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Butterfly Diversity Of Kundapura, Udupi District, Karnataka

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Abstract: A field survey was conducted to observe the butterfly fauna of Kundapura region by random observation from December 2023 to November 2024. Butterfly diversity was studied at four different habitat types that included forest, plantation, crop lands, and wetland. A total of 123 butterfly species belonging to the families of Hesperidae (28 species), Papilionidae (11 species), Pieridae (10 species), Nymphalidae (44 species) and Lycaenidae (30 species) were identified. Highest butterfly diversity and abundance was recorded from areas of dense forest (76.10% of individuals), while plantation (18.58% of individuals), cropland (4.05% of individuals) and wetland (1.27% of individuals) showed lower butterfly diversity and abundance. Maximum number of individuals and species of butterflies were recorded during the monsoon season (52.57% of individuals) followed by pre-monsoon (39.40% of individuals) and post-monsoon (8.03% of individuals). As the natural habitats are dwindling due to anthropogenic causes, the butterflies too are facing survival problems. We are hopeful that the present study on butterfly diversity of Kundapura Taluk may provide basic data for detailed long term study of biodiversity of this area.

Keywords: Diversity, Forest, Crop land, Wetland, Plantation

Introduction:

Butterflies are the most fascinating group of insects to humankind, often regarded as flagship species. They are the good bio-indicators of the ecosystem and are very sensitive to changes in the environment. They play an important role in food chain and are valuable pollinators in the local environment (Udaya Kumar *et al.*, 2019). Butterflies are very sensitive to pollution and have been used as bio-indicators to detect the pollution levels. They play a vital role in pollination of various flowering plants besides a key component of food chain (Krishna, 2018). There are 16,823 species recorded from all over the world among them 1501 species of butterflies are recorded from India (Gaonkar, 1996). A total of 317 butterfly species have been documented in Karnataka, of which 33 species are endemic (Sadasivan and Ashok., 2024). Of the various butterfly habitats found in India, the Western Ghats is one of the most diversified areas containing a wide variety of species due to the typical eco-climatic and geographic features (Gowda *et al.*, 2011). Among the insects, butterflies occupy a vital position in the ecosystem and their occurrence and diversity are considered as good indicators of the health of any given terrestrial biotope. Butterflies are also good indicators of environmental changes as they are sensitive to habitat degradation and climate change (Arya *et al.*, 2014).

Butterflies form a key component in knowing about biodiversity and ecological balance of any ecosystem because they serve as best bio-indicators. They also play a major role in maintaining food chain as they are food to many other animals (Prasannakumar and Vijaykumar., 2024). Today several species of butterflies are used by conservation biologist as indicator species to identify habitats that are critical and needs to be protected. Butterflies are also monitored to indicate climate change and environmental degradation. Thus, like other animals and birds, butterflies are now studied as living ecological components (Kehimkar, 2008). Butterflies and their caterpillars are dependent on specific host plants for food, thus the diversity of butterflies indirectly reflects the overall plant diversity especially that of shrubs and herbs in the given area (Gaikwad *et al.*, 2015). Some workers have documented the butterflies of Western Ghats.

Butterflies of Kundapura Taluk have not so far been explored, although some workers have documented the butterflies from few areas of Dakshina Kannada District. Butterflies are seasonal in their occurrence. They are common for only a few months and rare or absent in others. The seasons when they are rare or not active as adults are usually spent either as caterpillars or as pupae. The months when the adults are active are called the “flight period”. Distinct flight periods naturally imply seasonality of the early stages of butterflies as well (Gowda *et al.*, 2011). On the basis of temperature, humidity and rainfall the climate of Kundapura represents three seasons in a year namely: monsoon (June to September), post-monsoon (October to January), pre-monsoon (February to May). The present study was carried out in order to assess the species diversity of butterflies in Kundapura Taluk.

Materials and Methods:

Study area: To conduct the current study, four research sites were chosen based on the vegetation patterns in and around Kundapura.

Site 1: Forest: Aanejari Butterfly Park is situated in the Udupi District of Karnataka, located within the Mookambika Wildlife Sanctuary, approximately 35 kilometers from Kundapura. The forest is drained by the Chakra and Sowparnika rivers. The predominant types of vegetation found here include *Terminalia paniculata* (Hunalu), *Mangifera indica* (Maavu), *Artocarpus hirsutus* (Hebbelasu), *Syzygium* species (Nerale), and *Aporosa lindleyana* (Salle).

Site 2: Plantation: This site is situated in Mullikatte, approximately 15 kilometers from Kundapura. It encompasses an area of 0.04 square kilometers. The predominant types of vegetation found here include *Cocos nucifera* (Coconut), *Areca catechu* (Areca), *Mangifera indica* (Mango), *Psidium guajava* (Guava), *Piper betel* (Betel), *Piper nigrum* (Pepper), and *Pithecellobium dulce* (Tamarind).

Site3: Cropland: This site is situated in Hemmadi, approximately 8 kilometers from Kundapura. The types of vegetation present include *Oriza sativa* (Paddy), *Chrysanthemum (shevanthi)*, and *Basella alba* (Malabar Spanish).

Site 4: Wetland: The Malyadi bird sanctuary, situated in Tekkate approximately 8 kilometers from Kundapura, encompasses an area of 1.5 square kilometers. The vegetation found within the sanctuary includes water lilies, utricularia, sedges, lymnea, among others.

Data collection: Field survey of butterflies was conducted from December 2023 to November 2024 following modified pollard walking method (Gaikwad *et.al.*, 2015) that is walking along the fixed paths while recording the species at four distinct habitat: forest, plantation, cropland, and wetland in Kundapura. Field observations were made once in fifteen days for one year. All sighted butterflies were recorded by direct visual observations. For more specification the photographs of butterflies were taken with using a Canon 700d Camera fitted with a 10X Zoom Lens. The identification of the material has been made on basis of morphological characters such as wing maculation, legs, colour of wing, wing venation and wing shape (Charn Kumar, 2015).

Results and Discussion:

During one year survey at four different sites mentioned, a total of 123 species belonging to 83 different genera belonging to five families were recorded (Table-1). Of these, individuals of Nymphalidae family were found to be dominant with 44 species followed by Lycaenidae with 30 species, Hesperidae with 28 species, Papilionidae with 11 species and Pieridae with 10 species. A complete checklist of butterfly species is given in Table-1.

About 105 species of swallowtails (Papilios), out of the world's 700, are found in India, among them 19 species are present in peninsular India (Gowda *et. al.*, 2011). A total of 11 species have been documented in our study area throughout the duration of our research, which features India's largest butterfly, the Southern Bird Wing (*Triodes minos* Cramer), recognized as the state butterfly of Karnataka and endemic to peninsular India. The Tailed Jay (*Graphium agamemnon* Linnaeus) from this family is the most prevalent species in our study area. Lycaenidae is the most abundant family of the Western Ghats, compared to all other families

(Kunte, 2000). A total of 30 butterfly species belonging to this family were documented in this area throughout the duration of the study.

The Nymphalids are a large group of robust bodied butterflies that come in almost every shape and colour (Gowda *et al.*, 2011). Highest number of butterfly species (44 sp.) recorded from this area belongs to this family. The species of this family are distributed throughout the area. Most browns are common and often abundant, but are less seen due to their retiring habits. They keep to shady undergrowth, where they may be seen in slow, jerky flight close to the ground. Rustic (*Cupha erymanthis* Drury) of this family is most abundant in our study area.

The family Pieridae has some of the most familiar butterflies. Over 35 species are represented in this family in peninsular India out of which 33 species are found in Western Ghats and 10 species are found in Kundapura. Mottled emigrant (*Catopsilia pyranthe* Linnaeus), psyche (*Leptosia nina* Fabricius), and Common Grass Yellow (*Eurema sari* Horsfield) of this family are most abundant butterflies of this study area. The family Hesperidae is the third largest family of the butterflies in the world. 28 species belonging to this family were recorded from this area during our study period.

Table 1: Family wise distribution of butterfly species observed from the study site along with their status

(C = Common, NR = Not Rare, LC = Locally Common, VR= Very rare and Rare=R).

FAMILY	SPECIES	SCIENTIFIC NAME	STATUS
HESPERIDAE	Common small flat	<i>Sarangesa dasahara</i> Moore	C
	Tamil grass dart	<i>Taractrocera ceramas</i> Hewitson	LC
	Common red eye	<i>Matapa aria</i> Moore	C
	Spotted small flat	<i>Sarangesa purendra</i> Moore	NR
	Brown awl	<i>Badamia exclamationis</i> Fabricius	NR
	Common Dartlet	<i>Oriens goloides</i> Moore	C
	Dark palm dart	<i>Telicota ancilla</i> Herrich-Schaffer	C
	Indian palm bob	<i>Suastus gremius</i> Fabricius	C
	Restricted demon	<i>Notocrypta curvifascia</i> C & R Felder	C
	Bicolour ace	<i>Sovia hyrtacus</i> de Niceville	R
	Bevan's swift	<i>Pseudoborbo bevani</i> Moore	LC
	Blank swift	<i>Caltois kumara</i> Moore	C
	Chestnut bob	<i>Iambrix salsala</i> Moore	C
	Common awl	<i>Hasora badra</i> Moore	NR
	Conjoint swift	<i>Polytremis lubricans</i> Herrich-Schaffer	R
	Grass demon	<i>Udaspes folus</i> Cramer	C
	Great swift	<i>Pelopidas assamensis</i> de Niceville	R
	Large branded swift	<i>Pelopidas subochracea</i> Moore	R
	Madras Ace	<i>Halpe honorei</i>	VR
	Paint brush swift	<i>Baoris farri</i> Moore	NR
	Pale palm dart	<i>Telicota colon</i> Fabricius	NR
	Pygmy scrub hopper	<i>Aeromachus pygmaeus</i> Fabricius	C
	Rice swift	<i>Borbo cinnara</i> Wallace	C
	Small branded swift	<i>Pelopidas mathias</i> Fabricius	C
	Small palm bob	<i>Suastus minutus</i> Moore	C
	Southern spotted ace	<i>Thoressa astigmata</i> Swinhoe	NR
	Straight swift	<i>Parnara guttatus</i> Brener & Grey	C
	Water snow flat	<i>Tagiades litigiosa</i> Moschler	NR
LYCAENIDAE	Angled sunbeam	<i>Curetis acuta</i> Moore	NR
	Banded royal	<i>Rachana jalindra</i> Horsfield	R
	Banded blue pierrot	<i>Discolampa ethion</i> Westwood	LC
	Ape fly	<i>Spalgis epius</i> Westwood	R

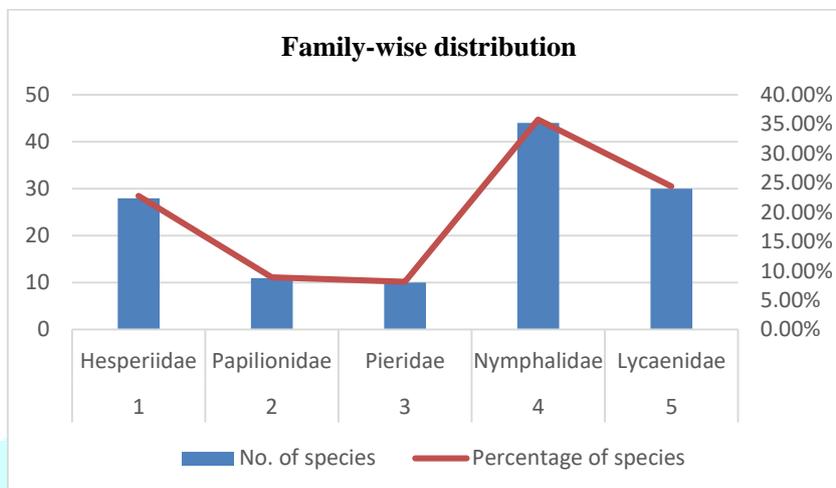
	Common hedge blue	<i>Acytolepis puspa</i> Horsfield	C
	Common line blue	<i>Prosotas nora</i> C Felder	C
	Common pierrot	<i>Castalius rosimon</i> Fabricius	C
	Dingy lineblue	<i>Petrelaea danade</i> Niceville	NR
	Dark cerulean	<i>Jamides bochus</i> Stoll	C
	Dark grass blue	<i>Zizeeria karsandra</i> Moore	C
	Fluffy tit	<i>Zeltus amasa</i> Hewitson	R
	Grass jewel	<i>Freyeria trochylus</i> Freyer	LC
	Large oakblue	<i>Arhopala amantes</i> Hewitson	LC
	Lime blue	<i>Chilades lajus</i> Stoll	C
	Leaf blue	<i>Amblypodia anita</i> Hewitson	NR
	Lesser grass blue	<i>Zizina otis</i> Fabricius	C
	Monkey puzzle	<i>Rathinda amor</i> Fabricius	NR
	Metalic cerulean	<i>Jamides alecto</i> C & R Felder	LC
	Pale grass blue	<i>Pseudozizeeria maha</i> Kollar	C
	Plum judy	<i>Abisara echerius</i> Stoll	C
	Small cupid	<i>Chilades parrhassius</i>	
	Rounded pierrot	<i>Tarucus nara</i> Kollar	NR
	Red pierrot	<i>Talicauda nyseus</i> Guerin-Meneville	LC
	Tamil oakblue	<i>Arhopala bazaloides</i> Hewitson	R
	Tailless lineblue	<i>Prosotas dubiosa indica</i> Evans	C
	Transparent 6-lineblue	<i>Nacaduba kurava</i> Moore	NR
	Tiny grass blue	<i>Zizula hylax</i> Fabricius	C
	Western centaur oakblue	<i>Arhopala pseudocentaurus</i> Doubleday	R
	Yamfly	<i>Loxura atymnus</i> Stoll	C
NYMPHALIDAE	Angled castor	<i>Ariadne ariadne</i> Linnaeus	R
	Baronet	<i>Euthalia nais</i> Forster	LC
	Blue oakleaf	<i>Kallima horsfieldi</i> Kollar	LC
	Blue tiger	<i>Tirumala limniace</i> Cramer	C
	Blue baron	<i>Euthalia telchinia</i> Menetries	R
	Brown king crow	<i>Euploea klugii</i> Moore	LC
	Double branded crow	<i>Euploea sylvester</i> Fabricius	LC
	Clipper	<i>Parthenos sylvia</i> Cramer	R
	Common baron	<i>Euthalia aconthea</i> Cramer	C
	Common bushbrown	<i>Mycalesis perseus</i> Fabricius	C
	Common crow	<i>Euploea core</i> Cramer	C
	Common evening brown	<i>Melanitis leda</i> Linnaeus	C
	Common fivering	<i>Ypthima baldus</i> Fabricius	C
	Common four ring	<i>Ypthima huebneri</i> Kirby	C
	Common leopard	<i>Phalanta phalantha</i>	C
	Common palm fly	<i>Elymnias hypermnestra</i> Linnaeus	C
	Common three ring	<i>Ypthima asterope</i> Klug	C
	Chocolate pansy	<i>Junonia iphita</i> Cramer	C
	Cruiser	<i>Vindula erota</i> Fabricius	NR
	Dark blue tiger	<i>Tirumala septentrionis</i> Butler	C
	Danaid eggfly	<i>Hypolimnas misippus</i> Linnaeus	C
	Dark brand bushbrown	<i>Mycalesis mineus</i> Linnaeus	C
	Dark evening brown	<i>Melanitis phedima</i> Cramer	NR
	Glad eye bushbrown	<i>Mycalesis patnia</i> Moore	C
	Glassy tiger	<i>Parantica aglea</i> Stoll	C
	Great eggfly	<i>Hypolimnas bolina</i> Linnaeus	C

NYMPHALIDAE	Great evening brown	<i>Melanitis zitenius</i> Herbst	R
	Grey count	<i>Tanaecia lepidea</i> Butler	R
	Grey pansy	<i>Junonia atlites</i> Linnaeus	LC
	Lemon pansy	<i>Junonia lemonias</i> Linnaeus	C
	Malabar tree nymph	<i>Idea malabarica</i> Moore	LC
	Long brand bushbrown	<i>Mycalesis visala</i> Moore	C
	Nilgiri four ring	<i>Ypthima chenui</i> Guerin-Meneville	C
	Nigger	<i>Orsotrioena medus</i> Fabricius	LC
	Painted lady	<i>Vanessa cardui</i> Linnaeus	C
	Plain tiger	<i>Danaus chrysippus</i> Linnaeus	C
	Peacock pansy	<i>Junonia almana</i> Linnaeus	C
	Red spot duke	<i>Dophla evelina</i> Stoll	R
	Southern duffer	<i>Discophora lepida</i> Moore	R
	Sullied sailer	<i>Neptis soma</i> Moore	R
	Striped tiger	<i>Danaus genutia</i> Cramer	C
	Rustic	<i>Cupha erymanthis</i> Drury	C
	Tamil yeoman	<i>Cirrochroa thais</i> Fabricius	LC
	Tawny coster	<i>Acraea violae</i> Fabricius	C
	White four ring	<i>Ypthima ceylonica</i> Hewitson	LC
	PAPILIONIDAE	Blue mormon	<i>Papilio polymnestor</i> Cramer
	Common jay	<i>Graphium doson</i> C & R Felder	LC
	Common mormon	<i>Papilio polytes</i> Linnaeus	NR
	Lime butterfly	<i>Papilio demoleus</i> Linnaeus	C
	Common rose	<i>Atrophaneura aristolochiae</i> Fabricius	C
	Malabar banded peacock	<i>Papilio buddha</i> Westwood	LC
	Malabar banded swallowtail	<i>Papilio liomedon</i> Moore	R
	Paris peacock	<i>Papilio paris</i> Linnaeus	NR
	Crimson rose	<i>Atrophaneura hector</i> Linnaeus	C
	Southern birdwing	<i>Troides minos</i> Cramer	NR
	Tailed jay	<i>Graphium agamemnon</i> Linnaeus	C
	PIERIDAE	Common emigrant	<i>Catopsilia pomona</i> Fabricius
	Common grass yellow	<i>Eurema sari</i> Horsfield	R
	Spotless grass yellow	<i>Eurema laeta</i> Boisduval	C
	Common jezebel	<i>Delias eucharis</i> Drury	C
	Common wanderer	<i>Pareronia valeria</i> Cramer	C
	Mottled emigrant	<i>Catopsilia pyranthe</i> Linnaeus	C
	Pioneer	<i>Belenois aurota</i> Fabricius	C
	Psyche	<i>Leptosia nina</i> Fabricius	C
	Three spot grass yellow	<i>Eurema blanda</i> Boisduval	C
	Common gull	<i>Cepora nerissa</i> Fabricius	C

In the current research, the largest proportion of butterfly species recorded was from the Nymphalidae family (35.78%), followed by the Lycaenidae (24.39%), Hesperidae (22.76%), Papilionidae (8.94%), while the fewest species were noted in the Pieridae (8.13%) family (Table-2, fig-1).

Table 2: Distribution of species of butterflies in respective families from the study site

Sl. No.	Family	No. of species	Percentage of species
1	Hesperiidae	28	22.76%
2	Papilionidae	11	8.94%
3	Pieridae	10	8.13%
4	Nymphalidae	44	35.78%
5	Lycaenidae	30	24.39%

**Fig 1:** Distribution of species of butterflies in respective families

A total of 1109 butterflies belonging to 83 genera and 5 families were observed from four different habitats in Kundapura region. Of these, Nymphalidae was the largest family represented by 25 genera and 615 individuals which constituted 55.46% of the total individuals of butterflies observed (Similar findings were reported by Divyashree and Lohith Kumar, 2024, Priyadharshini *et al.*, 2023 & Harisha *et al.*, 2019) followed by Pieridae with 7 genera and 267 individuals constituting 24.07% Lycaenidae with 24 genera and 83 individuals constituting 7.49%, Papilionidae with 1 genera and 74 individuals constituting 6.67%, and Hesperiidae with 23 genera and 70 individuals constituting 6.31% of the total individuals of butterflies observed in the study area.

Table 3: Family-wise distribution of observed butterflies from Kundapura region

Sl. No.	Family	No. of genera	No. of individuals	Percentage of individuals
1	Hesperiidae	23	70	6.31%
2	Papilionidae	4	74	6.67%
3	Pieridae	7	267	24.07%
4	Nymphalidae	25	615	55.46%
5	Lycaenidae	24	83	7.49%

Seasonality: Butterflies are seasonal in their occurrence. They are common for only a few months and rare or absent in other parts of the year. They are sensitive to the changes in the habitat and climate, which influence their distribution and abundance (Gowda *et al.*, 2011). Table 4 represents seasonal variation in species richness observed during the study period. Maximum numbers of butterflies were recorded during the monsoon season when the humidity and temperature were favourable for the growth and development. Highest number of species is recorded in monsoon, that is 77, which decreased to 69 species in pre-monsoon and it was only 18 species during post-monsoon season. Similar observations were made by (Yashwant and Preeti., 2023).

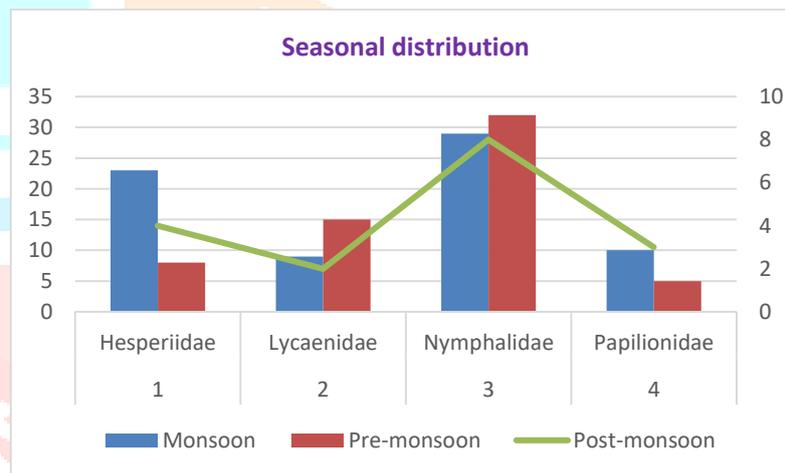
Table 4: Number of species and individuals recorded in different seasons

Sl. No.	Seasons	No. of individuals	No. of species	Percentage of individuals
1	Monsoon	583	77	52.57%
2	Pre-monsoon	437	69	39.40%
3	Post-monsoon	89	18	8.03%

Butterflies in all habitats showed a highly seasonal trend. Present study had identified monsoon season as the period of peak activity, for butterflies belonging to all the five families (Hesperiidae with 23 species, Lycaenidae with 9 species, Nymphalidae with 29 species, Papilionidae with 10 species, Pieridae with 6 species) were recorded in highest numbers (Table 5). The numbers were low in post-monsoon. This was undoubtedly due to the destruction of habitats caused by the harvesting of paddy crops, leading to increased heat. During unfavourable seasons, a low population was maintained; some species within a family are likely to be more stress-tolerant and therefore are able to survive in these months (Kunte, 1997).

Table 5: Distribution of butterfly species at different seasons

Sl. No.	Family	Monsoon	Pre-monsoon	Post-monsoon
1	Hesperiidae	23	8	4
2	Lycaenidae	9	15	2
3	Nymphalidae	29	32	8
4	Papilionidae	10	5	3
5	Pieridae	6	9	1

**Fig 2:** Distribution of butterfly species at different seasons

Abundance of butterflies:

Abundance of butterfly species can be attributed to the favorable conditions of the tropical climate, while the quality of habitats that provide food plants for both larval and adult stages is a significant factor in determining the butterfly community (Kumar *et al.*, 2014). Similar observations were made by (Umapati *et al.*, 2016). Total of 1109 individuals of butterflies were recorded during the study period. While 844 individuals belonging to 93 species were recorded from forest, 206 individuals representing 61 species were recorded from plantation, 45 individuals representing 22 species were recorded from crop land and 14 individuals representing 7 species were recorded from wetland. The growth of natural trees is main reason for species richness and diversity of butterflies and vegetation type plays an important role in diversity pattern of butterfly community (Prasannakumar and Vijaykumar 2024). Mottled emigrant (*Catopsilia pyranthe* Linnaeus) of Family Pieridae was recorded as the most abundant species and constituted 14.24% of the total recorded individuals of the butterflies. In the present study, forest site supported the maximum number of species of butterflies. Similar observations were made by (Sreekumar and Balakrishna, 2001).

Table 6: Number of species and individuals recorded in different habitats in study site

Sl. No.	Habitat	No. of species	Total number of individuals	Percentage of individuals
1	Plantation	61	206	18.58%
2	Forest	93	844	76.10%
3	Cropland	23	45	4.05%
4	Wetland	7	14	1.27%

In the present study, a total of 1109 individuals were documented, representing 123 species across 5 families. Among the four study locations, the forest site exhibited the highest species richness, with a greater number of species across all five families (Hesperiidae-17, Lycaenidae-21, Nymphalidae-40, Papilionidae-11, and Pieridae-7), suggesting the presence and accessibility of food plants. The type of vegetation significantly influenced the diversity patterns within the butterfly community (Sayeswara, 2018). The wetland site had the lowest number of butterfly species (Table 7).

Table 7: Distribution of butterfly species of different family at different habitat

Sl. No.	Family	Plantation	Forest	Cropland	Wetland
1	Hesperiidae	17	14	5	0
2	Lycaenidae	9	21	7	1
3	Nymphalidae	23	40	5	3
4	Papilionidae	8	11	1	1
5	Pieridae	4	7	5	2

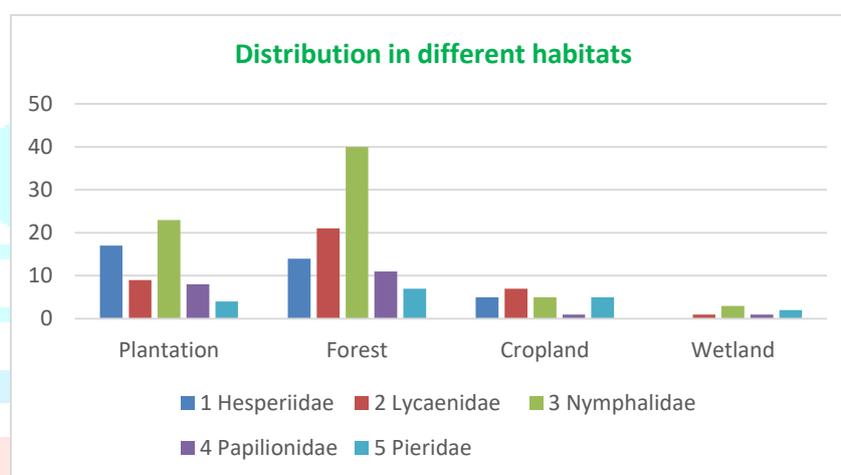


Fig 3: Number of species and individuals recorded in different habitats

Conclusion:

The region surrounding Kundapura is rich in butterfly species. This research suggests that the area provides appropriate ecological conditions and habitats conducive to butterflies. The highest species diversity was recorded in the Forest (site-1). The largest number of butterflies was observed during the rainy season, likely due to the presence of sufficient host plants and favorable climatic conditions that facilitate the development and growth of butterflies. The results from the butterfly survey in Kundapura indicate that the Nymphalidae family is the most common, with 44 species documented, followed by Lycaenidae (30), Hesperiidae (28), Papilionidae (11), and Pieridae (10). A smaller number of butterflies were noted in wetland regions, which may be linked to urbanization and the complete removal of greenery and flowering plants. Such circumstances can lead to a decline in butterfly populations or drive them away due to a lack of food and reduced opportunities for reproduction. The fewest butterflies were recorded during the post-monsoon season, which is attributed to unfavorable climatic conditions. Consequently, it is crucial to protect butterflies to prevent these rare and endemic species from facing extinction.

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