



A Checklist of Butterflies in Ananda Tea Estate and its Adjacent Areas of Lakhimpur District, Assam, India

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

Article Information

DOI: <https://doi.org/10.56557/upjoz/2024/v45i184478>

Open Peer Review History:

This journal follows the Advanced Open Peer Review policy. Identity of the Reviewers, Editor(s) and additional Reviewers, peer review comments, different versions of the manuscript, comments of the editors, etc are available here: <https://prh.mbimph.com/review-history/4085>

Original Research Article

Received: 10/07/2024

Accepted: 14/09/2024

Published: 20/09/2024

ABSTRACT

In the present study, a checklist of butterflies from the Ananda Tea Estate of Lakhimpur district, Assam is prepared and presented. During the study, surveys were carried out from October 2022 to April 2024 in the Ananda tea estate (27°27' N and 94°14' E) and its nearby areas– Dulung reserve forest and Subansiri river. A total of 36 species across 32 genera belonging to five families viz., Nymphalidae, Pieridae, Papilionidae, Lycaenidae, Riodinidae were recorded during the study. Amongst all the families, Nymphalidae was the most diverse family comprising 17 species which belong to 16 different genera. Approximately 48% of the recorded species belong to the Nymphalidae family, indicating the highest species richness. The dominant nature of the family

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Nymphalidae can be attributed to the polyphagous nature of the species under the family which help them to live in diverse habitats. The species Common albatross (*Appias albina*), recorded during the study, is protected under Schedule II of the Wildlife (Protection) Amendment Act, 2022 of India. The Whittaker β -diversity was found to be 0.6875, indicating a moderate level of species turnover among the study sites. In the tea estate, due to the spraying of chemical pesticides large number of butterflies die each year which can be saved by replacing the chemical pesticides with biopesticides and other eco-friendly pest control methods including use of botanicals, Indigenous Technical Knowledge (ITKs) and microbial antagonists.

Keywords: Butterflies; diversity; Ananda Tea estate; Dulung reserve forest; Subansiri river.

1. INTRODUCTION

Butterflies are fascinating insects with high aesthetic value and can be found across the globe. Butterflies play an important role in ecosystems, and their diversity as well as abundance are thought to be reliable markers of the state of any given terrestrial biotope [1,2,3]. Butterflies belong to the order Lepidoptera. There are roughly 19,000 butterfly species in the world [4] and in India there is about 1500 species of butterflies are known till date [5]. Like other regions of India, North-eastern region of the country too has a rich diversity of butterfly. Previously, many scientific studies have been carried out on the diversity and ecology of butterflies from the North-eastern region. In a study on the butterflies of Garo Hills, Meghalaya, around 298 species of butterflies has been recorded [6]. From the Kameng protected area of western Arunachal Pradesh, a total of 421 species of butterflies has been documented [7]. In the Southern Sikkim, 911 butterfly species have been documented [8]. In a study conducted in Tripura, 151 butterfly species were recorded from four wildlife sanctuaries of the state [9]. From Manipur, a total of 798 species have been recorded [10]. Approximately 962 species and subspecies of butterflies under five families – Nymphalidae, Pieridae, Papilionidae, Lycaenidae and Riodinidae have been reported from Assam [11]. Like other states of the region, many works have been done earlier on the diversity of butterflies in Assam. From Karimganj, a total of 135 species of butterflies from the district [12]. Another study on diversity of butterflies documented 105 species from Dibru-Saikhowa Biosphere Reserve [13]. In Gibbon Wildlife Sanctuary, a survey documented a total of 211 species [14]. From the eastern Assam, a total of 375 species of butterflies have been recorded [15]. Altogether, various studies carried out on the diversity of butterflies in the north eastern states of India depict the rich butterfly diversity of the region.

Assam with its diverse habitats, including the tea estates, supports variety of flora and fauna which contributes to its rich biodiversity. Among the tea estates of the state, the Ananda tea estate is one of the largest tea estates of Assam. With the presence of Dulung Reserve Forest (74.987 sq km) in the north and north-western side as well as Subansiri river in the eastern side, the tea estate is a home to variety of bird and butterfly species. In the present study, the authors have carried out an extensive survey on the butterflies of the Ananda Tea Estate of Lakhimpur district, Assam along with its adjacent areas and prepared a checklist of all the butterflies species recorded during the study period. This study is presumably the first to document the butterfly diversity of the tea estate. The study also raise high concerns regarding conservation of butterflies as many butterflies are killed each year due to the use of chemical pesticides.

2. MATERIALS AND METHODS

2.1 Study Area

The present study was carried out in the Ananda Tea Estate and its adjacent areas which are situated in Ananda Bagan of Lakhimpur district, Assam (Fig. 1). The tea estate is surrounded by Dulung Reserve Forest (74.987 sq km) on its North and North-western side along with the Subansiri River, an important tributary of the Brahmaputra, surrounding its eastern side. Coordinates of the estate are 27°27' N and 94°14' E. The tea estate has a total area of 960 hectares (9.2 square km). The vegetation of Dulung Reserve Forest includes numerous host plants of different butterfly species along with other plant species.

2.2 Methods of Data Collection

Surveys were conducted between October 2022 to April 2024 in all seasons i.e., pre-monsoon, monsoon, post-monsoon and winter. In each

winter season, around 55- 60 days and in other seasons, around 35-45 days of field studies were carried out. The survey was conducted between 0800 to 1600 hrs. Collection of data was done by randomized walk [16] and the species were photographed using DSLR camera (Nikon D3400). Despite of our full effort, we could not photograph some of the species observed during the study. All butterfly species observed and photographed were identified following the field guides of [17] and [18]. Field guides of [19] and [20] were also used for updated nomenclature and identification. The β -diversity among study sites were calculated using Past statistical software.

3. RESULTS AND DISCUSSION

A total of 36 species of butterflies across 32 genera were recorded. All the recorded butterflies from Ananda Tea Estate were under 5 families (Table 1, Fig. 2). With 17 species under 16 genera, Nymphalidae was found to be the most species rich lepidopteran family during this study period. Nymphalidae is followed by Pieridae (9 species under 9 genera), Papilionidae (2 genera consists of 5 species), Lycaenidae (4 genera consists of 4 species), and Riodinidae (1 genera consists of 1 species). Among all the species recorded, the Common

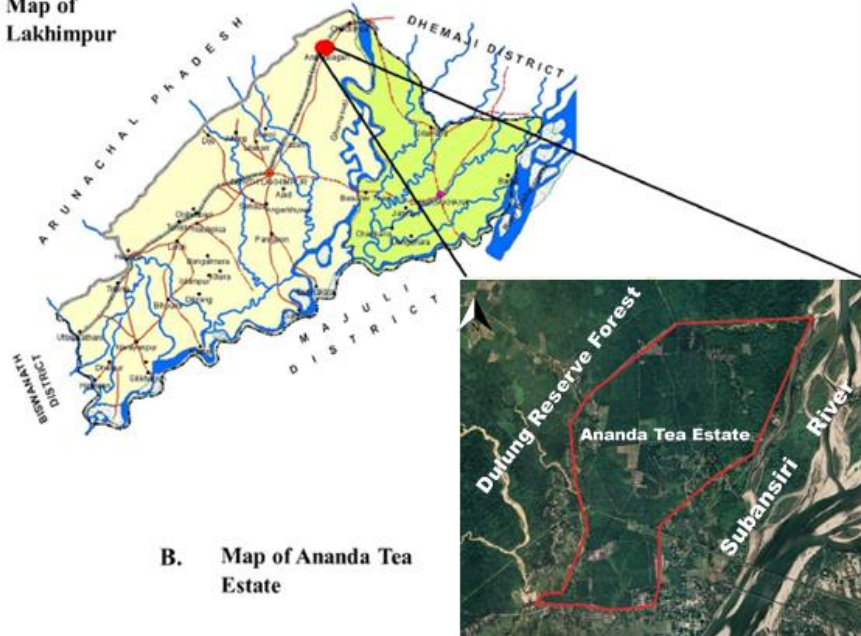
albatross (*Appias albina*) is protected under Schedule II of the Indian Wildlife (Protection) Amendment Act, 2022 [21]. Family wise distribution of butterflies shows that about 48% of the total species recorded were under the family Nymphalidae with highest species richness followed by Pieridae (25%), Papilionidae (14%), Lycaenidae (11%) and Riodinidae (2%) (Fig. 3). In many other similar studies conducted in major tea gardens of Sivasagar district of Assam [22] and Makaibari Tea Estate of Darjiling Hills [23] also reported the highest species richness (44.23% and 45% respectively) under the family Nymphalidae. The family Nymphalidae is the most dominant family in tropical regions [24], [25], [8]. The dominant nature of the family Nymphalidae can be attributed to the polyphagous nature of the species which help them to live in diverse habitats [26]. Besides, a lot of species in this family are long distance fliers, which could be useful for them while looking for resources over wide distances [27]. A large fraction of species under Nymphalidae also reflects high richness of host plants in the study areas [14]. The Whittaker β -diversity was found to be 0.6875 which indicates a moderate level of species turnover among the study sites. Simply, it implies that there is a noticeable difference in the species present among the study sites.

Table 1. Checklist of Butterflies of Ananda Tea Estate

Serial No.	Family	Scientific Name	Common Name
1	Lycaenidae	<i>Pseudozizeeria maha</i> (Kollar, 1844)	Pale Grass Blue
2		<i>Cheritra freja</i> (Fabricius, 1793)	Common Imperial
3		<i>Hypolycaena erylus</i> (Godart, 1823)	Common Tit
4		<i>Tajuria cippus</i> (Fabricius, 1798)	Peacock Royal
5	Nymphalidae	<i>Hypolimnas bolina</i> (Linnaeus, 1758)	Common Egg-fly
6		<i>Acraea issoria</i> (Hubner, 1819)	Himalayan Yellow Coster
7		<i>Athyma perius</i> (Hubner, 1819)	Common Sergeant
8		<i>Junonia atlites</i> (Hubner, 1819)	Grey Pansy
9		<i>Junonia lemonias</i> (Hubner, 1819)	Lemon Pansy
10		<i>Moduza procris</i> (Cramer, 1777)	Commander
11		<i>Parantica aglea</i> (Stoll, 1782)	Glassy Tiger
12		<i>Euthalia monina</i> (Moore, 1859)	Assam Powdered Baron
13		<i>Ypthima baldus</i> (Fabricius, 1775)	Common Five-ring
14		<i>Polyura athamas</i> (Drury, 1773)	Common Nawab
15		<i>Kallima inachus</i> (Doyère, 1840)	Indian Leaf Butterfly
16		<i>Cesthosia cyane</i> (Drury, 1773)	Leopard Lacewing
17		<i>Charaxes marmax</i> (Westwood, 1848)	Yellow Rajah
18		<i>Mycalasis perseus</i> (Fabricius, 1775)	Common Bush-brown
19		<i>Elymnias hypermnestra</i> (Linnaeus, 1763)	Common Palm-fly
20		<i>Neptis hylas</i> (Linnaeus, 1758)	Common Sailor
21		<i>Parantica sita</i> (Kollar, 1844)	Chestnut Tiger
22	Papilionidae	<i>Papilio protenor</i> (Kollar, 1844)	Spangle
23		<i>Papilio polytes</i> (Linnaeus, 1758)	Common Mormon
24		<i>Graphium antiphates</i> (Cramer, 1775)	Five Bar Swordtail
25		<i>Papilio helenus</i> (Linnaeus, 1758)	Red Helen

Serial No.	Family	Scientific Name	Common Name
26		<i>Papilio memnon</i> (Linnaeus, 1758)	Great Mormon
27	Pieridae	<i>Colotis fausta</i> (Olivier, 1804)	Large Salman Arab
28		<i>Appias lycida</i> (Cramer, 1777)	Chocolate Albatross
29		<i>Eurema andersonii</i> (Moore, 1886)	One-Spot Grass Yellow
30		<i>Ixias pyrene</i> (Linnaeus, 1764)	Yellow Orange Tip
31		<i>Cepora nadina</i> (Lucas, 1852)	Lesser Gull
32		<i>Catopsilia pomona</i> (Fabricius, 1775)	Common Emigrant
33		<i>Appias albina</i> (Boisduval, 1836)	Common Albatross
34		<i>Pieris canidia</i> (Sparrman, 1768)	India Cabbage White
35		<i>Leptosia nina</i> (Fabricius, 1793)	Wandering Psyche
36	Riodinidae	<i>Zemeros flegyas</i> (Cramer, 1780)	Punchinello

A. Map of Lakhimpur



B. Map of Ananda Tea Estate

Fig. 1. A. Map of Lakhimpur district (NIC, Lakhimpur District Unit), B. Satellite view of Ananda Tea Estate (Google Earth)

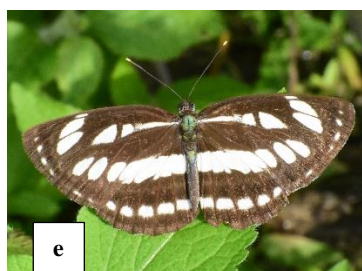




Fig. 2. Photographs of butterflies recorded during the study

a. Appias albina, b. Mycalesis perseus, c. Papilio polytes, d. Elymnias hypermnestra, e. Neptis hylas, f. Hypolycaena erylus, g. Hypolimnas bolina, h. Pieris canidia, i. Junonia atlites, j. Leptosia nina, k. Eurema andersonii, l. Parantica sita, m. Tajuria cippus, n. Papilio memnon, o. Polyura athamas, p. Graphium antiphates, q. Kallima inachus, r. Appias lycida

Based on the distribution of butterflies in different habitat such as the Ananda tea estate and its boundaries with Dulung reserve forest and Subansiri river, it has been observed that about 58% of the butterfly species were recorded at the boundary of the tea estate with Dulung reserve forest, indicating a rich diversity of butterflies in the reserve forest possibly due to numerous host plants it contains, whereas about 30% of the species were recorded from the tea estate. The rest 12% were recorded at the boundary of the tea estate with the river Subansiri. Species richness of butterflies recorded in the tea estate and nearby areas suggests that high diversity of

butterflies is due to the presence of diverse host plants that support a range of different butterfly species. On the other hand, it has also been observed that many butterflies die every year due to the use of chemical pesticide in the months of April-May in the tea estate and plays a detrimental effect on the butterfly diversity of the study area and the region. The use of chemical pesticides should be replaced with use of botanicals, Indigenous Technical Knowledge (ITKs) and microbial antagonist [28]. In a recent study, use of botanical substances, either individually or with cow urine is found effective for tea pest control [28].

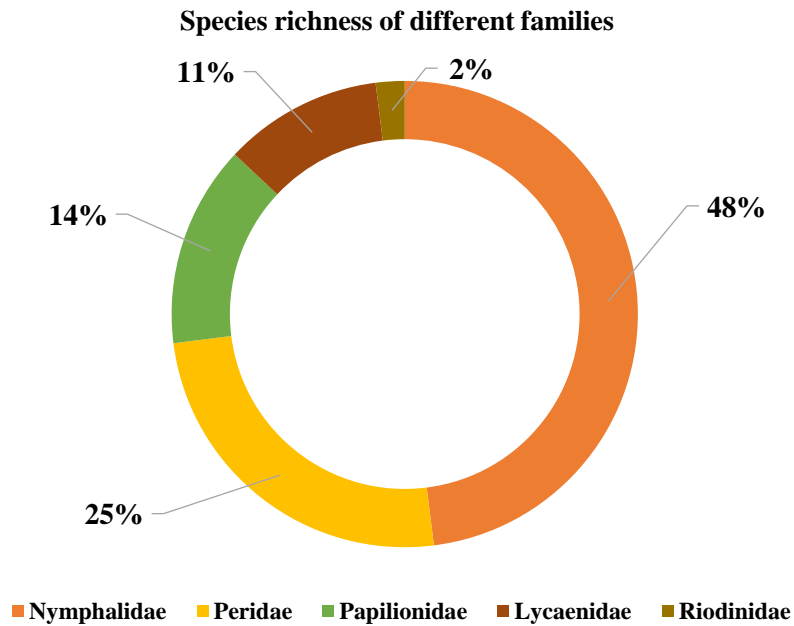


Fig. 3. Family wise species composition of butterflies during the study period

4. CONCLUSION

The current study highlights the biodiversity of butterflies found in the Ananda Tea Estate and its nearby areas during the study period. This study also infers that tea estates can be utilised as ideal territories for conserving butterflies with the plantation of suitable host plants. In-depth research in this area is needed to create a database of the local butterfly species. Unfortunately, due to the spraying of chemical pesticides in the tea estate kills large numbers of butterflies each year. In order to conserve the butterfly diversity of the study area, using of chemical pesticides should be replaced completely with bio-pesticides along with the plantation of a greater number of various host plants of butterflies.

DISCLAIMER (ARTIFICIAL INTELLIGENCE)

Authors hereby declare that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc.) and text-to-image generators have been used during the writing or editing of this manuscript.

ACKNOWLEDGEMENT

The authors acknowledge authorities of Ananda Tea Estate, Lakhimpur, Assam for permitting to conduct the present study. The authors are

grateful to Mr. Dipak Raito for his valuable help and support during the study.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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