



## Butterfly papilionoidea (Lepidoptera, Rhopalocera) fauna from Jabalpur region (M.P.): Preliminary survey

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### Abstract

Biological diversity refers to the variety of life on Earth including plants, animal, Bacteria and Fungi. Butterflies are one of the most important assemblages of insects that act as bio indicators as well as nature's gardeners. The present paper is based on the Survey Report on the Butterfly fauna of Jabalpur Region, Madhya Pradesh. Faunistic surveys were undertaken during July 2021- August 2022 and a total of 1143 individuals Lepidoptera (Rhopalocera) belonging to 47 species, 39 genera under 04 families from various localities in and around the Jabalpur, of which the members of family *Nymphalidae* is outnumbering the other butterfly families. Moreover, the study revealed 08 butterfly species newly recorded in the Central Indian landscape. Shannon-Weiner diversity index of the study site is -3.506764433 showing high diversity which is inversely proportional to Simpson Index value that is 0.034935156. The area of study having high organic pollution and rich diversity of butterflies, therefore it should be of great importance for conservation. The aim of this research is to contribute to the development of planning and management strategies for diversity restoration in the studied area.

**Keywords:** biodiversity, host plant, family, butterflies, species richness

### Introduction

Being the most beautiful and colorful creatures, the aesthetic importance of butterflies has increased a lot. Lepidoptera (Rhopalocera) maintaining the balance of nature. They are generally regarded as the best taxonomically studied group of insects. Second largest insect order Lepidoptera (Butterflies; Rhopalocera and Moths; Heterocera), about 1,49,969 species recorded worldwide belonging to 126 families (Life Catalog, 2021). In the entire continent, No Lepidoptera species have been recorded so far in the continent of Antarctica. Butterflies show Holometabolism and pass through different stages like egg, larva, pupa and adult stage. They play a role as pollinators and food chain components, as well as enabling the maintenance of ecosystem services. Being an indicator of the health and quality of ecosystems, butterfly finding becomes important. Butterflies serve as important plant pollinators in the local environment, and help to pollinate more than 50 economically important plant crops (Borges *et al.*, 2003) [2]. Butterflies are also good indicators of environmental changes as they are sensitive to habitat degradation and climate changes (Kunte, 2000) [7]. Tiple (2011) [12] reported in his research that the Indian subcontinent hosts about 1,504 species of butterflies, of which peninsular India and the Western Ghats host 351 and 334 species, respectively. In the recent past, several researchers have studied butterflies from some districts and conservation areas of Madhya Pradesh and Chhattisgarh (Singh and Chandra, 2002; Siddiqui and Singh, 2004; Chandra, 2006) [11, 5, 4]. Chandra

*et al.*, (2007) [5] recorded 174 species of butterflies belonging to eight families from Madhya Pradesh and Chhattisgarh.

### Material and Methods

Jabalpur (Known as Sanskardhani) is one of the largest cities in Madhya Pradesh and located in the centre of India at 23.17°N and 79.94°E (Map 01). The city of Jabalpur has a humid subtropical climate with a wet monsoon season from June to October, a cool dry winter from October to March, and a hot dry season from April to early June with the onset of rains. Minimum temperature recorded 10°C and maximum 45°C, humidity 11-17% to 62-96%. The annual rainfall is on average 1,388 mm. All research sampling sites were within and around Jabalpur region within 30km radius. The research is based on 01 year random surveys conducted during July 2021- August 2022 around Jabalpur region, Madhya Pradesh. Butterfly abundance and seasonality was observed from 5am to 11am in the morning and from 4pm to 7pm in the evening by line transect counting. Butterflies were identified in the field directly by observation and in difficult cases followed by capture or photography. In critical situations, samples were collected with handheld aerial sweep nets. Each sample was placed in a plastic bottle and taken to the laboratory for further identification with the help of a field guide (Wynter-Blyth, 1957; Kunte, 2000) [18, 7]. In the present study, all scientific names followed Varshney and Smetacek (2015) [17] and Kehimkar (2016) [6] guidelines.



Fig 1: Jabalpur Region of Madhya

The observed butterflies were categorized in four categories on the basis of their records in sampling sites i.e., Very common (VC), Common (C), Very Rare (VR) and Rare (R) (Tiple *et al.*, 2006) [15]. The Shannon-Weiner diversity index

(H) was calculated using the Shannon-Wiener equation according to Mangurran [8], (1988) and the dominance index, that is Simpson index (C), was calculated according to Simpson E.H. (1949) [10].

Table 1: Systematic list of Butterflies reported from Jabalpur Region (M.P.)

S. No.	Scientific Name	Common Name	Status	Total No. of Recorded Species	Flight Duration/Season
Order: Lepidoptera Suborder: Rhopalocera Superfamily: Papilionoidea Family – Nymphalidae					
	<i>Elymnias hypermnestra</i> (Linnaeus, 1763)	Common Palmfly	R	05	W
	<i>Ariadne merione</i> (Cramer, [1777])	Common Castor	C	25	PM, W, S
	<i>Hypolimnas bolina</i> (Linnaeus, 1758)	Great Eggfly	C	28	PM, W
	<i>Symphaedra nais</i> (Forster, 1771)	Baronet	C	30	PM, S
	<i>Euploea core</i> (Cramer, [1780])	Common Crow	VC	52	S, M, PM,W
	<i>Melanitis leda</i> (Linnaeus, 1758)	Common Evening Brown	VC	55	S, M, PM,W
	<i>Melanitis phedima</i> (Cramer, [1780])	Dark Evening Brown	VC	56	S, M, PM,W
	<i>Junonia lemonias</i> (Linnaeus, 1758)	Lemon Pansy	VC	59	S, M, PM,W
	<i>Junonia almana</i> (Linnaeus, 1758)	Peacock Pansy	C	32	W,S
	<i>Junonia atlites</i> (Linnaeus, 1763)	Grey Pansy	VC	55	S, M, PM,W
	<i>Junonia iphita</i> (Cramer, [1779])	Chocolate Pansy	C	35	W,S
	<i>Junonia orithya</i> (Linnaeus, 1758)	Blue Pansy	C	40	W,S
	<i>Acraea violae</i> (Fabricius, 1793)	Tawny Coster	R	11	W
	<i>Mycalesis mineus</i> (Linnaeus, 1758)	Dark brand Bushbrown	R	08	PM
	<i>Neptis hylas</i> (Linnaeus, 1758)	Common Sailer	C	22	W
	<i>Danaus chrysippus</i> (Linnaeus, 1758)	Plain Tiger	VC	60	S, M, PM,W
	<i>Polyura agraria</i> * (Swinhoe, 1887)	Anomalous Nawab	VR	01	PM
	<i>Phalanta phalantha</i> (Drury, [1773])	Common Leopard	R	08	S
	<i>Moduza procris</i> (Cramer, [1777])	Commander	VR	02	W, PM
Family – Pieridae					
	<i>Eurema brigitta</i> (Stoll, [1780])	Small Grass Yellow	C	30	W, S
	<i>Delias eucharis</i> (Drury, 1773)	Common Jezabel	C	32	PM, W

	Pareronia valeria (Cramer, [1776])	Common Wanderer	C	28	W, S
	Catopsilia pomona (Fabricius, 1775)	Common Emigrant	VC	57	S, M, PM,W
	Leptosia nina (Fabricius, 1793)	Psyche	VC	60	S, M, PM,W
	Cepora nerissa (Fabricius, 1775)	Common Gull	C	28	W, PM
	Eurema blanda* (Boisduval, 1836)	Three-spot Grass Yellow	R	08	PM
Family – Lycaenidae					
	Talicauda nyseus (Guerin-Meneville, 1843)	Red Pierrot	R	09	PM
	Tarucus extricatus* Butler 1886	Rounded Pierrot	VR	01	W
	Tarucus nara (Kollar, 1848)	Striped Pierrot	R	06	W
	Cyclargus thomasi* W.P. Comstock & Huntington, 1943	Miami Blue	VR	01	W
	Luthrodes pandava (Horsfield, [1829])	Plain Cupid	C	26	W, PM
	Freyeria putli (Kollar, [1844])	Small Grass Jewel	R	12	W
	Leptotes plinius (Fabricius, 1793)	Zebra Blue	R	09	W, M
	Euchrysops cnejus (Fabricius, 1798)	Gram blue	R	10	W, M
	Prosotas dubiosa* (Semper, [1879])	Tailless Line blue	VR	01	PM
	Castalius rosimon (Fabricius, 1775)	Common Pierrot	C	25	W
	Catochrysops* panormus (C. Felder, 1860)	Forget-me-not	R	08	W
	Prosotas nora* (C. Felder, 1860)	Common Line blue	C	35	W, PM
	Tarucus balkanicus (Freyer, 1844)	Black-spotted Pierrot	R	09	PM
	Zizeeria karsandra (Moore, 1865)	Dark grass blue	VR	02	M
	Rapala iarbus (Fabricius, 1787)	Common Red Flash	VR	01	W, PM
	Zizina hylax (Fabricius, 1775)	Tiny Grass Blue	R	12	W
Family – Papilionidae					
	Papilio polytes Linnaeus, 1758	Common Mormon	VC	52	S, M, PM,W
	Papilio demoleus Linnaeus, 1758	Lime Butterfly	VC	51	S, M, PM,W
	Pachliopta aristolochiae (Fabricius, 1775)	Common Rose	C	22	S, PM,W
	Graphium doson* (C. & R. Felder, 1864)	Common Jay	R	11	PM,W
	Graphium agamemnon (Linnaeus, 1758)	Tailed Jay	R	13	PM,W

\*New to Central India, VC-Very Common (>50sightings), C-Common (20-50sightings), R-Rare (05-20sightings), VR-Very Rare (1-2sightings) M-Monsoon, S-Summer, W-Winter, PM-Post Monsoon.

**Table 2.** Shannon-Weiner Diversity Index calculation for Rhopalocera in Jabalpur region (M.P.)

S. No	Scientific Name	Recorded Species (ni)	Pi=(ni / N)	log Pi = ln (ni/N)	H=Pi x log Pi	C=Pi <sup>2</sup>
Order: Lepidoptera						
Suborder: Rhopalocera						
Superfamily: Papilionoidea						
1.	Elymnias hypermnestra (Linnaeus, 1763)	5	0.0043745	-5.431973751	-0.023761915	1.91358E-05
2.	Ariadne merione (Cramer, [1777])	25	0.0218723	-3.822535839	-0.083607521	0.000478396
3.	Hypolimnas bolina (Linnaeus, 1758)	28	0.0244969	-3.709207154	-0.090864217	0.0006001
4.	Symphaedra nais (Forster, 1771)	30	0.0262467	-3.640214282	-0.095543682	0.00068889
5.	Euploea core (Cramer, [1780])	52	0.0454943	-3.090167945	-0.140585068	0.002069733
6.	Melanitis leda (Linnaeus, 1758)	55	0.048119	-3.034078479	-0.145996777	0.002315437
7.	Melanitis phedima (Cramer, [1780])	56	0.0489939	-3.016059973	-0.147768468	0.0024004
8.	Junonia lemonias (Linnaeus, 1758)	59	0.0516185	-2.96387422	-0.152990883	0.002664474
9.	Junonia almana (Linnaeus, 1758)	32	0.0279965	-3.575675761	-0.100106408	0.000783804
10.	Junonia atlites (Linnaeus, 1763)	55	0.048119	-3.034078479	-0.145996777	0.002315437
11.	Junonia iphita (Cramer, [1779])	35	0.0306212	-3.486063602	-0.106747354	0.000937656
12.	Junonia orithya (Linnaeus, 1758)	40	0.0349956	-3.35253221	-0.117323962	0.001224694
13.	Acraea violae (Fabricius, 1793)	11	0.0096238	-4.643516391	-0.044688259	9.26175E-05
14.	Mycalesis mineus (Linnaeus, 1758)	8	0.0069991	-4.961970122	-0.03472945	4.89878E-05
15.	Neptis hylas (Linnaeus, 1758)	22	0.0192476	-3.95036921	-0.076035103	0.00037047
16.	Danaus chrysippus (Linnaeus, 1758)	60	0.0524934	-2.947067102	-0.154701685	0.002755561
17.	Polyura agraria* (Swinhoe, 1887)	1	0.0008749	-7.041411664	-0.006160465	7.65434E-07
18.	Phalanta phalantha (Drury, [1773])	8	0.0069991	-4.961970122	-0.03472945	4.89878E-05
19.	Moduza procris (Cramer, [1777])	2	0.0017498	-6.348264483	-0.011108074	3.06173E-06
20.	Eurema brigitta (Stoll, [1780])	30	0.0262467	-3.640214282	-0.095543682	0.00068889
21.	Delias eucharis (Drury, 1773)	32	0.0279965	-3.575675761	-0.100106408	0.000783804
22.	Pareronia valeria (Cramer, [1776])	28	0.0244969	-3.709207154	-0.090864217	0.0006001
23.	Catopsilia pomona (Fabricius, 1775)	57	0.0498688	-2.998360396	-0.149524534	0.002486894
24.	Leptosia nina (Fabricius, 1793)	60	0.0524934	-2.947067102	-0.154701685	0.002755561
25.	Cepora nerissa (Fabricius, 1775)	28	0.0244969	-3.709207154	-0.090864217	0.0006001
26.	Eurema blanda* (Boisduval, 1836)	8	0.0069991	-4.961970122	-0.03472945	4.89878E-05
27.	Talicauda nyseus (Guerin-Meneville, 1843)	9	0.007874	-4.844187086	-0.038143205	6.20001E-05
28.	Tarucus extricatus* Butler 1886	1	0.0008749	-7.041411664	-0.006160465	7.65434E-07
29.	Tarucus nara (Kollar, 1848)	6	0.0052493	-5.249652195	-0.027557229	2.75556E-05

30.	Cyclargus thomasi* W.P. Comstock & Huntington, 1943	1	0.0008749	-7.041411664	-0.006160465	7.65434E-07
31.	Luthrodes pandava (Horsfield, [1829])	26	0.0227472	-3.783315126	-0.086059662	0.000517433
32.	Freyeria putli (Kollar, [1844])	12	0.0104987	-4.556505014	-0.047837323	0.000110222
33.	Leptotes plinius (Fabricius, 1793)	9	0.007874	-4.844187086	-0.038143205	6.20001E-05
34.	Euchrysops cnejus (Fabricius, 1798)	10	0.0087489	-4.738826571	-0.04145955	7.65434E-05
35.	Prosotas dubiosa* (Semper, [1879])	1	0.0008749	-7.041411664	-0.006160465	7.65434E-07
36.	Castalius rosomon (Fabricius, 1775)	25	0.0218723	-3.822535839	-0.083607521	0.000478396
37.	Catochrysops* panormus (C. Felder, 1860)	8	0.0069991	-4.961970122	-0.03472945	4.89878E-05
38.	Prosotas nora* (C. Felder, 1860)	35	0.0306212	-3.486063602	-0.106747354	0.000937656
39.	Tarucus balkanicus (Freyer, 1844)	9	0.007874	-4.844187086	-0.038143205	6.20001E-05
40.	Zizeeria karsandra (Moore, 1865)	2	0.0017498	-6.348264483	-0.011108074	3.06173E-06
41.	Rapala iarbus (Fabricius, 1787)	1	0.0008749	-7.041411664	-0.006160465	7.65434E-07
42.	Zizina hylax (Fabricius, 1775)	12	0.0104987	-4.556505014	-0.047837323	0.000110222
43.	Papilio polytes Linnaeus, 1758	52	0.0454943	-3.090167945	-0.140585068	0.002069733
44.	Papilio demoleus Linnaeus, 1758	51	0.0446194	-3.109586031	-0.138747933	0.001990893
45.	Pachliopta aristolochiae (Fabricius, 1775)	22	0.0192476	-3.95036921	-0.076035103	0.00037047
46.	Graphium doson* (C. & R. Felder, 1864)	11	0.0096238	-4.643516391	-0.044688259	9.26175E-05
47.	Graphium agamemnon (Linnaeus, 1758)	13	0.0113736	-4.476462306	-0.050913395	0.000129358
Grand Total		1143			H = -3.506764433	C = 0.034935156

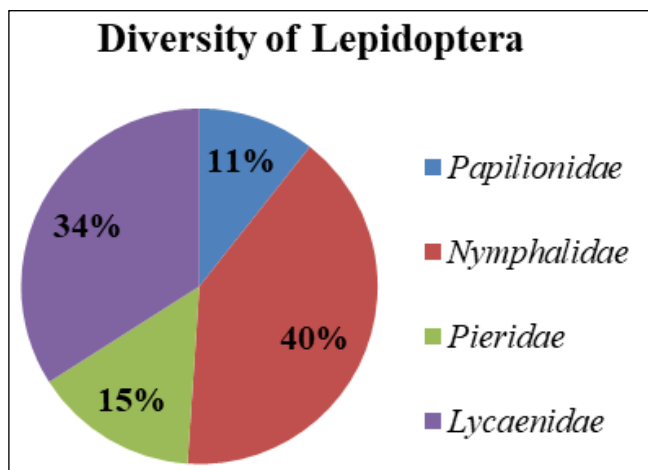


Fig 1: Diversity of Butterfly families.

**Results and Discussion**

A total of 1143 individuals of Lepidoptera (Rhopalocera) belonging to 47 species, 39 genera under 04 families were recorded from various localities in and around the Jabalpur region viz., *Nymphalidae*, *Papilionidae*, *Pieridae* and *Lycaenidae*. During the study, 08 New records were recorded for Central India. Among the species recorded from the Jabalpur region, 40% are belonging to the family *Nymphalidae* showed the maximum species richness, comprising of 19 species with 01 new records *Polyura agraria*, while the others are shown less representatives (Figure 1) i.e., followed by 7 species of *Pieridae* with 01 New record *Eurema blanda*, 16 species of *Lycaenidae* with 05 New record *Tarucus extricatus*, *Cyclargus thomasi*, *Prosotas dubiosa*, *Catochrysops panormus*, *Prosotas nora*, 5 species *Papilionidae* with 01 New record *Graphium doson*. Species wise distribution of Rhopalocera Shown in (Graph 1). Butterflies preference for particular habitat is linked to the availability of larval host plants and adult nectar plants. The rich diversity of butterflies, especially the *Nymphalidae* in Jabalpur indicates a varied assemblage of floral species. Even though family *Lycaenidae*, *Pieridae* and *Nymphalidae* exhibited maximum species diversity, the reason for the abundance of *Nymphalidae* in the study area may be due to

the dominance of larval food plants in the area (Balasubramaniam *et al.*, 2001). Among these species, 7(15%) was very rare, 15(32%) were rare, 15(32%) were commonly occurring and 10 (21%) were very common (Figure 2). It was also noted that 10 species were present in all seasons. Highest number (38) of species was seen during winter season. A total of 28 species were observed during Pre Monsoon, 13 species in Monsoon and 19 during Summer. (Figure 3).

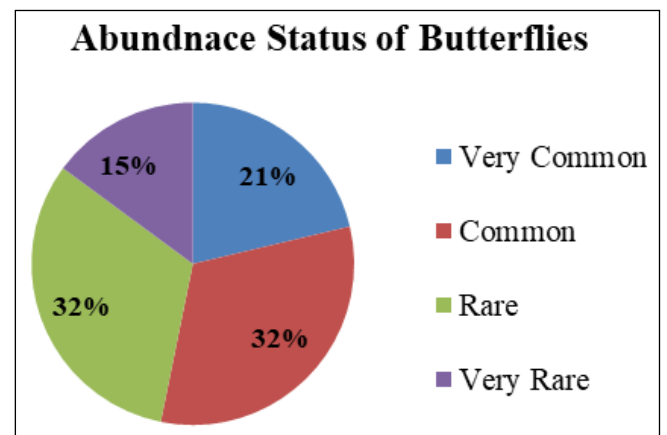


Fig 2: Abundance Status of Butterflies in Jabalpur Region

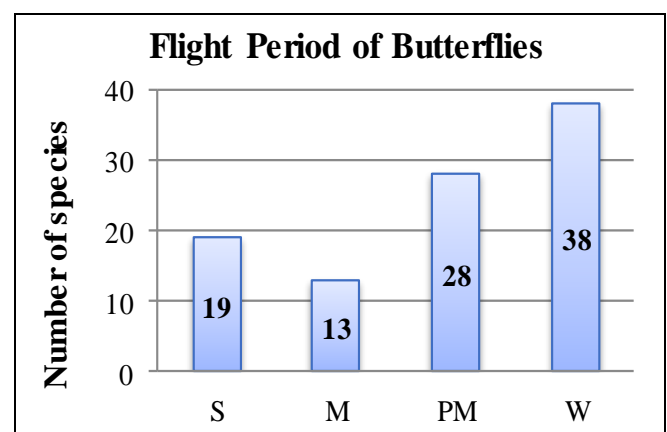
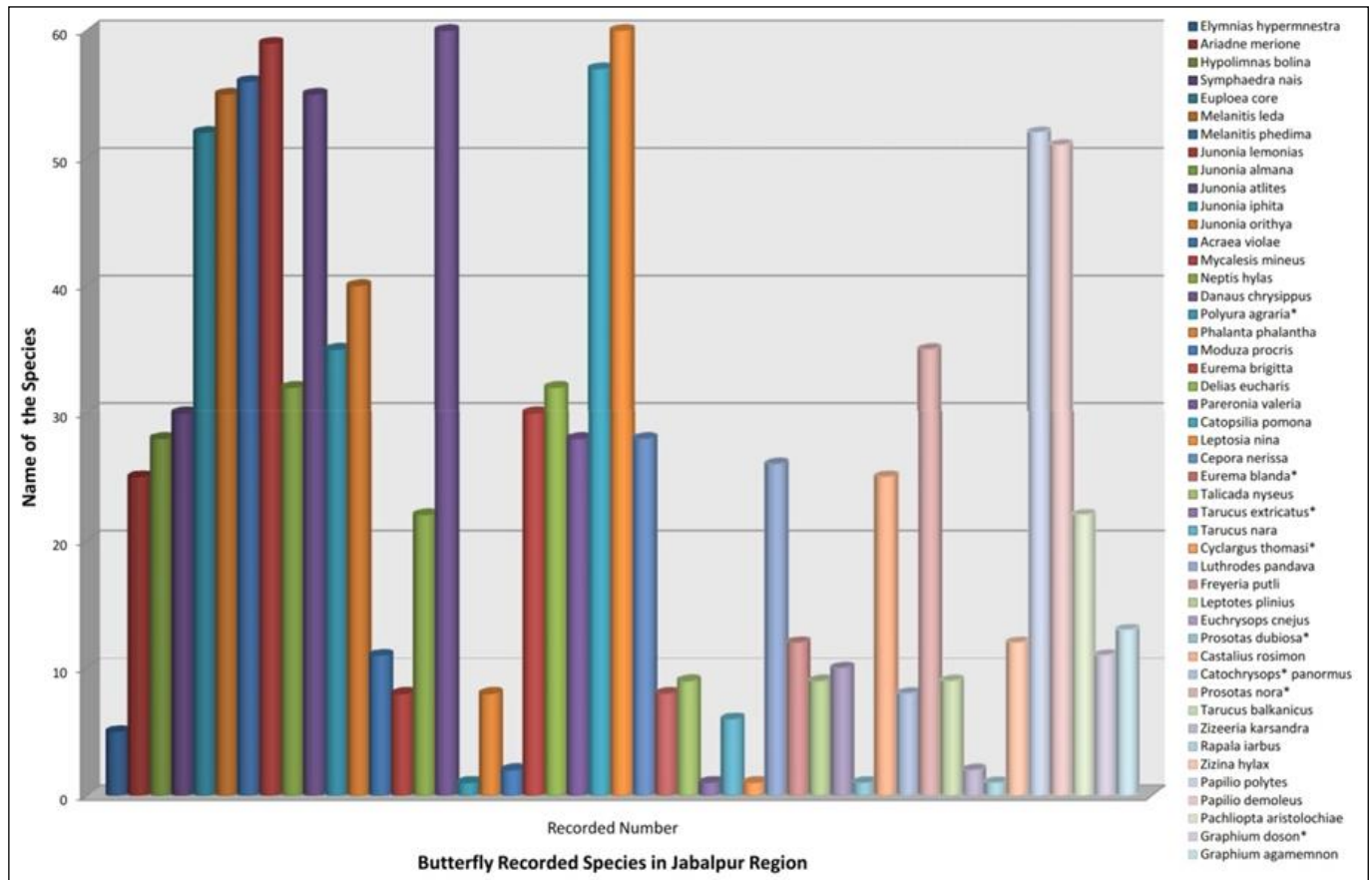


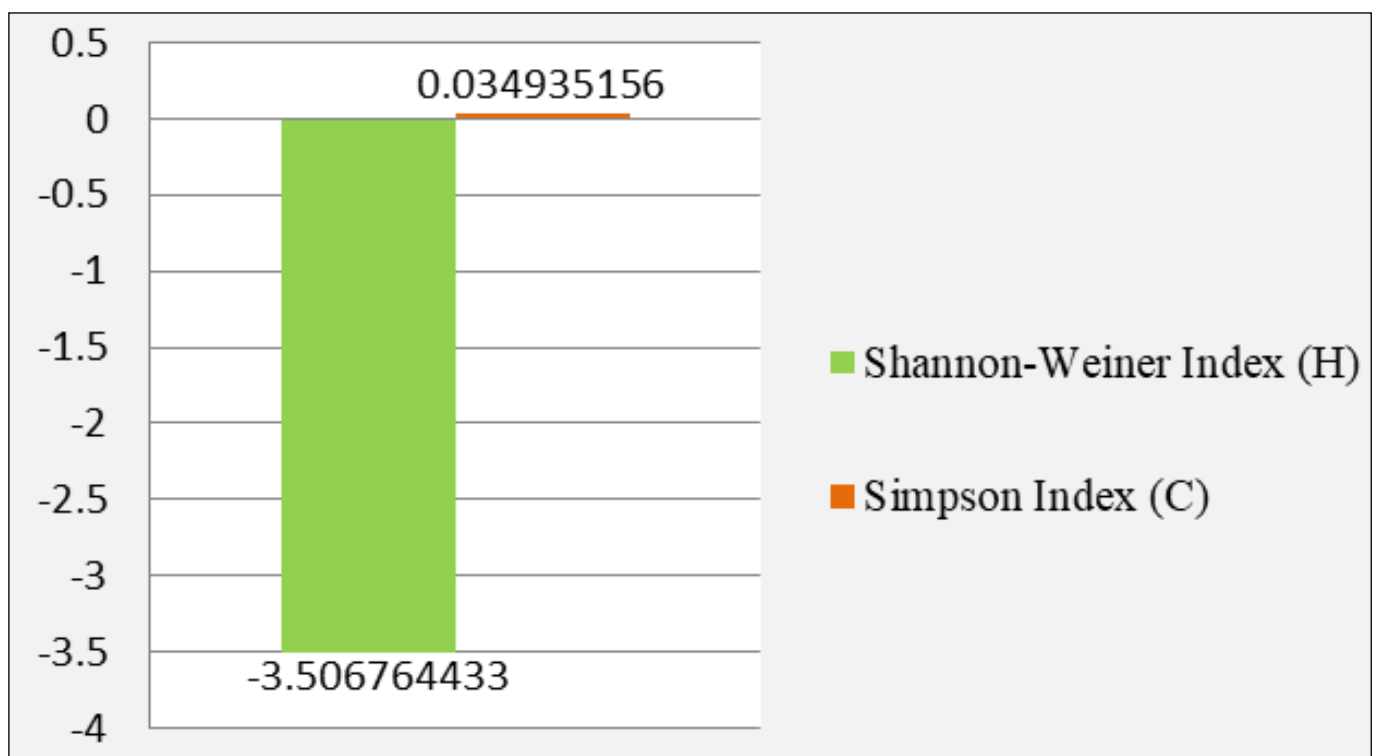
Fig 3: Flight Period of Butterflies in Jabalpur Region

Shannon Wiener Diversity index (H) in the current investigation the species diversity of Rhopalocera in Jabalpur region was found to be -3.506764433 at average which indicated high diversity of Butterfly in the study area. it shows both richness and abundance of species in the study

area. Simpson Index (C) the results were showed the value of species dominance index ranging 0.034935156. Values of Simpson index was increased with decrease of the Shannon-wiener diversity (show negative correlation) showing in (Graph 2).



Graph 1: Species wise distribution of Rhopalocera in Jabalpur region, Madhya Pradesh.



Graph 2: Shannon-Wiener Diversity index and Simpson’s dominance index of Rhopalocera in Jabalpur region, Madhya Pradesh.

Butterflies change seasonally, appearing in abundance for only a few months and in smaller numbers during other months of the year. According to Wynter-Blyth (1957) their abundance is seen in the months of March-April and October-November. During the present study, the numbers of the butterflies were peaked during post-monsoon season (late August to October) which was similar to the findings of Tiple *et al.*, (2007), Tiple (2012) and Tiple and Khurad (2009). The species abundance was less during monsoon. Apart from being major biodiversity indicators, these butterflies also act as gardeners for their dependence on indigenous plants to complete the life cycle. Therefore, an abundance of butterflies usually indicates a healthier ecosystem.

### Conclusion

This research underlines the fact that Jabalpur city can increase the diversity of butterflies if a comprehensive plan is made for plant diversity, it will provide a rich base for butterfly conservation as well as research. This study will also add to our future attempts in understanding the complex nature of mutualistic interaction between butterflies and lowering plants that is essential for continuity of ecosystem services. Butterflies inhabit all the terrestrial habitats always in association with flowering plants. Generally Lepidoptera are valued for their beauty but the larvae of Lepidoptera are probably more destructive to agricultural crops and forest trees than any other group of insects. Hence, the species of butterflies recorded during this research indicate their good habitat in Jabalpur.

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