

A checklist of butterflies in the Kalvarayan Hills, Eastern Ghats, Kallakurichi District, Tamil Nadu, India

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Abstract

Butterflies are important ecological indicators because their diversity, abundance, and distribution are closely associated with vegetation, habitat conditions, and environmental changes. The present study was undertaken to record the butterfly diversity and species abundance in the Kalvarayan Hills of Kallakurichi district, Tamil Nadu, India. Field surveys were conducted fortnightly for one year, from November 2024 to October 2025, covering the Parigam to Vellimalai regions. Butterfly observations were carried out using the line transect and Pollard walk methods. A total of 5,030 individual butterflies representing 77 species and six families, namely Nymphalidae, Papilionidae, Pieridae, Lycaenidae, Hesperidae and Riodinidae, of which eight species are legally protected under the Wildlife Protection Act, 1972 were recorded. Among the documented families, Pieridae was the most abundant, followed by Nymphalidae and Papilionidae, whereas Hesperidae and Riodinidae showed comparatively lower abundance. Common Grass Yellow (*Eurema hecabe*) was the most abundant species with 380 individuals, followed by Common Albatross (*Appias albina*) with 363 individuals and Chocolate Pansy (*Junonia iphita*) with 232 individuals. Several species were recorded with single individuals such as *Charaxes psaphon*, *Mycalesis subdita*, *Euthalia aconthea*, *Gomalia elma*, *Spalgis epius*, *Potanthus pseudomaesa*, *Tagiades japetus*, *Celaenorrhinus leucocera*, *Celaenorrhinus ambareesa*, *Halpe hindu* and *Abisara echerius*. The considerable variation in species abundance may be associated with differences in habitat utilization, availability of larval host plants and nectar resources, and local environmental conditions. The findings highlight the rich butterfly assemblage of the Kalvarayan Hills and emphasize the ecological importance of this landscape for butterfly conservation. The present study provides baseline information on butterfly diversity and abundance that can contribute to future ecological monitoring and conservation planning in the Eastern Ghats.

Keywords: Butterfly diversity, species abundance, Kalvarayan Hills, Eastern Ghats, Pollard walk, Conservation

Introduction

Butterflies fall under the group of insecta and phylum Arthropoda. They are exhibited in various colours and patterns. Certain butterflies serve as flagship (Gowda *et al.*, 2011) [6]. Butterflies are important flagship invertebrates that are crucial to conservation efforts and are frequently seen as colourful indicators of nature (Barua *et al.*, 2012) [2]. Butterflies are essential for pollination and maintaining the food chain and their presence indicate the environmental condition. Butterflies are widely recognized as important bioindicators because their diversity, abundance, and behaviour are highly sensitive to environmental changes, habitat disturbance, and climatic variations. As there are closely associated with vegetation and microclimatic conditions, they are extensively studied in the fields of ecology, taxonomy, conservation biology, and environmental monitoring (Tiple and Khurad, 2009) [19]. As a result, butterflies are recognized as a significant model group in the fields of ecology and conservation (Watt and Boggs 2003; Ehrlich and Hanski 2004) [3, 23]. Among insects, butterflies play significant roles in both pollination and as herbivores (Kunte 2000; Tiple *et al* 2006) [8, 18], having a history of coevolution with plants that spans a long period (Ehrlich and Raven 1964) [4]. Butterflies can respond to habitat changes and disturbances, serving as indicators of ecological health (Mac Nally and Fleishman, 2004) [10]. Pollination, an essential biological activity for the planet's

natural sustainability, is carried out by butterflies. They engage in intricate feeding connections with green plants since both adults and larvae rely on vegetation for development. The best rapid indicators of habit quality are butterflies, which are also thought to be sensitive indicators of climate change (Venkata Ramana, 2010) [20]. The type of soil, local temperatures, vegetation, altitude, and human interaction affects the diversity of insect groups (Hassan, 1997) [7]. Butterfly populations tend to exhibit seasonality, and these variations are frequently unfavourable because of climatic factors including temperature, light, rainfall, relative humidity, and variations in the availability of larval feeding resources and greenery like bushes and herbs (Tiple *et al.*, 2009) [19]. They are approximately 1,501 species of butterflies known to exist in the Indian region, among them 350 are found in Peninsular India, 331 in the Western Ghats, and 313 in South India, of these 42 are endemic (Gaonkar, 1996) [5]. Butterflies act as a proxy for determining biodiversity risk. Certain butterfly species are distinctive to specific habitats and seasons (Kunte, 1997) [9]. This study is aimed to estimate the butterfly diversity across the Kalvarayan Hills for period of one year. The objective of this study was to analyse butterfly species richness and distribution in this unique landscape within the hilly terrain. The findings from this research are intended to provide valuable insights to support conservation management efforts and enhance the ecological roles of butterfly species

in the Kalvarayan Hills and other similar geographic regions.

Material and Methods

Study Area

The present study was carried out in the Kalvarayan Hills, located in the Kallakurichi district of Tamil Nadu, India of Eastern Ghats mountain range. The study area extends

between Parigam and Vellimalai regions of the hills and lies between 11°36' N to 12°01' N latitude and 78°29' E to 78°54' E longitude (Fig. 1). The Kalvarayan Hills cover an approximate area of 1095 km² and are divided into Chinna Kalvarayan and Periya Kalvarayan hill ranges. The elevation of the study area ranges approximately from 600 to 1,220 meters above mean sea level, creating heterogeneous habitats suitable for butterfly diversity.

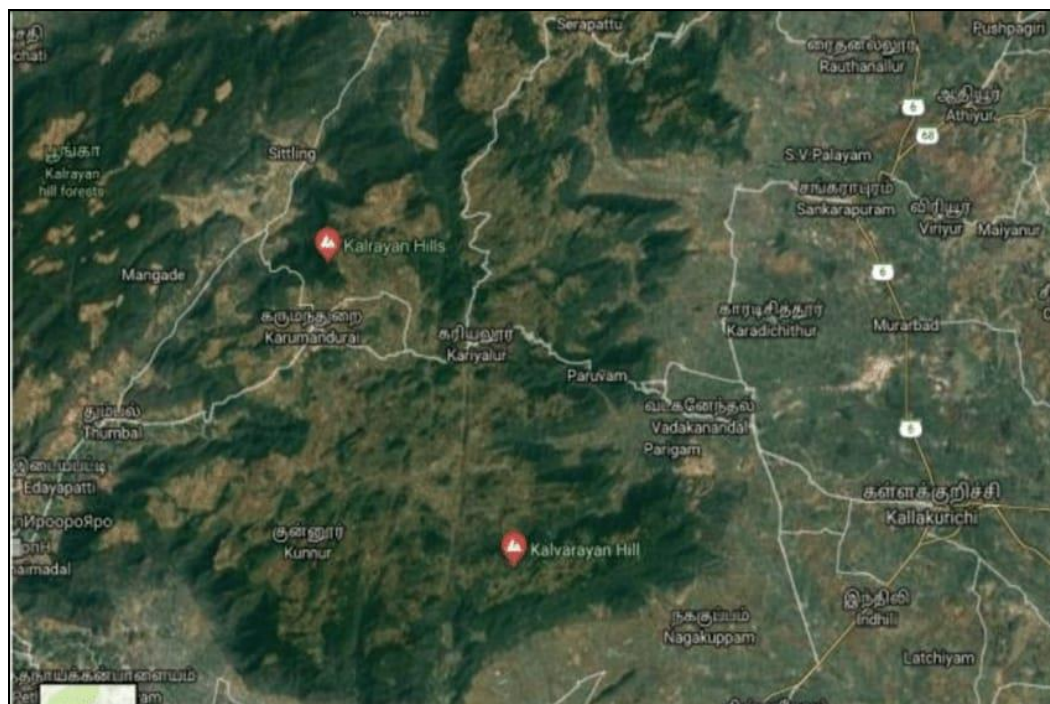


Fig 1: Map of the study area showing Parigam to Vellimalai regions in the Kalvarayan Hills, Eastern Ghats, Tamil Nadu, India.

Survey Method

Butterflies were observed in the study area from 9 am. to 1:00 pm and from 3 pm to 5 pm. Field surveys were conducted fortnightly for a period of one year from November 2024 to October 2025 to document butterfly diversity. Butterflies were surveyed using the line transect method and Pollard walk technique. A total of five fixed transects were established in representative habitats between Parigam and Vellimalai regions. Each transect measured approximately 500 m in length and 5 m in width on either side. In the field, photographs of the butterflies were taken with the help of DSLR camera, cannon 200D as shown in fig 3 and Butterflies were identified based on the colour patterns, size, and shapes by using Field guide (Butterflies of Chennai).

Diversity Indices

Simpson Diversity Indices (1 – D):

$$SDI = \frac{1 - \sum n(n-1)}{N(N-1)}$$

Shannon Wiener Diversity Index

To calculate the diversity of Butterfly, Shannon index (H') was used as a measure the species richness and abundance. Formula for Shannon Index is

$$H = -\sum P_i \times (\ln p_i)$$

where, P_i = Proportion of the i th species.

$\ln$ = Natural logarithm of P_i .

Species evenness was calculated using the formula; $J = H'/\ln(s)$.

where, H' = Value of Shannon–Wiener index.

$\ln s$ = The natural log of the species richness (total number of species)

Pielou's Evenness Index (Equitability):

The species evenness is the proportion of individuals among the species.

$$J = H/H_{\max}$$

J = Pielou's evenness index

H = The observed value of Shannon–Wiener index

$H_{\max}$: $\ln S$ (S : Total number of species, $\ln$: The natural logarithm)

Result and discussion

A total of 5,030 individual butterflies representing 77 species were recorded from the study area during the study period as shown in Table 1. The recorded butterflies were from six different families, namely Nymphalidae, Papilionidae, Pieridae, Lycaenidae, Hesperidae and Riodinidae. Pieridae was the most abundant family, followed by Nymphalidae and Papilionidae. Lycaenidae showed moderate abundance, whereas Hesperidae and Riodinidae were represented by comparatively less individuals. Notably, from the observed eight species, four species are protected under Schedule I and II of the Indian Wildlife (Protection) Act, 1972, highlighting the ecological significance of this assemblage as shown in Table 1. Among

the recorded species, Common Grass Yellow (*Eurema hecabe*) was the most abundant species, with 380 individuals, followed by Common Albatross (*Appias albina*) with 363 individuals and Chocolate Pansy (*Junonia iphita*) with 232 individuals. Psyche (*Leptosia nina*) and Common Crow (*Euploea core*) were also relatively abundant, with 221 and 219 individuals, respectively. In contrast, several species were observed only once such as Plain Tawny Rajah (*Charaxes psaphon*), Tamil Bushbrown (*Mycalesis subdita*), Common Baron (*Euthalia aconthea*), African Marbled Skipper (*Gomalia elma*), Apefly (*Spalgis epius*), Common Dart (*Potanthus pseudomaesa*), Common Snow Flat (*Tagiades japetus*), Common Spotted Flat (*Celaenorrhinus leucocera*), Malabar spotted Flat (*Celaenorrhinus ambareesa*), Indian Ace (*Halpe hindu*) and Plum Judy (*Abisara echerius*), indicating considerable variation in species abundance within the butterfly assemblage. The higher abundance of Pieridae and Nymphalidae indicates that these families constituted the major component of the butterfly community recorded in the study area. The variation in abundance among species may reflect differences in habitat utilization, availability of larval host plants, nectar resources and environmental conditions within the Kalvarayan Hills. Nymphalidae showed considerable variation in abundance, ranging from one individual species such as Tamil Bushbrown and Common Baron. Among Papilionidae, Common Mormon (*Papilio polytes*) was the most abundant species with 176 individuals, followed by

Blue Mormon (*Papilio polymnestor*) with 154 and Common Banded Peacock (*Papilio crino*) with 145 individuals. Common Grass Yellow (*Eurema hecabe*) was the most abundant species in the entire table, with 380 individuals, followed by Common Albatross (*Appias albina*) with 363 individuals. Common Emigrant (*Catopsilia pomona*) was represented by 201 individuals, while Common Gull (*Cepora nerissa*) and Common Wanderer (*Pareronia hippa*) had 148 and 144 individuals, respectively. In Lycaenidae, Common Lineblue (*Prosotas nora*) was the most abundant species with 186 individuals, followed by Common Cerulean (*Jamides celeno*) with 36 and Lesser Grass Blue (*Zizina otis*) with 29 individuals. Hesperidae showed comparatively low abundance. Most species were represented by only one individual, although Golden Angle and Indian Grizzled Skipper each had 11 individuals. The data reveals a marked difference between the most and least abundant species. Common Grass Yellow had 380 individuals, that indicates abundance of Pieridae and Nymphalidae contributed the major proportion of recorded individuals, whereas Hesperidae and Riodinidae contributed relatively few individuals. The results throw that the butterfly assemblage in the study area was characterized by high species richness and substantial variation in species-level abundance, with Pieridae and Nymphalidae forming the major components of the recorded assemblage as shown in Fig 2.

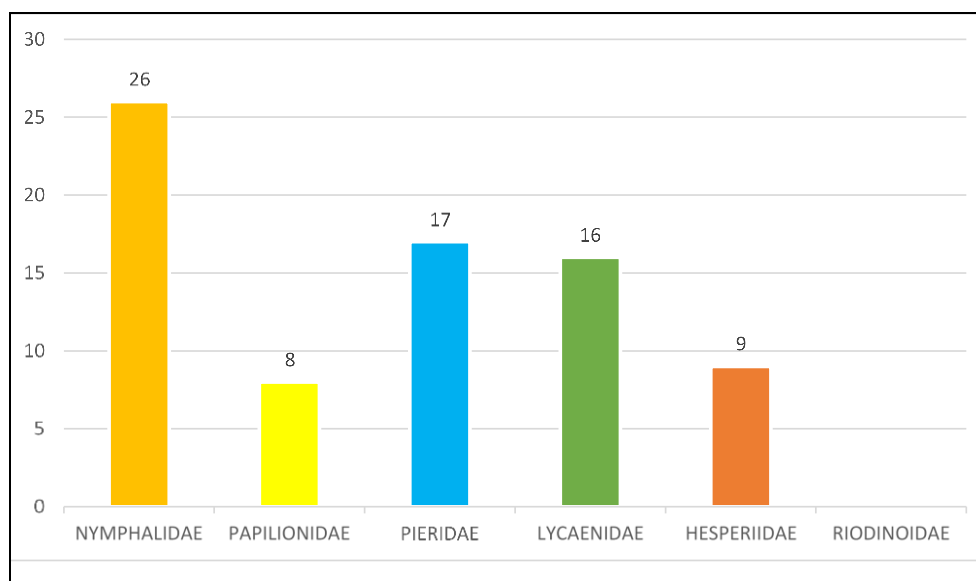


Fig 2: Family-wise distribution of Butterflies in the Kalvarayan Hills from November 2024 - October 2025

Table 1: Checklist of Butterfly Species and their abundance in the Kalrayan Hill

S. No	Family	Species	Scientific Name	Total No of Butterflies	WL(P)A, 1972
	Nymphalidae	Common Sailer	<i>Neptis hylas</i>	151	
		Chestnut-streaked sailer	<i>Neptis jumbah</i>	5	
		Common Lascar	<i>Pantoporia hordonia</i>	91	
		Chocolate Pansy	<i>Junonia iphita</i>	232	
		Peacock Pansy	<i>Junonia almanac</i>	3	
		Lemon Pansy	<i>Junonia lemonias</i>	96	
		Blue Pansy	<i>Junonia orithya</i>	2	
		Anamalous Nawab	<i>Charaxes agrarius</i>	53	
		Plain Tawny Rajah	<i>Charaxes psaphon</i>	1	
		Autumn Leaf	<i>Doleschallia bisaltide</i>	2	
		Blue Tiger	<i>Tirumala limniace</i>	171	
		Glassy Blue Tiger	<i>Parantica algae</i>	15	

		Dark Blue Tiger	<i>Tirumala septentrionis</i>	188	
		Common Crow	<i>Euploea core</i>	219	
		Double Branded Crow	<i>Euploea Sylvester</i>	191	
		Tamil Bushbrown	<i>Mycalesis subdita</i>	1	
		Tawny Coster	<i>Acraea terpsicore</i>	116	
		Danaid Eggfly	<i>Hypolimnias misippus</i>	4	Schedule I &II
		Great Eggfly	<i>Hypolimnias bolina</i>	2	
		Common Castor	<i>Ariadne merione</i>	138	
		Rustic	<i>Cupha erymanthis</i>	14	
		Common Leopard	<i>Phalanta phalantha</i>	27	
		Common Baron	<i>Euthalia aconthea</i>	1	Schedule II
		Plain Tiger	<i>Danaus chrysippus</i>	71	
		Striped Tiger	<i>Danaus genutia</i>	4	
		Lobed Beak	<i>Libythea laius</i>	3	
	Papilionidae	Blue Mormon	<i>Papilio polymnestor</i>	154	
		Lime Swallowtail	<i>Papilio demoleus</i>	136	
		Common Mormon	<i>Papilio polytes</i>	176	
		Crimson Rose	<i>Pachliopta hector</i>	57	Schedule II
		Common Banded Peacock	<i>Papilio crino</i>	145	
		Common Jay	<i>Graphium doson</i>	33	
		Tailed Jay	<i>Graphium agamemnon</i>	28	
	Peiridae	Spot Swordtail	<i>Graphium nomius</i>	49	
		Three Spot Grass Yellow	<i>Eurema blanda</i>	10	
		Common Grass Yellow	<i>Eurema hecabe</i>	380	
		Common Emigrant	<i>Catopsilia pomona</i>	201	
		Mottled Emigrant	<i>Catopsilia pyranthe</i>	112	
		Large Salmon Arab	<i>Colotis fausta</i>	73	
		Common Jezebel	<i>Delias eucharis</i>	32	
		Crimson Tip	<i>Colotis danae</i>	27	
		Plain Orange Tip	<i>Colotis aurora</i>	61	
		White Orange Tip	<i>Ixias marianne</i>	35	
		Yellow Orange Tip	<i>Ixias pyrene</i>	32	
		Great Orange Tip	<i>Hebomoia glaucippe</i>	93	
		Common Wanderer	<i>Pareronia hippa</i>	144	
		Dark Wanderer	<i>Pareronia ceylanica</i>	5	
		Common Albatross	<i>Appias albina</i>	363	Schedule II
		Common Gull	<i>Cepora nerissa</i>	148	Schedule II
		Pioneer	<i>Belenois aurota</i>	4	
	Lycaenidae	Psyche	<i>Leptosia nina</i>	221	
		Indian Sunbeam	<i>Curetis thetis</i>	3	
		Common Acacia Blue	<i>Surendra quercetorum</i>	6	
		Slate Flash	<i>Rapala manea</i>	5	
		Common Sliverline	<i>Spindasis vulcanus</i>	9	
		Lime Blue	<i>Chilades lajus</i>	4	
		Common Pierrot	<i>Castalius rosimon</i>	132	Schedule I
		Stripped Pierrot	<i>Tarucus nara</i>	13	
		Monkey Puzzle	<i>Rathinda amor</i>	5	
		Zebra Blue	<i>Leptotes plinius</i>	9	
		Common Line Blue	<i>Prosotas nora</i>	186	Schedule II
		Lesser Grass Blue	<i>Zizina otis</i>	29	
		Grass jewel	<i>Freyeria trochylus</i>	22	
		African Babul Blue	<i>Azanus jesus</i>	12	
		Pointed Ciliate Blue	<i>Anthene lucaenina</i>	2	Schedule II
		Common Cerulean	<i>Jamides celeno</i>	36	
		Apefly	<i>Spalgis epus</i>	1	
	Hesperiidae	Golden Angle	<i>Caprona ransonnetti</i>	11	
		Common Banded Awl	<i>Hasora chromus</i>	7	
		Indian Grizzled Skipper	<i>Spialia galba</i>	11	
		African Marbled Skipper	<i>Gomalia elma</i>	1	
		Common Dart	<i>Potanthus pseudomaesa</i>	1	
		Common Snow Flat	<i>Tagiades japetus</i>	1	
		Spotted Flat	<i>Celaenorrhinus leucocera</i>	1	
		Malabar Spotted Flat	<i>Celaenorrhinus ambareesa</i>	1	
		Indian Ace	<i>Halpe hindu</i>	1	
	Riodinoidae	Plum Judy	<i>Abisara echerius</i>	1	

Table 2: Species Diversity, Richness, Evenness of Butterflies in Kalvarayan Hills from November 2024 - October 2025

Site	No. of Species	No. of Families	Simpson's diversity index(D)	Shannon- Weiner diversity index(H)	Pielou's Evenness index(J)
Kalvarayan hills	77	6	0.965	3.597	0.47

The Simpson's Index of Diversity ($1 - D$) was 0.965, indicating a 96.5% probability that two randomly selected individuals belong to different species, reflecting an exceptionally low probability of single-species dominance. The finding was further supported by the Shannon-Wiener Index ($H' = 3.597$), which signifies a structurally complex ecosystem characterized by high species richness and strong overall biodiversity. However, Pielou's Evenness Index (J') was found to be 0.474. This moderate-to-low evenness value suggests that while the habitat supports a broad array of species, and the individual abundance is unequally distributed as shown in Table 2.

Similar findings have been reported by several researchers from different regions of India. Walia *et.al.*, (2025) compiled a checklist comprising 39 butterfly species highlighting the

diversity of butterflies in their study area. Singh & Lal (2024) ^[16] conducted a study on the faunal diversity of butterflies and recorded 42 species. Monsoon, J.G. *et.al.*, (2016) reported a high level of butterfly diversity in Barail wildlife sanctuary, documenting 343 species. Similarly, Sunil, k. *et.al.*, (2016) recorded 25 butterfly species from Gangetic Plain of Allahabad, Uttar Pradesh. Anirban, M. *et al.*, (2017) studied butterfly diversity in the Eastern Ghats and recorded 60 species. The present study 77 species belonging to six different families in the kalvarayan hills of the Eastern Ghats, indicating considerable butterfly diversity in the study area. The variation in species richness may be attributed to differences in habitat characteristics, vegetation composition, climatic condition, seasonal variation and availability of host and nectar plants.



Family: Lycaenidae



Neptis hylas



Neptis jumbah



Pantoporia hordonia



Junonia iphita



Junonia almanac



Junonia lemonias



Junonia orithya



Charaxes agrarius



Charaxes psaphon



Doleschallia bisaltia



Tirumala limniace



Tirumala septentrionis



Parantica algae



Euploea core



Euploea sylvester



Mycalesis subdita



Acraea terpsicore



Hypolimnas misippus



Hypolimnas bolina



Ariadene merione



Cupha erymanthis



Euthalia aconthea



Libythea laius



Danaus genutia



Danaus chrisippus



Phalanta phalantha

Family: Nymphalidae



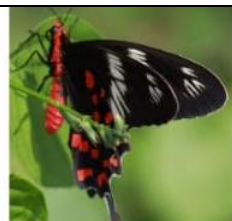
Papilio polymnestor



Papilio demoleus



Papilio polytes



Pachilocta hector



Papilio crino



Graphium doson



Graphium agamemnon



Graphium nomius

Family : Pieridae



Eurema blanda



Eurema hecabe



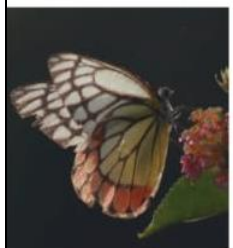
Catopsilia pomona



Catopsilia pyranthe



Colotis fausta



Delias eucharis



Colotis danae



Colotis aurora



Ixias marianne



Ixias pyrene



Hebomoia glaucippe



Pareronia hippa



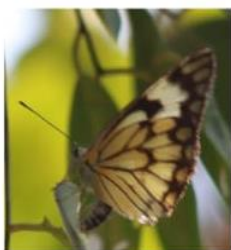
Pareronia ceylanica



Appias albina



Cepora nerissa



Belenois aurota



Leptosia nina

Family: Papilionidae

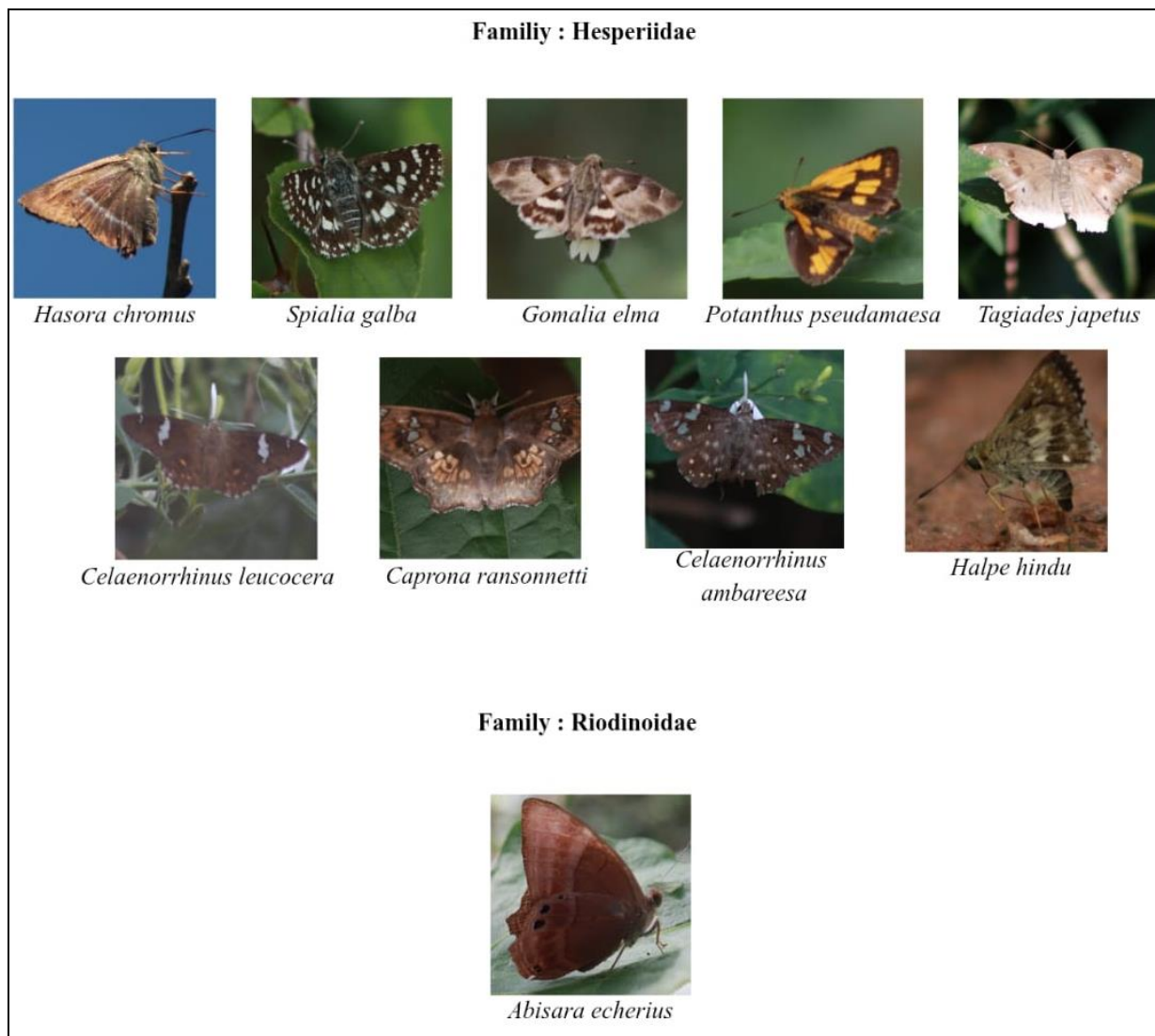


Fig 3: Images of Butterfly diversity of Kalvarayan Hills from November 2024 – October 2025

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