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A Review on Butterfly Diversity and Distribution in Andhra Pradesh

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Abstract
This study aims to provide a comprehensive review of the existing literature on butterfly diversity, distribution, and composition in different regions of Andhra Pradesh. This includes forests, and sanctuaries and protected areas within the state. The review highlights the ecological significance of butterflies as pollinators and pests, and explores the potential use of butterflies as bioindicators to assess the effectiveness of protected areas in biodiversity conservation. Various parameters have been utilized by researchers to assess the composition and species richness of different butterfly families. These parameters range from categorizing species as very common, common, rare, or very rare, to employing statistical measures such as the evenness index and other ecological indicators. Through this review, it becomes evident that the Nymphalidae family stands out as the most dominant, with a large number of individuals, while the Lycaenidae family exhibits relatively fewer individuals. The occurrence of other butterfly families varies moderately across different regions of Andhra Pradesh. The findings from the literature review emphasize the importance of each butterfly family in upholding the biodiversity of ecosystems. Consequently, effective conservation planning is necessary to safeguard not only the butterflies themselves but also their host plants and nectar food sources. Furthermore, the review aims to assess the current biodiversity status of butterflies in Andhra Pradesh state, including the protected areas located within its vicinity.

Keywords: Butterfly, diversity, Andhra Pradesh, Different regions

Introduction

Butterflies, the enchanting and elegant insects, play a significant role in benefiting both the economy and the environment. With their vibrant and diverse wing colours, they undoubtedly enrich the beauty of our planet and bring immense aesthetic value to their surroundings. Moreover, butterflies serve as crucial pollinators, contributing to the essential ecological process that ensures the sustainability of nature worldwide. Belonging to the order Lepidoptera in the class Insecta, butterflies possess wings covered in tiny scales, distinguishing them as part of the largest phylum Arthropoda in the animal kingdom. These enchanting beings can be found across the globe, except in polar regions. In particular, India, with a total geographical area spanning 329 million hectares, accounts for a mere 2.5% of the world's land area, yet possesses an astonishing 7.8% of the planet's recorded species, showcasing its rich biological diversity of flora and fauna.

Butterflies, with their captivating colour patterns, possess immense aesthetic value (Patil and Shende, 2014 [1]; Khan *et al*., 2016 [2]; Patil *et al*., 2017) [3]. They serve as natural pollinators and share a symbiotic relationship with flowering plants. Additionally, they hold ecological significance as they are more susceptible to changes in their environment, acting as indicators of ecological conditions. These remarkable creatures exhibit variations in colour, markings, and patterns in response to different climatic conditions, ranging from dark to pale or other diverse shades. Not only do butterflies contribute to the food chain as herbivores, but they also serve as prey to predators such As amphibians, reptiles, birds, and mammals (Gupta and Mondal, 2005) [4].

Around 19,238 butterfly species have been documented worldwide, according to Heppner's research in 1998 [5]. Within the Indian subcontinent, there are approximately 1,504 butterfly species, as reported by Gaonkar in 1996 [6] and Smetacek in 1992 [7]. The Western Ghats have recorded 334 butterfly species (Tiple and Khurad, 2009) [8], while the Eastern Ghats have documented 150 species (Gunathilagaraj *et al*., 1998) [9]. Monitoring the diversity of butterfly species in a specific region is crucial for understanding their ecological roles and ensuring their conservation in their natural habitats.

Current research has indicated that the northern Eastern Ghats region, owing to its close proximity to the eastern Himalayan, Indo-Malayan, and Western Ghats biodiversity hotspots, serves as a transitional zone that blends the characteristics of these distinct eco-regions. Consequently, the northern Eastern Ghats display a higher diversity of plants and animals. For instance, the Stripe-necked Mongoose (Herpestes vitticollis), previously known only from the Western Ghats, has now been discovered in the northern Eastern Ghats (Balaji & Satyanarayana, 2016) [10]. Additionally, bird species such as the Ruby-cheeked Sunbird (Chalcoparia singalensis) and Pale-chinned Blue Flycatcher (Cyornis poliogenys), previously associated with northeastern regions, have been sighted in the northern Eastern Ghats (Prashanth, 2016) [11]. In addition to sharing biological attributes with the neighboring hotspots, the northern Eastern Ghats are host to a variety of rare, endemic, and threatened flora and fauna. These include

reptiles like the Golden Gecko (Calodactylodes aureus) (Javed *et al*., 2007) [12], Jeypore Ground Gecko (Geckoella jeyporensis) (Agarwal *et al*., 2012) [13], and a newly discovered caecilian species, Gegeneophis orientalis (Agarwal *et al*., 2013). Noteworthy bird species found in this region include the Yellow-throated Bulbul (Pycnonotus xantholaemus) (Sreekar & Srinivasulu, 2010) [14] and the Critically Endangered Blewitt's Owl or Forest Owlet (Heteroglaux blewetti) (Kumar *et al*., 2010) [15].

Table 1: Checklist of few butterflies from the northern Eastern Ghats (Rajkamal Goswami *et al*., 2018) [25]

Family	Common name	Scientific name
Hesperiidae	Orange-tailed Awl	Bibasis sena
	Common Awl	Hasora badra
	Plain Banded Awl	Hasora vita
	Wax Dart	Cupitha purreea
	Chestnut Bob	Iambrix salsala
	Common Redeye	Matapa aria
Lycaenidae	(Rounded six-lineblue	Nacaduba berenice
	Yamfy	Loxura atymnus
Nymphalidae	Marbled Map	Cyrests cocles
	Double Branded Crow	Euploea sylvester
	Pallas' Sailer	Nepts sappho
	Tamil Treebrown	Lethe drypets
Papilionidae	(Great Jay	Graphium eurypylus
	Red Helen	Papilio helenus Linnaeus

The butterfly diversity in Andhra Pradesh, India, has been subject to limited research. In a study conducted by Guptha *et al*. in 2012, 50 butterfly species from 5 families were recorded in the Seshachalam Biosphere Reserve in the Eastern Ghats of Andhra Pradesh. The dominant family observed was Nymphalidae with 20 species, followed by Lycaenidae with 12 species, Pieridae with 11 species, Papilionidae with 5 species, and Hesperiidae with 2 species. Another study conducted by ENVID from 2000-2002 documented a total of 60 butterfly species. Similarly, Rao *et al*. in 2004 [18] recorded 89 species from 64 genera across five families in the Nagarjunasagar, Srisailam Tiger Reserve in Andhra Pradesh. The family Nymphalidae displayed dominance with 27 species, followed by Lycaenidae with 24 species, Pieridae with 17 species, Hesperiidae with 12 species, and Papilionidae with 9 species. Srinivasulu and Rao (1999) [19] reported 15 butterfly species from 3 families in the Gundla Brameshwaram Wildlife Sanctuary. Additionally, preliminary surveys conducted in the Kawal Wildlife Sanctuary have yielded up to 19 butterfly species from four families, as observed by C. Srinivasulu. However, these surveys were informal in nature. Overall, the known diversity of butterflies in Andhra Pradesh is relatively limited, highlighting the need for further research and exploration in this region.

Some of the commonly found butterfly species in Andhra Pradesh include

Andhra Pradesh, with its diverse landscapes ranging from coastal regions to hills and forests, supports a rich biodiversity, including a variety of butterfly species. The state's different ecosystems provide suitable habitats for numerous butterfly species. Some common and notable butterflies found in Andhra Pradesh include:

Common Mormon (Papilio polytes)

This large and colourful butterfly is often seen in gardens and open areas.

Fig 1

Blue Tiger (Tirumala limniace): A striking butterfly with blue wings and black stripes, often found in open habitats.

Fig 2

Common Rose (Pachliopta aristolochiae): Known for its attractive black and red coloration, this butterfly is often found near its larval host plants.

Fig 3

Common Lime Butterfly (Papilio demoleus): Widely distributed, this butterfly is recognized by its greenish wings with black spots.

Fig 4

Common Jezebel (Delias eucharis): This butterfly is known for its bright colors, with males having a combination of red and yellow hues.

Fig 5

Common Grass Yellow (Eurema hecabe): A small, bright yellow butterfly commonly found in open areas.

Fig 6

Blue Pansy (Junonia orithya): This butterfly has distinctive blue and black markings on its wings.

Fig 7

Baronet (Euthalia nais): A butterfly with brown wings and prominent eye spots, often found in forested areas.

Fig 8

Malabar Banded Peacock (Papilio buddha): This species is known for its striking peacock-like eye spots on the wings.

Fig 9

Southern Birdwing (Troides minos): One of the largest butterflies in India, known for its size and attractive coloration.

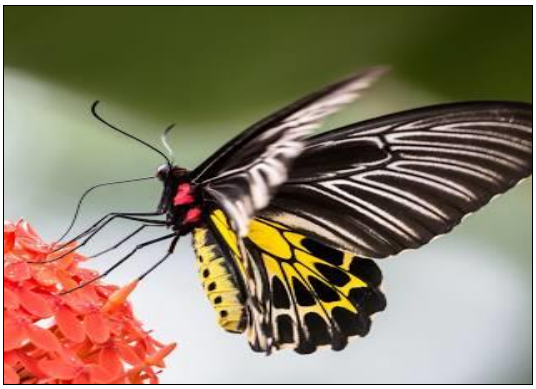

Fig 10

India exhibits varying butterfly diversity across different regions. The city of Visakhapatnam has been documented to have 68 species of butterflies in a study conducted by Solomon Raju *et al*. in 2003. The Sri Lankamalleswara Reserve Forest boasts a higher diversity with 75 identified species, as documented by Harinath *et al*. in 2014 [21]. At Nelapattu Bird Sanctuary in Nellore, Gupta and Rao (2013) recorded 44 butterfly species. Additionally, Mounica and Milu Mathew reported a total of 40 butterfly species from West and East Godavari districts in Andhra Pradesh, India.

Table 2: List of Butterflies of Godavari district (Mounica and Milu Mathew., 2020) [23]

Family	Common name	Scientific name
Nymphalidae	Blue Pansy	Junonia orithya
	Striped Tiger	Danaus genutia
	Common Crow	Acraea violae
	Black Rajah	Charaxes solon
	Mottled Emigrant	Catopsilia pyranthae
	Yellow Pansy	Junonia hierta
	Black Rajah	Charaxes solon
Papilionidae	Crimson Rose	Pachliopta hector
	Lime Butterfly	Papilio demoleus
	Tailed Jay	Graphium agamemnon
	Common Mormon	Papilio polytes
Pieridae	Common Emigrant	Catopsilia pomona
	Large Salmon Arab	Colotis fausta
	Small Salmon Arab	Colotis amata
	Common Grass Yellow	Eurema hecabe
	White Orange Tip	Ixias marianne
Hesperidae	Common Banded Awl	Hasora chromus
	Indian Palm Bob	Suastus gremius
	Grass Demon	Udaspes folus
Lycaenidae	Gram Blue	Euchrysops cnejus
	Common Guava Blue	Virachola isocrates
	Oriental Apefly	Spalgius epeus

Table 3: List of Butterflies in Seshachalam Biosphere Reserve, Eastern Ghats (Bhupesh *et al*., 2013)

Family	Common name	Scientific name
Papilionidae	Common Rose	Pachliopta aristolochiae Fabricius
	Common Banded Peacock	Papilio crino
	Spot Swordtail	Graphium nomius
	Common Mormon	Papilio polytes Linnaeus
	Common Bluebottle	Graphium sarpedon
Pieridae	Common Grass Yellow	Eurema hecabe Linnaeus
	Mottled Emigrant	Catopsilia pyranthe Linnaeus
	Three Spot Grass Yellow	Eurema blanda
	Psyche	Leptosia nina Fabricius
	White Orange Tip	Ixias marianne Cramer
	Pioneer Or Caper White	Anaphaeis aurota
	Indian Wanderer	Pareronia hippia
	Common Jezebel	Delias eucharis Drury
	Crimson Tip	Colotis danae
	Dark colourded Yellow	Colias fieldii
Lycaenidae	Bright Sunbeam	Curetis bulis Doubleday
	Red Pierrot	Talicada nyseus
	Zebra Blue	Leptotes plinius Fabricius
	Gram Blue	Euchrysops cnefus
	Centaur Oak Blue	Nilasera centaurus
	Pea Blue	Lampides boeticus
	Lime Blue	Chilades laius
	Plain Cupid	Chilades pandava
	Scarlet Flash	Rapala dieneces
Nymphalidae	Common Evening Brown	Melanitis leda Linnaeus
	Dark Evening Brown	Melanitis phedima
	Tawny Coster	Acraea violae Fabricius
	Black Rajah	Charaxes solon
	Tawny Rajah	Charaxes polyxena
	Chocolate Pansy	Precis iphita Cramer
	Blue Tiger	Tirumala limniace Cramer
	Glassy Tige	Parantica aglea
	Danaid Eggfly	Hypolimnas misippus Linnaeus
Hesperiidae	Golden Angle	Odontoptilum ransonnetti
	Small-Branded Swift	Pelopidas mathias
	Indian Skipper	Spialia galba Fabricius
	Indian Palm Bob	Suastus gremius
	Suffused Snow Flat	Tagiades gana athos
	Common Snow Flat	Tagiades japetus ravi
	Dark Grass Blue	Zizeeria karsandra
	Brown Awl	Badamia exclamationis

According to Bubesh Guptha *et al*., (2014) [24] in seshachala hills butterflies' diversity is the Nymphalidae and Lycaenidae families were the most dominant, comprising 33% and 23% of the total species, respectively. The Pieridae family accounted for 20% of the species, followed by Hesperiidae with 15% and Papilionidae with 9%.

Conclusion

In the past few years, there have been notable advancements in studying the diversity of butterflies in Andhra Pradesh. However, the majority of research has been focused on specific regions such as forests, sanctuaries, and parks. Within Andhra Pradesh, the Nymphalidae family continues to dominate, comprising almost one-third of the total butterfly species known in the area. To accurately determine the present state of butterfly biodiversity in Andhra Pradesh, a comprehensive survey is essential. While significant efforts have been made in protected areas, it is imperative to begin monitoring the sanctuaries, hills and parks where the need for exploration and investigations is crucial.

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