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Butterfly species diversity and richness in Govt. science PG. College Rewa Madhya Pradesh (India)

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Abstract
Butterflies are not only beautiful creatures but do a great deal for the environment. Like bees, they are plant pollinators, and they provide population control for a number of plant and even insect species by eating them. They also serve as sustenance for other species. A study to find out the diversity and richness of butterflies at the Govt. Science P.G. College Rewa, India was carried out over a period of two years from 2021 to 2022. A total 38 butterfly species belonging to 5 families and 01 order. The maximum number of species belong to family Nymphal idea with 15 species, Lucanidae with 08 species, Pieridine with 07 species, Papilionoidea with 05 species, and minimum number of 03 species Hesperides. Out of 38 species *Eurema hecabe* was the most dominate species followed by *Talicada nyseus* and *Catopsilia pyranthe*. The most abundant species are *Eurema he Cabe* (with 74 individual) followed by *Talicia nisus* (with 34 individual) and *Catonsville pyran the* (with 24 individual). Diversity and richness of butterfly species were calculated during the course of study which were H=2.401 and 5.664 respectively. Dominance of the species can be explained by the presence of their larval form and host plants in the college campus.

Keywords: Diversity, nymphalid, Eurema, Talicada, *Catopsilia*

Introduction
Butterflies are one of the most conspicuous species of the Earth's biodiversity. Being extremely responsive to any changes in their environment, namely temperature, humidity, light and rainfall patterns (Murphy & Weiss, 1988 and Brereton & Roy, 2011) [1, 2]. Butterflies are lovely and graceful insects provide economic and ecological benefits to the human society (Gupta *et al* 2012) [3]. Butterflies play an immense role in pollination brings variations through kinds of pollen dispersion from one place to another place (Mahendra *et al.* 2013) [4]. Although India has a rich butterfly fauna, but due to various reason such as habitat destruction, fire, use of pesticides and weedicides and illegal collection for trade, many species have become very, and some are on the verge of extinction. Increase urbanization one of the main causes of decrease butterfly species richness, diversity and abundance (Blair and Launer, 1997; Clark *et al*. 2007 and Pocewicz, *et al.* 2009) [5, 6, 7].
The present study aims to examine the diversity and richness of butterfly species in the Govt. Girls' P.G. College campus. Purpose of study also kindle the light of bio-ethical spirit and sense to justify the protection of butterfly's biodiversity and to arouse the sense of responsibility to prevent environmental degradation and destruction. A checklist of butterfly species with common name, scientific name, family name and number of individuals documented during the course of study.

Material and Methods
Rewa is located at 24°32' N 81°18' E. It has an average elevation of 275 meters (902 feet). It is connected by all-weather roads to Allahabad, Mirzapur, Siddhi, Shahdol, Satna, Katni and Sirmour. Rewa town has its own importance on account of its location, where rich mineral deposits are found out of these three main rock formations; mirror sand, iron ore and Limestone are prominent.

Study Area: The study done in the Govt. Science P.G. College Rewa M.P., India, from February 2020 to January 2022. The survey of butterflies was done using Pollard walk method (Kunte, 2000 and Mahendra *et al.* 2013) [8, 4], from 8 am to 10 am.

Identification of butterflies done by standard book and e-identification by various software. The observations were made with digital camera (Nikon 7000). The recorded species were identified with the help of photographs by using standard books (Kunte, 2000, Winter-Blyth, 1957, Kehimkar, 2008) [8-10]. The present work provided the update comprehensive checklist of butterflies in the study area with their abundance and diversity.

Data Analysis

Shannon- Wiener Diversity Index

SH' = -Σpi in pi

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 (Pielou, 1969) [11].

Simpson Index

D= 1/Σ (P^2)

The Simpson index is a dominance index because it gives more weight to common or dominant species. In this case, a few rare species with only a few representatives will not affect the diversity. In the Simpson index, Pi 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

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

Marg alef's index = (S - 1) / In N

Where S = total number of species

N = total number of individuals in the sample

In = natural logarithm

Measurement of Evenness

For calculating the evenness of species, the Pielou's Evenness index (J) was used (Pielou, 1969 and Tiple, *et al.* 2007) [11-12].

J = H / In S

Where H= Shannon-Wiener diversity index

S = total number of species in the sample

Results and Discussion

In Govt. Science P.G. College Rewa 202 butterfly recorded with 31 species belonging to 05 family and one order. The butterfly checklist is given in the Table-1. The most abundant species are *Eurema hecabe* (with 74 individual) followed by *Talicada nyseus* (with 34 individual) and *Catopsilla pyranthe* (with 24 individual). The greatest number of all these three species accorded in everywhere of college campus. In the college campus 06 species of butterfly recorded number of individual one other than more. Out of five family of butterfly Nymphalid were the most commonly recorded, accounting for 39.47% (n=15) of total species recorded followed by Lucanidae 21.05% (n=08), Pieridae 18.42% (n=07) of total species, Papilionoidea 13.16% (n=5) and the minimum number of species were recorded for Hesperidia 7.89% (n=3) which given in Fig-1. In College campus butterflies statical calculation recorded H=2.401 (Shannan diversity index), D=5.94 (Simpson index), Richness 5.664 (Marg alef's index) and J = 0.68 (Pielou's Evenness index). 38 species observed during the study, Nymphalid dominant family and *Eurema hecabe* most abundance species in the Govt. Science P.G. College, Rewa (M.P.), India. There are many studies have shown butterflies diversity in many institutes and college campus Bhopal & Ujjain city (Sprih, 2014 and Shobha, 2018) [13-14]. There are many studies that have shown higher butterfly diversity in disturbed habitat or forest gaps than that in dense forest or closed canopy (Wood & Gillman, 1998 and Blair,1999) [15,16].

Human interference result in more gaps, edges which provide lighter and space, and diversity in plant structure to support more butterfly species than natural forest (Blair, 1999; Sparrow, *et al*. 1994 and Hamer, *et al.* 1997) [16-18]. The correlation of disturbance and occurrence of butterflies is attributed to the emergence of secondary vegetation like Lantana camera and so forth, which are good food source of many butterfly species (Brereton and Roy, 2011) [2]. Many species of butterflies depend on remnant vegetation or secondary forest for survival especially in urban areas (Sparrow, *et al.* 1994 and Saikia, *et al.* 2009) [17,19]. So, for the conversation of species in human dominated landscape, institutional campus maintaining high plant diversity and also different type of habitats is a good option.

Table 1: Taxonomic composition and number of individuals of butterflies recorded from Govt. Science P.G. College, Rewa, India

S. No.	Common Name	Scientific Name	Number of individuals
	Nymphalid		
1.	Lemon pansy	*Junonia lemonias*	05
2.	Blue pansy	*Junonia orithya*	02
3.	Peacock pansy	*Junonia almana*	04
4.	Grey pansy	*Junonia atlites*	01
5.	Lemon Pansy	*Junonia* hierta	02
6.	Common tiger	*Danaus chrysippus*	05
7.	Striped tiger	*Danaus genutia*	06
8.	Blue tiger	*Tirumala limniace*	03
9.	Common crow	*Euploea core*	08
10.	Common evening brown	*Melanitis leda*	04
11.	Common castor	*Ariadne merione*	02
12.	Common leopard	*Phalantha phalantha*	03
13.	Chocolate Pansy	*Precis iphita*	04
14.	Common five ring	*Ypthima baldus*	01
15.	Common palm fly	*Elymnias hypermetria*	02

		Lucanidae	
16.	Common Gen.	Portia hewitsoni	04
17.	Small cupid	*Chiladesparrhassius*	02
18.	Common Brownie	Miletus chinensis	06
19.	Striped Pierrot	*Tarucus nara*	01
20.	Common Pierrot	*Castalius rosimon*	02
21.	Red Pierrot	*Talicada nyseus*	34
22.	Lesser grass blue	*Zizina otis*	05
23.	Powdered oak blue	*Arthopala bazalus*	03
		Pieridae	
24.	Bath whites	*Pontia daplidice*	05
25.	Common gull	*Cepora nerissa*	03
26.	Common grass yellow	*Eurema hecabe*	74
27.	Mottle emigrant	*Catopsilia pyranthe*	24
28.	White, orange tip	*Ixias marrianne*	02
29.	Indian pioneer	*Belenois aurita*	03
30.	Common jezebel	*Delias eucharis*	02
		Papilionidae	
31.	Snow Apollos	*Parnassius hardwickei*	06
32.	Lime butterfly	*Papilio demoleus*	02
33.	Tailed jay	*Graphiuma gamemnon*	01
34.	Spot sward tail	*Graphium nomius*	03
35.	Spot Swordtail	*Pathysa nomius*	04
		Hesperidia	
36.	Awlets	*Bibasis vasutana*	02
37.	Indian skipper	*Spialiag alba*	01
38.	Brown Awl	*Badamia exclamationis*	01

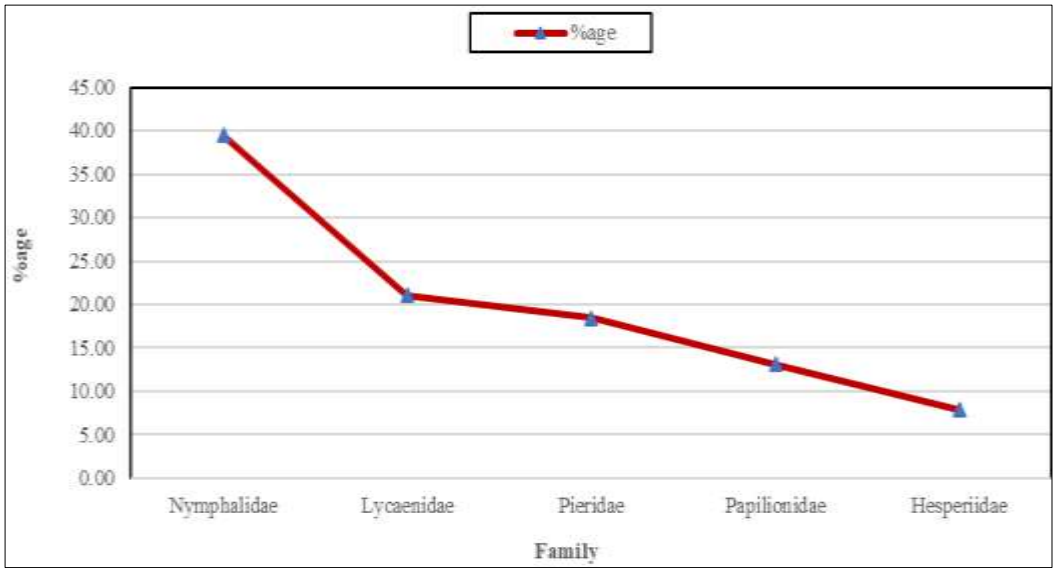

Fig 1: Graph analysis of family wise species distribution percentage.

Conclusion

The present study conclude family Nymphalid carries the maximum number of species than followed by Lucanidae, Pieridine, Papilionoidea and Hesperidia. This study would be useful to conserve wide range of indigenous butterfly species in on area. Butterfly plays important role in our ecosystem, act as a pollinator, a food source and an indicator of the ecosystem's wellbeing. The sole purpose of the present investigation is that diversity of butterflies of Govt. Science P.G College Rewa (M.P.), India, highlights on global scenario and light lamp for lepidopterologist. Butterfly species richness are natural wealth of Govt. Science P.G. College Rewa (M.P.), India.

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