Journal of Entomology and Zoology Studies

Available online at www.entomoljournal.com

E-ISSN: 2320-7078
P-ISSN: 2349-6800
www.entomoljournal.com
JEZS 2024; 12(4): 63-68

Received: 04-04-2024
Accepted: 03-05-2024

Mohit Arya
Department of Zoology, Government KRGPG (Auto.) College, Gwalior, Madhya Pradesh, India

Corresponding Author:
Mohit Arya
Department of Zoology, Government KRGPG (Auto.) College, Gwalior, Madhya Pradesh, India

Diversity, abundance and habitat association of butterflies at govt. Kamla Raja Girls College Campus, Gwalior, Madhya Pradesh, India

Mohit Arya

DOI: https://doi.org/10.22271/j.ento.2024.v12.i4a.9351

Abstract
A study has been carried out in Government Kamla Raja Girls College, Gwalior (KRGC) to estimate the diversity and abundance of butterflies and their habitat association. The college campus serves suitable habitat for butterflies in the form of so many small and big green patches, mowed lawn, scrubland and shady bushy areas. The KRGC campus consists of 10 gardens and open grounds which are enriched in varieties of herbs, shrubs and trees. The current investigations yielded a total of 36 species of butterflies which belongs to five families found in the campus of Govt. K.R.G. College, Gwalior. Out of 36 species, family Nymphalidae dominated with 13species (36%) followed by Pieridae 10 species (28%), Lycaenidae 6 species (17%), Papilionidae 4 species (11%) and Heperiidae 3 species (8%). Among these species, 11 species were very common, 15 species were common, 6 species were uncommon, 3 species were rare and 1 species was very rare occurring. It was also noted that out of 36 species of butterflies, 33 species were recorded in post monsoon season which was heights in numbers, 31 species were recorded in summer season, 27 species were observed in winter and 21 species were found in monsoon season.

Keywords: Diversity, abundance, habitat association, butterfly species, college campus

1. Introduction
Our earth has profound diversity with reference to its flora and fauna. Among the 1.4 million species present on earth, more than 53% are insects and among them about 15,000-16,000 butterflies species had been reported worldwide (Hassan, 1994). The Lepidoptera (Butterflies and Moths) constitute the second largest order under the Class Insecta. In account of total species of butterflies, Indian butterflies account to one fifth of the world of butterfly. Butterflies are found to be omnipresent in the whole world and found to be seen in all types of environment; whether it is hot, cold, dry, moist, from sea level to the high range of the mountain. Tropical areas especially tropical rainforest is also found to be abundant of butterflies, while several butterflies migrate to avoid adverse conditions of the environment. Urban areas in the form of small parks, green belts and natural landscapes in the form of scattered trees and bushes could be the good habitat for sustenance of butterfly species. The diversity and abundance of butterflies are found in good numbers in these urban green patches. Institutional campus provides natural vegetation as well as planted seasonal flowering plants provides potential habitat for butterflies (Dasgupta & Rao, 2014) [6]. Butterflies face multiple threats across the globe. An increase in pesticide use, deforestation, changes in land use pattern and climate change are some of the reasons for habitat loss of butterflies. Habitat change and loss as well as changes in climate conditions are the biggest threats to butterflies today.

2. Study area
Gwalior lies between latitudes 26.22° N and longitudes 78.18° E, 197 msl. It situated in the Semi-Arid Zone of Central India and dominated by tropical dry deciduous mixed forest and scrub land vegetation, is a district in Madhya Pradesh, India. Geologically, the area is intruded by quartz veins and the oldest rocks exposed are referred to as Bundelkhand Granite (Singh and Singh, 2011) [19]. The area has a sub-tropical climate with hot summers from late March to early July, the humid monsoon season from late June to early October and a cool dry winter from early November to late February. The highest recorded temperature was 53°C and the lowest was -1°C.

Gwalior gets 970 mm of average rainfalls, most of which is concentrated in the monsoon months from late June to early October.

In the Gwalior-Chambal division of Madhya Pradesh, Govt. Kamla Raja Girls College is a pioneer and premier institution for women for higher education. It is situated in the heart of the Gwalior city in Kampoo, Lashkar area, about 7 Km. Away from Railway Station and Bus Stand of the city The College is housed in one of the palaces of the erstwhile Scindia dynasty. The College campus lies between latitudes 26º 11' 26.37" N and longitudes 78º 9' 16.15" E and covers the area of 53714 sq. meters in which 21484 sq. meters is constructed area and covered with buildings. Total 13892 sq. Meters area is covered with greenery which is approximately 24% of the campus. 12525 sq. Meters' area of the campus is used as playground and reaming 5740 sq. Meters area is used for miscellaneous purposes. The impressive historic main building of college is found to be alternated by profound green gardens with varieties of small and big bushes and trees. The ecosystem of college is also ornamented by so many seasonal and annual flowering plants, grass lands and scrub land. For the survey of butterfly species total 10 study sites were established inside the college campus. All the 10 study sites are named as Sarswati Pratima Garden, Matriya Garden, Apala Garden, Gargi Garden, Ghosha Garden, Vangbhat Garden, Jeevak Garden, Nagarjun Garden, Charak Garden (Medicinal & Herbal Garden) and Surpal Garden respectively from the entrance of college campus to end of the campus (Image 1).

Source: Google Earth

Image 1: Satellite image of Govt. Kamla Raja Girls College Campus, Gwalior

3. Materials and Methods

3.1 Sampling Period

The present investigation was conducted at Govt. K.R.G. College, Campus during the period of one year from February 2022 to January, 2023. The study site visited thrice for a day as for Morning, afternoon and Evening.

3.2 Data Sheet Designing

During the survey details of the observed butterfly species, their location, individual species count, activities, date & time and remarks on the habitat types and host plant species were recorded in entailed data sheet. Opportunistic observations section was also included in the data sheet.

3.3 Sampling Techniques

Butterflies were sampled in the field following "Pollard Walk" method (Pollard, 1977, Pollard & Yates, 1993) [14-15] as per point transect method and line transect method. In point transect method, sampling was done from a particular point in sampling site while in line transect method, transects was fixed for a particular distance and distance covered on either side of transect on a day were specified. Photographic collection of specimens was done to avoid potential risk of damaging wings or scales of specimen by hand collection. Thus, collection of specimens from the study area has been avoided. Nikon action 8X40 binocular and DSLR (Canon 1500D) camera have been utilized for viewing and taking pictures of the habitat and butterflies. Location of specimen where it has been collected was recorded with date and time during collection of specimens. Temperature and humidity conditions were recorded with the help of thermo hygrometer and specified. For identification of specimen; identification keys were used respectively; (Evans, 1932; Wynter-Blyth, 1957; Haribal, 1992; Kunte, 2000; Kehimkar, 2008) [7, 22, 8, 12, 10].

3.4 Basis of determination of relative abundance and diversity of butterfly species

For each study site, relative abundance and diversity estimations were done on basis of site wise and seasonal wise variations. For site wise variations, study area was divided in 10 various sites on the basis of following; • Types of vegetation and canopy present in site • Presence of intervention of human activities in site (whether it is a disturbed or undisturbed area) • Presence of any water resource near the site.

For season wise variations for each year, following periods was included; • Winter (December, January, February) • Summer (March, April, May) • Monsoon (June, July, August, September) • Post Monsoon (October, November). On basis of number of sightings in a sampling site of study area and in a particular period of a year including data of relative abundance for each butterfly species coming under a particular family, their status was considered as common, very common, uncommon, rare and very rare. Any species coming under Indian Wildlife Act, 1972 was also be specified as under status of endemism.

4. Results and Discussion

The current investigations yielded a total of 36 species of butterflies which belongs to five families found in the campus of Govt. Kamla Raja Girls College, Gwalior (Table 1). Out of 36 species, family Nymphalidae dominated with 13 species (36%), followed by Pieridae 10 species (28%), Lycaenidae 6 species (17%), Papilionidae 4 species (11%) and Heperiidae 3 species (8%) (Table 2 & Figure 1). Among these species, 11 species were very common, 15 species were common, 6 species were uncommon, 3 species were rare and 1 species was very rare occurring (Figure 2). It was also noted that out of 36 species of butterflies, 33 species were recorded in post monsoon season which was heights in numbers, 31 species were recorded in summer season, 27 species were observed in winter and 21 species were found in monsoon season (Figure 3). The most dominant butterfly species observed during the survey were Common Crow (*Euploea core*), Plain Tiger (*Danaus chrysippus*), Common Evening Brown (*Melanitis leda*), Common Lepord (*Phalantha phalantha*), Common Grass Yellow (*Eurema hecabe*), Mottled Emigrant (*Catopsilia pyranthe*), Common Emigrant (*Catopsilia pomona*), Common Mormon (*Papilio polytes*), Lime Bitterfly (*Papilio domoleus*), Dark Grass Blue (*Zizeeria karsandra*)

and Common Hedge Blue (*Acytolepis puspa*) throughout the investigation, and Small Orange Tip (*Colotis etrida*) was noted only in post monsoon season.

The preference of butterflies for particular habitats is associated with the availability of larval host plants and adult nectar plants (Nair, *et al*., 2014) [13]. Various types of flowering and fruiting plant species are found to be well developed and well spared in the various parts of the college campus which are responsible for the attraction of butterflies. Saraswati Garden is first entrance garden of campus which is lavish with varieties of colourful ornamental plants. Sawani (*Lagerstroemia indica*), Raimunia (*Lantana camare*), Gulab (*Rosa indica*), Sago Palm (*Cycas revolute*) varieties of hybrid ornamental plants were main attraction of the campus. Gargi Garden, Matriya Garden and Apala Garden have some open grass area, small and big trees with surrounding hedge bushes. The area also possesses species of grasses and climbers like Doob (*Cynodon dactylon*), Khus (*Desmostachya bipinnata*) Satawar (*Asparagus recemossus*), Woolly morning glory (*Argyria nervosa*), Geloy (*Tinospora cordifolia*), Sarpgandha (*Rouvolfia serpentine*) etc.

Jeevak Garden, Vangbhat Garden, Ghosha Garden and Nagarjun Garden of the college campus had various types of shrubs and herbs like Vidya (*Thuja occidentalis*), Cocoloba (*Muehlenbeckia platycladus*), Harsinghar (*Nyctanthes arbortristis*), Rubber tree (*Ficus elastic*), Gulmehendi (*Impatiens balsamina*), Tulsi (*Ocimum sanctum*), Gawar-patha (*Aloevera*), Datura (*Datura strumonium*), Besharam (*Ipomaea batatas*), Akauwa (*Calotropis procera*), Nagphani (*Opuntia dillenii*), Karonda (*Carissa opaca*), Makoi (*Solanum nigrum*) and Ber (*Zizyphus jujuba*)) etc.

Surpal Garden had some scattered wild plants like Peeli-kteri (*Argemone mexicana*), Bhata-katani (*Solanum indicum*) and Jharberi (*Zizyphus nummularia*). The Charak Garden of the college has thick, dense and undisturbed area having verities of trees, bushes, herbs, shrubs and climbers as Babul (*Acacia nilotica*), Karanj (*Pongamia pinnata*), Arandi (*Ricinus communis*) and Amarbel (*Cuscuta reflexa*).

Species of trees reported in the study area were Kadam (*Anthocephalus kadamba*), Neem (*Azadirachta indica*), Bel (*Aegle marmelos*), Kachnar (*Bauhinia variegata*), Palas (*Butea monosperma*), Bottle Brush (*Callistemon lanceolatus*), Amaltas (*Cassia fistula*), Pawar (*Cassia tora*), Shisham (*Dalbergia latifolia*), Gulmohar (*Delonix regia*), Kaitha (*Feronia limnonia*), Bargad (*Ficus bengalensis*), Pipal (*Ficus religiosa*), Mithinim (*Murraya koenigil*), Asok (*Polyalthia longifolia*), Sagon (*Tectona grandis*), Arjun (*Terminalia arjuna*), Gular (*Ficus racemosa*) and Toon (*Cedrela toona*) found at the various parts in the college campus (Arya & Mishra, 2018) [3].

Nectarivorous butterfly's species have been found to be attracted by horticultural plants (fruiting and flowering) (Vishwakarma, 2022) [21]. Some fruiting plants were recorded are Aam (*Mangifera indica*), Amla (*Emblica officinalis*), Jamun (*Syzygium cumini*), Amrood (*Psidium Guava*), Imli (*Tamarindus indica*), Kathel (*Artocarpus heterophyllus*), Anaar (*punica granatum*), Shahtoot (*Morus laevigata*), Sitaphal (*Anona squamosa*), Senjhna (*Moringa oleifera*), Neebu (*Citrus limon*), Kela (*Musa paridisiaca*), Papeeta (*Carica papaya*). While Gurhal (*Hibiscus rosasinensis*), Chandini (*Iberis amara*), Sooraj-mukhi (*Helianthus annus*), Kanher (*Nerium indicum*), Genda (*Tagetes erecta*), Guldaudi (*Chrysanthemum indicum*), Purslane (*Potulaca oleracea*) were some flowering plants of the campus. Sem (*Dolicos lablab*), Kaddu (*Cucurbita pepo*), Toriya (*Luffa cylindrica*) and Lohki (*Lagenaria vulgaris*) were the vegetable climbers found in the campus. Many butterfly species are using these plants as larval-host plants and for feeding purposes.

Jeevak Garden, Vangbhat Garden, Ghosha Garden and Nagarjun Garden are comparatively small in size but have varieties of flora. Gargi Garden, Matriya Garden and Apala Garden have open mowed lawns, which were used by students for their various activities. So number of butterflies recorded here were less. Charak Garden is largest garden in size and Jeevak Garden is smallest Garden of the campus. During the survey maximum diversity of butterfly species were found in surrounding areas of Charak Garden and Surpal Garden. Perhaps the reasons behind it are these gardens are safer for butterflies and provides more undisturbed habitat with varieties of flora.

Similar kinds of studies have done by several workers in various parts of India. Tiple (2012) [20] conducted the survey in Tropical Forest Research Institute, Jabalpur, Madhya Pradesh; Sayeswara (2014) [17] surveyed in Sahyadri College Campus, Shivamogga, Karnataka; Alleppa & Shrivastava (2016) [1] investigated the diversity of butterflies within the college campus of Bhilai, Chhattisgarh; Shouche & Ratnakar (2018) [18] studied at Govt. Madhav Science College campus, Ujjain (M.P.); Buragohain (2018) [4] served in the vicinity of IIT Guwahati campus; Kumar *et al*., (2019) [11] studied on community structure, richness and diversity of butterflies in forestry college campus, Sirsi, Uttara Kannada; Dabhadkar (2020) [5] studied at M. N. College, Visnagar, Gujarat; Ponmanickam *et al*., (2022) [16] studied at Ayya Nadar Janaki Ammal College campus Sivakasi, Tamil Nadu.

Table 1: List of butterflies found in Govt. Kamla Raja Girls College Campus, Gwalior, (M.P.) along with individual count, status and seasonal occurrence

S. No.	Common Name	Scientific Name	No. of Individuals	Status	Seasonal Occurrence
Family: Nymphalidae					
1.	Lemon Pansy	*Junonia lemonias* (Linnaeus)	10	UC	S, PM, W
2.	Blue Pansy	*Junonia orithiya* (Cramer)	6	C	S, PM, W
3.	Yellow Pansy	*Junonia hierta* (Fabricus)	1	R	S, PM
4.	Peacock Pansy	*Junonia almana* (Linnaeus)	8	C	PM, W
5.	Grey Pansy	*Junonia atlites* (Linnaeus)	5	C	S, PM, W
6.	Common Castor	*Ariadne merione* (Cramer)	6	C	S, M, W
7.	Common Crow	*Euploea core* (Cramer)	6	VC	S, M, PM, W
8.	Plain Tiger	*Danaus chrysippus* (Linnaeus)	10	VC	S,M, PM, W
9.	Stripped Tiger	*Danaus genutia* (Cramer)	7	VC	S, PM, W
10.	Great Eggfly	*Hypolimnas bolina* (Linnaeus)	2	R	M, PM, W
11.	Blue Tiger	*Tirumala limniace* (Cramer)	3	UC	S, PM, W
12.	Common Evening Brown	*Melanitis leda* (Linnaeus)	5	UC	S,M, PM, W

13.	Common Leopard	*Phalantha phalantha* (Drury)	2	C	S,M, PM, W
Family: Pieridae					
14.	Common Grass Yellow	*Eurema hecabe* (Linnaeus)	12	VC	S, M, PM, W
15.	Spotless Grass Yellow	*Eurema laeta* (Baisduval)	4	R	S, PM
16.	Small Grass Yellow	*Eurema brigitta* (Cramer)	14	VC	S, M, PM
17.	Mottled Emigrant	*Catopsilia pyranthe* (Linnaeus)	8	VC	S, M, PM, W
18.	Common Emigrant	*Catopsilia pomona* (Fabricius)	7	VC	S, M, PM, W
19.	White Orange Tip	*Ixias marianne* (Cramer)	4	VC	S, M, PM
20.	Common Gull	*Cepora nerissa* (Fabricius)	3	C	S, M, PM
21.	Small Orange Tip	*Colotis etrida* (Boisduval)	3	C	PM
22.	Psyche	*Leptosia nina* (Fabricius)	4	C	S, PM, W
23.	Pioneer	*Belenois eaurota* (Fabricius)	3	C	S, M, W
Family: Papilionidae					
24.	Lime Butterfly	*Papilio domoleus* (Linnaeus)	2	VC	S, M, PM, W
25.	Common Jay	*Graphium doson* (C. & R. Felder)	2	C	S, M, PM
26.	Common Rose	*Pachliopta aristolochiae* (Fabricius)	8	C	S, PM
27.	Common Mormon	*Papilio polytes* (Linnaeus)	4	VC	S, M, PM, W
Family: Lycaenidae					
28.	Small Cupid	*Chilades parrhassius* (Fabricius)	2	UC	S, W
29.	Common Pierrot	*Castalius rosimon* (Fabricius)	4	C	PM, W
30.	Pea Blue	*Lampides boeticus* (Linnaeus)	3	C	S, PM, W
31.	Dark Grass Blue	*Zizeeria karsandra* (Moore)	8	C	S, M, PM, W
32.	Common Hedge Blue	*Acytolepis puspa* (Horsfield)	12	VC	S, M, PM, W
33.	Tiny Grass Blue	*Zizula hylax* (Fabricius)	7	C	M, PM, W
Family: Hesperiidae					
34.	Common Banded Awl	*Hasora chromus* (Cramer)	2	VR	S, M, PM
35.	Indian Skipper	*Spialia galba* (Fabricius)	2	UC	S, PM, W
36.	Indian Palm Bob	*Suastus gremius* (Fabricius)	3	UC	S, M, PM, W

*Status: VC = Very Common, C = Common, UC = Uncommon, R = Rare, Very Rare = VR
*Seasonal Occurrence: S = Summer, M = Monsoon, PM = Post Monsoon, W = Winter

Table 2: Family wise total number of butterfly species with their percentages found in Govt. Kamla Raja Girls College Campus, Gwalior, M.P.

S. No.	Families	No. of Species	Percentages
1.	Nymphalidae	13	36%
2.	Pieridae	10	28%
3.	Papilionidae	4	11%
4.	Lycaenidae	6	17%
5.	Hesperiidae	3	8%

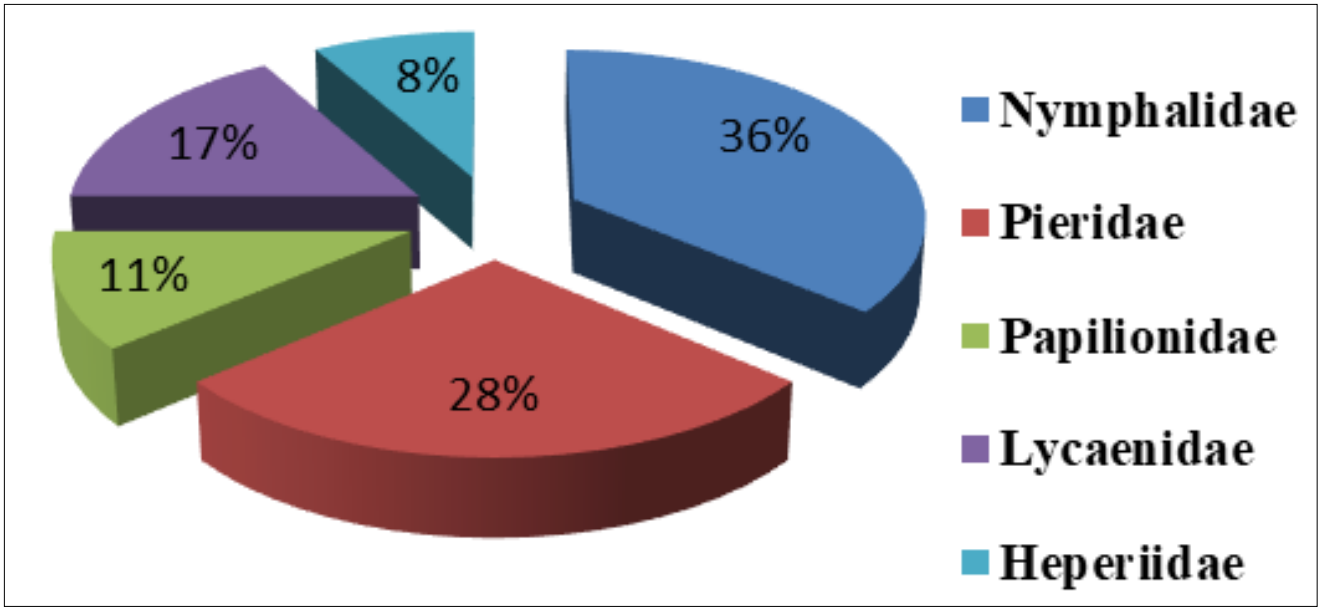

Fig 1: Showing percent contribution of each family of butterflies at Govt. Kamla Raja Girls College Campus, Gwalior, M.P.

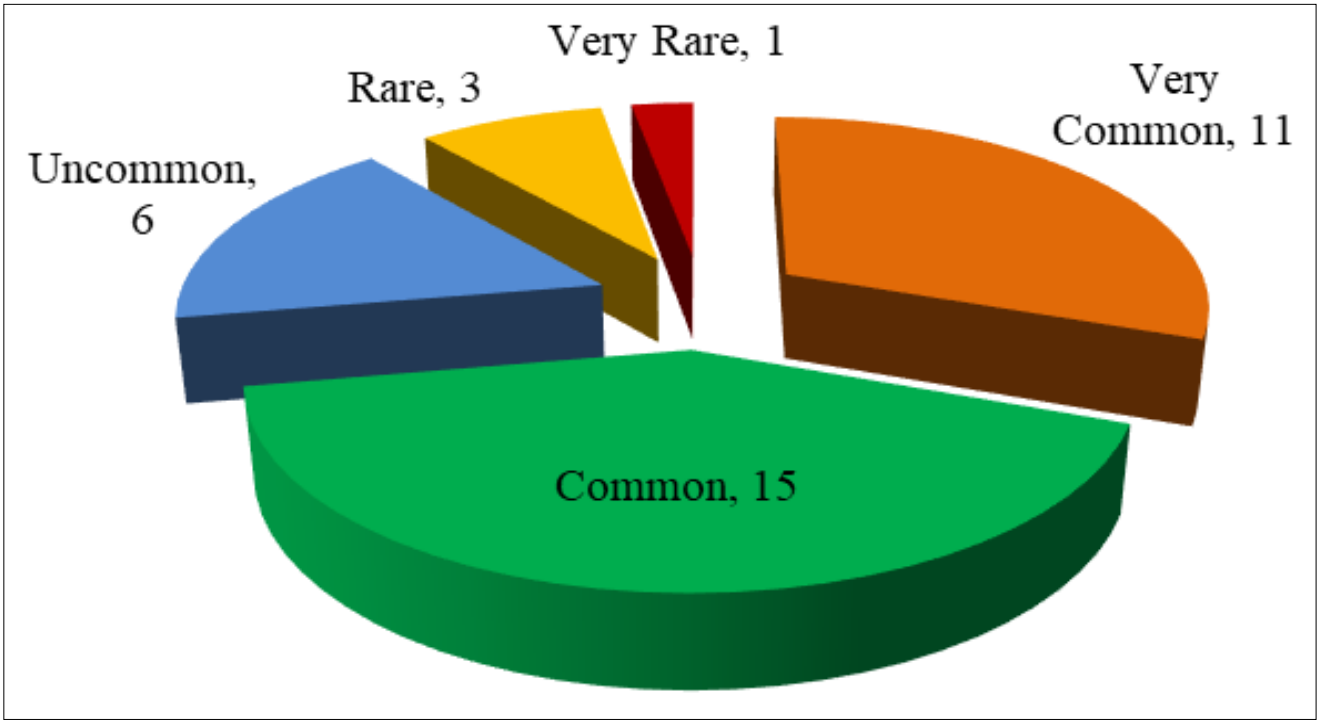

Fig 2: Status of butterfly species at Govt. Kamla Raja College Campus, Gwalior, M.P.

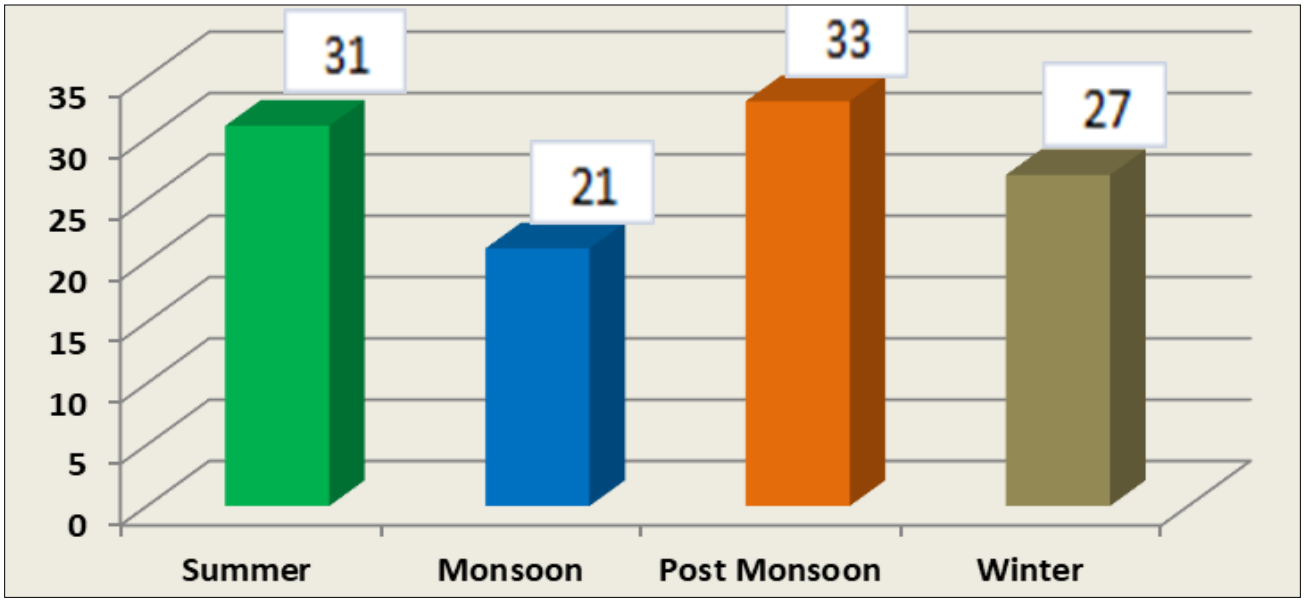

Fig 3: Season wise sight frequency of butterfly species at Govt. Kamla Raja Girls College Campus, Gwalior, M.P.

5. Conclusion

A healthy ecosystem is represented by the abundance of butterflies. If there is a subtle change in the environment, it may trigger an extreme drop in the butterfly population. Loss of butterflies from any community could cause "butterfly effect" which continues to affect the entire ecosystem, even up to the trophic levels (Altermatte & Pearse, 2011) [2]. Climatic change has caused a significant amount of damage to butterfly populations. Anthropogenic activities are also implicated in the butterfly's decline. Other threats for butterflies include invasive plants, forest fire and over grazing.

The observations of the present study clearly indicate the importance of institutional campuses for providing natural environment and safer habitat for butterfly population inside developing cities. If the city planners and other responsible authorities carefully planned and maintained this type of small habitats, these areas will provide sustainable habitat for butterflies as well as others insects, birds and plants also. If the natural environment, landscaping and gardens are carefully handled the diversity and abundance may increase in the college campus. Also need to take care the diversity of nectarivorous and larval host plants for sustaining healthy environment for butterflies. The systematic study and public awareness about butterflies are very important for their conservation. The present list is from a short pilot survey during one year and future exploration will be continued to update this checklist.

6. References

1. Alleppa R, Shrivastava S. The Butterfly Diversity in Bhilai Mahila Mahavidyalaya College Campus. Open

Science Journal. 2016;1(2):1-9.
2. Altermatt F, Pearse IS. Similarity and specialization of the larval versus adult diet of European butterflies and moths. American Naturalist. 2011;178:372-382.
3. Arya MA, Mishra AK. Diversity of avifauna in the campus of Govt. Kamla Raja Girls Postgraduate College, Gwalior, M.P., India. Asian Resonance. 2018;7(5):26-85.
4. Buragohain D, Hussain B, Acharjee BK. A preliminary checklist of butterfly diversity in the vicinity of IIT Guwahati Campus, Guwahati, Assam, India. Journal of Entomology and Zoology Studies. 2018;6(3):1845-1852.
5. Dabhadkar S, Prajapati R. A Study of Butterfly Species Diversity in M. N. College Campus, Visnagar, Mehsana District, Gujarat, India. International Journal of Research in Engineering, Science and Management. 2020;3(12):98-104.
6. Dasgupta N, Rao RJ. Diversity and seasonal occurrence of butterflies at Jiwaji University Campus, Gwalior, Madhya Pradesh. Bug R All. 2014;21:16-20.
7. Evans WH. The identification of Indian butterflies. Bombay Natural History Society. 1932;464.
8. Haribal M. The butterflies of Sikkim Himalayas and their natural history. Sikkim Nature Conservation Foundation (SNCF); c1992, 217.
9. Hassan SA. Butterflies of Islamabad and Murree Hills. Asian Study Group, Islamabad, Pakistan. 1994;1-68.
10. Kehimkar I. The book of Indian butterflies. Bombay Natural History Society and Oxford University Press, Mumbai; c2008, 1-496.
11. Kumar UK, Rathod R, Pai V, Karthik NJ, Shastri N. Study of butterfly diversity in College of Forestry campus, Sirsi, Uttara Kannada. Journal of Entomology and Zoology Studies. 2019;7(4):01-11.
12. Kunte K. Butterflies of Peninsular India. Hyderabad: Universities Press (India) Limited. 2000;254.
13. Nair AV, Mitra P, Bandyopadhyay SA. Studies on the diversity and abundance of butterfly (*Lepidoptera*: *Rhopalocera*) fauna in and around Sarojini Naidu College campus, Kolkata, West Bengal, India. Journal of Entomology and Zoology Studies. 2014;2(4):129-134.
14. Pollard E. A method for assessing changes in the abundance of butterflies. Biological Conservation. 1977;12:115-134.
15. Pollard E, Yates TJ. Monitoring butterflies for ecology and conservation. Chapman and Hall, London. 1993;292.
16. Ponmanickam P, Gowsalyal K, Rajagopal T, Muniasamy S, Kumar K, Sundaram M. Biodiversity of butterflies in Ayya Nadar Janaki Ammal College Campus, Sivakasi, Tamil Nadu, India. International Journal of Entomology Research. 2022;7(5):175-182.
17. Sayeswara HA. A Preliminary Observation on Butterflies of Sahyadri College Campus, Shivamogga, Karnataka, India. International Journal of Pharma Medicine and Biological Science. 2014;3(4).
18. Shouche S, Ratnakar SS. Diversity and richness of butterflies from Government Madhav Science College campus, Ujjain, Madhya Pradesh, India. Journal of Entomology and Zoology Studies. 2018;6(2):939-942.
19. Singh V, Singh UC. Sedimentary structures in the part of Gwalior district (Madhya Pradesh). International Journal of Geology, Earth and Environmental Sciences. 2011;1(1):1-8.
20. Tiple AD. Butterfly species diversity, relative abundance and status in Tropical Forest Research Institute, Jabalpur, Madhya Pradesh, Central India. Journal of Threatened Taxa. 2012;4(7):2713-2717.
21. Vishwakarma H, Trivedi G, Sharma VK. The Butterfly Diversity and Butterfly Larval-Host Plant Distribution at Government Holkar Science College, Indore. Conference paper proceeding; c2022.
22. Blyth WMA. Butterflies of the Indian region. Bombay Natural History Society, Bombay; c1957.