

Species

To Cite:

Kumar J, Sharma I. A preliminary study on butterfly fauna (Lepidoptera: Papilionoidea) of the Todgarh-Raoli Wildlife Sanctuary, Rajasthan (India). *Species* 2025; 26: e6s1771
doi: <https://doi.org/10.54905/disssi.v26i77.e6s1771>

Author Affiliation:

Desert Regional Centre, Zoological Survey of India, Jhalamand, Pali Road, Jodhpur-342016, Rajasthan, India

*Corresponding Author

Desert Regional Centre, Zoological Survey of India, Jhalamand, Pali Road, Jodhpur-342016, Rajasthan, India
Email: jayverma@gmail.com

Contact List

Jitendra Kumar jayverma1584@gmail.com
Indu Sharma indudrc@gmail.com

Peer-Review History

Received: 23 October 2024
Reviewed & Revised: 26/October/2024 to 17/January/2025
Accepted: 21 January 2025
Published: 25 January 2025

Peer-Review Model

External peer-review was done through double-blind method.

Species

pISSN 2319–5746; eISSN 2319–5754



© The Author(s) 2025. Open Access. This article is licensed under a [Creative Commons Attribution License 4.0 \(CC BY 4.0\)](http://creativecommons.org/licenses/by/4.0/), which permits use, sharing, adaptation, distribution and reproduction in any medium or format, as long as you give appropriate credit to the original author(s) and the source, provide a link to the Creative Commons license, and indicate if changes were made. To view a copy of this license, visit <http://creativecommons.org/licenses/by/4.0/>.

A preliminary study on butterfly fauna (Lepidoptera: Papilionoidea) of the Todgarh-Raoli Wildlife Sanctuary, Rajasthan (India)

Jitendra Kumar*, Indu Sharma

ABSTRACT

The present study provides a preliminary assessment of butterfly diversity in Todgarh-Raoli Wildlife Sanctuary (TR-WLS) based on surveys conducted from 2023 to 2024 across three forest ranges. Forty-one species were recorded across five families, with Lycaenidae being the most diverse (14 species). Eight species were very common, 19 common, 11 occasional, and three rare, including *Cigaritis lilacinus*, *Potanthus pseudomaesa*, and *Spialia galba*. This baseline study underscores the need for further research to develop effective butterfly conservation strategies.

Keywords: Aravalli, Lepidoptera, Todgarh-Raoli, Rajasthan, Wildlife Sanctuary.

1. INTRODUCTION

Butterflies belong to the superfamily Papilionoidea of the insect order Lepidoptera, which also comprises moths. Their beautiful colors and environmental significance set them apart. As pollinators, butterflies are important organisms essential to preserve floral composition and population dynamics in natural and artificial systems. According to Losey and Vaughan, (2006), butterflies are unquestionably the most aesthetically pleasing examples of the biological diversity on the planet. Globally, approximately 166,320 species of Lepidoptera have been documented, including about 18,768 species of butterflies (Van-Nieuwerkerken et al., 2011; Singh et al., 2024a). India hosts 1,379 butterfly species, including 124 species recorded in Rajasthan (Das et al., 2023; Singh et al., 2024b).

Rajasthan, the largest state in India by area, hosts four National Parks and 26 Wildlife Sanctuaries. A literature survey reveals a significant lack of information on the butterfly fauna of the Todgarh-Raoli Wildlife Sanctuary (TR-WLS). Though previous studies have offered useful information about butterfly biodiversity in protected regions of Rajasthan, relatively few of them have specifically focused on the protected areas of the state. MacPherson, (1927); Palot and Soniya, (2001);

Trigunayat et al., (2008); Sharma, (2012); Sharma, (2014); Sharma, (2018); Sharma and Dhadeech, (2014); Ghorpade, (2016); Bhagat, (2020); Kaur et al., (2020); Khandal and Sharma, (2020); Sundar et al., (2020); Mukherjee et al., (2021); Panwar and Patel, (2023); and Prajapat et al., (2023) have contributed significantly to the study of butterfly fauna in these areas. This study is the first attempt to provide preliminary information on the butterfly fauna of TR-WLS.

TR-WLS lies in the southwest part of Rajasthan within the historic Aravalli Mountain range. It is named after the renowned historian Lieutenant Colonel James Tod and is one of the largest wildlife sanctuaries in the state. It was officially designated as a sanctuary under the Rajasthan Wildlife Protection Act, 1972, through Government of Rajasthan notification No. F II (56) Rev-Group-8/82, dated 28th September 1983, Section 18 (1). The forest areas of the sanctuary fall under the tropical dry deciduous forest category (Champion and Seth, 1968). The prominent tree species present in the area include *Terminalia pendula*, *Boswellia serrata*, *Butea monosperma*, *Ziziphus mauritiana*, *Ziziphus nummularia*, *Vachellia nilotica*, *Vachellia leucophloea*, *Balanites aegyptiaca*, *Lannea coromandelica*, *Capparis decidua*, and *Senegalia catechu*, among others (Kanther, 2019).

2. MATERIAL AND METHODS

Study area

TR-WLS is located (25°20'N to 26°00'N and 73°40'E to 74°10'E) in the Aravalli hills, Rajasthan, India (Figure 1). It spans an area of 495.27 km², extending across the Ajmer, Pali, and Rajsamand districts. The sanctuary landscape features undulating Aravalli hills, covered with dry deciduous forests, and interspersed with numerous ravines and seasonal streams (Figure 2). Maps of the study area were created using QGIS (version 3.34, Prizren) and Google Earth.

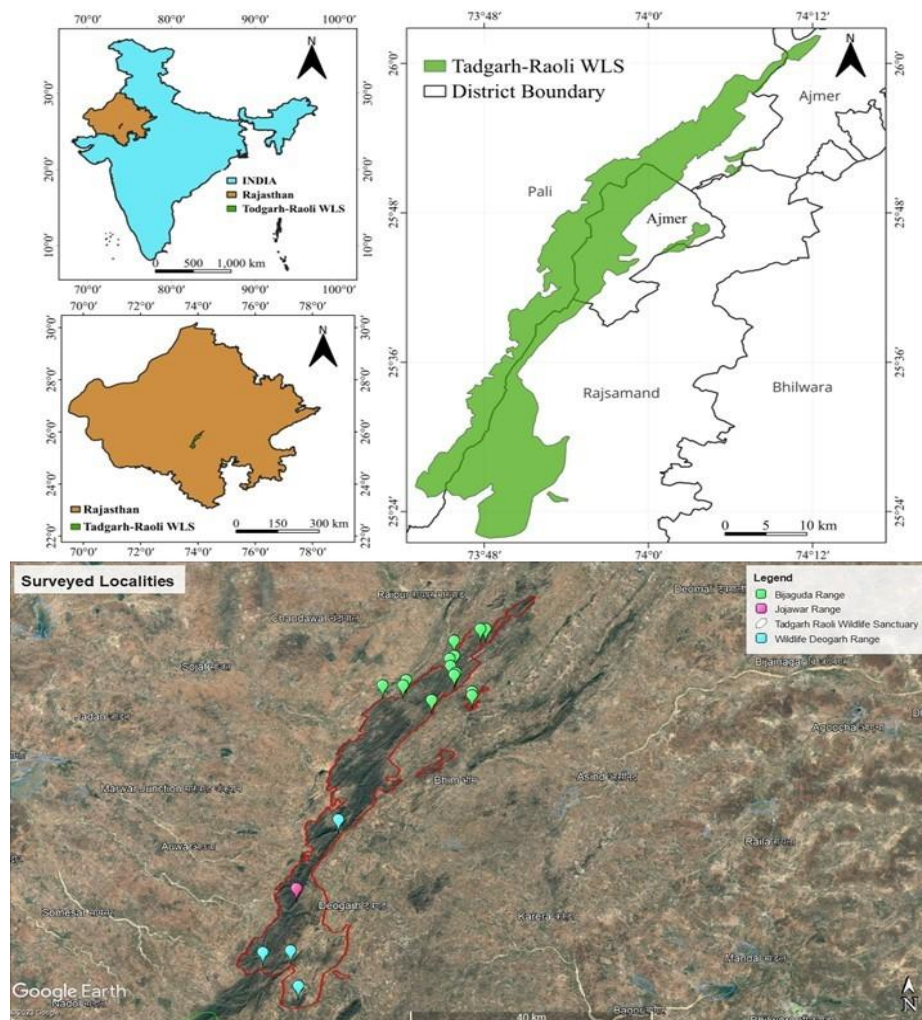


Figure 1 Map of the study area (TR-WLS) indicating surveyed localities.

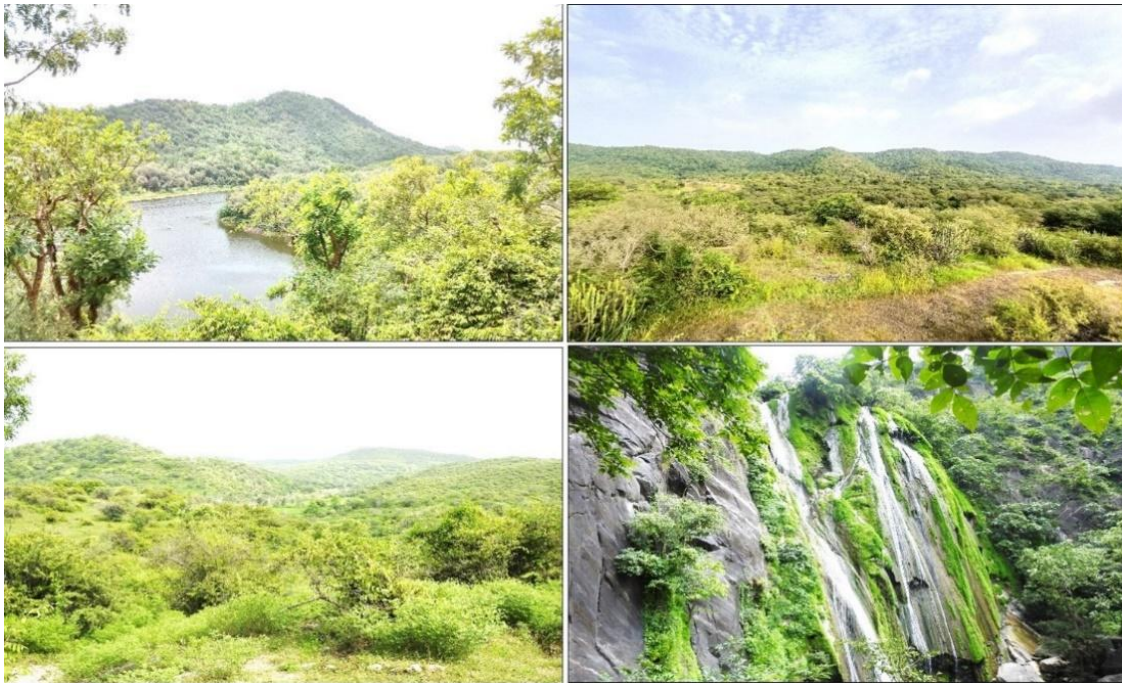


Figure 2 Landscape photographs of the tropical dry deciduous forest of TR-WLS.

Methodology

The Zoological Survey of India (ZSI), Desert Regional Centre (DRC), Jodhpur, Rajasthan conducted surveys of TR-WLS from 2023 to 2024 to explore the butterfly diversity. The surveys covered various localities within three forest ranges of the TR-WLS: Bijaguda (or Bijaji ka Guda), Wildlife Deogarh, and Jojwar. Butterflies (only non-scheduled) were collected with the help of aerial nets during daylight hours (7:00 AM to 5:00 PM). Voucher specimens were labeled on-site and processed following standard practices in Lepidopterology. During the field surveys, the authors observed and photographed butterfly species using a Nikon P900 camera and a Realme 64-MP camera phone. Butterfly species were identified by consulting relevant literature, including (Wynter-Blyth, 1957; Kehimkar, 2008; Kehimkar, 2016; Kunte et al., 2024).

The classification of Lepidoptera followed Van-Nieukerken et al., (2011) to systematically organize the taxa. We determined butterfly abundance by categorizing species based on the percentage of days they were observed during the surveys. Species observed 80–100% of the time classified as very common (VC), 60–80% as common (C), 40–60% as occasional (O), and 20–40% as rare (R), following the methodologies of (Aneesh et al., 2013; Sreekumar et al., 2018). Table 1 lists the common names of the reported butterflies according to (Kunte et al., 2024). All identified specimens have been preserved and cataloged within the National Zoological Collection (NZC) at the ZSI, DRC, Jodhpur.

3. RESULTS AND DISCUSSION

This study recorded 41 butterfly species for the first time in the area, comprising 31 genera across five families. Photo plates I and II display images of the butterfly species listed in Table 1 (Serial Nos. 1–41). Family-level analysis revealed that Lycaenidae was the most species-rich family, comprising 14 species, followed by Nymphalidae and Pieridae each with (11 species), Hesperiiidae (three species), and Papilionidae represented by two species (Figure 3 & Table 1). The assessment of relative abundance revealed that among the observed species, eight butterflies emerged as very common, 19 as common, 11 as occasional, and three as rare (Table 1). This preliminary investigation of butterfly diversity in TR-WLS establishes a foundational dataset that will help researchers study the ecology, biology, and conservation of butterflies throughout Rajasthan and specifically within the sanctuary. The present study emphasizes that TR-WLS harbors diverse butterfly fauna.

Table 1 Systematic list of butterfly species of Todgarh-Raoli WLS.

S. No.	Species	Common Name	Relative Abundance
	Order LEPIDOPTERA Linnaeus, 1758		
	Suborder GLOSSATA Fabricius, 1775		
	Superfamily PAPILIONOIDEA Latreille, 1802		
	Papilionidae: Papilioninae		
1	<i>Pachliopta aristolochiae</i> (Fabricius, 1775)	Common Rose	C
2	<i>Papilio demoleus</i> Linnaeus, 1758	Lime Swallowtails	C
	Pieridae: Pierinae		
3	<i>Belenois aurota</i> (Fabricius, 1793)	Pioneer	C
4	<i>Cepora nerissa</i> (Fabricius, 1775)	Common Gull	VC
5	<i>Colotis danae</i> (Fabricius, 1775)	Crimson Tip	C
6	<i>Colotis etrida</i> (Boisduval, 1836)	Little Orange-tip	VC
7	<i>Colotis fausta</i> (Olivier, 1804)	Large Salman Arab	O
8	<i>Ixias marianne</i> (Cramer, 1779)	White Orange-tip	C
9	<i>Ixias pyrene</i> (Linnaeus, 1764)	Yellow Orange-tip	O
	Coliadinae		
10	<i>Catopsilia pyranthe</i> (Linnaeus, 1758)	Mottled Emigrant	VC
11	<i>Eurema brigitta</i> (Stoll, [1780])	Small Grass Yellow	VC
12	<i>Eurema hecabe</i> (Linnaeus, 1758)	Common Grass Yellow	VC
13	<i>Eurema laeta</i> (Boisduval, 1836)	Spotless Grass Yellow	C
	Lycaenidae: Polyommatainae		
14	<i>Azonus jesous</i> (Guérin-Méneville, 1849)	African Babul Blue	C
15	<i>Castalius rosimon</i> (Fabricius, 1775)	Common Pierrot	O
16	<i>Catochrysops strabo</i> (Fabricius, 1793)	Forget-me-not	VC
17	<i>Chilades parrhasius</i> (Fabricius, 1793)	Small Cupid	O
18	<i>Freyeria putli</i> (Kollar, 1844)	Black-spotted Grass Jewel	C
19	<i>Jamides celeno</i> (Cramer, 1775)	Common Cerulean	O
20	<i>Leptotes plinius</i> (Fabricius, 1793)	Zebra Blue	O
21	<i>Pseudozizeeria maha</i> (Kollar, [1844])	Pale Grass Blue	C
22	<i>Tarucus callinara</i> Butler, 1886	Spotted Pierrot	O
23	<i>Tarucus indica</i> Evans, 1932	Transparent Pierrot	C
24	<i>Tarucus nara</i> (Kollar, 1848)	Striped Pierrot	VC
25	<i>Zizeeria karsandra</i> (Moore, 1865)	Dark Grass Blue	C
26	<i>Zizula hylax</i> (Fabricius, 1775)	Tiny Grass Blue	VC
	Theclinae		
27	<i>Cigaritis lilacinus</i> (Moore, 1884)	Lilac Silverline	R
	Nymphalidae: Heliconiinae		
28	<i>Acraea terpsicore</i> (Linnaeus, 1758)	Tawny Coster	C
	Biblidinae		
29	<i>Byblia ilithyia</i> (Drury, [1773])	Joker	O
	Danainae		
30	<i>Danaus chrysippus</i> (Linnaeus, 1758)	Plain Tiger	C

31	<i>Tirumala limniace</i> (Cramer, [1775])	Blue Tiger	O
Nymphalinae			
32	<i>Hypolimnas misippus</i> (Linnaeus, 1764)	Danaid Eggfly	O
33	<i>Junonia almana</i> (Linnaeus, 1758)	Peacock Pansy	C
34	<i>Junonia hierta</i> (Fabricius, 1798)	Yellow Pansy	C
35	<i>Junonia lemonias</i> (Linnaeus, 1758)	Lemon Pansy	C
36	<i>Junonia orithya</i> (Linnaeus, 1758)	Blue Pansy	C
Heliconiinae			
37	<i>Phalanta phalantha</i> (Drury, 1773)	Common Leopard	C
Satyrinae			
38	<i>Ypthima asterope</i> (Kluge, 1832)	Common Three-ring	O
Hesperiidae: Hesperinae			
39	<i>Pelopidas mathias</i> (Fabricius, 1798)	Small Branded Swift	O
40	<i>Potanthus pseudomaesa</i> (Moore, 1881)	Indian Dart	R
Pyrginae			
41	<i>Spialia galba</i> (Fabricius, 1793)	Asian Grizzled Skipper	R

VC = Very Common, C = Common, O = Occasional, R = Rare.

Nestled within the ecologically significant ancient Aravalli Mountain range, the sanctuary functions as an ecotone, bridging the desert ecosystem and hilly terrain. Hills within the sanctuary block the eastward expansion of the Thar Desert, serving as a natural barrier. This barrier effect creates higher rainfall patterns in southern Rajasthan, nurturing diverse flora and fauna, including butterflies (Koli, 2014). The sanctuary hosts three rare butterfly species: *Cigaritis lilacinus* (Lilac Silverline), *Potanthus pseudomaesa* (Indian Dart), and *Spialia galba* (Asian Grizzled Skipper). Sundar et al., (2020) documented *C. lilacinus* from the nearby Kumbhalgarh WLS, marking this as a new record for Rajasthan. Its presence in TR-WLS emphasizes the significance of the sanctuary as a vital habitat for rare butterfly species. This study recorded more than twice the number of butterfly species in TR-WLS compared to the findings of Sharma and Dhadeech (2013) who reported only 19 species in the Kumbhalgarh WLS.

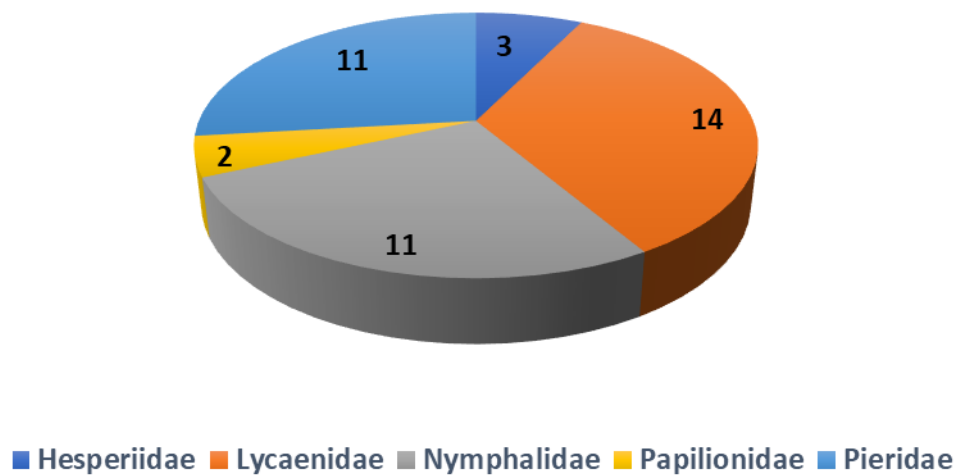


Figure 3 Pie chart indicating the number of species under each family.

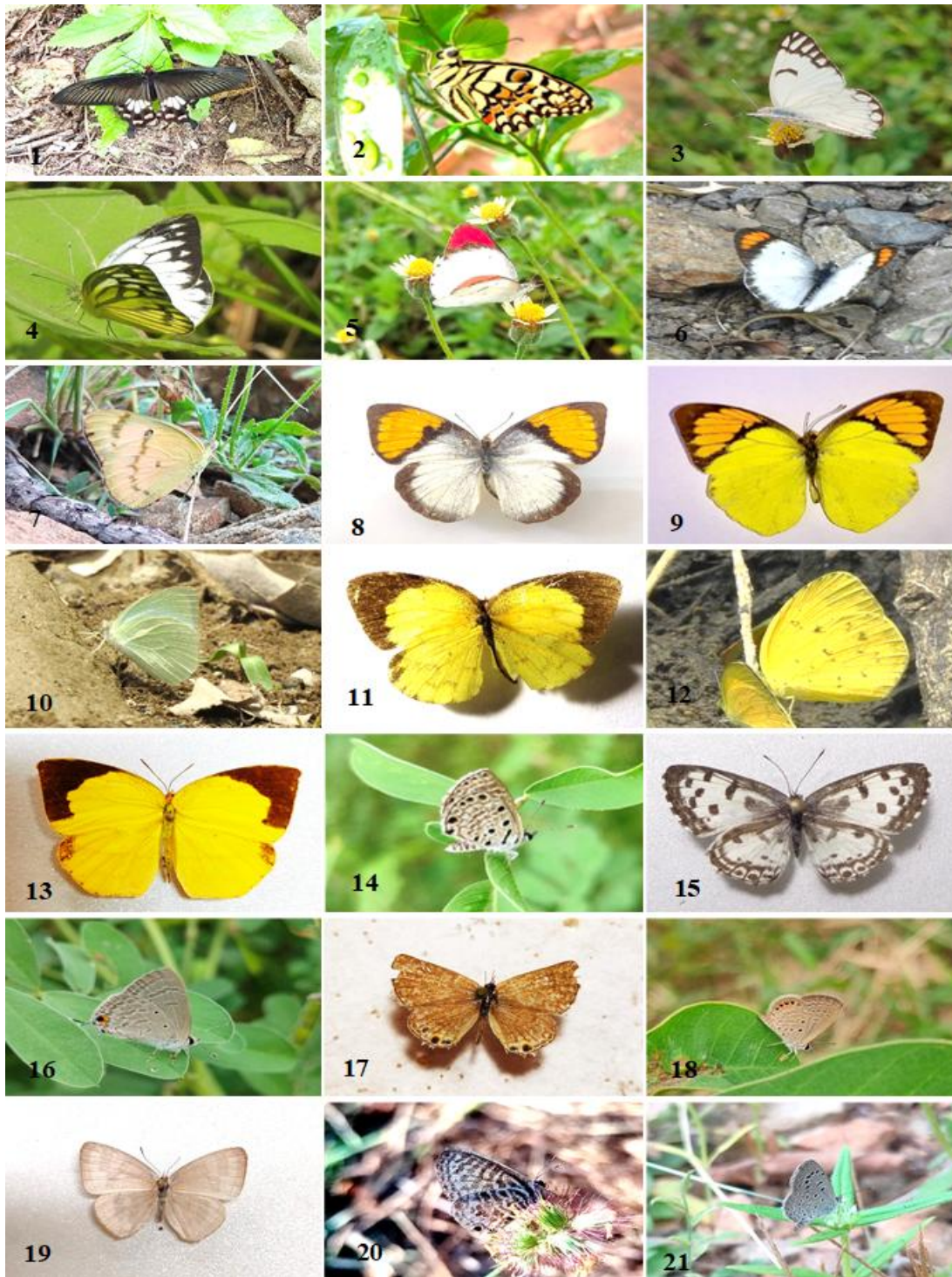


Photo Plate-I Butterflies recorded from the TR-WLS 1. *Pachliopta aristolochiae* (Fabricius, 1775); 2. *Papilio demoleus* Linnaeus, 1758; 3. *Belenois aurota* (Fabricius, 1793); 4. *Cepora nerissa* (Fabricius, 1775); 5. *Colotis danae* (Fabricius, 1775); 6. *Colotis etrida* (Boisduval, 1836); 7. *Colotis fausta* (Olivier, 1804); 8. *Ixias marianne* (Cramer, 1779); 9. *Ixias pyrene* (Linnaeus, 1764); 10. *Catopsilia pyranthe* (Linnaeus, 1758); 11. *Eurema brigitta* (Stoll, [1780]), 12. *Eurema hecabe* (Linnaeus, 1758); 13. *Eurema laeta* (Boisduval, 1836); 14. *Azanus jesous* (Guérin-Ménéville, 1849); 15. *Castalius rosimon* (Fabricius, 1775); 16. *Catochrysops strabo* (Fabricius, 1793); 17. *Chilades parrhasius* (Fabricius 1793); 18. *Freyeria putli* (Kollar, 1844); 19. *Jamides celeno* (Cramer, 1775); 20. *Leptotes plinius* (Fabricius, 1793); 21. *Pseudozizeeria maha* (Kollar, [1844]).

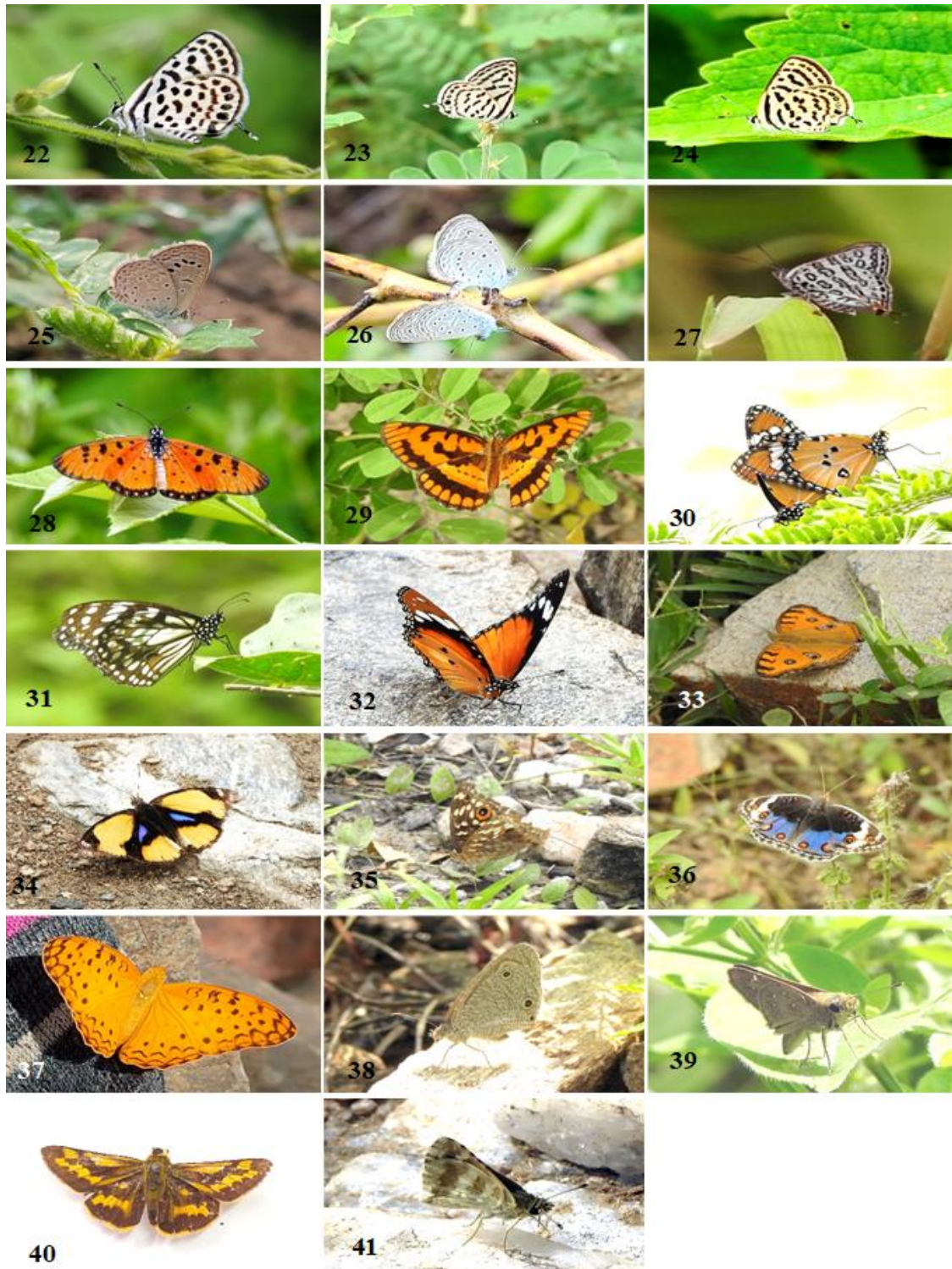


Photo Plate-II Butterflies recorded from the TR-WLS 22. *Tarucus callinara* Butler, 1886; 23. *Tarucus indica* Evans, 1932; 24. *Tarucus nara* (Kollar, 1848); 25. *Zizeeria karsandra* (Moore, 1865); 26. *Zizula hylax* (Fabricius, 1775); 27. *Cigaritis lilacinus* (Moore, 1884); 28. *Acraea terpsicore* (Linnaeus, 1758); 29. *Byblia ilithyia* (Drury, [1773]); 30. *Danaus chrysippus* (Linnaeus, 1758), 31. *Tirumala limniace* (Cramer, [1775]); 32. *Hypolimnas misippus* (Linnaeus, 1764); 33. *Junonia almana* (Linnaeus, 1758); 34. *Junonia hierta* (Fabricius, 1798); 35. *Junonia lemonias* (Linnaeus, 1758); 36. *Junonia orithya* (Linnaeus, 1758); 37. *Phalanta phalantha* (Drury, 1773); 38. *Ypthima asterope* (Klug, 1832); 39. *Pelopidas mathias* (Fabricius, 1798); 40. *Potanthus pseudomaesa* (Moore, 1881); 41. *Spialia galba* (Fabricius, 1793)

4. CONCLUSION

The current study provides the first preliminary checklist of butterfly fauna and their relative abundance in TR-WLS, revealing a varied range of species that underscore the ecological significance of the sanctuary. Extensive research on the populations, habitats, and ecological roles of these fascinating insects is needed to ensure their long-term survival. This checklist will serve as a foundation for further evaluations of the butterfly fauna of this region and aid in enhanced protection efforts and the conservation of species-specific habitats.

Acknowledgments

The authors are thankful to Dr. Dhriti Banerjee, Director, Zoological Survey of India, Kolkata for the necessary laboratory facilities provided for carrying out this study. Thanks, are also due to the Forest Department, Government of Rajasthan for the necessary permission to undertake the general Faunistic Survey work and DFO, and RFOs of the TR-WLS for various courtesies.

Author's Contributions

Jitendra Kumar: Data Collection, Investigation, Manuscript writing, Species handling, and identification.

Indu Sharma: Supervision and Resources.

Ethical approval & declaration

In this article, as per the animal regulations followed in Desert Regional Centre, Zoological Survey of India, Jhalamand, Jodhpur-342016, Rajasthan, India, the authors observed the preliminary assessment of butterfly diversity in Todgarh-Raoli Wildlife Sanctuary (TR-WLS) based on surveys conducted from 2023 to 2024 across three forest ranges, India. The Animal ethical guidelines are followed in the study for species observation, identification & experimentation. Plants were not collected for this study so ethical approval does not arise in this regard.

Informed consent

Not applicable.

Conflicts of interests:

The authors declare that there are no conflicts of interests.

Funding:

The study has not received any external funding.

Data and materials availability

All data associated with this study are present in the paper.

REFERENCES

1. Aneesh KS, Adarsh CK, Nameer PO. Butterflies of Kerala Agricultural University (KAU) campus, Thrissur, Kerala, India. *J Threat Taxa* 2013; 4422-4440. doi: 10.11609/JoTT.o2870.4422-40
2. Bhagat R. Checklist of Butterflies (Insecta: Lepidoptera) from Mukundara Hills Tiger Reserve, Rajasthan. *Bionotes* 2020; 22(2):50-54.
3. Champion HG, Seth SK. *A Revised Forest Types of India*. Manager of Publications, Government of India, Delhi, 1968.
4. Das GN, Fric ZF, Panthee S, Irungbam JS, Konvicka M. Geography of Indian Butterflies: Patterns Revealed by Checklists of Federal States. *Insects* 2023; 14(6):549. doi: 10.3390/insects14060549
5. Ghorpade K. Butterflies of Keoladeo National Park, Bharatpur (Rajasthan). *Bionotes* 2016; 18(3):81.
6. Kanther RP. Dominant flora of Todgarh-Raoli Wildlife Sanctuary Rajasthan, India. *J Indian Bot Soc* 2019; 98 (1 and 2) :59-70. doi: 10.5958/2455-7218.2019.00011.1
7. Kaur M, Das SK, Sarma KA. A study on the selected invertebrate fauna in Tal Chhapar Wildlife Sanctuary of Churu district, Rajasthan, India. *Res J Agric For Sci* 2020; 8(1): 57-61.

8. Kehimkar I. Butterflies of India. Bombay Natural History Society, Mumbai, 2016; 528.
9. Kehimkar I. The book of Indian butterflies. Bombay Natural History Society, Oxford University Press, Oxford, Mumbai, 2008.
10. Khandal D, Sharma SK. First Records of Dakhan Tricolour Pied Flat (*Coladenia indrani indra*) and Spotted Small Flat (*Sarangesa purendra sati*) (Lepidoptera: Family HesperIIDae) from outskirts of the Ranthambore Tiger Reserve, Sawai Madhopur, Rajasthan, India. *Indian J Environ Sci, Green Earth Foundation*, 2020; 24(2):89–92.
11. Koli VK. Diversity and status of avifauna in Todgarh-Raoli Wildlife Sanctuary, Rajasthan, India. *J Asia-Pac Biodivers* 2014; 7(4):401–407. doi: 10.1016/j.japb.2014.10.005
12. Kunte K, Sondhi S, Roy P. Butterflies of India. v. 4.27. Indian Foundation for Butterflies, 2024. <https://www.ifoundbutterflies.org>. (Accessed in December 2024).
13. Losey JE, Vaughan M. The economic value of ecological services provided by insects. *Biosci* 2006; 56(4):311–323.
14. MacPherson AD. Notes on a collection of butterflies made in Jodhpur and Mount Abu during year 1924, 1925 and 1926. *J Bombay Nat Hist Soc* 1927; 32(1): 228–30.
15. Mukherjee S, Bhattacharyya K, Biswas S. First record of Desert Bath White butterfly *Pontia glauconome* (Klug, 1829) (Lepidoptera: Pieridae) from Rajasthan, India. *Bionotes* 2021; 23(4):169–170.
16. Palot MJ, Soniya VP. Additions to the Butterflies of Keoladeo National Park, Bharatpur, Rajasthan, India. *Zoos' Print J* 2001; 16(9):588.
17. Panwar M, Patel P. Distribution of the Zebra Skipper *Ernstia zebra* (Lepidoptera: HesperIIDae) in the wildlife sanctuaries of Rajasthan. *Bionotes* 2023; 25(4):36–38.
18. Prajapat R, Meena P, Kumawat N, Kumari V, Meena S. Butterflies diversity in the Aravalli Range, Rajasthan, India. *J Exp Zool India* 2023; 26(1):589–593. doi: 10.51470/jez.2023.26.1.589
19. Sharma G, Dhadeech SN. Insecta: Lepidoptera: Rhopalocera. In *Faunal Exploration of Kumbhalgarh Wildlife Sanctuary, Rajasthan*. Director, Zoological Survey of India, Kolkata, 2013: 43–50.
20. Sharma G, Dhadeech SN. Insecta: Lepidoptera: Rhopalocera. In *Faunal exploration of Sitamata Wildlife Sanctuary, Rajasthan, Conservation Area Series*. Director, Zoological Survey of India, Kolkata, 2014; (54):51–67.
21. Sharma G. Studies on Odonata and Lepidoptera Fauna of Desert Ecosystem of Rajasthan. *Rec Zool Surv India, Occ Pap* 2018; 394:1–90.
22. Sharma G. Studies on Odonata and Lepidoptera fauna of foothills of Aravalli Range, Rajasthan. Director, Zoological Survey of India, Kolkata, 2014; (353):1-104.
23. Sharma G. Studies on the Diversity of Odonata and Lepidoptera Fauna of Mount Abu, Rajasthan, India. In C. Raghunathan, C. Sivaperuman, & K. Venkataraman (Eds.), *Recent Advances in Biodiversity of India*, Director, Zoological Survey of India, Kolkata, 2012; 243–250.
24. Singh N, Joshi R, Kendrick RC, Pathania P, Banerjee D. An illustrated guide to the Lepidoptera of India: taxonomic procedures, family characters, diversity and distribution. Director, Zoological Survey of India, Kolkata, 2024a.
25. Singh N, Kaur A, Pathania PC, Sharma N, Kalawate A, Palot J, Banerjee D, Talukdar A, Lenka R, Kumari A, Raha A, Joshi R. Fauna of India Checklist: Arthropoda: Insecta: Lepidoptera. Version 1.0. Zoological Survey India, 2024b.
26. Sreekumar ER, Nikhil S, Ajay KG, Nameer PO. Diversity and endemism of butterflies of montane forests of Eravikulam National Park in the Western Ghats, India. *J Threat Taxa* 2018; 10(9):12235–12246.
27. Sundar KG, Kittur S, Koli VK, Prajapati U. Range extension of the Lilac Silverline *Apharitis lilacinus* to southern Rajasthan and a review of the literature. *J Threat Taxa* 2020; 12(9):16180-16182. doi: 10.11609/jott.5800.12.9.16180-16182
28. Trigunayat MM, Singh NP, Saxena N. On the Butterfly Diversity in Keoladeo National Park, Bharatpur, Rajasthan. *Bionotes* 2008; 10(2):53–54.
29. Van-Nieuwerkerken EJ, Kaila L, Kitching IJ, Kristensen NP, et al. Order Lepidoptera Linnaeus, 1758: 212:221. In: Zhang, Z.-Q. (Ed.) *Animal Biodiversity: An outline of higher classification and survey of taxonomic richness*. *Zootaxa* 2011; 3148(1):212–221. doi: 10.11646/zootaxa.3148.1.7
30. Wynter-Blyth MA. Butterflies of the Indian region. Bombay Natural History Society, Bombay, India, 1957.