



ISSN: 0976-3376

Available Online at <http://www.journalajst.com>

ASIAN JOURNAL OF
SCIENCE AND TECHNOLOGY

Asian Journal of Science and Technology
Vol. 09, Issue, 04, pp.7964-7969, April, 2018

RESEARCH ARTICLE

BUTTERFLY SPECIES DIVERSITY FROM VIKRAM UNIVERSITY CAMPUS MADHYA PRADESH, INDIA

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ARTICLE INFO

Article History:

Received 27th January, 2018

Received in revised form

20th February, 2018

Accepted 24th March, 2018

Published online 30th April, 2018

Key words:

Butterfly, Diversity,
Species,
Ujjain.

ABSTRACT

The total of 150 individuals of butterfly recorded with 21 species belonging to five families was recorded from Vikram university campus Ujjain during the period from 2014 and 2015. Family - Nymphalidae were most abundant with 9 species followed by family- Pieridae with 4 species and family Lycaenidae with 4 species followed by family- Papilionidae with 3 species and family- Hesperidae with 1 species. The most abundant species were *Eurema hecabe* (family-Pieridae) with 70 individuals followed by *Catopsilia pyranthe* (family- Pieridae) with 28 individuals followed by *Danaus chrysippus* (family- Nymphalidae) with 7 individuals and *Hypolimnas bolina* (family- Nymphalidae) with 7 individuals.

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INTRODUCTION

Butterfly is nectar feeding insects and they are important member in the food chain. They are important pollinators in the ecosystem. They are the favorite for scientific research on loss of habitat and fragmentation, climate changes, pest control, embryology, mimicry, evolution, genetics, population dynamics and biodiversity conservation. Butterflies are found all over the world and found in all types of environments hot and cold, dry and moist, at sea level to the high in the mountain. Most of the butterfly species are found in tropical areas especially tropical rain forest, many of butterfly migrate to avoid adverse conditions of environment. The around 17200 species of butterfly found all around the world of which 1501 species of butterfly are found in India (Kunte, 2000). India has rich butterfly fauna but due to various reasons like as habitat destruction, fire, pesticides uses and weedicides and illegal collection for trade lot of species have become very rare (Sharma and Joshi, 2009).the butterfly fauna may be affected and harmful by many factors like wide variety of human activities such as urbanization, intensive forestry, agriculture and exotic species (New, 1997 and Wagner and Van Driesche, 2010). Butterfly is very sensitive to changes in microclimate and habitats (Erhardt, 1985 and Kremen, 1992).

MATERIALS AND METHODS

The present study has been carried out for a period of two year from 2014 to 2015.

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The observations were made with digital camera (Nikon 7000). The sites were visited in morning hours to note maximum possible of butterflies and record its activities. The recorded species are identifies with the help of photographs by using standard books of Wynter-Blyth, 1957, Kunte (2000) and Kehimkar (2008). A study on various aspect of the problem like species diversity, richness and evenness of butterflies from Vikram University Campus Ujjain were done.

Statistical analysis

The following diversity indexes are used:

Shannon- Wiener Diversity index

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

The Shannon index is an information statistic index, which means it assumes all species are represented in a sample and that they are randomly sampled. In the Shannon index, P is the proportion (n/N) of individuals of one particular species found (n) divided by the total number of individuals found (N), \ln is the natural log, Σ is the sum of the calculations, and s is the number of species.

Simpson index

$$D = 1 / \sum (P_i^2)$$

The Simpson index is a dominance index because it gives more weight to common or dominant species.

Table 1. Taxonomic composition and number of individuals of butterflies recorded from Vikram University Campus Ujjain

S. No	Family	Scientific name	Common name	No. of individuals
1	Nymphalidae	<i>Junonia lemonias</i>	Lemon pansy	6
2	Nymphalidae	<i>Junonia orithya</i>	Blue pansy	5
3	Nymphalidae	<i>Junonia almana</i>	Peacock pansy	1
4	Nymphalidae	<i>Danaus chrysippus</i>	Plain tiger	7
5	Nymphalidae	<i>Danaus genutia</i>	Striped tiger	1
6	Nymphalidae	<i>Hypolimnas bolina</i>	Great eggfly	7
7	Nymphalidae	<i>Tirumala limniace</i>	Blue tiger	2
8	Nymphalidae	<i>Melanitis leda</i>	Common evening brown	1
9	Nymphalidae	<i>Phalantha phalantha</i>	Common leopard	2
10	Pieridae	<i>Eurema hecabe</i>	Common grass yellow	70
11	Pieridae	<i>Catopsilia pyranthe</i>	Mottled emigrant	28
12	Pieridae	<i>Ixias marriane</i>	White orange tip	3
13	Pieridae	<i>Cepora nerissa</i>	Common gull	4
14	Papilionidae	<i>Papilio demoleus</i>	Lime butterfly	1
15	Papilionidae	<i>Graphium doson</i>	Common jay	2
16	Papilionidae	<i>Graphium agamemnon</i>	Tailed jay	3
17	Lycaenidae	<i>Chilades parrhasius</i>	Small cupid	3
18	Lycaenidae	<i>Tarucus nara</i>	Striped pierrot	1
19	Lycaenidae	<i>Zizina otis</i>	Lesser grass blue	1
20	Lycaenidae	<i>Freyeria putli</i>	Oriental grass jewel	1
21	Heperiidae	<i>Hasora chromus</i>	Common banded awl	1



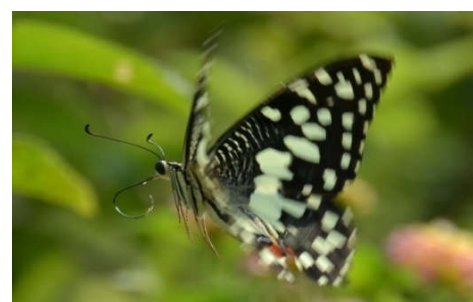
Junonia almana
(Peacock pansy)



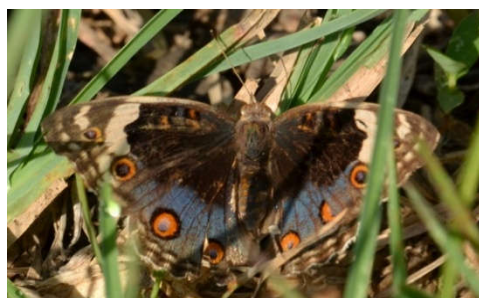
Danaus chrysippus
(Plain tiger)



Chilades parrhasius
(Small cupid)



Papilio demoleus
(Lime butterfly)



Junonia orithya
(Blue pansy)



Zizina otis
(Lesser grass blue)

Figure 2. Photographs of butterfly species recorded from Vikram university campus Ujjain



Eurema hecabe
(Common grass blue)



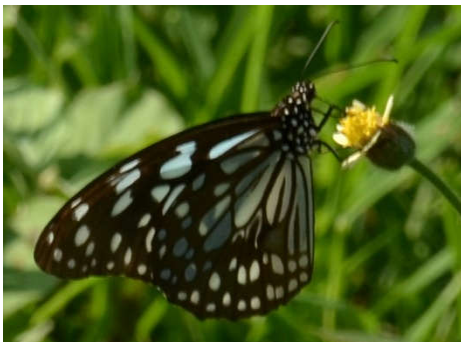
Junonia lemonias
(Lemon pansy)



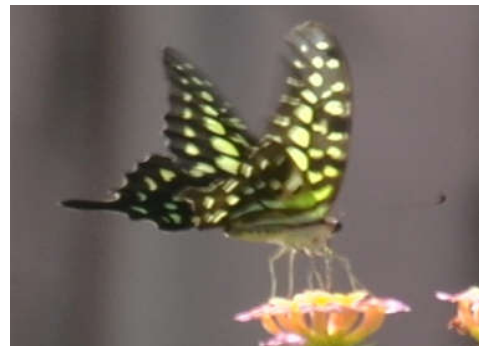
Ixias marrianna
(White orange tip)



Cepora nerissa
(Common gull)



Tirumala limniace
(Blue tiger)



Graphium agamemnon
(Tailed jay)



Tarucus nara
(Striped pierrot)



Hypolimnas bolina
(Great eggfly)

Figure 2. Photographs of butterfly species recorded from Vikram university campus Ujjain



Catopsilia pyranthe
(Mottled emigrant)



Hasora chromus
(Common banded awl)



Graphium doson
(Common jay)



Melanitis leda
(Common evening brown)



Danaus genutia
(Striped tiger)



Phalantha phalantha
(Common leopard)



Freyeria putli
(Oriental grass jewel)

Figure 3. Photographs of butterfly species recorded from Vikram university campus Ujjain

In this case, a few rare species with only a few representatives will not affect the diversity. In the Simpson index, P_i is the proportion (n/N) of individuals of one particular species found (n) divided by the total number of individuals found (N), Σ is still the sum of the calculations, and s is the number of species.

Measurement of species richness

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

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

S = total number of species

N = total number of individuals in the sample

\ln = natural logarithm

Measurement of evenness

For calculating the evenness of species, the Pielou's Evenness index (J) was used.

$$J = H / \ln S$$

H = Shannon- Wiener diversity index

S = total number of species in the sample

\ln = natural logarithm

Table 2. Calculation of Diversity in Vikram University Campus Ujjain

Species	No. of individuals (n)	n/N	Pi	pi ²	ln pi	pi lnpi
Lemon pansy	6	6/150	0.04	0.0016	-3.218	-0.128
Blue pansy	5	5/150	0.033	0.00108	-3.411	-0.112
Peacock pansy	1	1/150	0.006	0.00003	-5.115	-0.030
Plain tiger	7	7/150	0.046	0.00211	-3.079	-0.141
Striped tiger	1	1/150	0.006	0.00003	-5.115	-0.030
Great eggfly	7	7/150	0.046	0.00211	-3.079	-0.141
Blue tiger	2	2/150	0.013	0.00016	-4.342	-0.056
Common evening brown	1	1/150	0.006	0.00003	-5.115	-0.030
Common leopard	2	2/150	0.013	0.00016	-4.342	-0.056
Common grass yellow	70	70/150	0.466	0.21715	-0.763	-0.355
Mottled emigrant	28	28/150	0.186	0.03459	-1.682	-0.312
White orange tip	3	3/150	0.02	0.0004	-3.912	-0.078
Common gull	4	4/150	0.026	0.00067	-3.649	-0.094
Lime butterfly	1	1/150	0.006	0.00003	-5.115	-0.030
Common jay	2	2/150	0.013	0.00016	-4.342	-0.056
Tailed jay	3	3/150	0.02	0.0004	-3.912	-0.078
Small cupid	3	3/150	0.02	0.0004	-3.912	-0.078
Striped pierrot	1	1/150	0.006	0.00003	-5.115	-0.030
Lesser grass blue	1	1/150	0.006	0.00003	-5.115	-0.030
Oriental grass jewel	1	1/150	0.006	0.00003	-5.115	-0.030
Common banded awl	1	1/150	0.006	0.00003	-5.115	-0.030

RESULTS AND DISCUSSION

In university campus 150 butterfly recorded with 21 species, these species are *Junonia lemonias* (lemon pansy) with 6 individuals, *Junonia orithya* (blue pansy) with 5 individuals, *Junonia almana* (peacock pansy) with 1 individuals, *Danaus chrysippus* (plain tiger) with 7 individuals, *Danaus genutia* (striped tiger) with 1 individuals, *Hypolimnas bolina* (great eggfly) with 7 individuals, *Tirumala limniace* (blue tiger) with 2 individuals, *Melanitis leda* (common evening brown) with 1 individuals, *Phalantha phalantha* (common leopard) with 2 individuals, *Eurema hecabe* (common grass yellow) with 70 individuals, *Catopsilia pyranthe* (mottled emigrant) with 28 individuals, *Ixias marriane* (white orange tip) with 3 individuals, *Cepora nerissa* (common gull) with 4 individuals, *Papilio demoleus* (lime butterfly) with 1 individuals, *Graphium doson* (common jay) with 2 individuals, *Graphium agamemnon* (tailed jay) with 3 individuals, *Chilades parrhassius* (small cupid) with 3 individuals, *Tarucus nara* (striped pierrot) with 1 individuals, *Zizina otis* (lesser grass blue) with 1 individuals, *Freyeria putli* (oriental grass jewel) with 1 individuals and *Hasora chromus* (common banded awl) with 1 individuals. The most abundant family is Nymphalidae with 9 species (*Junonia lemonias*, *Junonia orithya*, *Junonia almana*, *Danaus chrysippus*, *Danaus genutia*, *Hypolimnas bolina*, *Tirumala limniace*, *Melanitis leda*, *Phalantha phalantha*) followed by family pieridae with 4 species (*Eurema hecabe*, *Catopsilia pyranthe*, *Ixias marriane*, *Cepora nerissa*) and Lycaenidae with 4 species (*Chilades parrhassius*, *Tarucus nara*, *Zizina otis*, *Freyeria putli*) followed by family Papilionidae with 3 species (*Papilio demoleus*, *Graphium doson* and *Graphium agamemnon*) and family Hesperidae is least with 1 species (*Hasora chromus*).

Shannon index (H)

$$H = -(-0.128 + -0.112 + -0.030 + -0.141 + -0.030 + -0.141 + -0.056 + -0.030 + -0.056 + -0.355 + -0.312 + -0.078 + -0.094 + -0.030 + -0.056 + -0.078 + -0.078 + -0.030 + -0.030 + -0.030 + -0.030) = 1.925.$$

Simpson index (D)

$$D = 1 / (0.0016 + 0.00108 + 0.00003 + 0.00211 + 0.00003 + 0.00211 + 0.00016 + 0.00003 + 0.00016 + 0.21715 + 0.03459 + 0.0004 + 0.00067 + 0.00003 + 0.00016 + 0.0004 + 0.0004 + 0.00003 + 0.00003 + 0.00003 + 0.00003) = 1 / 0.26123 = 3.82$$

Measurement of species richness

$$\text{Margalef's index} = (21-1) / \ln 150 = 20/5.01$$

$$\text{Margalef's index} = 3.992$$

Measurement of evenness

$$J = 1.925 / \ln 21 = 1.925 / 3.044$$

$$J = 0.632$$

Conclusion

The present research have concludes that the family-Nymphalidae carries the maximum number of species (9) than other families and Hesperidae is rare family carries only one species. *Eurema hecabe* is most abundant species followed by *Catopsilia pyranthe*.

Acknowledgement

The authors are grateful to Principal Dr. Usha Shrivastava and all staff of the department of Zoology, Govt. Madhav Science P.G. College Ujjain for their constant encouragement and for providing the necessary facilities.

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