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Assessment of diversity and abundance of butterfly fauna in the adjoining area of Ranthambore National Park (Zone 7), Sawai Madhopur, Rajasthan, India

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Abstract
Butterflies are important ecological indicators which play a crucial role in the proper functioning of the ecosystem. The present study was conducted in the month of November, 2024, to assess the diversity and abundance of butterfly community in the adjoining area of Ranthambore National Park (Zone 7), Sawai Madhopur, Rajasthan. Butterfly sampling was done by using line transect method in which the entire survey path (5600 m) was divided into 8 transects and were surveyed every day following the same transect path. A total of 68 species of butterflies belonging to five different families were recorded from the study site. Percentage composition analysis of the five families illustrated that family Nymphalidae had the maximum number of butterflies (44.31%), followed by Pieridae (26.70%), Lycaenidae (20.05%), Papilionidae (6.45%), Hesperiidae (3.30%). Based on the sightings of butterflies at the study site, it was found that 41.87% of the total butterflies belonged to very common category, followed by common category (33.38%), not rare category (19.29%), rare category (5.46%), very rare category (0.10%). Among the recorded butterfly species, 11 of them were found to be protected under various Schedules of the Wildlife Protection Act, 1972. Values of Shannon diversity index (H'=3.82) implied the high species richness of the butterfly community. Pielou's evenness index (j=0.91) depicted the evenly distributed nature of the butterfly community and Simpson's index of diversity (D=0.97) indicated the persistence of high abundance of species in the sampled butterfly community. Therefore, the information from this preliminary survey will prove to be beneficial for implementing necessary conservation strategies required for the management of the habitat as well as conservation of the butterfly fauna in the study site and its surrounding areas.

Keywords: Butterfly community, nymphalidae, ranthambore national park (Zone 7), sawai madhopur, species richness

Introduction

Butterflies belonging to order Lepidoptera, are one of the most efficient bioindicators which depict the overall health status of an ecosystem (Pollard, 1991) [18]. These brightly coloured, winged hexapods are able to detect any minute variations in climatic pattern. Their diversity is greatly affected by any change in climatic conditions which include changes in temperature, rainfall patterns or harsh climatic conditions like heat waves and persistent rainfall or dry weather (Gocher and Dang, 2025) [6]. Apart from their taxonomic significance, these vibrant coloured insects are renowned for their photophilic behaviour and conspicuous size (Sharma and Jat, 2024) [27]. They play a crucial role as pollinators influencing the floral dynamics in distinct ecosystems. They also play a pivotal role in promoting ecosystem stability by acting as a sentinel species by maintainingpredator-prey dynamics and monitoring environmental disturbances like habitat encroachment, pollution, resource depletion which typically persists in urbanizing countries like India (Khairunnisa *et al*, 2015) [12].

Approximately 18,768 species of butterfly are found worldwide (Van Nieukerken *et al*, 2011) [34], out of which 1379 butterfly species are found in India (Das *et al*., 2023) [4]. Butterfly fauna was previously explored in different parts of Rajasthan such as in Jodhpur and Mount Abu by Macpherson (1927) [15], in Udaipur by Kushwaha *et al*. (1963) [14], in Thar desert by Varshney and Gupta (1996) [35].Recent documentation on butterfly diversity from the state includes studies on butterfly diversity at Machiya Safari Biological Park, Jodhpur by Rajpurohit *et al*. (2017) [23], diversity gradient of butterflies from urban to rural habitats in Udaipur district by Choudhary *et al*. (2019) [3], distribution around Mukundara hills tiger reserve by Bhagat (2020) [2] as well as by Sharma and Jat (2024) [28], diversity and distribution of lepidopteran butterflies in Kota district by Gupta and Jain (2021) [8], butterfly diversity in the Aravalli range by Prajapat *et al*. (2023) [20],comparative study of diversity and seasonal abundance of butterflies in two different sites of Kota district by Gocher and Dang (2025)[6] and checklist of butterflies from the University of Rajasthan Campus, situated in Jaipur by Prajapat *et al*. (2024) [21].

Aravallli hill ranges separate the Thar desert from the fertile eastern plains of Rajasthan which is formed by the Yamuna River and its tributaries (Prajapat and Meena, 2021) [19]. Ranthambore National Park is a renowned National Park of Northen India which is located in Sawai Madhopur district, is bound to the north by the Banas River and to the south by the Chambal River. It covers a total area of 1334 km^2, with a core area of about 275 km^2. At this time, Ranthambore Tiger Reserve is the only forest reserve in Rajasthan state and in the entire Aravallli hill ranges which is a home to a significant number of world's tiger population (Sivaperuman and Kumar, 2010) [30]. It is one of the largest and most prominent tiger reserves ofIndia, serving as anatural habitatfor the majestic Bengal Tiger species. The

land area is inhabited by dense tropical dry forest, open bushland and rocky terrain interspersed with streams and lakes. Ranthambore National Park is endowed with diverse flora and fauna including over 300 species of trees, some of which also have medicinal importance (Riley, 2005) [24].Other than Bengal tiger population, the reserve area also hosts wild animals like chital, sambar, blackbuck, chinkara, langurs, rhesus macaques, nilgai, jackals, striped hyenas, caracals, leopard, jungle cats and sloth bear, and over 270 species of birds (Times of India, 2024) [32]. Current research on biodiversity conservationdemands a comprehensive understanding on the fauna of an area along with their distribution and abundance which are key prerequisites for the conservation and management of that habitat, especially the adjoining area of a Wildlife Sanctuary and National Park. As butterflies are one of the important well-known ecological indicators, their local extinction or an increase or decrease of their diversity and abundance in an area would able to depict the extent and condition of that habitat and ecosystem health.

Hence, the objective of the current study was to assess the diversity and abundance of butterfly fauna in the adjoining area of Ranthambore National Park (Zone 7), Sawai Madhopur, which remains inadequately investigated. This preliminary report on the butterfly community of the studied habitatwill provide a baseline data which will be useful in adopting conservation plan for the butterflies as well as the study area.

Materials and Methods

Study area

The entire study was conducted in the adjoining area of zone 7, Ranthambore National Park, Sawai Madhopur, spanning over an area of 5.6 km from Hammir Circle (26.01253°N, 76.35609°E) to the gate of Zone7 of Ranthambore National Park (25.97890°N, 76.37592°E).

The study area experiences a semi-arid climate characterized by distinct seasons which includes extremely hot summerswith peak heat occurring in May and June when temperatures reach up to 47°C, followed by monsoon and post monsoon months when the temperature gradually decrease leading to a much more pleasant weather. The average annual rainfall experienced in the region is 800 mm, during the monsoon seasons which lasts from July to October. The winter spans from December to February with temperatures ranging from 8°C to 25°C.

Survey technique

The entire process of data collection was carried out in the month of November, 2024 when the climactic conditions were pleasant and moderate. The observations were mainly done by naked eyes or by photographs and binocular. The line transect method was implemented for the procedure of butterfly sampling (Hossain and Aditya, 2016) [9]. The entire survey path of 5600m was divided into 8 transects, each transect comprised of 700m were surveyed every day. The sampling process was carried out for 10 consecutive days and the same transect path was followed for each and every sampling, in order to minimize the number of variables (Pyle, 1992) [22]. The butterfly species which were observed during the sampling period were recorded along with their number. Maximum butterfly species were identified through direct observation and in few difficult cases photographs were clicked for the purpose of identification. Identification was carried out by following the keys of Kunte *et al*. (2014) [13], Kehimkar (2016) [11] and Dey *et al*. (2017) [5]. Throughout the survey period, the butterflies were neither collected nor captured. The common English names and Scientific names followed in the study are in accordance with Varshney and Smetacek (2015) [36].

Statistical data Analysis

To understand the community structure of the butterfly species in the sampled site, all the recorded data were usedto estimate the diversity indices with the help of Microsoft Excel 2019 software. Species richness, abundance and evenness were determined through Shannon index (Shannon and Weaver, 1963) [26], Simpson index (Simpson, 1964) [28] and Pielou's index (Mulder *et al*, 2004) [16] respectively. To explain species richness and evenness a rank abundance curve was prepared (Whittaker, 1965) [37].

Shannon diversity index (H') = - Σ pi ln pi

Shannon H_{max}= Log_1 (N)

Dominance index (D_{BP}) = ni/N (Berger and Parker, 1970) [1]

Simpson's diversity index (Ds) = Σ^{S}_{i-1}[Ni (ni-1)/N (N-1)]

Simpson's index of diversity (D) = 1-Σ^{S}_{i-1}[ni (ni-1)/N (N-1)]

Simpson's reciprocal index (Dr) = 1/ Σ^{S}_{i} pi^2

Pielou's evenness index (J') = H'/ln N

Here, pi is the proportion of the i^{th} species in the butterfly community. N is the number of species present in a butterfly fauna. Ni is the number of individuals of i^{th} species.

Result

The satellite image of India, Rajasthan, Sawai Madhopur and the study area was represented in figure 1. Table 1 delineated the list of butterfly species that were documented during the course of the sampling period along with their scientific name, their family, relative abundance and WPA Schedule (Wildlife Protection Act, 1972). The study revealed that a total of 68 species belonging to 45 genera and 5 families of butterflies (Nymphalidae, Lycaenidae, Pieridae, Hesperiidae, and Papilionidae) were recorded in this study. Family Nymphalidae was found to be the dominant one having 25 species from 15 genera, followed by family Pieridae having 18 species from 11 genera, family Lycaenidae having 12 species from 12 genera, family Papilionidae having 8 species from 3 genera and family Hesperiidae having 5 species from 4 genera. Few butterfly species were highly abundant at the study site which includes Plain Tiger (*Danaus chrysippus*; RA-5.33), followed by Pale Grass Blue (*Pseudozizeeria maha*; RA-4.71), Blue Tiger (*Tirumala limniace*; RA-4.67) and Psyche (*Leptosia Nina;* RA- 4.67) and Common Fivering (*Ypthima baldus*; RA-4.11). There were nine butterfly species were found whose relative abundance were in between 4 to 3, whereas fourteen species were in between 3 to 2. The relative abundance of the remaining butterfly species were less than 1.

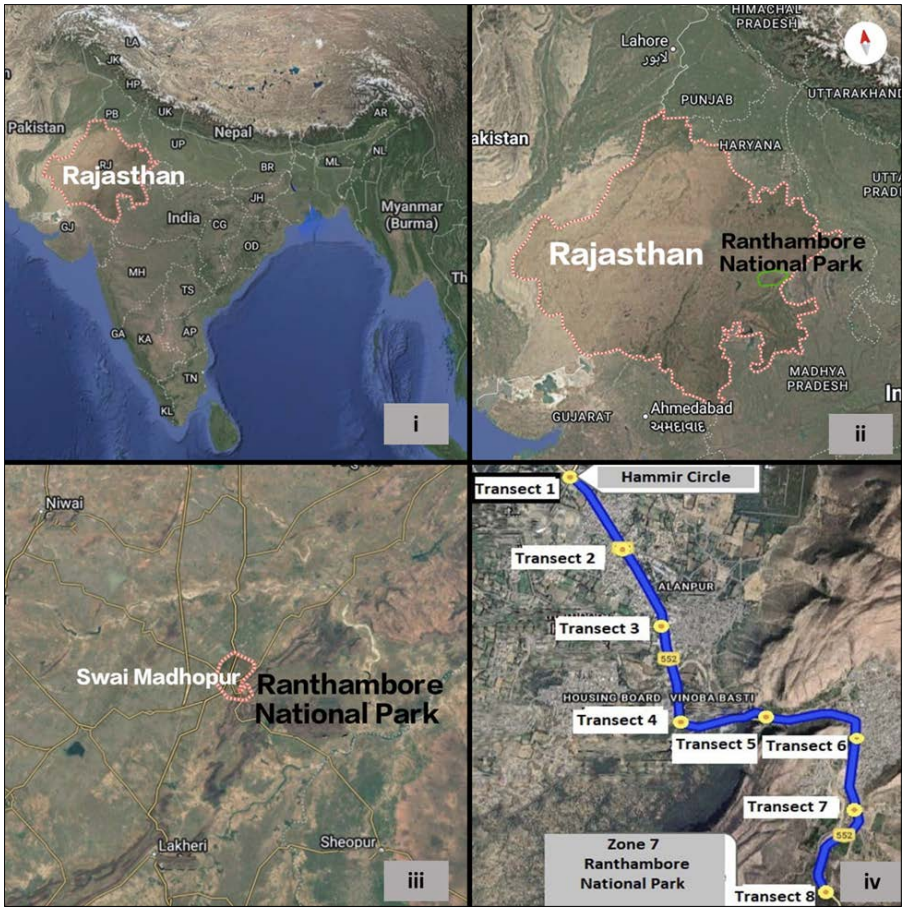

Fig 1: Satellite image of India (i), Rajasthan (ii), Swai Madhopur (iii) and study area (iv)

Table 1: Checklist of butterfly species along with their family, relative abundance, status and WPA Schedule recoded in the study area.

Sl. No.	Family	Common Name	Scientific name	Relative Abundance	Status	WPA schedule
1	Papilionidae	Common Mormon	*Papilio polytes*	1.71	C	
2		Crimson Rose	*Pachliopta hector*	0.36	R	Schedule I
3		Common Rose	*Pachliopta aristolochiae*	0.92	NR	
4		Common Bluebottle	*Graphium sarpedon*	0.53	NR	
5		Common Jay	*Graphium doson*	0.30	R	
6		Tailed Jay	*Graphium agamemnon*	1.68	C	
7		Common Mime	*Papilio clytia*	0.33	R	Schedule I
8		Lime Butterfly	*Papilio demoleus*	0.63	NR	
9	Nymphalidae	Common Palmfly	*Elymnias hypermnestra*	0.66	NR	
10		Common Crow	*Euploea core*	1.91	C	
11		Common Castor	*Ariadne merione*	1.74	C	
12		Plain Tiger	*Danaus chrysippus*	5.33	VC	
13		Blue Tiger	*Tirumala limniace*	4.67	VC	
14		Common Sailor	*Neptis hylas*	4.05	VC	
15		Yellow Coster	*Acraea issoria*	0.16	R	
16		Tawny Coster	*Acraea terpsicore*	3.13	C	
17		Glassy Tiger	*Parantica aglea*	0.23	R	
18		Great Eggfly	*Hypolimnas bolina*	0.30	R	
19		Common Baron	*Euthalia aconthea*	0.56	NR	Schedule II
20		Grey Pansy	*Junonia atlites*	0.30	R	
21		Dark Blue Pansy	*Junonia oenone*	0.33	R	
22		Yellow Pansy	*Junonia hiertas*	0.95	NR	
23		Lemon Pansy	*Junonia lemonias*	1.42	NR	
24		Pale Blue Pansy	*Junonia orithya*	1.25	NR	
25		Peacock Pansy	*Junonia almana*	1.12	NR	
26		Danaid Eggfly	*Hypolimnas misippus*	3.06	C	Schedule I & II
27		Angled Castor	*Ariadne ariadne*	0.30	R	
28		Common Evening brown	*Melanitis leda*	3.06	C	
29		Common Fivering	*Ypthima baldus*	4.11	VC	
30		Painted Lady	*Vanessa cardui*	0.46	R	
31		Common Fourring	*Ypthima huebneri*	1.25	NR	

32		Striped Tiger	*Danaus genutia*	3.09	C	
33		Common Bushbrown	*Mycalesis perseus*	0.86	NR	
34	Pieridae	Common Gull	*Cepora nerissa*	0.72	NR	Schedule II
35		Pioneer	*Belenois aurota*	1.81	C	
36		Common Grass Yellow	*Eurema hecabe*	3.52	VC	
37		Crimson-tip	*Colotis danae*	0.46	R	
38		Yellow Orange-tip	*Ixias pyrene*	2.14	C	
39		Psyche	*Leptosia nina*	4.67	VC	
40		Cabbage White	*Pieris rapae*	0.56	NR	
41		Lemon Emigrant	*Catopsilia pomona*	3.00	C	
42		Mottled Emigrant	*Catopsilia pyranthe*	3.72	VC	
43		Common Albatross	*Appias albina*	0.79	NR	Schedule II
44		Striped Albatross	*Appias olferna*	1.68	C	
45		Common Jezebel	*Delias eucharis*	0.66	NR	
46		Spotless Grass Yellow	*Eurema laeta*	0.07	VR	
47		White Orange-tip	*Ixias marianne*	0.63	NR	
48		Small Salmon Arab	*Colotis amata*	0.86	NR	
49		White Arab	*Colotis vestalis*	0.23	R	
50		Great Orange-tip	*Hebomoia glaucippe*	0.56	NR	
51		Little Orange-tip	*Colotis etrida*	0.63	NR	
52	Lycaenidae	Common Pierrot	*Castalius rosimon*	0.59	NR	Schedule I
53		Forget-me-not	*Catochrysops strabo*	0.79	NR	
54		Pale Grass Blue	*Pseudozizeeria maha*	4.71	VC	
55		Plains Cupid	*Chilades pandava*	1.58	NR	
56		Ceraunus Blue	*Hemiargus ceraunus*	3.75	VC	
57		Pea Blue	*Lampides boeticus*	1.88	C	Schedule II
58		Oriental Grass Jewel	*Freyeria putli*	1.81	C	
59		Common Ciliate Blue	*Anthene emolus*	0.82	NR	Schedule II
60		Tiny Grass Blue	*Zizula hylax*	3.32	VC	
61		Zebra Blue	*Leptotes plinius*	0.36	R	
62		Dark Grass Blue	*Zizeeria karsandra*	0.39	R	
63		Striped Pierrot	*Tarucus nara*	0.03	VR	Schedule II
64	Hesperiidae	Tricolour Pied Flat	*Coladenia indrani*	0.39	R	
65		Spotted Small Flat	*Sarangesa purendra sati*	0.69	NR	
66		Small Branded Swift	*Pelopidas mathias*	0.86	NR	
67		Indian Skipper	*Spialia galba*	0.33	R	
68		Large Branded Swift	*Pelopidas subochracea*	0.23	R	Schedule IV

VC -very common (>100 sightings), C – common (51 to 100sightings), NR – nor rare (16 to 50 sightings), R – rare (3 to 15 sightings), VR – very rare (1 to 2) to indicate the rarest to the most common butterfly species (Tiple *et al*., 2006) [33]
WPA- Species enlisted in Indian Wildlife Protection Act, 1972.

While considering family Nymphalidae, Plain Tiger (*Danaus chrysippus*) was found to be the most abundant species, followed by Blue Tiger (*Tirumala limniace*), whereas Yellow Coster (*Acraea issoria*) was counted with the least number. Within Pieridae family, Psyche (*Leptosia nina*) was recorded with maximum number, followed by Mottled Emigrant (*Catopsilia pyranthe*) whereas Spotless Grass Yellow (*Eurema laeta*) with the minimum number.

Pale Grass Blue (*Pseudozizeeria maha*) from family Lycaenidae was the maximum counted species, followed by Ceraunus Blue (*Hemiargus ceraunus*) while Striped Pierrot (*Tarucus nara*) was the least counted one. When family Papilionidae was taken under consideration, it was found that Common Mormon (*Papilio polytes*) was the most abundant species whereas Common Jay (*Graphium doson*) was the least counted species. Under Hesperiidae family, Small Branded Swift (*Pelopidas mathias*) was observed as the utmost numbered butterfly species, while Large Branded Swift (*Pelopidas subochracea*) was recorded in low number

Figure 2 (i) showed an illustration of the percentage composition of the butterflies observed at the study site. Analysis of the results depicted that the family Nymphalidae had the maximum percentage composition (44.31%), followed by the family Pieridae (26.70%), Lycaenidae (20.05%), Papilionidae (6.45%) and the family Hesperiidae was with the least percentage composition (3.30%).

Analysis of genus proportion results presented in figure 2 (ii) that illustrated maximum number of genera were observed under the family Nymphalidae which comprised of 33.33%, followed the family Lycaenidae (26.67%), Pieridae (24.44%), Hesperiidae (8.89%), Papilionidae (6.67%). While considering species proportion analysis, it was noted that maximum number of species were recorded from the family Nymphalidae (36.76%), followed by the family Pieridae (26.47%), Lycaenidae (17.65%), Papilionidae (11.76%), Hesperiidae (7.35%).

Most of the butterfly species sampled at the study site were ‘common’ and ‘generalist species’ and none of them were universally threatened according to IUCN Red List (Ver. 3.1). Only 11 species of butterfly, observed at the study site, were found to be protected under various Schedules of the Wildlife Protection Act, 1972. Among these butterfly species, 3 of them are undesr Schedule I namely, Crimson Rose (*Pachliopta hector*), Common Mime (*Papilio clytia*) and Common Pierrot (*Castalius rosimon*), 6 of them are under Schedule II namely Common Baron (*Euthalia aconthea*), Common Gull (*Cepora nerissa*), Common Albatross (*Appias albino*), Pea Blue (*Lampides boeticus*), Common Ciliate Blue (*Anthene emolus*) and Striped Pierrot (*Tarucus nara*). Danaid Eggfly (*Hypolimnas misippus*) is protected under both Schedule I and II, while Large Branded swift (*Pelopidas subochracea*) under Schedule IV.

Species richness of the recorded 45 butterfly genera of the study site was elucidated by the figure 2 (iii). It was found that genus *Junonia* under the family Nymphalidae was the dominant one comprised of 6 species namely *Junonia atlites*, *Junonia hierta*, *Junonia oenone*, *Junonia lemonias*, *Junonia orithya* and *Junonia almanac*, followed by genus *Colotis* under Pieridae family comprised of 4 species (*Colotis danae*, *Colotis amata*, *Colotis vestalis*, *Colotis etrida*). Genus *Papilio* and *Graphium* of the family Papilionidae was found to have 3 species each namely *Papilio clytia*, *Papilio demoleus* and *Papilio polytes*, and *Graphium agamemnon*, *Graphium doson* and *Graphium sarpedon* respectively. In the study, the genera having two species were *Pachliopta* of the family Papilionidae, *Ariadne*, *Danas us*, *Acraea*, *Hypolimnas* and *Ypthima* of the family Nsysmphalidae, *Eurema*, *Ixia*, *Catopsilia* and *Appias* of the family Pieridae, and *Pelopidas* of the family Hesperiidae. Remaining 30 genera were all comprised of only one species. The Species-Genus ratio was found 1.51:1.

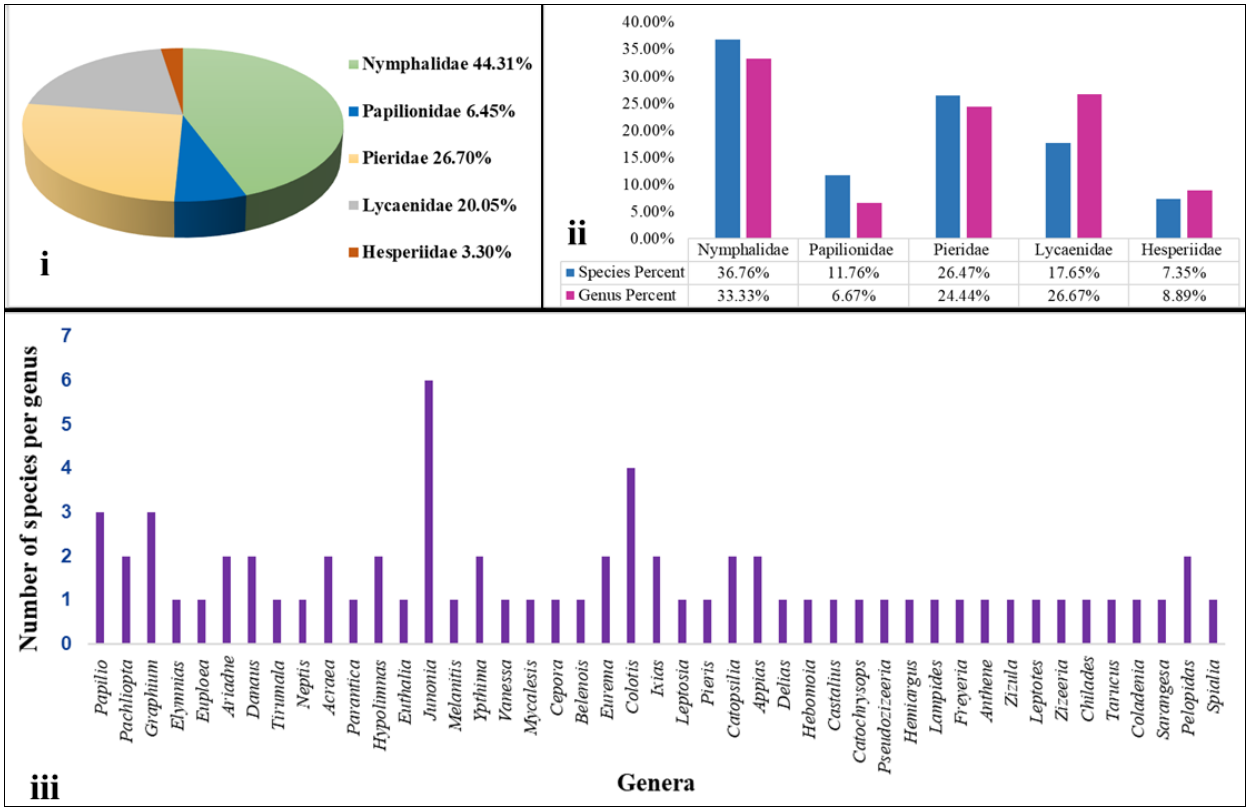

Fig 2: Percentage composition (i), genus to species proportion of butterflies of five families (ii), and genus wise species richness of the recorded butterfly genera (iii) of the study site

The butterflies recorded from the sampling site were categorized into five different classes on the basis of their prevalence, namely very common (VC), common (C), not rare (NR), rare (R) and very rare (VR). The results showed that 41.87% belonged to the VC category, followed by 33.38% to the C category, 19.29% to the NR category, 5.46 % to the R category and 0.10% to the VR category (figure 3).

Table 2 displayed the results of different diversity indices such as such as Shannon diversity index (H'), Pielou's evenness index (j), Simpson's diversity index (Ds) and Simpson's index of diversity (D). The Shannon diversity index (H') value (3.82) depicted that the species richness and diversity of the butterfly fauna at the study site was very high. The abundance of the butterfly community was evaluated by the Simpson's diversity index (Ds) whose value was more inclined towards 0 indicating the prevalence of high abundance within the butterfly community. Again, the value OSF Simpson's index of diversity (D=0.97) revealed that the surveyed butterfly community had high abundance. The value of Pielou's evenness index (j=0.91) was inclined towards 1 which interpreted the persistence of more evenness among the butterfly species of the sampled butterfly community. The results of the studied diversity indices expressed the butterfly community was highly diverse with high abundance and high evenness, thus implying the community was in the direction of an ideal natural community.

Table 2: Values of different biodiversity indices of butterfly population of the study area

Shannon diversity index (H')	Pielou's evenness index (j)	Simpson's diversity index (Ds)	Simpson's index of diversity(D)
3.82	0.91	0.03	0.97

Table 3 explained the result of different biodiversity indices of the five recorded families. The Shannon diversity index (H') value was found to be ranged from 2.85 to 1.50. In this case, thse family Nymphalidae was noted with the highest value as the maximum number of species were recorded from this family, followed sby Pieridae, Lycaenidae,

Papilionidae whereas, the least value was observed from the family Hesperiidae. Moreover, the highest value of Shannon H_{max} was obtained from the family Nymphalidae (3.13), followed by Pieridae (2.91), Lycaenidae (2.78), Papilionidae (2.29), Hesperiidae (1.88). The values of Pielou's evenness index (j) determine whether a community is evenly distributed or not. This value was highest in case of Hesperiidae (0.93), followed by Papilionidae (0.90), Nymphalidae (0.89), Pieridae (0.87), Lycaenidae (0.85). In this study, the value of Simpson's reciprocal index (Dr) confirmed the higher diversity of butterfly of the Nymphalidae family (14.24).

Table 3: Values of different biodiversity indices of five butterfly families of the study area.

Family	Shannon diversity index (H')	Shannon H_{max}	Pielou's evenness index (j)	Simpson's diversity index (Ds)	Simpson's index of diversity (D)	Simpson's reciprocal index (Dr)
Nymphalidae	2.85	3.13	0.89	0.07	0.93	14.24
Papilionidae	1.87	2.29	0.90	0.18	0.82	5.48
Pieridae	2.52	2.91	0.87	0.10	0.90	9.94
Lycaenidae	2.11	2.78	0.85	0.14	0.86	6.87
Hesperiidae	1.50	1.88	0.93	0.23	0.77	4.10

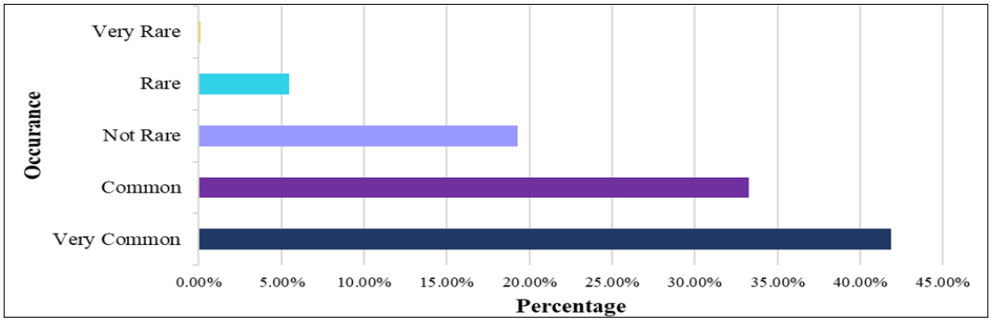

Figure 3: Occurrence of different butterfly species in the study area

Figure 4 (i) portrayed the Whittaker plot i.e., species-wise rank abundance curve that described the species abundance with evenness, while figure 4 (ii) displayed the graph of family-wise rank abundance of the sampled species that explained the species abundance and evenness among the five families. The Whittaker plot's curve showed a steep inclination up to the first fifteen butterfly species those were recorded with high abundance and less evenness in comparison to the remaining butterfly species of the surveyeds csommunssity. While considering the family-wise rank abundasnce curve, it was clearly observed that more evenness was in the sfamily Hesperiidae, followed by family Papilionidae, family Nymphalidae whereas, family Pieridae and Lycaenidae showed relatively less evenness.

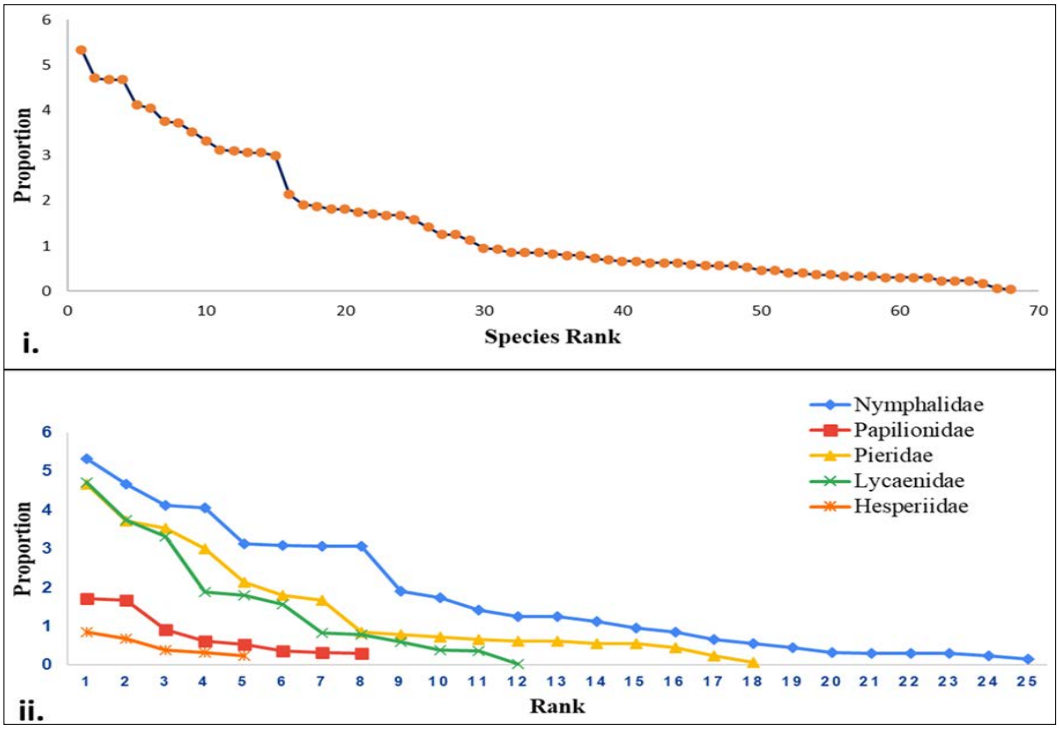

Fig 4: Rank abundance curve of 68 species of butterfly (i) and rank abundance curve of five families of butterfly community (ii) in the study area

Fig 5: Photographs of different butterfly species recorded in the study area, 1) *Vanessa cardui*, 2) *Ypthima huebneri*, 3) *Catopsilia pomona*, 4) *Junonia hierta*, 5) *Junonia atlites*, 6), *Junonia ocyale*, 7) *Junonia lemonias*, 8) *Junonia orithya*, 9) *Eurema laeta*, 10), *Danaus chrysippus* 11), *Tirumala limniace*, 12) *Hypolimnas misippu*

Fig 6: Photographs of diffessrent butterfly species recorded in the study area, 13) *Hypolimnas bolina*, 14) *Papilio clytia*, 15) *Junonia almanac*, 16) *Danaus genutia*, 17) *Ixias Marianne*, 18) *Ixias pyrene*, 19) *Colotis amata*, 20) *Freyeria putli*, 21) *Appias olferna*, 22) *Catochrysops strabo*, 23), *Acraea terpsicore*, 24) *Neptis hylas.*

Discussion

Butterflies are brightly coloured and scaled winged hexapods that play a significant role in the proper functioning of the ecosystem. They play a pivotal role in the terrestrial habitat by facilitating pollination of forest trees, agricultural crops, nutrient recycling and energy conversion up to the progressive trophic level, thus contributing towards the efficient functioning of forest food chain (Prajapat *et al*., 2024) [21]. They act as indispensable ecological indicators by providing critical insights regarding the habitat quality as well as the overall environmental integrity (Sharma and Jat, 2024) [29].

A total of 68 butterfly species belonging to five different families were recorded from the study site. Maximum number of butterflies documented from the survey site belonged to family Nymphalidae, which comprised of 25 species while, Prajapat *et al*. (2024) [21] recorded 14 species of the family Nymphalidae from the University of Rajasthan campus, Jaipur. From the Aravalli Range, 9 butterfly species belonging to family Nymphalidae were recorded by Prajapat *et al*. (2023) [20] and from Mukundara Hills Tiger Reserve, 17 butterfly species were documented by Bhagat (2020) [2]. When considering the family Pieridae, 18 species were recorded in the present study, while 11 species from the campus of University of Rajasthan (Prajapat *et al*., 2024) [21], 12 species from the Aravalli ranges (Prajapat *et al*., 2023) [20] and 15 species from Mukundra Hills Tiger reserve (Bhagat, 2020) [2] were documented previously. From the current study site, under the family Lycaenidae, the recorded number of butterfly species was 12 which is exactly similar to the findings of Prajapat *et al*. (2024) [21]. Under the family Papilionidae the recorded number of butterflyspecies of the present study was found similar as observed from the University of Rajasthan campus (Prajapat *et al*, 2024) [21], Aravalli ranges (Prajapat *et al*, 2023) [20] and Mukundara Hills Tiger reserve (Bhagat, 2020) [2]. On the contrary, the total number of butterflyspecies of thefamily Hesperiidae noted in this study was more than the earlier studies conducted by Bhagat (2020) [2], Prajapat *et al*. (2024) [21] and Prajapat *et al*. (2023) [20].

In the present study, the values of Shannon diversity index (H') and Pielou's evenness index (j) revealed that the family Nymphalidae was the most diverse family in which the recorded species were evenly distributed. The findings of Sharma and Jat (2024) [30] studied from Mukundra Hill Tiger Reserve, was in the same line as documented in this study where the value of 'H'' was 2.69 and 'j'was 0.95 for the family Nymphalidae.

Butterfly species richness and abundance of Chatra Villas Garden and Abheda of Kota, Rajasthan (Gocher and Dang, 2025) [6] was low as compared to the present study which might be due to variation in vegetation and anthropogenic interferences. This speculation was supported by Sreekumar and Balakrishnan (2001) [31] and stated that prevalence of this lepidopteran species in a habitat is generally influenced by various factors, of which the availability of the nectar plants is the most important.

The results of present study agree with the findings of Gosavi *et al*. (2022) [7], Gocher and Dang (2025) [6] and Sayeswara (2018) [25] who recorded higher percentage of butterflies from Nymphalidae family, and least percentage from Hesperiidae family. The predominance of the family Nymphalidae might be due to their polyphagous nature that favored them to live in all habitats (Sreekumar and Balakrishnan, 2001) [32]. Following the family Nymphalidae, Pieridae, commonly seen basking in sun with partially openwings, was observed in this study in higher number of butterflies which was supported by the studies of Gocher and Dang (2025) [6] who reported that notable Pieridae assemblage could be due to the presence of supporting habitat. Family Hesperiidae was recorded minimally in this study which was confirmed by Ombugadu *et al*. (2021) [17]. The reason behind the lowest species richness and abundance of Hesperiidae family might be due to their flight period (Kehimkar, 2008) [10].

Ranthambore National Park and its adjoining areas are typically comprised of Tropical dry deciduous type of forests, which is rich in butterfly fauna. *Lepidagathis cristata* and *Lepidagathis hamiltoniana* which commonly grow in and around Ranthambore National Park, are generally the host plants for Spotted Small Flat (*Sarangesa purendra sati*) (Singh and Shrivastava, 2007) [29], whereas Tricolour Pied Flat (*Coladenia indrani*) was found hovering around its host plants like *Bauhinia racemosa* and *Bridelia retusa*. Pioneer butterflies (*Belenois aurota*) were mostly found hovering around their host plants, *Capparis sepiaria*, *Capparis deciduas* and *Lantana camara.* Therefore, the Ranthambore National Park and its adjoining areas provide an ideal habitat for the conglomeration of a diverse butterfly community. The varied vegetation pattern of the study site is one of the reasons for the diverse nature of the butterfly community, as they are largely dependent on the host plants which were present in abundance at the study site. Although several survey-based studies on butterfly diversity and abundance were conducted in different areas of Rajasthan, the Ranthambore National Park and its adjoining areas are inadequately explored. Therefore, a preliminary attempt was made to assess the diversity and abundance of butterfly community at the selected study site in order to get an idea on this Lepidopteran fauna residing at the study site.

Conclusion

Thus, the current study recorded the prevalence of a diverse butterfly community in the adjoining areas of Ranthambore National Park (Zone 7), Sawai Madhopur, Rajasthan. The fertile eastern plains have thus provided a suitable habitat for the dwelling of a large number of butterflies. The rich diversity of the butterfly community observed at the study site gives us an insight of the bountiful forests which has permitted the aggregation of the butterfly community. Therefore, data recorded from this preliminary study will prove to be beneficial for the upcoming systematic survey-based studies and will provide an opportunity to estimate the overall butterfly diversity and abundance in Ranthambore National Park which could be useful in adopting conservation policies for the forest as well as for the butterfly fauna dwelling in that Tiger Reserve.

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