



Diversity of Butterfly from gardens of Baramati city

Daivajnani R Beera, Sharvari V Shah, Kishor U More

Department of Zoology, Tuljaram Chaturchand College of Arts, Science & Commerce, Baramati, Pune (Autonomous), Maharashtra, India

Abstract

A study assessing butterfly diversity took place in Baramati, India, spanning the period from September 2023 to March 2024. This research documented 26 distinct butterfly species belonging to five families. Notably, the Nymphalidae family was the most frequently observed. The identification of threatened species within the study area underscores the urgent requirement for conservation initiatives. Butterfly populations are valuable indicators of environmental health, and the findings highlight the damaging consequences of pollution and urban expansion on these insects. As a potential conservation measure to counteract these pressures, the report suggests establishing botanical gardens within educational settings. Nonetheless, preserving the variety of butterfly life necessitates a broader conservation approach, incorporating the protection of natural habitats, implementation of legal safeguards, and efforts to educate the public.

Keywords: Butterfly diversity, Baramati, Conservation, Botanical gardens, Ecosystem health.

Introduction

The vast array of life on Earth is a product of millions of years of evolution, shaped by forces like natural selection, genetic drift, and environmental pressures. This concept is central to the theory of island biogeography developed by MacArthur and Wilson (1967). India stands out as one of the world's principal biodiversity hotspots, possessing a particularly remarkable fauna. This richness is supported by the country's diverse geography—spanning from the Himalayan peaks to the tropical forests of the Western Ghats—which allows an incredible variety of animal life to flourish.

India serves as a crucial global centre for biodiversity, harbouring an exceptional range of both vertebrate and invertebrate species. The nation is home to over 1,200 bird species, 400 mammal species, and an estimated 91,000 insect species (Molur *et al.*, 2011). Among insects, butterflies and moths are classified under the order Lepidoptera, meaning "scaly wings" (Kehimkar, 2008). Lepidoptera ranks as the second-largest order within the class Insecta, encompassing roughly 150,000 species worldwide, with about 70,820 identified as butterflies (Shield, 1989). Global estimates for the number of butterfly species have varied, historically ranging from 13,000 (Owen, 1971) to 20,000 (Vane-Wright, 1978).

Despite often being perceived negatively as pests, insects fulfil essential roles in maintaining planetary health and human well-being. They demonstrate remarkable adaptability, thriving in nearly every type of environment on Earth by utilizing a vast array of habitats and nutritional sources. Insects have also been critically important in scientific research, contributing to numerous significant discoveries. Furthermore, over 80% of flowering plants depend on insect pollinators—such as bees, butterflies, beetles, and flies—for fertilization, which is vital for producing fruits, vegetables, and seeds. Insects are also a fundamental food source for numerous animals, including birds, bats, reptiles, amphibians, and mammals. Consequently, they are indispensable for maintaining

healthy ecosystems, supporting biodiversity, contributing to food security, and enhancing human well-being.

Butterflies are widely admired for their aesthetic appeal, showcasing a diverse spectrum of colorful wings. Their variety is linked to the ability of different species to adapt to specific microhabitats. Butterflies are currently classified into superfamilies, primarily Hesperioidea (skippers) and Papilionoidea (which includes groups like swallowtails, whites, yellows, brush-footed butterflies, and blues) (Kehimkar, 2008). It is estimated that there are around 18,000 butterfly species globally. India hosts 1,501 of these species, broken down into 321 skippers, 107 swallowtails, 109 whites and yellows, 521 brush-footed butterflies, and 443 blues (Kehimkar, 2008).

Functioning as key elements of the food chain, butterflies serve as prey for birds, reptiles, spiders, and predatory insects. Their high sensitivity to environmental fluctuations also makes them excellent indicators of environmental quality. The distribution and diversity patterns of butterflies are influenced by geography and specific ecological needs (Khan *et al.*, 2011). However, threats such as habitat destruction, pollution, and other human-induced (anthropogenic) factors are driving rapid declines in butterfly, bird, and other wildlife populations. These declines disrupt ecosystems and contribute to species extinctions (Tiple *et al.*, 2007).

Butterflies exhibit complete metamorphosis, developing through four distinct life stages: egg, larva (caterpillar), pupa (chrysalis), and adult. Understanding the distribution and diversity of butterflies across various habitats, including areas surrounding Baramati city, is essential for guiding conservation efforts. As major pollinators, butterflies play a crucial role in plant reproduction by transferring pollen between flowers.

Methodology

This study focused on the diversity and distribution of butterflies in and around Baramati tehsil, Pune district. The research was conducted from September 30, 2023, to March 15, 2024, covering various regions and surrounding areas of

Baramati tehsil. Weekly random surveys were performed, targeting locations based on the presence of greenery and vegetation. Surveys were conducted during favourable weather conditions, at appropriate temperatures, and during the active periods of butterflies, specifically from 07:00 to 17:00 hours. Butterflies were photographed using a phone camera, identified to the species level, counted, and recorded along with the date and location. Identification was facilitated using standard guides, particularly those by Isaac Kehimkar (2008).

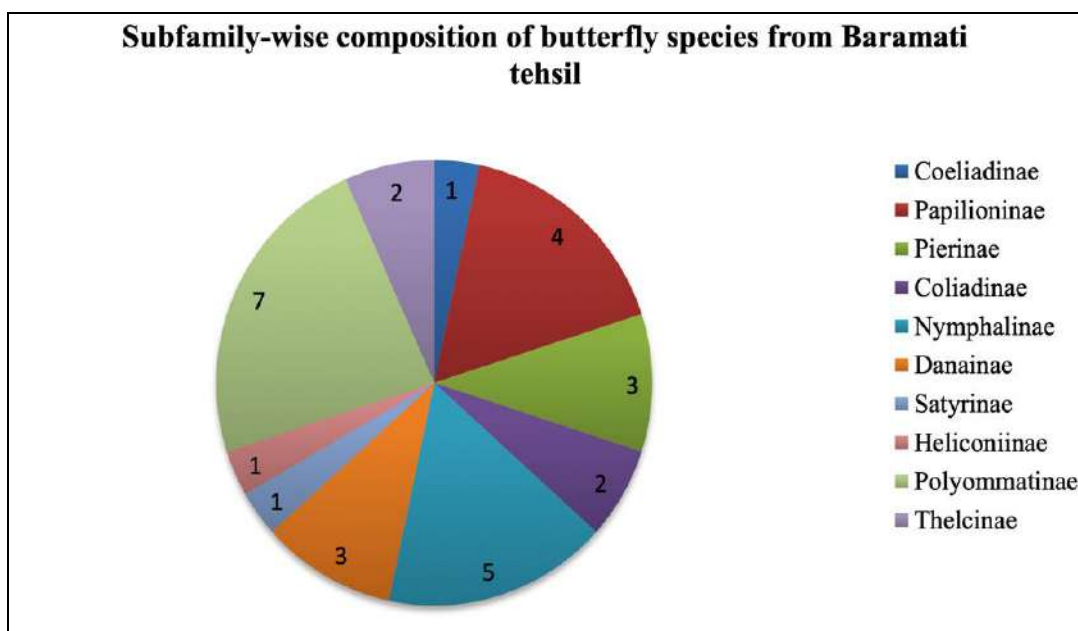
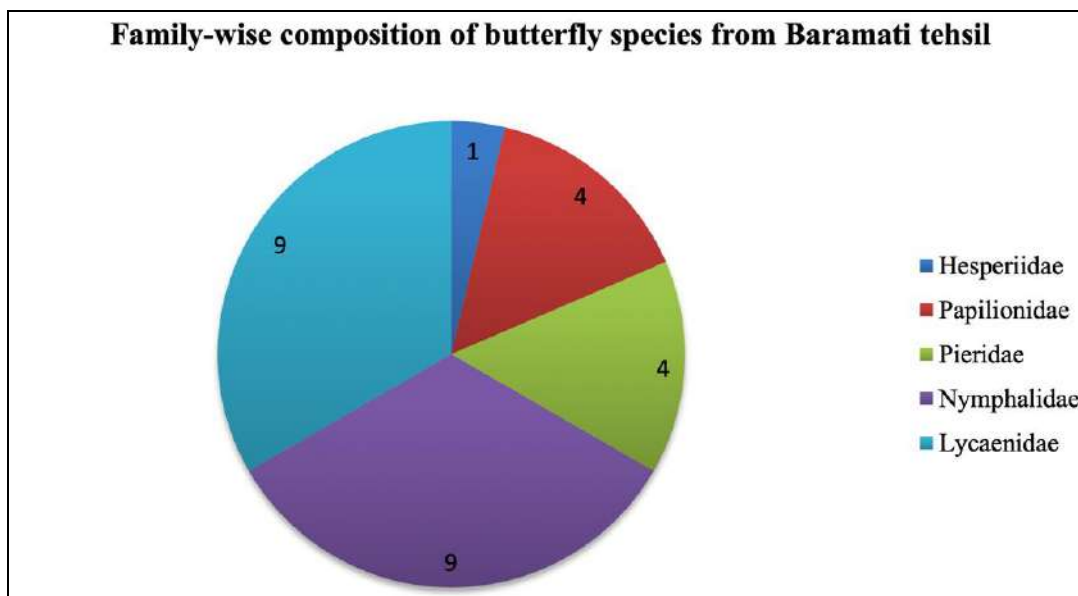
Observations and Results

In the current study, 26 butterfly species from 5 families, 11 subfamilies, and 24 genera were collected and identified (Table 1). Among these, 9 species belonged to the family Nymphalidae, 9 to Lycaenidae, 4 to Papilionidae, 4 to Pieridae, and 1 to Hesperidae. Notably, the Common Pierrot and Danaid Eggfly were listed under Schedule I and Danaid Eggfly also under Schedule II of the Indian Wildlife (Protection) Act, 1972. Kunte (2000)

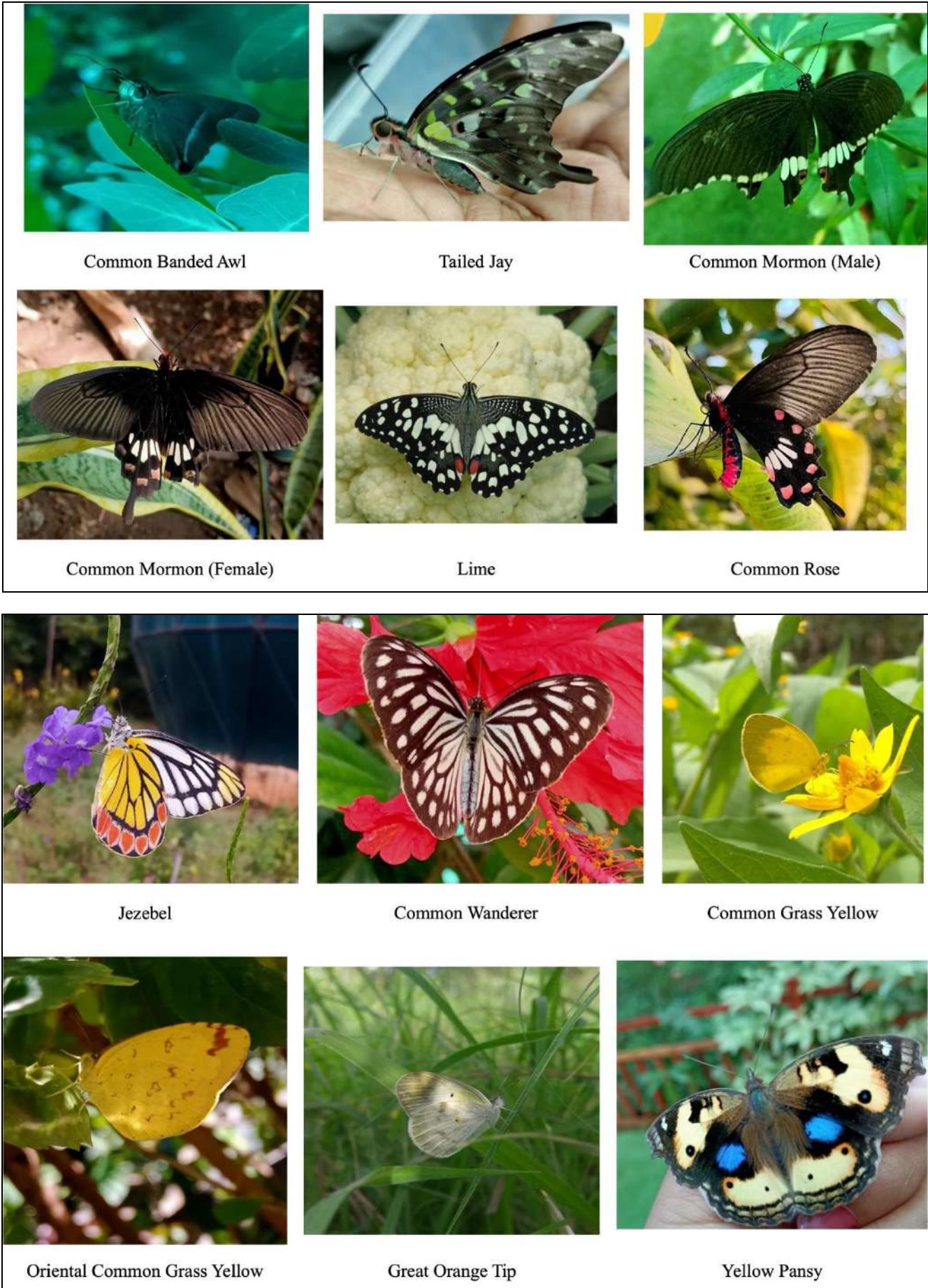
suggested that the scheduled list needs revision to provide suitable and sufficient legal protection to Indian butterflies. The Nymphalidae family was the most dominant in terms of species number, consistent with findings by Parasharya (2007), who noted their prevalence in tropical regions due to their polyphagous nature, enabling them to inhabit diverse habitats. These butterflies are also strong, active fliers capable of searching large areas for resources (Eswaran and Pramod, 2005; Krishnakumar *et al.*, 2008; Raut and Pendharkar, 2010; Padhye *et al.*, 2006).

Butterfly abundance typically indicates a healthier ecosystem. The flora in and around Baramati tehsil provides a variety of habitats, food, and breeding sites for butterflies. However, increasing pollution and urbanization are affecting butterfly habitats. To conserve butterflies, it is essential to protect their primary habitats. Establishing and maintaining botanical gardens in educational institutions is an innovative approach that can significantly contribute to butterfly conservation.

***Listed in Indian Wildlife (Protection) Act, 1972**



Photographs of Butterfly specimens





Lemon Pansy



Common Crow



Double-branded Crow



Blue Tiger



Great Egg fly



Danaid Eggfly



Danaid Eggfly (female)



Common Evening Brown



Tawny Coster



Zebra Blue



Red Pierrot



Common Pierrot



Table 1: List of Butterflies in and around Baramati Area

Sr. No.	Common Name	Scientific Name	Subfamily
Family: Hesperidae			
1.	Common banded Awl	<i>Hasora chromus</i>	Coeliadinae
Family: Papilionidae			
2.	Tailed Jay	<i>Graphium agamemnon</i>	Papilioninae
3.	Common Mormon (Male)	<i>Papilio polytes</i>	
4.	Common Mormon (Female)	<i>Papilio polytes</i>	
5.	Lime	<i>Papilio demoleus</i>	
6.	Common Rose	<i>Pachliopta aristolochiae</i>	
Family: Pieridae			
7.	Jezebel	<i>Delias eucharis</i>	Pierinae
8.	Common Wanderer	<i>Pareronia valeria</i>	Coliadinae
9.	Common Grass yellow	<i>Eurema hecabe</i>	
10.	Oriental common grass yellow	<i>Eurema hecabe</i>	
11.	Great Orange Tip	<i>Hebomoia glaucippe</i>	
Family: Nymphalidae			
12.	Yellow Pansy	<i>Junonia hierta</i>	Nymphalinae
13.	Lemon Pansy	<i>Junonia lemonias</i>	
14.	Common Crow	<i>Euploea core</i>	Danainae
15.	Double-branded Crow	<i>Euploea sylvester</i>	
16.	Blue Tiger	<i>Tirumal limniace</i>	
17.	Great Eggfly (Female)	<i>Hypolimnas bolina</i>	Nymphalinae
18.	Danaid Eggfly*	<i>Hypolimnas misipus</i>	
19.	Danaid Eggfly (Female)	<i>Hypolimnas misipus</i>	
20.	Common Evening Brown	<i>Melanitis leda</i>	Satyrinae
21.	Tawny Coster	<i>Acraea terpsicore</i>	Heliconiinae
Family: Lycaenidae			
22.	Zebra Blue	<i>Leptotes plinius</i>	Polyommatainae
23.	Red Pierrot	<i>Talicauda nyseus</i>	
24.	Common Pierrot*	<i>Castalius rosimon</i>	
25.	Rounded Pierrot	<i>Tarucus nara kollar</i>	
26.	Common Shot silverline	<i>Spindasis ictis</i>	Thelcinae
27.	Orange-spotted Grass Jewel	<i>Freyeria trochylus</i>	Polyommatainae
28.	Pea blue	<i>Lampides boeticus</i>	
29.	Plains Cupid	<i>Chilades pandava</i>	
30.	Common Red Flash	<i>Rapala iarbus</i>	

*Listed in Indian Wildlife (Protection) Act, 1972

Summary

Based on comprehensive study and observations of butterfly diversity within the Baramati tehsil, several important findings and conservation implications have emerged. The presence and relative numbers of 26 butterfly species, spread across 5 families and 11 subfamilies, demonstrate significant biodiversity in this area. Notably, the Nymphalidae family is dominant, likely due to their ability to feed on various plants (polyphagy) and their strong flying capabilities, which allow them to adapt to different habitats and contribute to their ecological resilience.

The discovery of species requiring legal protection, such as the Common Pierrot and Danaid Eggfly, highlights the critical need for regulatory actions to conserve butterfly populations facing vulnerability or threats. The Indian Wildlife (Protection) Act, 1972, is a key instrument in this regard. As suggested by Kunte (2000), periodically revising the Act's scheduled lists is important to ensure protective measures are up-to-date and reflect current ecological conditions and conservation requirements.

Butterflies are valuable indicators of ecosystem health. Their abundance in the Baramati tehsil suggests that the local environment currently sustains a variety of wildlife, vital for ecological balance. However, increasing pollution and urbanization pose significant threats that could degrade these habitats, potentially causing declines in butterfly numbers and impacting overall biodiversity.

To counteract these dangers, conservation initiatives should concentrate on protecting and improving butterfly habitats. One promising and effective strategy is the establishment and upkeep of botanical gardens within educational institutions. These gardens can provide safe havens for butterflies, offering necessary resources and breeding areas. Simultaneously, they serve as important educational resources, raising public awareness and actively engaging students and the wider community in conservation work.

Conclusion

Butterfly conservation efforts in Baramati tehsil and comparable areas can be substantially enhanced by applying habitat preservation tactics, updating legal safeguards based on comprehensive research, and promoting community involvement through educational outreach. Adopting such a multifaceted strategy will not only help protect butterflies but will also contribute positively to the region's overall biodiversity and ecological stability.

References

- Agase DM, Markam MS, Kothe TS, Bisen MK, Kamleshya P. Butterfly diversity of Gangulpara, Balaghat, Madhya Pradesh, 2022.
- Sheikh T, Awan MA, Parey SH. Checklist of Butterflies (Lepidoptera: Rhopalocera) of Union Territory Jammu and Kashmir, India. *Records of the Zoological Survey of India*, 2021;121(1):127–171.
- Luna P, Villalobos F, Escobar F, Neves F, Castillo-Campos G, Hinojosa-Díaz I, et al. Temperature dissimilarity drives flower–visitor interaction turnover across elevation in the Mexican Transition Zone. *Journal of Biogeography*, 2023;50(10):1737–1748. <https://doi.org/10.1111/jbi.14579>
- Chaudhary RA. Checklist of butterflies (Lepidoptera) in Agra District of Uttar Pradesh, 2023.
- Fang SQ, Li YP, Pan Y, Wang CY, Peng MC, Hu SJ. Butterfly Diversity in a Rapidly Developing Urban Area: A Case Study on a University Campus. *Diversity*, 2023;16(1):4. <https://doi.org/10.3390/d16010004>
- Ravivarma D, Bhargavi C, Chepyala S, Podishetti V, Shakati S, Manasa M, Kolagani C. Diversity, Seasonal Dynamics and Host Plants of Butterflies in Forest Research Centre, Siddipet, Telangana, India. *International Journal of Environment and Climate Change*, 2023;13(11):866–882.
- Bhowate S, Kumar P. Diversity and abundance of butterfly fauna of Chhindwara district, Madhya Pradesh. *International Journal of Entomology Research*, 2020;5(6):121–124.
- Mohite SK. Seasonal variation and abundance of butterflies in Ajara Tehsil, Kolhapur District, Maharashtra State, India. *BIOINFOLET - A Quarterly Journal of Life Sciences*, 2022;19(2):99–103.
- Devdhariya DR, Bamaniya VV, Raval JV. Diversity of butterflies at Hiranvel, Gir Somnath, Gujarat, India. *BIOINFOLET - A Quarterly Journal of Life Sciences*, 2022;19(3):260–265.
- Weibull AC, Bengtsson J, Nohlgren E. Diversity of butterflies in the agricultural landscape: the role of farming system and landscape heterogeneity. *Ecography*, 2000;23(6):743–750. <https://doi.org/10.1111/j.1600-0587.2000.tb00317.x>
- Ismail T, Maulany RI, Ngakan PO. Abundance assessment of *Papilio gigon gigon* and availability of resource plants in Bantimurung Bulusaraung National Park, South Sulawesi, Indonesia. *Biodiversitas Journal of Biological Diversity*, 2024, 25(2). <https://doi.org/10.13057/biodiv/d250248>
- Husain A, Hasan W. Skipper butterflies (Hesperiidae: Lepidoptera) common to Sulawesi (Indonesia) and India, with their host plants. [Year not provided].
- Roychoudhury N, Mishra RK. Occurrence of Swallowtails Butterflies in Kanha National Park. [Year not provided].
- Bora A, Meitei LR. Diversity of butterflies (Order: Lepidoptera) in Assam University campus and its vicinity, Cachar district, Assam, India. *Journal of Biodiversity and Environmental Sciences*, 2014;5(3):328–339.
- Mey W, Speidel W. Global diversity of butterflies (Lepidoptera) in freshwater. *Freshwater Animal Diversity Assessment*, 2008;521:521–528.
- Parandhaman D, Sivasankaran K, Meerasa MN, Ignacimuthu S. Diversity of butterflies in different habitats from Tamil Nadu part of Western Ghats (Lepidoptera: Rhopalocera). *Elixir Applied Biology*, 2012;51:10861–10865.
- Prabakaran S, Chezhan Y, Evangelin G, William SJ. Diversity of butterflies (Lepidoptera: Rhopalocera) in Tiruvallur District, Tamil Nadu, India. *Biolife*, 2014;2(3):769–778.
- Dwari S, Mondal AK, Chowdhury S. Diversity of butterflies (Lepidoptera: Rhopalocera) of Howrah

- District, West Bengal, India. *Journal of Entomology and Zoology Studies*,2017:5(6):815–828.
19. Arya MK, Dayakrishna CR. Species richness and diversity of butterflies in and around Kumaun University, Nainital, Uttarakhand, India. *Journal of Entomology and Zoology Studies*,2014:2(3):153–159.
 20. Nidup T, Dorji T, Tshering U. Taxon diversity of butterflies in different habitat types in Royal Manas National Park. *Journal of Entomology and Zoology Studies*,2014:2(6):292–298.
 21. Sethy J, Behera S, Chauhan NS. Species diversity of butterflies in south-eastern part of Namdapha Tiger Reserve, Arunachal Pradesh, India. *Asian Journal of Conservation Biology*,2014:3(1):75–82.
 22. Owen DF. Species diversity in butterflies in a tropical garden. *Biological Conservation*,1971:3(3):191–198.
 23. Haneda NF, Panggabean PB. Diversity of butterflies on different ecosystems and seasons. In: IOP Conference Series: Earth and Environmental Science,2019:394(1):012041.
<https://doi.org/10.1088/1755-1315/394/1/012041>
 24. Khanal B, Chalise MK, Solanki GS. Diversity of butterflies with respect to altitudinal rise at various pockets of the Langtang National Park, central Nepal. *International Multidisciplinary Research Journal*,2012:2(2):41–48.
 25. Antony AK, Prasad G, Kalesh S. Diversity and abundance of butterflies of Kerala University campus, Kariavattom Thiruvananthapuram. *Journal of Entomology and Zoology Studies*,2016:4(5):1074–1081.
 26. Shamsudeen RSM, Mathew G. Diversity of Butterflies in Shendurny Wildlife Sanctuary, Kerala (India). *World Journal of Zoology*,2010:5(4):324-329.
 27. Parmar H, Parihar A, Parihar V. Lepidopteran diversity of Singoda lake, Visnagar, North Gujarat.