomly selected would be from same species (Table-I).

**Table-I: Similarity and difference among butterfly's species collected from haripur district**

Species	No. of species (n)	(n-1)	n(n-1)
<i>Colias myrmidone</i>	10	9	$10 \times 9 = 90$
<i>Nathalis iole</i>	9	8	$9 \times 8 = 72$
<i>Helicanus charithonia</i>	1	0	$1 \times 0 = 0$
<i>Junonia orithya</i>	4	3	$4 \times 3 = 12$
<i>Papilio demoleas</i>	4	3	$4 \times 3 = 12$
<i>Staphylus mazans</i>	1	0	$1 \times 0 = 0$
<i>Callerebia Nirmala</i>	3	2	$3 \times 2 = 6$
<i>Ponita produdice</i>	13	12	$13 \times 12 = 156$
<i>Colias eurytheme</i>	6	5	$6 \times 5 = 30$
<i>Vanessa cardui</i>	6	5	$6 \times 5 = 30$
<i>Danaus chrysippus</i>	6	5	$6 \times 5 = 30$
<i>Ascia monuste</i>	4	3	$4 \times 3 = 12$
<i>Papilio bianor</i>	2	1	$2 \times 1 = 2$
<i>Cupido minimus</i>	2	1	$2 \times 1 = 2$
<i>Pieris barassieae</i>	15	14	$15 \times 14 = 210$
<i>Ypthima huebneri</i>	2	1	$2 \times 1 = 2$
<i>Zizerria Karsandra</i>	1	0	$1 \times 0 = 0$
<i>Aargynnis hyperbius</i>	6	5	$6 \times 5 = 30$
<i>Lycaena phlaes</i>	4	3	$4 \times 3 = 12$
<i>Pieris rapae</i>	3	2	$3 \times 2 = 6$
<i>Papilio Polytes</i>	2	1	$2 \times 1 = 2$
<i>Pieris napi</i>	2	1	$2 \times 1 = 2$
<i>Pieris erate</i>	2	1	$2 \times 1 = 2$
	<b>N = 108</b>		<b><math>\Sigma n(n-1) = 2070</math></b>

$$SDI = \Sigma n(n-1) / N(N-1)$$

$$SDI = 1 - \Sigma n(n-1) / N(N-1)$$

$$SDI = 1 - 2070/108(107)$$

$$= 1 - 2070/11556 = 1 - 0.17 = 0.83 = 83 \%$$

Table-II: Checklist of butterflies of haripur district

Families	Scientific name	Common name	No. of Species
<b>Pieridae</b>	<i>Colias myrmidone</i>	Danube clouded yellow	10
	<i>Nathalis iole</i>	Dainty Sulphur	9
	<i>Pointa produdice</i>	Checkered white	13
	<i>Colias eurytheme</i>	Orange sulphur	6
	<i>Asciamonuste</i>	Chocolate albatross	4
	<i>Pieris barassicae</i>	Cabbage white	15
	<i>Pieris rapae</i>	Samall cabbage white	3
	<i>Pieris napi</i>	Green-veined white	2
	<i>Pieris erate</i>	Indian cabbage white	2
<b>Nymphalidae</b>	<i>Heliconius charithonia</i>	Zebra long wing	1
	<i>Junonia orithya</i>	Blue pansy	4
	<i>Callerebia nirmala</i>	Common argus	3
	<i>Vanessa Cardui</i>	The painted lady	6
	<i>Danaus eresimus</i>	Plain tiger	6
	<i>Ypthima huebneri</i>	Common four ring	2
	<i>Aargynnis hyperbius</i>	Indian fritillary	6
	<b>Papilionidae</b>	<i>Papilio demoleas</i>	Lime butterfly
<i>Papilio bianor</i>		Common peacock	2
<i>Papilio polytes</i>		Common Mormon	2
<b>Lycaenidae</b>	<i>Zizerria karsandr</i>	Dark grass blue	1
	<i>Celastrina huegeli</i>	Large hedge blue	2
	<i>Lycaena phlaes</i>	Small copper	4
<b>Hesperiidae</b>	<i>Staphylus mazans</i>	Mazansscallopwing	1

#### IV. DISCUSSION

108 butterflies were collected during the present study. After identification, 5 families, 18 genera and 23 species were revealed. (Khan *et al.* 2004; 2007) identified 28 species from Muzaffarabad and 16 from Kotly, 20 from Mirpur and 19 from Bhimber respectively. (Perveen, 2012) from Kohat reported 21 species from 3 different families. (Parveen and Fazal, 2013) from Hazara University Mansehra reported 10 species, 8 genera and 3 families. Family Pieridae was also found most abundant and 10 species of family Pieridae were reported by Shah *et al.* (2001) from kohat region while in our study 9 species of family Pieridae were reported. Similar work was done by Perveen and Ahmad (2012) from Kohat, Pakistan who also identifies 21 species of butterfly fauna from 3 families (Pieridae 57%, Nymphalidae 33% and Papilionidae 10%). There



is no possibility of comparison because of same ecological environments in the study areas. (Khan *et al.*, 2007) from Kotli identified 16 species, 20 and 19 from Mirpur and Bhimber respectively, which showed similarities with our collected species. Khan *et al.* (2004) from Skardu recorded 16 species from 5 families. (Ahson and Iqbal, 1975) surveyed butterflies from different localities of Lahore. (Ambrose and Raj, 2005) from India identified 24 species belongs to 9 families but 4 families were described in detail while from the present research, only 23 species, 8 genera and 5 families were identified. (Martinez *et al.*, 2003) identified 1800 species from Maxico having 10% of the butterflies of the world. The 21 localities were recognized due to abundance of butterflies and comparisons were made between these localities in Maxico. (Borang *et al.*, 2008) from India identified 134 species belongs to 8 families and 81 genera Nymphalidae (28 genera), Papilionidae (9 genera) and Pieridae (10 genera) whereas in the present study 23 species, 18 genera belonging to 5 families were reported.

## V. CONCLUSION

Haripur city is the natural habitat of butterflies that's support breeding and survival of butterflies. The pattern of diversity and species richness of butterflies were diverse in these habitats.

## REFERENCES

- A. M. Mayur, S. Hattappa, M. Mahadevamurthy and AK Chakravarthy, "The impact of newly established Bangalore international airport on local biodiversity", Gobar journal of biology, agriculture and health sciences, 2(2) 2013, pp. 49-53.
- J. R. Alfred, AK. Das and AK. Sanyal, "Faunal Diversity in India, ENVIS Centre", Zoological Survey of India, Kolkata, 1998, pp. 497.
- F. Perveen and A. Ahmad, "Checklist of butterfly fauna of Kohat, Khyber Pakhtunkhwa, Pakistan", Arthro- pods, 1, 2012, pp. 112-117.
- J. Ghazoul, "Impact of logging on the richness and diversity of forest butterflies in a tropical dry forest in Thailand," Biodiversity Conservation, 11, 2002, pp. 521-541.

- P. R. Ackery, C.R. Smith, and R.I. Vane-Wright, "Carcasson's African Butterflies An Annotated Catalogue of the Papilionoidea and Hesperioidea of the Afrotropical Region," CSIRO, Canberra, Australia, 1995,
- S. A. Hassan, "Butterflies of Islamabad and Murree Hills," Asian Study Group, Islamabad, Pakistan, 1994, pp. 1-68.
- M. Attaullah, N. Haq, I.D. Buner, and R. Ullah, A. Rahim, " Diversity of butterfly fauna of doag Dara, Sheringai, Dir Upper, Pakistan," J. Bio. & Env. Sci, 13(2), 2018, pp. 297-305.
- M. R. Khan, M.A. Rafi, M. Ilyas, and M. Safder, "Distribution and diversity of Papilio spp. (Lepidoptera: Papilionidae) Rawalpindi and Islamabad," Pakistan Journal of Scientific, 52(1-2), 2000, pp. 1-3.
- M. R. Khan, M.A. Rafi, M. Munir, S. Hussain, M.W. Baig, and M.W. Khan, "Biodiversity of butterflies from district Kotli, Mirpur and Bhimber, Azad Kashmir," Pakistan Journal of Zoology, 39, 2007, pp. 27-34.
- F. Naz, M. Ilyas, M. Ashfaq, and A. Shahzad, "The genus Junonia (Lepidoptera: Nymphalidae) in Pakistan," Sarhad J. Agric. 25(1), 2010, pp. 267-70.
- Rrower, and J. V Zandt, (1958). "Experimental studies of mimicry in some North American butterflies Part I," The monarch, *Danaus plexippus*, and viceroy, *Limenitis archippus*. EVO. 12, 1958, pp. 3247.
- M, Abbas, M.A. Rafi, M. Inayatullah, and P. Pavulaan, "Taxonomy and distribution of butterflies of the Skardu region, Pakistan," The International Lepidoptera Survey (TILS), USA, Taxonomic Report, 3, 2002, pp. 15.
- M. Tayyab, A. Suhail, A. Shazia. and M. Arshad, "Biodiversity of Lepidopterous insects in agro-forest area of Bahawalpur," Pakistan Entomologist, 28(22), 2006, pp. 11-20.
- F. Perveen, and A. Ahmad, "Exploring butterfly fauna (Lepidoptera) of Kohat, Khyber Pakhtunkhwa, Pakistan," Signpost Open Access Journal of Entomological Studies, 1, 2012, pp. 94-107.
- F. Perveen, and F. Fazal, "Biology and distribution of butterfly fauna of Hazara University, Garden Campus, Mansehra, Pakistan," Journal of Animal Science, 3, 2013, 28-36.
- F. Perveen, A. Khan, and Sikander, "Characteristics of butterfly (Lepidoptera) fauna from Kabal, Swat, Pakistan," JEZS, 2 (1), 2014, pp. 56-69.

- F. Perveen and Haroon. (2016). "A contribution key for identification of butterflies (Lepidoptera) Tehsil Tangi, Khyber Pakhtunkhwa, Pakistan," International Academy of Ecology and Environmental Sciences. 5(3), 2016, pp. 97-108.
- M. Jorge, Soberón<sup>1</sup>, B. Jorge, Lorene and Leonor Onate, "The use of specimen-label databases for conservation purposes: an example using Mexican Papilionid and Pierid butterflies," Biodiversity and Conservation 9, 2000, pp. 1441–1466.
- Koi. Sandy, Craig, van. Der. Heiden, "Butterfly Diversity on a Southeast Florida Military Base Located within an Urban Matrix," Journal of Zoological Research, 2 (3),2020.
- J. S. Garth, and J.W. Tilden,(1986). "California Butterflies University of California Press, Berkeley, California," 1986.
- Rosset, N. Gary, Fales, M. Henry, Lloyd. and Helen, A. Jones, Tappey, Sokoloski, A. Edward, Marshall-Batty, Kimberly, Blum, S. Murray, "Novel Chemistry of Abdominal Defensive Glands of Nymphalid Butterfly *Agraulisvanillae*," Journal of Chemical Ecology, 27(6), 2001, pp. 1219–1228.
- G. Beccaloni, M. Scoble, I. Kitching, T. Simonsen, G. Robinson, B. Pitkin, A. Hine, C. Lyal, eds. "Heliconius charithonia," 2003.
- M. R. Khan, M.A. Rafi, M. Munir, S. Hussain, M.W. Baig, and M.W. Khan, "Biodiversity of butterflies from district Kotli, Mirpur and Bhimber, Azad Kashmir," Pakistan Journal of Zoology, 39, 2007, pp. 27-34.
- M. R. Khan, R. Ahmad, M.R. Khan, A. Hayat, and M. Khalid, (2003) "Diversity of butterflies from district Bagh, Azad Kashmir," Pak. J. BIOL. SCI, 6, 2003, pp. 2007-2009.
- M. R. Khan, M.R. Rafi, M. Ilyas, and M. Safder, "Distribution and diversity of *Papilio* spp. (Lepidoptera: Papilionidae) Rawalpindi and Islamabad," Pakistan Journal of Scientific, 52(1-2), 2000, pp. 1-3.
- T. N. Pandharipande, "Butterflies from Nagpur City, Central India (Lepidoptera: Rhopalocera)," Journal of Research on the Lepidoptera, 29, pp. 1990, 157.
- G. Sharma, and P.C. Joshi, "Diversity of butterflies (Lepidoptera: Insect) from Dholbaha dam (District. Hoshiarpur) in Punjab Shivalik, India," Biological Forum\_An international Journal. 1(2), 2009, pp. 11-14.
- G. A. Lesilic, W.H. Evans, "The butterflies of Chitral," Journal of Bombay Natural History Society, 14, 1903, pp. 666- 678.

- M. Ahsan, and J. Iqbal, "A contribution to the butterflies of Lahore with the addition of new records," *Biologia*, 24(2), 1975, pp. 238-247
- M. Inayatullah, V. Tuzov, M.A. Rafi, M. Ahmad, "The butterflies of the Malakand Agency and Lower Swat, Pakistan," *Helios (Collection of lepidopterological articles)*, Moscow, Sovetsky Sport, Russia, 3, 2002, pp. 94-96.
- J. Iqbal, "A preliminary report on butterflies of district Rawalpindi and Islamabad," *Biologia*, 24, 1978.
- Reakirt.1867. butterflies of america.com. bywikipeda
- M. R. Khan, R. Ahmad, M.R. Khan, A. Hayat and M. Khalid, "Diversity of butterflies from district Bagh, Azad Kashmir," *Pak. J. BIOL. SCI.*, 6, 2003, pp. 2007-2009. doi:10.3923/Pak. J. Biol. Sci.2003.2007.2009
- H. Khan, and F. Perveen, "Distribution of butterflies (Family Nymphalidae) in Union Council Koaz Bahram Dheri, Khyber Pakhtunkhwa, Pakistan," *Social and Basic Sciences Research Review*, 3(1), 2015, pp.52-57.
- M. R. Khan, M.R. Khan, K. Ali, I. Bashir, I.A. Malik, and A. Mir, "Biodiversity of butterflies from districts Poonch and Sudhnoti, Azad Kashmir," *Asian Journal of Plant Sciences*, 3, 2004, pp. 556-560.
- M. Shah, M.A. Rafi, and M. Inayatullah, "Some pierids butterflies of Kohat district," *Sarhad Journal of Agriculture*, 17, 2001, pp. 407-413.
- S. W. Shah, M.A. Rafi, and A. Zia, "Biology of *Pontiadaplidice* (Lepidoptera: Pieridae) on its new host plant *Lepidus pinnatifidum* from Potohar region Pakistan," *JEZS*, 4(3), 2016, pp. 179-183.
- G. Sharma, and P.C. Joshi, "Diversity of butterflies (Lepidoptera: Insect) from Dholbaha dam (District. Hoshiarpur) in Punjab Shivalik, India," *Biological Forum\_An international Journal*, 1(2), 2009, pp. 11-14
- T. J. Roberts, "The Butterflies of Pakistan," Oxford University Press, Karachi, 2001, 290.
- B. Mal, N. Memon, J.K. Turk, S.A. Memon, A.M. Shah, and A.N. Shah, "Checklist of butterfly fauna (Lepidoptera: Rhopalocera) of Sindh," *Pakistan.Pure Appl. Bio.* 3(4), 2014, pp. 199-203.
- D. S. Smith, G. Naseer, Z. Balint, and S.A. Hasan, "Butterflies of the hunza region, Northern Pakistan, and Adjacent Afghanistan," *Holarctic Lepidoptera*, 11(102), 2007, pp. 1-57.

- S. Prabakaran, Y. Chezian, G. Evangelin, and J.S. William, "Diversity of butterflies (Lepidoptera: Rhopalocera) in tiruvallur district, tamilnadu, india," *An International Quarterly Journal of biology and life sciences*, 2(3), 2014, pp. 769-778.
- S. Noor, H.A. Ahmed, F. Mengal, S. Durrani, S. Rasheed, F. Abang, and I.A. Sani, I.A. "An annotated list of the butterfly fauna of Quetta, Pakistan," *JEZS*, 6(1), 2018, pp. 771-777.
- A. Borang, B. B. Bhatt, M. Tamuk, A. Borkotoki, and J. Kalita, "Butterflies of Dihang Dibang biosphere reserve of Arunachal Pradesh, eastern Himalayas, India," *Bulletin of Arunachal Forest Research* 24 (1- 2), 2008, pp. 41-53.
- A. L. Martinez, J.L. Bousquets, I.V.Fernandez, and A.D Warren, "Biodiversity and biogeography of Mexican butterflies (Lepidoptera: Papilionoidea and Hesperioidea)," *Proceedings of the Entomological Society of Washington*, 105, 2003, pp. 209-224.
- W. H. Evans, "Introduction. In: Identification of Indian Butterflies, 2nd Edition," *Bombay Natural History Society*, Mumbai, 1932, pp. 1-35.
- T. N Pandharipande. "Butterflies from Nagpur city, central India (Lepidoptera: Rhopalocera). *Journal of research on the Lepidoptera*, 29. 1990. pp. 157-160  
Online (<https://louisvillezoo.org>).
- A.M. Sabir, A.H. Bhatti, M.A. Rafi, A. and Suhail, "Distribution of Nymphalid butterflies (brush footed) in districts Rawalpindi and Islamabad," *Pakistan Journal of Biological Sciences*, 3(8), 2002, pp. 1253-1254.
- M. Munir, A.W. Jasra1, and S. Rafique, "Lamb production under different systems of management on rangelands of Balochistan," *Pakistan Veterinary Journal*, 28(2), 2008, pp. 68-70.
- J. K Maheshwari, "Endangered pollinators," *Environmental News Archives*, 9, 2003, pp. 32-45.
- S. Dickie, (2012). <http://carbon-based-ghg.blogspot.com/2012/09/butterfliesact-as-wildlife-indicators.htm>.
- P. R. Ehrlich, "The structure and dynamics of butterfly populations, *The Biology of Butterflies*," Academic Press, London, 1984, pp. 25-40.
- J. Shi, Y.B. Luo, J.C. Ran, Z.J. Liu, Q. Zhou, "Pollination by deceit in *Paphiopedilum barbigerum* (Orchidaceae): a staminode exploits innate colour preference of hoverflies (Syrphidae)," *Plant Biology*, 2009, pp. 11:17-28.

- A. Bora, L. R. Meitei, Mitrajit Deb, "Butterfly species richness and diversity in Experimental Botanic Garden, Botanical Survey of India, ERC, Umiam, Meghalaya, India," J Entomol Zool Stud 2(5), 2014, pp. 212-217.
- B. Barb. *Colias eurytheme*". Animal diversity web. University of Michigan Meuseum. Of Zoology, Retrived 10 octber 2013.
- R. K. Varshney, Smetacek, Peter, "A Synoptic Catalogue of the Butterfully of India,"New Delhi, Butterfly Research Center, Bimtal and Indinov Publishing, New Delhi, 2015, pp. 179.
- K. Kunte, S. Sondhi and R. Roy," Butterfly of India," Indian Foundation of Butterflies, V.412, 2022.
- ICUN Red List of Threatened Species. Retrieved 17 August 2018.
- Wu Chunsheng, 2001, Fanuna Sinica Insect vol, 25 Lepidoptera Papilionidae, Science Press, Beijing.