

SHORT ARTICLE

## The Butterfly Diversity in Bhilai Mahila Mahavidyalaya College Campus

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### Abstract:

In the midst of the industrial area of Bhilai steel plant, the greenery on the campus of this college provides a home for many butterflies. The diversity of butterflies was investigated within the college campus of Bhilai Mahila Mahavidyalaya, Bhilai, which lies in the Durg district of Chattisgarh State. The state enjoys a tropical climate. The survey was done from February 2015 to October 2015. This period includes the summer and monsoon months. During the survey, a total of 45 species, belonging to five families of the Order Lepidoptera, were recorded in the study area. The predominance of family Nymphalidae was noted, which comprised of 37.77% of the butterflies surveyed, followed by Pieridae (22.22%), Papilionidae (20%), Lycaenidae (11.11%), and Hesperidae (8.88%). Among the forty-five species of butterflies investigated, 11 species come under the Indian Wild Life (Protection) Act 1972.

**Key words:** Lepidoptera, Nymphalidae, Pieridae, Papilionidae, Lycaenidae, Hesperidae

## Introduction

Bhilai is an important industrial town of Chhattisgarh State lying in Durg District. It is located between east longitude  $81.38^{\circ}$  E and north latitude  $21.21^{\circ}$  N, covering an area of 269.45 sq km at an altitude of 452 m. The state of Chhattisgarh biogeographically belongs to the Deccan Plateau. Chhattisgarh enjoys a tropical climate. Summers are hot and humid, with temperatures ranging from  $23^{\circ}\text{C}$  to over  $40^{\circ}\text{C}$ , while winters are pleasant, as the temperatures fall down to  $10^{\circ}\text{C}$ . The average rainfall is 1292 mm.

Bhilai is popularly known as steel city in central India because the famous Bhilai Steel Plant is situated there along with other smaller industries (Sahu et al., 2014). It is an important location for studying the effect of industrial pollution on the biodiversity of this area. The steel industry is complex and highly pollution-intensive, adversely affecting the environment along with the entire biodiversity.

Environmental changes can be quickly monitored by the response of arthropods as they are good indicators of habitat diversity. Arthropods have now been included in planning programmes for biodiversity conservation (Gadgil, 1996). Butterflies belong to the order Lepidoptera of the class Insecta, which is the largest class of the phylum Arthropoda.

The study of butterflies is very important because these insects are useful indicators of environmental and ecological changes. Butterflies also serve as “flagship” species for biodiversity inventories (Lawton et al., 1998). These insects form an important aspect of the ecosystem because they interact with plants as pollinators and herbivores.

In view of the growing anthropogenic activity (Tiple et al., 2007), industrialization, and landscaping (Thomas, 1984; Kunte, 2001), it is time to focus our attention on the conservation of these scaly-winged, flying jewels, which in turn can be used as bio-indicators.

Bhilai is an important city in this state, and the diversity of butterflies needs to be explored here so that the health of the environment can be monitored. The chosen study site lies in the township area of Bhilai, which can be used to compare the effect of the environmental pollution in and around the steel plant.

This study was conducted to identify the species on the college campus of Bhilai Mahila Mahavidyalaya, Bhilai. The campus of the college was chosen because it is covered with a variety of vegetation, open ground, and plenty of sunshine.

## Material and Methods:

### *Study location*

The college in which the survey was done lies on one edge of the steel city towards the adjoining city of Durg at the opposite end to where the Steel Plant is situated. The campus is spread over an area of 14 hectares, and it is surrounded by tall trees. There is a large garden inside surrounded by the building, which includes a huge lawn, perennial flowering plants, crotons, and ornamental

seasonal plants. The campus includes a botanical garden, which has many medicinal plants, as well as other herbs, shrubs, and trees.

#### *Methodology*

The observations listed here are based on a bi-weekly random survey carried out from February 2015 to October 2015 at the college campus. The site was regularly visited from 09:00 hr to 12:00 hr and in the late afternoon. Spots on the campus were selected according to the maximum availability of butterfly species. Multiple site visits were carried out where abundance and richness of species were observed to confirm their identification.

Date, time, wind speed, temperature, and cloud cover were recorded. Days with bad weather and total cloud cover were avoided for the survey.

The observations were made with the aid of a digital camera. Documentation was done by photography to avoid collection. The various species were identified directly in the field to note the maximum possible species. Both nectarivorous and frugivorous butterflies were observed. Nectar-feeding butterflies were from all five families, while frugivorous were from the family Nymphalidae. They were attracted to rotten fruits that had dropped from fruit trees. The nymphalids were also seen mud-puddling; landing on bird droppings, mammal excrement, and carrion; and sucking plant exudes. When conditions were critical, specimens were captured with the handheld aerial sweep net. Each specimen was placed in a glass jar and carried to the laboratory for further identification with field guides and then released. Identification was done with the help of field guides by Evans (1932), Wynter Blyth (1957), Kunte (2000), and Kehimkar (2014).

## Observation

- 1) It was observed that the factors that limit the diversity of butterflies are the abundance of larval and adult food plants and sunlight.
- 2) The butterflies emerged around 08:00 hr during times with moderate temperatures.
- 3) During hot days of summer, they emerged as early as 05:00 hr but disappeared when the sun became unbearable and reappeared in the evenings.
- 4) Monsoon season brought out the butterflies for the whole day, in great abundance.
- 5) Most of the species were seen visiting the herbs and the shrubs, but many soared up to the tall trees.
- 6) With the length of exposure to the sun, their mobility increased, and their flying bouts were seen to increase with temperature and radiation and decrease when clouds appeared. The butterflies were active during the sunny part of the day and retreated to the damp and shady places when it got cloudy.
- 7) The various species of butterflies observed are listed in Table No.1.

**Table No.1. Butterflies observed at the study site:**

Common Name	Scientific Name
Family- Papilionidae - 9	
Glassy Blue Bottle	<i>Graphium cloanthus</i> [Westwood]

Great Jay	<i>Graphium euripylus</i> [Linnaeus]
Common Blue Bottle	<i>Graphium sarpedon</i> [Linnaeus]
Common Jay	<i>Graphium doson</i> [C.& R. Felder]
Common Mime	<i>Chilasa clytia</i> [Linnaeus]
Common Mormon	<i>Papilio polytes</i> [Linnaeus]
Red Helen	<i>Papilio helenus</i> [Linnaeus]
Lime Butterfly	<i>Papilio demoleus</i> [Linnaeus]
Crimson Rose*	<i>Atrophaneura hector</i> [Linnaeus]
<b>Family-Nymphalidae - 17</b>	
Plain Tiger	<i>Danaus chrisippus</i> [Linnaeus]
Striped Tiger	<i>Danaus genutia</i> [Cramer]
Common Crow*	<i>Euploea core</i> [Cramer]
Common Evening Brown*	<i>Melanitis leda</i> [Linnaeus]
Dark Evening Brown#	<i>Melanitis phedima</i> [Cramer]
Common Palm Fly	<i>Elymnias hypermnestra</i> [Linnaeus]
Tawny Caster	<i>Acraea violae</i> [Fabricius]
Indian Fritillary	<i>Argyreus hyperbius</i> [Linnaeus]
White Edged Blue Baron	<i>Euthalia phemius</i> [Doubleday]
Common Baron	<i>Euthalia aconthea</i> [Cramer]
Common Castor	<i>Ariadne merione</i> [Cramer]
Chocolate Pansy	<i>Junonia iphita</i> [Cramer]
Grey Pansy	<i>Junonia atlites</i> [Linnaeus]
Peacock Pansy	<i>Junonia almana</i> [Linnaeus]
Lemon Pansy	<i>Junonia lemonias</i> [Linnaeus]
Great Eggfly	<i>Hypolimnas bolina</i> [Linnaeus]
Danaid Eggfly*	<i>Hypolimnas misippus</i> [Linnaeus]
<b>Family- Lycaenidae - 6</b>	
Common Pierrot*	<i>Castalius rosimon</i> [Fabricius]
Zebra Blue	<i>Leptotes plinius</i> [Fabricius]
Common Line Blue#	<i>Prosotas nora</i> [C.Felder]
Plains Cupid	<i>Chilades pandava</i> [Horsfield]
Gram Blue*	<i>Euchrysops cnejus</i> [Fabricius]
Bright Babul Blue#	<i>Azanus ubaldus</i> [Stoll]
<b>Family Pieridae – 10</b>	
Mottled Emigrant	<i>Catopsila pyranthe</i> [Linnaeus]
Common Emigrant	<i>Catopsila pomoma</i> [Fabricius]
Common Grass Yellow	<i>Eurema hecabe</i> [Linnaeus]
Spotless Grass Yellow	<i>Eurema laeta</i> [Biosduval]
Small Grass Yellow	<i>Eurema brigitta</i> [Cramer]
One Spot Grass Yellow*#	<i>Eurema andersoni</i> [Moore]
Tree Yellow	<i>Gandaca harina</i> [Horsfield]

\*Listed in the Indian Wildlife (Protection) Act 1972, #New Report.

## Results and Discussion

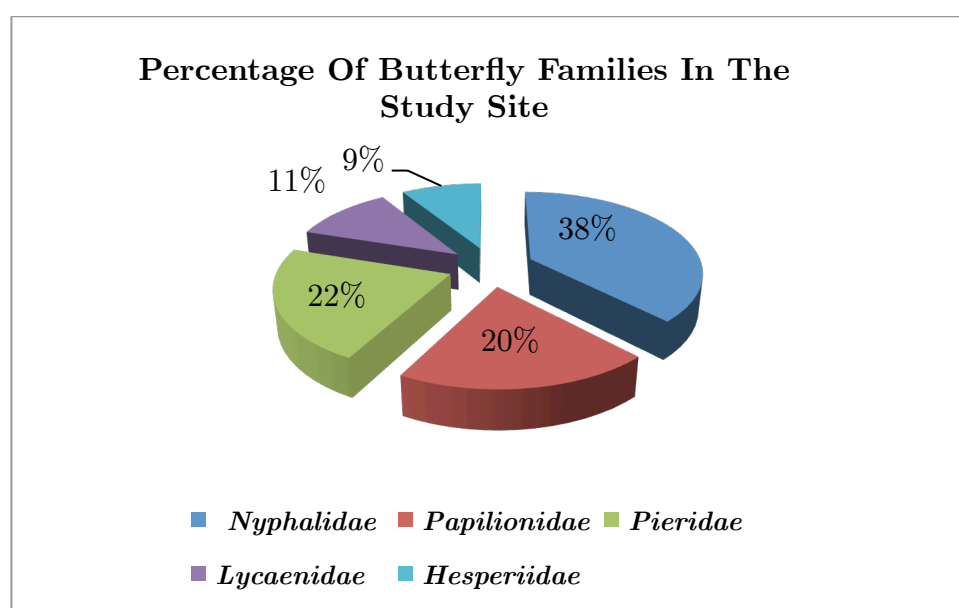
Butterflies are highly habitat-specific, as they are dependent on it during their entire life cycle. The plants and butterflies are closely interlinked (Feltwell 1986), and thus, the butterfly diversity reflects overall plant diversity. The plant diversity in the study area (college campus) in which the survey of butterflies was done includes *Pongamia pinnata*, *Delonix regia* (Caesalpiniaceae), *Prunus amygdalus* (Rosaceae), *Terminalia bellirica*, *Mascarena lagenicaulis*, *Aegle marmelos*, *Anthocephalus chinensis*, etc.

The garden area of the college campus has a variety of trees and shrubs, including *Hibiscus rosa-sinensis*, *Bougainvillea spectabilis*, *Ixora inermis*, *Jasminum auriculatum*, *Lantana camara*, *Calotropis procera*, etc. In the garden, it was also possible to find herbs such as *Syzygium aromaticum*, *Murraya paniculata*, *Tinospora cordifolia*, etc.

Modes of feeding, and food are different in the adult and larval stages (Kunte 2000). A habitat that includes sufficient adult and larval food resources is a successful butterfly habitat (Ramesh et al. 2010).

During the survey, a total of 45 species of butterflies belonging to 5 families were identified. They are Papilionadae (9 species), Nymphalidae (17 species), Pieridae (10 species), Lycaenidae (5 species), and Hesperidae (4 species). The observations have been listed with their common names and scientific names in Table 1. The species that come under the Wildlife Protection Act have been marked. Four of the recorded species come under the Indian Wildlife (Protection) Act 1972.

The predominance of family Nymphalidae on the campus was noted, as it constituted 37.77% (figure No.1) of the species surveyed. Their numbers were highest from monsoon to early winter. This has also been reported by Padhye et al. (2008) and Kunte (1997) *Danaus chrysippus* (Linnaeus) was the dominant species and was seen throughout the study period; likewise, the low-flying *Euploea core* (Cramer) were also abundant. *Danaus genutia* [Cramer], *Elymnias hypermnestra* Linnaeus, *Acraea violae* Fabricus, *Argyreus hyperbius* Linnaeus, and *Ariadne merione* [Cramer] were seen in selected areas of the campus.



**Figure No.1:** Percentage Of Butterfly Families In The Study Site

The beautiful species of Pansies - *Junonia iphita* [Cramer], *Junonia atlites* [Linnaeus], *Junonia almana* [Linnaeus], and *Junonia lemonias* [Linnaeus] - were observed among shrubs and herbs in the garden, and also, in mud puddles (Patil & Shinde, 2014) .

*Hypolimnas bolina* [Linnaeus] and *Hypolimnas misippus* [Linnaeus] which are protected under the Indian Wild Life Act of 1972, were seen under tall trees and were not very common. The Barons, *Euthalia phemius* [Doubleday], and *Euthalia aconthea* [Cramer] had appeared much later, during a part of the study period, preferring rotten fruits and mud-puddling. Meanwhile, the Browns, *Melantia leda* (Linnaeus), and *Melanitis phedima* [Cramer] were often seen throughout the study period.

Papilionidae comprises 20% of the butterflies observed at the study site. Nine species of these large swallowtails were recorded: *Atrophaneura hector* [Linnaeus], *Papilio helenus* [Linnaeus], and *Chilasa clytia* [Linnaeus] were occasionally seen. *Papilio demoleus* [Linnaeus] was first to be recorded and seen in the study period. *Papilio polytes* [Linnaeus] is a commonly seen, prominent and sturdy butterfly. Butterflies of the genus *Graphium* of the Family Papilionidae are highly agile, always soaring up on tall trees, and rarely settling down, which make observation difficult. These are *Graphium cloanthus* [Westwood], *Graphium euripylus* [Linnaeus], *Graphium sarpedon* [Linnaeus], and *Graphium doson* [C. & R. Felder].

The family Pieridae, or the Whites and Yellows, comprises 22.22% of the butterflies observed. With the first rains, the abundance of these butterflies suddenly increased. They were seen flying in the low grasses to the tip of the tallest trees. The *Eurema* spp., the species *Eurema hecabe* [Linnaeus], *Eurema laeta* [Biosduval], *Eurema brigitta* [Cramer] and *Eurema andersoni* [Moore], were present in all seasons. *Catopsilia pyranthe* [Linnaeus], *Catopsilia pomona* [Fabricius], *Gandaca harina* [Horsfield], *Gonepteryx rahmni* [Linnaeus], and *Colias erate* [Esper] were seen in extraordinary abundance, dominating the skies. *Appias albina* [Biosduval], which is protected under the Wild Life (protection) Act 1972, was seen very rarely.

The family Lycaenidae was represented by six species, where 11.11% of the species recorded. They were found among the low-level grasses, bird droppings, and small flowers. *Leptotes plinius* [Fabricius], *Prosotas nora* [C. Felder], and *Chilades pandava* [Horsfield] were very commonly observed. *Euchrysops cnejus* [Fabricius], *Castalius rosimon* [Fabricius], and *Azanius ubaldus* [Stoll] are protected under the Indian Wild Life (protection) Act 1972. *A. ubaldus* [Stoll] was seen only in February and March on the plant *Cycas revoluta*.

The family Hesperidae with four species represents 8.88% of the total number of butterflies discovered. This family consists of butterflies that have rapid bounding flight and are seen in the early hours of the day, which makes them difficult to observe and photograph. *Badamia exclamationis* [Fabricius] appeared during premonsoon rains. *Hasora vitta* [Butler] and *Saustus gremius* [Fabricius] were seen during a monsoon, followed by *Parnara guttatus* [Bremer & Grey] a little later, which is included in the list of the Indian Wild Life (protection) Act 1972.

Among the 45 butterflies recorded, 11 (24%) species are listed under the protected category of the Indian Wild Life (protection) Act, 1972. Among them, *Atrophaneura hector* comes under the Schedule I (Part IV) of the act., and *Euploea core* and *Melanitis leda* come under Schedule IV: *Melanitis phedima* and

*Prosotas nora*, *Azonus ubaldus* and skipper *Saustus gremius* are included in the new report of the act. *Hypolimnias misippus* is mentioned in the Schedules I and II. *Euchrysops cnejus*, Schedule II, and *Castalius rosimon* are included in the old records, while *Appias albina* and *Eurema andersoni* are mentioned in the old and new reports, as well.

The diversity of butterflies from areas in and around Madhya Pradesh and Chhattisgarh have been reported by Singh, (1977), Gupta and Shukla, (1987), Chaudhury, (1995); Chandra et al.,(2000a,b & 2002); Singh & Chandra 2002; Siddiqui & Singh (2004); Chandra (2006); Chandra et al,(2007). New records and updated lista of butterflies from Chhattisgarh have been given Chandra,et al.(2014). The list consists of 137 butterflies with their district-wise distribution.

## Conclusion

The present study reveals that the study area provides suitable ecological conditions for the butterfly population. It can be easily understood that the presence of these butterflies, being bioindicators, show that the environmental and ecological health of the campus is good. The occurrence of 11 protected species confirms that statement. The greenery in the college campus is, thus, helpful in their conservation.

In spite of being surrounded by an industrial area and the pollution emitted by the steel plant and the traffic, the college campus is still a resort not only for the common species like *Danaus chrisppus*, *Euploea core*, *Chilades pandava*, but also for some uncommon species like *Appias albino* and *Parnara guttatus*, which are uncommon in this area. The plantation landscape, in the college, is of a mixed type, which again, supports these butterflies during their entire life cycles. All life stages of the butterflies were recorded and photographed in the botanical garden. The factors that limit the diversity of butterflies is the abundance of larval and adult food plants and sunlight, all of which are available on the campus, thus, proving that ecological conditions of the campus support a good diversity of butterflies.

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