



Species Richness and Abundance of butterflies in and around Model Degree College Campus, Boudh, Odisha, India

Debananda Sahoo^{1*}, Mousumi Mahana², Ardhendu Sekher Mallick²

¹ Department of Zoology, Model Degree College, Boudh, Odisha, India

² Department of Zoology, Angul Government Autonomous College, Angul, Odisha, India

Corresponding Author: Debananda Sahoo*

Abstract

Among the various insects, butterflies are some of the most enchanting, appealing, and beautiful beings. These brightly coloured insects, belonging to the order Lepidoptera, are vital for the conservation of invertebrate species. Their heightened sensitivity to changes in the environment makes them excellent indicators of ecosystem health. Consequently, a study was conducted at Model Degree College in Boudh, Odisha to assess the diversity and population of butterflies along with their seasonal variations. A short-term survey was performed over a one-year period, from March 2024 to February 2025, within and around the college campus to examine the diversity of butterflies and their distribution across various families, subfamilies, and genera. A total of 41 butterfly species from 5 families, subfamilies, and genera were identified during the survey. Among the 37 species recorded, the Nymphalidae i.e. 14 species which is 38% of total butterflies' population found in and around the college campus followed by family Lycaenidae i.e 8 species (22%) Pieridae 7 species (19%), Papilionidae 5 species (13%) and Heperiidae 3 species (8%). Of these species, 20 were classified as very common, 10 as common, 20 as uncommon and 4 as rare.

Keywords: Boudh, butterfly, diversity, nymphalidae

Introduction

Insects represent over 50 % of the species diversity on Earth (May, 1992) ^[14]. Healthy biological communities depend on insect species for various roles, including seed dispersal, pollination, herbivory, and serving as both predators and prey. Within these ecological communities, insects account for a significant portion of the biomass and are crucial for energy transfer throughout the system (Battist, 1988). The significance of insect diversity has been highlighted in numerous studies due to their prevalence in both terrestrial and aquatic ecosystems, as well as their provision of ecosystem services (Losey and Vaughan 2006) ^[13]. Among insects, butterflies perform important roles in pollination and herbivores (Kunte 2000^[12]; Tiple *et al* 2006) bearing a history of long-term coevolution with plants. In addition to being stunning insects, butterflies are important ecological markers. Their diversity and abundance frequently serve as indicators of an ecosystem's health. Their diversity and richness tell stories of complex ecological relationships and changes in the environment, reflecting the health of an ecosystem. The world's vegetation and wildlife are incredibly diverse. India is regarded as one of the world's seventeenth most diverse nations, with an abundance of both plant and animal life. One of the key elements of biodiversity among these orders is Lepidoptera (New and Collins 1991) ^[19]

There are about 17,000 species of butterflies in the globe (Kumar, 2014) ^[10] and 1502 species have been reported from India (Tiple 2008) ^[9], and roughly 100 species are indigenous (Singh, 2011) ^[27]. Peninsular India is home to about 351 species (Tiple, 2011) ^[28]. There have been reports of about 200 different species of butterflies in Odisha, India. Their variety is limited to certain seasons, and they have a preference for particular habitats (Kunte, 1997) ^[11]. They have been regarded as outstanding bio-indicators of climate due to their high sensitivity to environmental change (Das

and Parida 2015) ^[3]. Because of their position in the food chain of the forest environment, butterflies are both an important component of biodiversity and ecologically significant. Numerous birds and reptiles consume their eggs, larvae, and adult stages. Additionally, they aid in floral pollination (Singh, 2011) ^[27].

Seasonal Dynamics: Communities of butterflies are dynamic. Throughout the year, a variety of factors, including temperature, rainfall, resource availability, and predator-prey interactions, affect their composition and abundance. Effective conservation and management of butterfly populations depend on an understanding of these periodic fluctuations.

Materials and method

Study sites

The Boudh district is located between latitudes 20°.22' and 20°.50'N and longitudes 83°.34' and 84°.49'E. Northern tropical moist deciduous and dry deciduous forests make up the majority of the district's 40–41% forest cover, which contributes to its rich biodiversity. Sal, Bija, Asana, and Mahua are important plants that thrive in tropical climates. The region experiences hot, dry, subtropical summers from March to June, a humid rainy season from mid-June to October, and chilly, dry winters from December to February. Significant seasonal extremes occur in the district, with temperatures ranging from 6 to 10 degrees Celsius in the winter to 46 degrees Celsius in the summer.

Model Degree College, Boudh is located at 20.7884° N, 84.306° E. The vegetation and biodiversity of the College are influenced by the surrounding ecological conditions of the Boudh district, which is characterised by tropical dry deciduous forests and rich floristic diversity. The campus provides a suitable environment with flowering plants, shrubs, and open grassy areas that support various butterfly species.

Sampling period

The current study was carried out over the course of a year, from March 2024 to February 2025, on and around the Model Degree College campus. Every week, the research site is visited in the morning (7:00–11:00 AM) and afternoon (2:00–6:00 PM).

Data Sheet Designing

Details on the observed species of butterflies, their location, the number of each species, their behaviours, the date and time of the survey, and comments about the host plant species and habitat types were all noted in the accompanying data sheet.

Sampling Techniques

The "Pollard Walk" method (Pollard, 1977^[24], Pollard and Yates, 1993) was used to sample butterflies in the field using both point and line transect methods. In the line transect method, transects were defined for a specific distance and the distance traversed on either side of the transect on a given day were stated, but in the point transect method, sampling was done from a specific point in the sampling location. The habitat and butterflies have been observed and photographed using a DSLR (Canon 1500D) camera with a Nikon action 8X40 binocular. Identification keys were utilised to identify the specimens (Evans, 1932; Wynter-Blyth, 1957; Haribal, 1992; Kunte, 2000; Kehimkar, 2008)^[5, 6, 7, 33].

Relative abundance was calculated for each butterfly species within their respective families. The following time periods were considered for each year's seasonal variations. The winter months are December, January, and February, March, April, and May are the summer months, June, July, August, and September are the monsoon months, October and November are considered as the monsoon. Also, species were categorised as very common, common, uncommon, and rare based on the number of sightings founded at sampling site within the study area over a defined annual period. Additionally, Species listed under the Indian Wildlife Act of 1972 were identified to highlight their conservation significance.

Results and discussion

A total of 37 species of butterflies from 5 families were identified in this study (Table 1). The family Nymphalidae had the greatest number of species (14 species, or 38% of all butterflies on campus), followed by the families Lycaenidae (8 species, or 22%), Pieridae (7 species, or 19%),

Papilionidae (5 species, or 13%), and Hesperidae (3 species, or 8%) (Fig. 1). Three of these species were extremely common, ten were common, twenty were uncommon, and four were rare (Fig. 2).

All five families of butterflies Papilionidae, Pieridae, Nymphalidae, Lycaenidae, and Hesperidae were observed in the research region throughout our investigation. *Acraea terpsicore*, *Euploea core*, *Danaus chrysippus*, *Junonia atlites*, *Leptosia nina*, and *Eurema hecabe* were the most frequently observed species of butterflies. Due to their polyphagous character, large bodies, and capacity for flight, the majority of species are members of the Nymphalidae family (Eswaran and Promod, 2005, Krishnakumar *et al.*, 2008)^[4, 9]. Due to its extreme site specificity, love of shadow, and preference for particular host plants, the Hesperidae family has the fewest recorded species. Singh (2011)^[27] states that with 522 species of butterflies, Nymphalidae is the most diverse family in India, followed by Lycaenidae with 443 species, Hesperidae with 321 species, and Papilionidae with 107 species.

The availability of adult nectar plants and larval host plants is linked to butterflies' selection for specific settings (Nair *et al.*, 2014)^[18]. The several areas of the college campus that attract butterflies are home to a variety of well-developed and spared kinds of flowering and fruiting plants. The majority of species, or 42 species, belonged to the Nymphalidae family. In their 2014 study, Palai and Rath identified 40 species of butterflies in the Nymphalidae family at Sunabeda Wildlife Sanctuary. In the Nandankanan Wildlife Sanctuary in Bhubaneswar, 92 species from 68 taxa were identified by Mishra *et al.* (2010)^[15]. 24 species of Nymphalidae, 14 species of Pieridae, 12 species of Lycaenidae, 7 species of Hesperidae, and 6 species of Papilionidae were found in a study carried out at the Utkal University Campus in Bhubaneswar, Odisha. Wherein 4 species were discovered to fall within the 1972 IWPA (Mohapatra *et al.*, 2013)^[17]. According to Panda *et al.*, the population habitat of Bhubaneswar contains 101 species of butterflies from five families of Lepidoptera, with 35 species of Nymphalidae being the most prevalent (Panda *et al.*, 2016)^[22]. Numerous researchers in different regions of India have conducted similar experiments. Sayeswara (2014)^[26] surveyed the Sahyadri College Campus in Shivamogga, Karnataka; Alleppa & Shrivastava (2016)^[1] examined the variety of butterflies on the college campus in Bhilai, Chhattisgarh; and Tiple (2012)^[29] surveyed the Tropical Forest Research Institute in Jabalpur, Madhya Pradesh.

Table 1: List of butterfly species recorded from the study site along with their family affiliation, Common name, IWPA Status and Relative Abundance

Sl. No.	Common name	Scientific name	Status	IWPA	Relative Abundance (RA)
Nymphalidae (brush-footed)					
1	Common sailer	<i>Neptis hylas</i>	C		2.76
2	Common baron	<i>Euthalia aconthea</i>	UC		2.01
3	Plain tiger	<i>Danaus chrysippus</i>	C		4.46
4	Chocolate pansy	<i>Junonia iphita</i>	UC		2.86
5	Lemon pansy	<i>Junonia lemonia</i>	UC		2.01
6	Grey pansy	<i>Junonia atlites</i>	UC		2.55
7	Peacock pansy	<i>Junonia almana</i>	UC		2.44
8	Common crow	<i>Euploea core</i>	C		4.99
9	Common castor	<i>Ariadne merione</i>	UC		2.01
10	Common evening brown	<i>Melanitis leda</i>	UC		3.08

11	Tawny coster	<i>Acraea terpsicore</i>	VC		5.41
12	Common fourring	<i>Ypthima huebneri</i>	UC		1.80
13	Common threeering	<i>Ypthima asterope</i>	UC		1.16
14	Commander	<i>Moduza Procris</i>	UC		2.23
Pieridae (white and sulphurs)					
15	Common grass yellow	<i>Eurema hecabe</i>	C		4.25
16	Three spot grass yellow	<i>Eurema blanda</i>	C		3.29
17	Spotless grassy yellow	<i>Eurema laeta</i>	UC		1.91
18	Small grass yellow	<i>Eurema brigitta</i>	C		3.93
19	Common emigrant	<i>Catopsilia pomona</i>	C		5.20
20	Psyche	<i>Leptosia nina</i>	VC		5.73
21	Common gull*	<i>Cepora nerissa</i>	UC	Sch II	1.70
Lycaenidae (blues and coppers)					
22	Common pierrot*	<i>Castalius rosimon</i>	C	Sch I	3.93
23	Stripped pierrot	<i>Tarucus nara</i>	UC		2.65
24	Forget me not	<i>Catochrysops strabo</i>	UC		2.44
25	Tiny grass blue	<i>Zizula hylax</i>	VC		5.41
26	Plains cupid	<i>Luthrodes pandava</i>	C		3.40
27	Common lineblue	<i>Prosotas nora</i>	UC		2.55
28	Gram blue*	<i>Euchrysops cnejus</i>	UC	Sch II	1.91
29	Zebra blue	<i>Leptotes plinius</i>	C		3.50
Papilionidae (swallowtails)					
30	Common rose*	<i>Pachliopta aristolochiae</i>	UC	Sch IV	1.59
31	Common mormon	<i>Papilio polytes</i>	UC		1.38
32	Blue mormon	<i>Papilio polymnestor</i>	UC		1.16
33	Crimson rose	<i>Atrophaneura hector</i>	R		0.95
34	Lime	<i>Papilio demoleus</i>	UC		1.06
Hesperiidae (skippers)					
35	Rice swift	<i>Borbo cinnara</i>	R		0.85
36	Grass demon	<i>Ancistroides folus</i>	R		0.74
37	Common small flat	<i>Sarangesa dasahara</i>	R		0.53

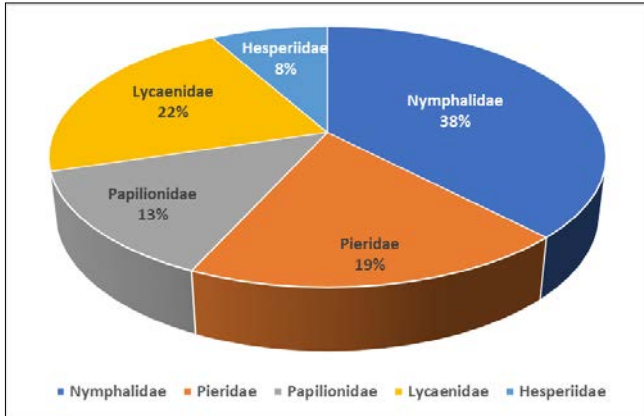


Fig 1: Percentage composition of different butterflies recorded in the study area

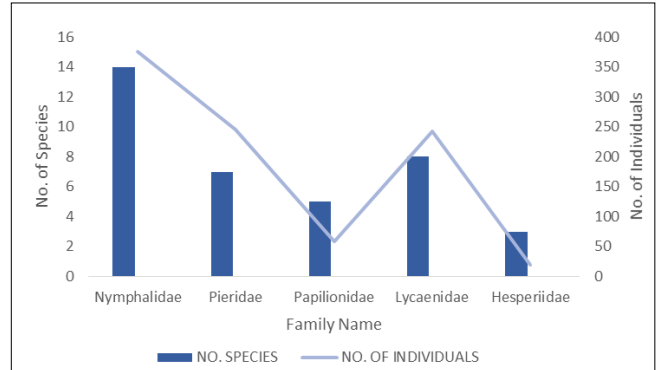


Fig 3: Dual-axis bar graph showing the no. of species and no. of individuals (Y- axes) across five butterfly families (X-axis)

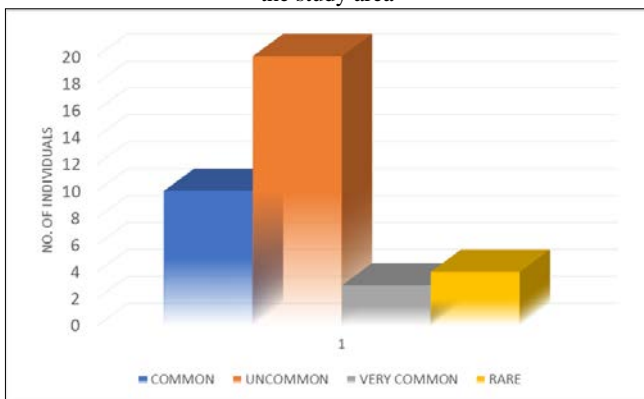


Fig 2: Abundance distribution of butterflies based on the number of individuals in each category

Conclusion

Butterfly abundance is a sign of a healthy ecosystem. A slight alteration in the surroundings could cause the butterfly population to drastically decline. Any community that loses butterflies may experience the "butterfly effect," which has an impact on the ecosystem as a whole, even at the trophic levels. Butterfly populations have suffered greatly as a result of climate change. The demise of the butterfly is also linked to anthropogenic activity. The current study shows that the studied area maintains a reasonably high level of species richness and community heterogeneity within a semi-urban landscape matrix by providing a quantitative assessment of butterfly diversity in and around the model degree college campus, Boudh, Odisha. Based on established ecological indices, diversity

patterns indicate that vegetation complexity and habitat structure are important factors in determining community dynamics. The current study's findings unequivocally show how crucial institutional campuses are for giving butterfly populations in growing cities a safer and more natural environment. These places will offer a sustainable home for butterflies as well as other insects, birds, and plants if city planners and other relevant authorities carefully plan and maintain these kinds of modest habitats. Diversity and abundance on college campuses may rise with careful management of the natural environment, gardens, and landscaping. In order to maintain a healthy environment for butterflies, it is also necessary to maintain the variety of nectarivores and larval host plants. The current list is based on a brief pilot poll conducted over the course of a year, and further research will be done to update it.

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