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Exploring the Butterfly (Lepidoptera:Rhopalocera) Diversity of Ramdhari, Bhavnagar, Gujarat, India

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Abstract: The present study was conducted to assess the diversity of butterfly species in the Ramdhari area of Bhavnagar, Gujarat, India. A total of 38 butterfly species were identified and classified into five different families, namely Hesperidae, Lycaenidae, Nymphalidae, Papilionidae and Pieridae spanning across 27 genera. The findings underscore the significant butterfly diversity in an unexplored area of the Ramdhari region, emphasizing the imperative to preserve and protect their habitats for the overall health of the ecosystem. It also encourages further research for habitat restoration and conservation, reinforcing the importance of ongoing initiatives to ensure the sustainability of the ecosystem.

Keywords: Butterflies, Diversity, Ramdhari, Nymphalidae, Conservation

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Introduction

Butterflies are important pollinators and considered as bio indicators of the health of an ecosystem. As per taxonomic depth, butterflies stand out as one of the most extensively researched insect groups, owing to their captivating aesthetic qualities derived from vibrant colors, intriguing behavior and diurnal activity patterns (Boggs *et al.*, 2003). Butterflies stand out as a prominent component of Earth's

biodiversity, exhibiting remarkable sensitivity to alterations in their surroundings such as temperature (Cerrato *et al.*, 2019), humidity (Gupta *et al.*, 2019), rainfall (Grøtan *et al.*, 2012) and light (Douglas *et al.*, 2007). Research indicates that the foraging behavior of butterfly species is significantly influenced by morphological variables specific to the plant species (Naznin, 2022). Adult butterflies typically depend on nectar, while larvae

rely on leaves (Naznin, 2022). The dietary preferences of butterflies play a pivotal role in shaping their distribution, abundance and migratory patterns (Spitzer *et al.*, 1993; Curtis *et al.*, 2015).

Butterflies have been subject to systematic study since the early 18th century, and as of 1998 approximately 19238 species have been documented worldwide (Heppner, 1998) and Indian subcontinent is home to 1318 butterfly species (Varshney and Smetacek, 2015; Samal *et al.*, 2021). In India several studies are being performed with butterfly diversity including their interaction with food plants (Kunte *et al.*, 1999; Mukherjee *et al.*, 2016). Gujarat State is home to a total of 193 species of Butterflies (Parasharya and Jani, 2007; Gohel and Raval, 2019). However, it is important to note that this figure is not constant due to the continuous discovery of new butterflies and ongoing disagreements among taxonomists regarding the classification and status of many existing species (Simonson *et al.*, 2001). The dynamic nature of butterfly taxonomy underscores the evolving understanding of their diversity and emphasizes the need for ongoing research and consensus-building within the scientific community.

Ramdhari village is 40 km away from Bhavnagar city. Bhavnagar is situated at coastal region of Gulf of Khambhat. Ramdhari unveils a diverse landscape, featuring scrublands, grasslands and lush forests. This diversity of ecosystems set the scene for intricate interplays among flora, fauna and environmental forces. Ramdhari and its surroundings showcase a captivating fusion of terrestrial and aquatic habitats, ranging from lush forest to pristine wetlands and fresh water bodies.

This study underscores the remarkable butterfly biodiversity of Ramdhari area of Bhavnagar, Gujarat, India, emphasizing our collective duty to preserve and restore habitats for the well-being of these exquisite insects. Beyond fascination it signifies to understand, appreciate and safe guard the delicate connections that

defines our natural world in Bhavnagar, Gujarat, India.

Materials and Methods

Study site:

Field survey and investigations was carried out at Ramdhari (21°43'29" N 71°49'33" E) Bhavnagar, Gujarat, India (Fig. 1). It is well known for its rich biodiversity. The area is having various kind of habitat like agricultural, gauchar land, forest patch, and temporary water body (seasonal river and check dam). Annual temperature of the study area ranges between 27°C and 42°C and average annual rainfall is 580 mm (Metrology station Bhavnagar).

Sample collection and Identification:

The present study was carried out for one year (Jan-Dec, 2023). The study site was visited twice in a week. To unveil the kaleidoscopic spectrum of butterflies in Ramdhari, a combination of zigzag and line transect methods was employed. Covering a total distance of 5 km through 30 transects. Butterfly species was primarily identified directly on the field. Identification of butterfly species was documented with the help of field guide book "Butterflies of the Indian region" (Wynther-Blyth, 1957) and <https://www.ifoundbutterflies.org/>. Nikon COOLPIX P1000 camera was used for documentation of butterfly species. The observed butterfly species belongs to the Hesperidae, Lycaenidae, Nymphalidae, Papilionidae and Pieridae families. This study illuminates the presence of 38 distinct butterfly species. The canvas of diversity further expands with the recognition of 27 different genera, underscoring the intricacies of this delicate ecosystem.

Results and Discussion

Exploring the diversity of butterflies through studies offers valuable insights into the intricate tapestry of habitats, unveiling the mosaic of spatial distribution. The survey unveiled the prevailing dominance of Nymphalidae, comprising 34 % out of 38 observed butterfly species, with subsequent

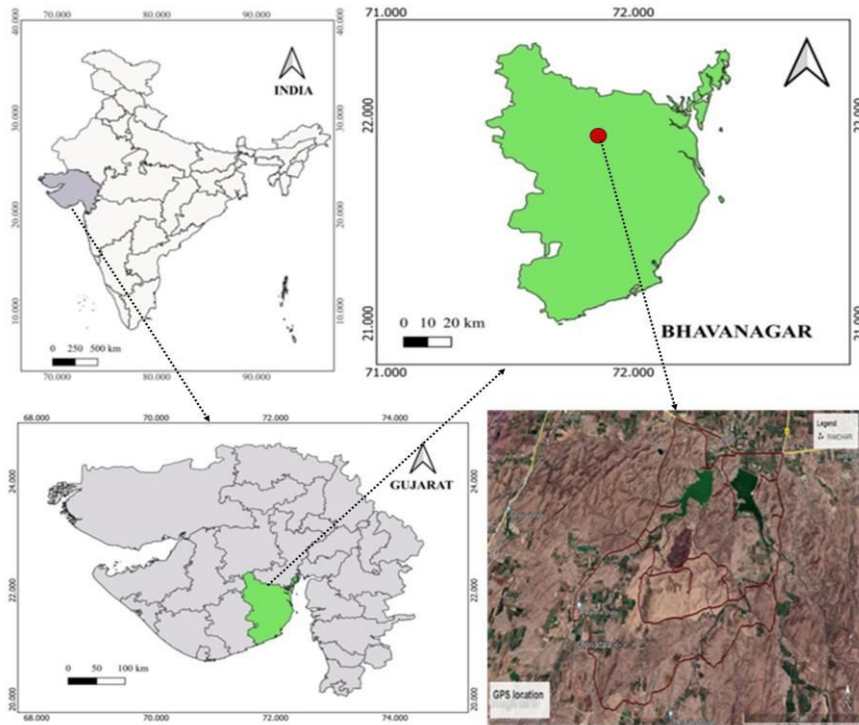


Fig. 1: Map of Ramdhari, Bhavnagar, Gujarat, India.

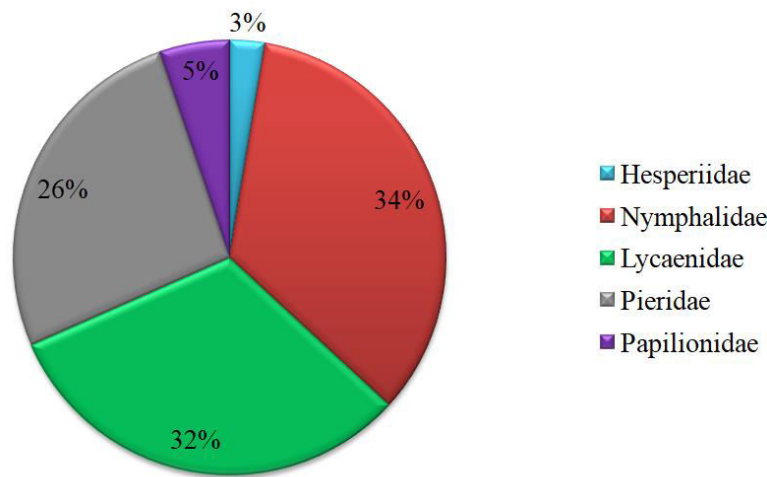


Fig. 2: Family wise distribution of butterfly species in Ramdhari

contributions from Lycaenidae, Pieridae, Papilionidae and Hesperidae at 32%, 26%, 5% and 3%, respectively (Fig. 2). Similar dominance of Nymphalidae family was observed among 69 butterfly species in the Victoria Park Reserve Forest, Bhavnagar (Trivedi *et al.*, 2022).

In Ramdhari, a total of 27 genera and 38 species were recorded (Fig. 3). Assessing the

diversity of butterfly species not only discloses these proportions but also imparts valuable insights into the nuanced variations in richness and abundance across the landscape (Harrington and Stork, 1995; Naznin, 2022).

The diverse butterfly species belongs to various families, such as Hesperidae (1 species), Lycaenidae (12 species), Nymphalidae (13

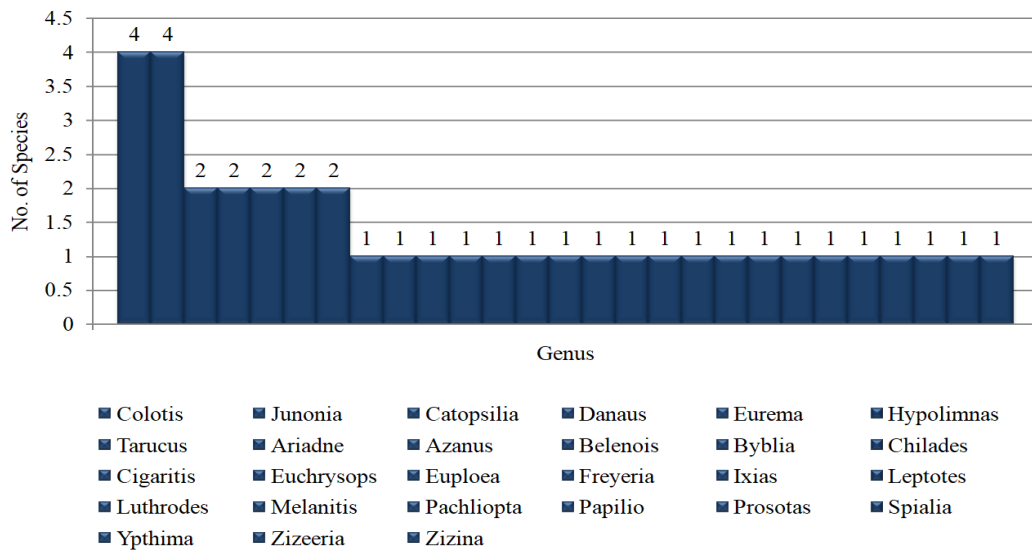


Fig. 3: Distribution of butterfly species belonging to different genera in Ramdhari.

Table 1: Family wise checklist of butterflies recorded from Ramdhari with its status in IUCN and WPA 1972

No.	Genus	Species	Scientific name	Local name	Abundance	IUCN Status
Family : Hesperiiidae						
1.	<i>Spialia</i>	<i>S. galba</i>	<i>Spialia galba</i> (Fabricius, 1793)	Indian grizzled skipper	VR	LC
Family : Lycaenidae						
2.	<i>Cigaritis</i>	<i>C. vulcanus</i>	<i>Cigaritis vulcanus</i> (Fabricius, 1775)	Common silverline	NR	LC
3.	<i>Tarucus</i>	<i>T. nara</i>	<i>Tarucus nara</i> (Kollar, 1848)	Striped Pierrot	VC	LC
4.	<i>Freyeria</i>	<i>F. putli</i>	<i>Freyeria putli</i> (Kollar, 1844)	Black-spotted Grass Jewel	C	LC
5.	<i>Luthrodes</i>	<i>L. pandava</i>	<i>Luthrodes pandava</i> (Horsfield, 1829)	Oriental Plains Cupid	C	LC
6.	<i>Prosotas</i>	<i>P. dubiosa</i>	<i>Prosotas dubiosa</i> (Semper, 1879)	Tailless Line blue	R	LC
7.	<i>Zizeeria</i>	<i>Z. karsandra</i>	<i>Zizeeria karsandra</i> (Moore, 1865)	Dark grass blue	R	LC
8.	<i>Leptotes</i>	<i>L. plinius</i>	<i>Leptotes plinius</i> (Fabricius, 1793)	Zebra Blue	VC	LC
9.	<i>Euchrysops</i>	<i>E. cnejus</i>	<i>Euchrysops cnejus cnejus</i> (Fabricius, 1798)	Oriental Gram Blue	VC	Schedule II
10.	<i>Zizina</i>	<i>Z. otis</i>	<i>Zizina otis indica</i> (Murray, 1874)	Indian Lesser Grass Blue	C	LC
11.	<i>Tarucus</i>	<i>T. balkanicus</i>	<i>Tarucus balkanicus nigra</i> (Bethune-Baker, 1918)	Black-spotted Pierrot	NR	LC
12.	<i>Chilades</i>	<i>C. lajus</i>	<i>Chilades lajus</i> (Stoll, 1780)	Indian Lime Blue	C	LC
13.	<i>Azanus</i>	<i>A. jesous</i>	<i>Azanus jesous</i> (Guérin, 1847)	African Babul Blue	R	LC
Family : Nymphalidae						
14.	<i>Junonia</i>	<i>J. hierta</i>	<i>Junonia hierta hierta</i> (Fabricius, 1798)	Oriental Yellow Pansy	NR	LC

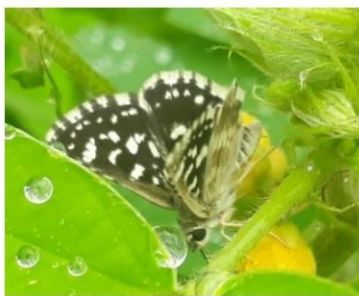
15.	<i>Junonia</i>	<i>J. orithya</i>	<i>Junonia orithya</i> (Linnaeus, 1758)	Blue Pansy	VC	LC
16.	<i>Junonia</i>	<i>J. lemonias</i>	<i>Junonia lemonias</i> (Linnaeus, 1758)	Lemon Pansy	NR	LC
17.	<i>Junonia</i>	<i>J. almana</i>	<i>Junonia almana almana</i> (Linnaeus, 1758)	Oriental Peacock Pansy	NR	LC
18.	<i>Danaus</i>	<i>D. chrysippus</i>	<i>Danaus chrysippus chrysippus</i> (Linnaeus, 1758)	Oriental Plain Tiger	C	LC
19.	<i>Danaus</i>	<i>D. genutia</i>	<i>Danaus genutia genutia</i> (Cramer, 1779)	Oriental Striped Tiger	R	LC
20.	<i>Byblia</i>	<i>B. ilityia</i>	<i>Byblia ilityia</i> (Drury, 1773)	Joker	VC	LC
21.	<i>Euploea</i>	<i>E. core</i>	<i>Euploea core core</i> (Cramer, 1780)	Indian Common Crow	VR	LC
22.	<i>Hypolimnas</i>	<i>H. bolina</i>	<i>Hypolimnas bolina jacintha</i> (Drury, 1773)	Oriental Great Eggfly	VR	LC
23.	<i>Hypolimnas</i>	<i>H. misippus</i>	<i>Hypolimnas misippus</i> (Linnaeus, 1764)	Danaid Eggfly	NR	Schedule I
24.	<i>Ariadne</i>	<i>A. ariadne</i>	<i>Ariadne ariadne</i> (Linnaeus, 1763)	Angled Castor	VR	LC
25.	<i>Melanitis</i>	<i>M. leda</i>	<i>Melanitis leda</i> (Linnaeus, 1758)	Oriental Common Evening Brown	VR	LC
26.	<i>Ypthima</i>	<i>Y. asterope</i>	<i>Ypthima asterope mahratta</i> (Moore, 1884)	Indian Common Three-ring	VR	LC
Family : Papilionidae						
27.	<i>Papilio</i>	<i>P. demoleus</i>	<i>Papilio demoleus</i> (Linnaeus, 1758)	Lime Swallowtail	NR	LC
28.	<i>Pachliopta</i>	<i>P. aristolochiae</i>	<i>Pachliopta aristolochiae aristolochiae</i> (Fabricius, 1775)	Indian Common Rose	VR	LC
Family : Pieridae						
29.	<i>Belenois</i>	<i>B. aurota</i>	<i>Belenois aurota aurota</i> (Fabricius, 1793)	Indian Pioneer	NR	LC
30.	<i>Colotis</i>	<i>C. fausta</i>	<i>Colotis fausta</i> (Olivier, 1804)	Large Salmon Arab	NR	LC
31.	<i>Catopsilia</i>	<i>C. pyranthe</i>	<i>Catopsilia pyranthe pyranthe</i> (Linnaeus, 1758)	Oriental Mottled Emigrant	VC	LC
32.	<i>Colotis</i>	<i>C. amata</i>	<i>Colotis amata</i> (Fabricius, 1775)	small salmon Arab	R	LC
33.	<i>Ixias</i>	<i>I. marianne</i>	<i>Ixias marianne</i> (Cramer, 1779)	White Orange-tip	NR	LC
34.	<i>Colotis</i>	<i>C. danae</i>	<i>Colotis danae</i> (Fabricius, 1775)	Crimson-tip	NR	LC
35.	<i>Colotis</i>	<i>C. etrida</i>	<i>Colotis etrida</i> (Boisduval, 1836)	Little Orange-tip	NR	LC
36.	<i>Catopsilia</i>	<i>C. pomona</i>	<i>Catopsilia pomona pomona</i> (Fabricius, 1775)	Oriental Lemon Emigrant	C	LC
37.	<i>Eurema</i>	<i>E. hecabe</i>	<i>Eurema hecabe</i> (Linnaeus, 1758)	Common Grass Yellow	VC	LC
38.	<i>Eurema</i>	<i>E. laeta</i>	<i>Eurema laeta</i> (Boisduval, 1836)	Spotless Grass Yellow	R	LC

**VC-Very Common (> 75), C-Common (75-50 sightings), NR-Not Rare (50-25 sightings), R-Rare (25-10 sightings), Very Rare (<10 sightings), LC-Least Concern

species), Papilionidae (2 species) and Pieridae (10 species) each contributing to the rich biodiversity (Table 1). Figure 4 depicts photographs of some butterflies documented at Ramdhari.

In the present investigation, 36 out of the 38 studied butterfly species were classified as "Least

Concern" according to the IUCN Red list, indicating a generally stable conservation status. Simultaneously, 2 species from the same set were also categorized under the Indian Wildlife Protection Act of 1972, emphasizing the need for dual conservation considerations and management.



Indian grizzled skipper

Spialia galba
(Fabricius, 1793)



Common silverline

Cigaritis vulcanus
(Fabricius, 1775)



Striped pierrot

Tarucus nara
(Kollar, 1848)



Black-spotted grass jewel

Freyeria putli
(Kollar, 1844)



Oriental Plains cupid

Luthrodes pandava
(Horsfield, 1829)



Tailless Lineblue

Prosotas dubiosa
(Semper, 1879)



Dark grass blue

Zizeeria karsandra
(Moore, 1865)



Zebra blue

Leptotes plinius
(Fabricius, 1793)



Oriental Gram Blue

Euchrysops cnejus cnejus
(Fabricius, 1798)



Indian Lesser Grass Blue

Zizina otis indica

(Murray, 1874)



Black-spotted Pierrot

Tarucus balkanica nigra

(Bethune-Baker, 1918)



Indian Lime Blue

Chilades lajus

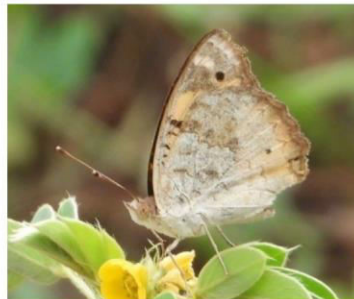
(Stoll, 1780)



African babul blue

Azanus jesous

(Guérin, 1847)



Oriental Yellow pansy

Junonia hierta hierta

(Fabricius, 1798)



Blue pansy

Junonia orithya

(Linnaeus, 1758)



Lemon pansy

Junonia lemonias

(Linnaeus, 1758)



Oriental Peacock pansy

Junonia almana almana

(Linnaeus, 1758)



Oriental Plain tiger

Danaus chrysippus chrysippus

(Linnaeus, 1758)



Oriental Stripped Tiger

Danaus genutia genutia

(Cramer, 1779)



Joker

Byblia ilithyia

(Drury, 1773)



Indian Common Crow

Euploea core core

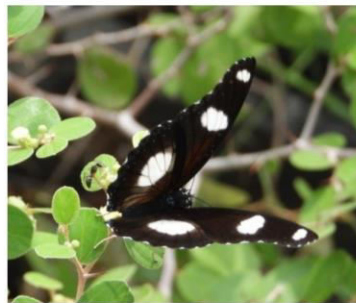
(Cramer, 1780)



Oriental Great Eggfly

Hypolimnna bolina jacintha

(Drury, 1773)



Danaid Eggfly

Hypolimnna misippus

(Linnaeus, 1764)



Angled Castor

Ariadne ariadne

(Linnaeus, 1763)



Oriental Common Evening

Brown

Melanitis leda

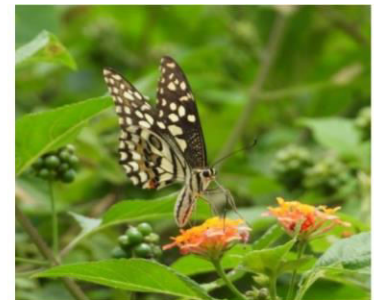
(Linnaeus, 1758)



Indian Common Three-ring

Ypthima asterope mahratta

(Moore, 1884)



Lime Swallowtail

Papilio demoleus

(Linnaeus, 1758)



Indian Common Rose

Pachliopta aristolochiae
aristolochiae
 (Fabricius, 1775)



Indian Pioneer

Belenois aurota aurota
 (Fabricius, 1793)



Large Salmon Arab

Colotis fausta
 (Olivier, 1804)



Oriental Mottled Emigrant

Catopsilia pyranthe pyranthe
 (Linnaeus, 1758)



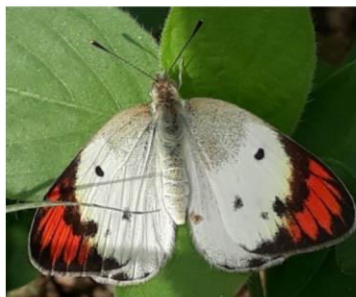
Small salmon Arab

Colotis amata
 (Fabricius, 1775)



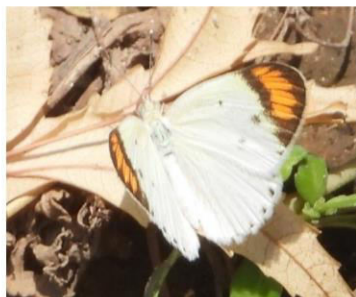
White Orange-tip

Ixias marianne
 (Cramer, 1779)



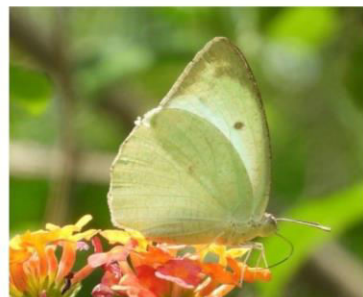
Crimson-tip

Colotis danae
 (Fabricius, 1775)



Little Orange-tip

Colotis etrida
 (Boisduval, 1836)



Oriental Lemon Emigrant

Catopsilia pomona pomona
 (Fabricius, 1775)

Fig. 4: Photographs of some butterflies documented at Ramdhari.

Among them *Hypolimnas misippus* were noteworthy as they were recorded under the higher-priority Schedule-I category and *Euchrysops cnejus* were documented under the Schedule-II category.

The current study contributes to the growing body of research on butterfly diversity in Gujarat, with parallels to documented findings by various researchers (Bhalodia *et al.*, 2002; Sharma *et al.*, 2017; Suthar *et al.*, 2019; Pillai and Dolly, 2020; Devdhariya *et al.*, 2022). This collective body of work underscores the importance of continued research efforts to deepen our understanding of butterfly populations and their dynamics in diverse ecosystems. The diverse array of butterflies in the region not only adds aesthetic beauty but serves as a crucial indicator in unraveling the intricate connection between climate fluctuations and biological occurrence.

Conclusion

A comprehensive survey unveiled the presence of 38 butterfly species. Notably, Nymphalidae emerged as the predominant family, constituting 34 % of the observed butterfly species, with subsequent contributions from Lycaenidae (32%), Pieridae (26%), Papilionidae (5%) and Hesperidae (3%). The present study not only enriches our understanding of the butterfly diversity in Ramdhari but also underscores its potential significance in guiding conservation efforts. By shedding light on the intricate dynamics of various butterfly families, this research reveals the preservation of habitats conducive to the thriving existence of these mesmerizing butterfly species in the Ramdhari region. These efforts are imperative to comprehensively understand and conserve the terrestrial ecosystem.

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Conflict of Interest

The authors declare no conflicts of interest.

References

- Bhalodia K, Bhuva VJ, Dave SM and Soni VC. (2002) Butterflies of Vansda national park, Gujarat. Zoos' Print J. 17(10): 903-904.
- Boggs CL, Watt WB, Ehrlich PR. (2003) Butterflies: ecology and evolution taking flight. University of Chicago Press.
- Cerrato C, Rocchia E, Brunettin M, Bionda R, Bassano B, Provenza A, Simona B and Viterbi R. (2019) Butterfly distribution along altitudinal gradients : temporal changes over short time period. Nat Conserv. 34(34): 91-118.
- Curtis RJ, Brereton TM, Dennis RL, Carbone C and Isaac NJ. (2015) Butterfly abundance is determined by food availability and is mediated by species traits. J Appl Ecol. 52(6): 1676-1684.
- Devdhariya DR, Bamaniya VV and Raval JV. (2022) Diversity of butterflies at Hiranvel, Gir Somnath, Gujarat, India. Bioinfolet 19(3): 260-265.
- Douglas JM, Cronin TW, Chiou TH and Dominy NJ. (2007) Light habitats and the role of polarized iridescence in the sensory ecology of neotropical nymphalid butterflies (Lepidoptera: Nymphalidae). J Exp Biol. 210(5): 788-799.
- Gohel V and Raval J. (2019) Butterfly diversity, seasonality and status at Junagadh, Gujarat, India. Int J Env Ecol Family Urban Stud. 9(2): 15-28.
- Grøtan V, Lande R, Engen S, Saether BE and DeVries PJ. (2012) Seasonal cycles of species diversity and similarity in a tropical butterfly community. J Anim Ecol. 81(3): 714-723.
- Gupta H, Tiwari C and Diwakar S. (2019) Butterfly diversity and effect of temperature and humidity gradients on butterfly assemblages in a sub-tropical urban landscape. Trop Ecol. 60: 150-158.
- Harrington R and Stork N. (1995) Insects in a Changing Environment. Academic Press, London, pp 535.
- Heppner JB. (1998) Classification of Lepidoptera. Part 1. Introduction. Holarc Lepid. 5(1): 1-148.
- Kunte K, Joglekar A, Utkarsh G and Padmanabhan P. (1999) Patterns of butterfly, bird and tree diversity in the Western Ghats. Curr Sci. 77(4): 577-586.

- Mukherjee S, Aditya G, Basu P and Saha GK. (2016) Butterfly diversity in Kolkata metropolis: a synoptic check list. *Check List* 12(2): 1-9.
- Naznin K. (2022) Butterfly diversity in and around Bolpur-Shantiniketan urban area, West Bengal, India. *Environ Ecol.* 40(4C): 2563-2567.
- Parasharya BM and Jani JJ. (2007) Butterflies of Gujarat. Anand Agricultural University, Anand, Gujarat 1-138.
- Pillai LS and Dolly K. (2020) Seasonal variations in the diversity and abundance of butterflies in the forest of Champaner-Pavagadh, Gujarat. *Environ Ecol.* 38(1): 62-70.
- Samal SK, Satapathy A and Pattanaik N. (2021) Diversity of butterflies (Lepidoptera: Rhopalocera) in Bhubaneswar, Odisha, India. *Notulae Sci Biol.* 13(4): 11074-11074.
- Sharma A, Ahmed SI and Kumar S. (2017) Conservation of biodiversity with particular reference of butterfly fauna of Gir protected area, Gujarat. *Int J Adv Res.* 5(2): 233-237.
- Simonson SE, Opler PA, Stohlgren TJ and Chong GW. (2001) Rapid assessment of butterfly diversity in a montane landscape. *Biodivers Conserv.* 10: 1369-1386.
- Spitzer K, Novotny V, Tonner M and Leps J. (1993) Habitat preferences, distribution and seasonality of the butterflies (Lepidoptera, Papilionoidea) in a montane tropical rain forest, Vietnam. *J Biogeogr.* 20(1): 109-121.
- Suthar AR, Sankhwal AO, Rathod JY and Gavali DJ. (2019) Rapid assessment of butterfly diversity and host plants at Piplaidevi Forest Range, Dangs, Gujarat. *Biol Bull.* 5(1): 25-31.
- Trivedi D, Makwana VM, Shukla AH and Dodia PP. (2022) Diversity of butterflies in Victoria Park Reserve Forest, Bhavnagar, Gujarat, India. *Notulae Sci Biol.* 14(3): 11293-11293.
- Varshney RK and Smetacek P. (2015) A synoptic catalogue of the butterflies of India. Indinov Publishing, New Delhi, pp 261.
- Wynter-Blyth MA. (1957) Butterflies of the Indian region. Bombay Natural History Society.