

Diversity of Butterflies in Maidan Valley, with New Records for Lower Dir District, Pakistan

Muhammad Khan¹, Mudassir Khan², Sayaf Khan², Habib Ul Haq², Waqas Ahmad^{1*}

¹Institute of Zoological Sciences, University of Peshawar, Peshawar, Pakistan.

²Department of Zoology, Govt Degree College Lal Qila Lower Dir, Pakistan.

ABSTRACT

An explorative study was carried out in Maidan Valley, Lower Dir district, from September 2023 to August 2024. A total of 180 butterfly specimens were collected and identified into 33 species, classified into five families: Nymphalidae, Pieridae, Lycaenidae, Papilionidae, and Hesperidae. The family Nymphalidae was the most diverse, comprising 15 species, followed by Pieridae with eight species, Lycaenidae with six species, Papilionidae with three species, and Hesperidae with one species. The highest species abundance was observed during the summer months, with peak collection occurring from June to September. This study also expands the known butterfly diversity of District Lower Dir, introducing several new species to the region, which are *Ariadne merione*, *Hestina persimilus*, *Kaniska canace*, *Neptis sappho*, *Tirumala limniace*, *Catopsilia Pomona*, *Colias fieldii*, *Colias erate*, *Gonepteryx rahmni*, *Pieris rapae*, *Deudorix epijarbas*, *Heliporus sena*, *Cigaritis ictis*, *Zizeeria karsandra*, *Papilio polytes*, *Celaenorrhinus leucocera*. The results highlight the importance of conducting comprehensive, seasonal surveys to accurately document the butterfly fauna of the region. These findings emphasize the ecological significance of butterflies and reinforce the need for sustained conservation efforts to preserve the biodiversity of District Lower Dir.

Keywords: Butterfly, Lal Qila, Lower Dir, Insects diversity, Lepidoptera.

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Corresponding author: Waqas Ahmad

E-mail ✉ waqaschakisar@uop.edu.pk

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INTRODUCTION

The second biggest order in the class Insecta is the order Lepidoptera, which includes butterflies [1]. As herbivores, butterflies are crucial to the stability of food webs and are the main consumers in the forest ecosystem [2]. Because they are sensitive to changes in environmental factors including temperature, microclimate, and the presence of plants for oviposition and larval development, butterflies are valuable ecosystem bioindicators [3, 4]. Butterflies have long captivated naturalists, scientists and the public, and they have played a central part in studies of speciation, community ecology [5]. They are considered to be a representation of grace and beauty and Butterflies are elegant, beautiful, and charming insects due to their colorful insects [6, 7]. Butterflies are a diverse and charismatic

insect group that are thought to have evolved with plants and dispersed throughout the world in response to key geological events [8]. Researchers are now closely examining butterflies for indicators of habitat destruction and climate change [9]. The diversity of Butterfly is greatly impacted by low latitude and altitude as well as excessive quantities of pesticides and insecticide [10]. Numerous researchers have studied Pakistan's butterfly fauna. Thirteen species were found in a study conducted at the Union Council Koaz Bahram Dheri, District Charsadda [3]. Butterfly fauna of Doag Dara, Dir Upper, was evaluated yielding, Ten species [11]. A total of 23 butterfly species were recorded in Tehsil Tangi over the period from August 2014 to May 2015 [12]. Pierid butterfly fauna was explored and yielded 11 species from Swat district [13]. Similarly, 21 species were reported

from Battagram district [1]. Besides, many researchers have worked on the butterfly fauna of Pakistan [3, 14-17].

Previously, a preliminary survey of the butterfly fauna in the Lower Dir district was conducted. Identification found 24 species across 20 genera and 7 families. The families included Papilionidae, Pieridae, Danidae, Nymphalidae, Satyridae, Lycaenidae, and Lybethidae [18].

This study aims to conduct a comprehensive survey of butterfly species in District Lower Dir, documenting both previously recorded and new species. It seeks to expand knowledge of species diversity and distribution, contributing to conservation efforts by establishing a baseline for future ecological monitoring.

MATERIALS AND METHODS

Study area

The Maidan Valley, which spans 300 square kilometers and lies between latitudes 34°–37/ to 35°–7/ N and longitudes 71°–31/ to 72°–14/ E, is located in the Dir Lower District of Khyber Pakhtunkhwa Province, Pakistan. The southern portion of the Hindukush Mountain Range, which is between 1800 and 2000 meters high, dominates Maidan Valley. The vast majority of people in the area are employed in farming, horticulture, sericulture, and agriculture. The summer months are moderately hot, with June and July having the highest temperatures, which vary from 15.6°C to 32.5°C. The winter season is harsh and frigid, with temperatures dropping sharply starting in November. The coldest months, when the temperature drops below 0°C, are December, January, and February. In 2000, the average temperature in January was measured, including its highest and lowest values.

Data collection

Between September 2023 and July 2024, ten distinct localities of Maidan—Sroogal, Dall Gall, Lacha Bala, Kareen, Mirgam Payen, Shigai, Zaimdara, Guli Bagh, Dapoor Chinar kote, and Lal Qilla—were used to randomly capture butterflies using sweep nets and aerial nets. The specimens of butterflies were slain in the killing jar with ethyl-acetate soaked in cotton. The collected specimens were suitably pinned and labeled in

an insect box containing phenolphthalein balls [19].

Preservation

The collected specimens were pinned with insect pins in their thoracic region and set on a thermocouple setting board. The specimens were labeled with the date, location, and scientific name. The specimens were placed in various rows within a wooden box, and to protect them from pests, phenolphthalein balls were stored within [19].

Identification

The butterfly specimens were identified with the help of available literature [1, 12-15, 20-26]

The identified specimens were tagged and kept on paper for photography with the help of a Camera. All the identified specimens were deposited in the museum of the Department of Zoology, GDC Lal Qilla, Dir lower, KP, Pakistan.

RESULTS AND DISCUSSION

The current study was carried out in Lal Qilla, District Lower Dir, from September 2023 to August 2024. During this period, a total of 180 butterfly specimens were collected and identified into 34 species, classified into five families: Nymphalidae, Pieridae, Lycaenidae, Papilionidae, and Hesperidae (**Figure 1 and Table 1**). Among these, the family Nymphalidae was the most species-rich, comprising 15 species, followed by Pieridae with eight species, Lycaenidae with six species, Papilionidae with three species, and Hesperidae with one species.

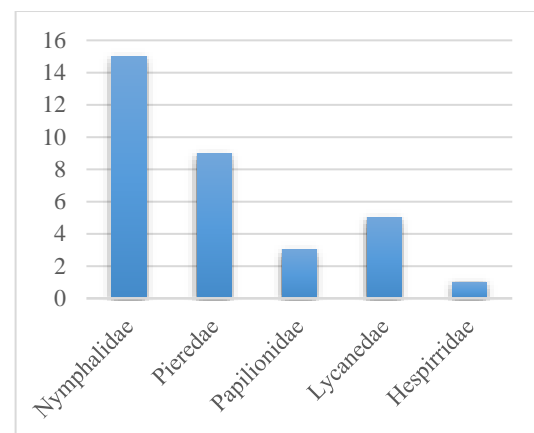


Figure 1. Graph showing species species-wise composition of families in Maidan Valley

Table 1. Checklist of Butterfly species reported from the study area

| Family | S.No | SPECIES | Remarks |
|--------------|------|---------------------------------|--|
| NYMPHALIDAE | 1 | <i>Aglais cashmiriensis</i> | Timergara, Munda and Lal Qila. |
| | 2 | <i>Argynnis hyperbius</i> | Timergara, Khall, Munda and Lal Qila. |
| | 3 | <i>Ariadne merino</i> | New record |
| | 4 | <i>Danaus chrysippus</i> | Timergara, Khall, Adenzai, Balambat, Munda, Lal Qila and Samarbagh. |
| | 5 | <i>Hestina persimilis</i> | New record |
| | 6 | <i>Junonia almana</i> | Previously reported from Timergara, Munda, and Lal Qila [18]. |
| | 7 | <i>Junonia hierta</i> | Previously reported from Adenzai and Balambat. |
| | 8 | <i>Junonia orithya</i> | Previously reported from Timergara, Khall, Adenzai, Balambat, Munda, Lal Qila, and Samarbagh [18]. |
| | 9 | <i>Kaniska canace</i> | New record |
| | 10 | <i>Libythea lepita</i> | Previously reported from Timergara and Khall [18]. |
| | 11 | <i>Lasiommata schakra</i> | Previously reported from Samarbagh [18]. |
| | 12 | <i>Neptis sappho</i> | New record |
| | 13 | <i>Phalanta phalantha</i> | Previously reported from Timergara [18]. |
| | 14 | <i>Tirumala limniace</i> | New record |
| PIEREDAE | 15 | <i>Vanessa cardui</i> | Previously reported from Timergara, Khall, Adenzai, Balambat, Lal Qila, and Samarbagh [18]. |
| | 16 | <i>Belenois aurota,</i> | Previously reported from Timergara [18]. |
| | 17 | <i>Catopsilia Pomona</i> | New record |
| | 18 | <i>Colias fieldii</i> | New record |
| | 19 | <i>Colias erate</i> | Previously reported from Adenzai and Balambat [18]. |
| | 20 | <i>Eurema hecabe,</i> | Previously reported from Timergara and Khall [18]. |
| | 21 | <i>Gonepteryx rahmni</i> | New record |
| | 22 | <i>Pieris canidia,</i> | Previously reported from Timergara, khall, Balambat, Adenzai, Lal Qila, Munda, and Samarbagh [18]. |
| | 23 | <i>Pieris rapae</i> | New record |
| | 24 | <i>Pontia daplidice</i> | Previously reported from Timergara, Balambat, and Munda [18]. |
| LYCAENEDAE | 25 | <i>Deudorix epijarbas</i> | New record |
| | 26 | <i>Heliophorus sena</i> | New record |
| | 27 | <i>Lycaena phlease</i> | Previously reported from Timergara, Adenzai, and Munda [18]. |
| | 28 | <i>Cigaritis ictis</i> | New record |
| | 29 | <i>Zizeeria karsandr</i> | New record |
| PAPILIONIDAE | 30 | <i>Papilio polytes</i> | New record |
| | 31 | <i>Papilio bianor</i> | Previously reported from timergara, Adenzai and Balambat [18] |
| HESPIRRIDAE | 32 | <i>Papilio demoleus</i> | Previously reported from Timergara, Adenzai, Munda, Lal Qila and Samarbagh [18] |
| | 33 | <i>Celaenorrhinus leucocera</i> | New record |

The family Nymphalidae was not only the richest in terms of species diversity but also the most abundant in terms of individuals collected during the survey. The following species were reported within Nymphalidae: *Aglais caschmirensis*, *Argyreus hyperbius*, *Ariadne merione*, *Danaus chrysippus*, *Hestina persimilis*, *Junonia almana*, *Junonia hierta*, *Junonia orithya*, *Kaniska canace*, *Libythea lepita*, *Lasiommata schakra*, *Neptis sappho*, *Phalanta phalantha*, *Tirumala limniace*,

and *Vanessa cardui* (**Figure 2**). In the family Pieridae, eight species were documented: *Belenois aurota*, *Catopsilia pomona*, *Colias fieldii*, *Colias erate*, *Eurema hecabe*, *Gonepteryx rhamni*, *Pieris brassicae*, *Pieris rapae*, and *Pontia daplidice*. The family Lycaenidae was represented by five species: *Deudorix epijarbas*, *Heliophorus sena*, *Lycaena phlaeas*, *Cigaritis ictis*, and *Zizeeria karsandra* (**Figure 3**).

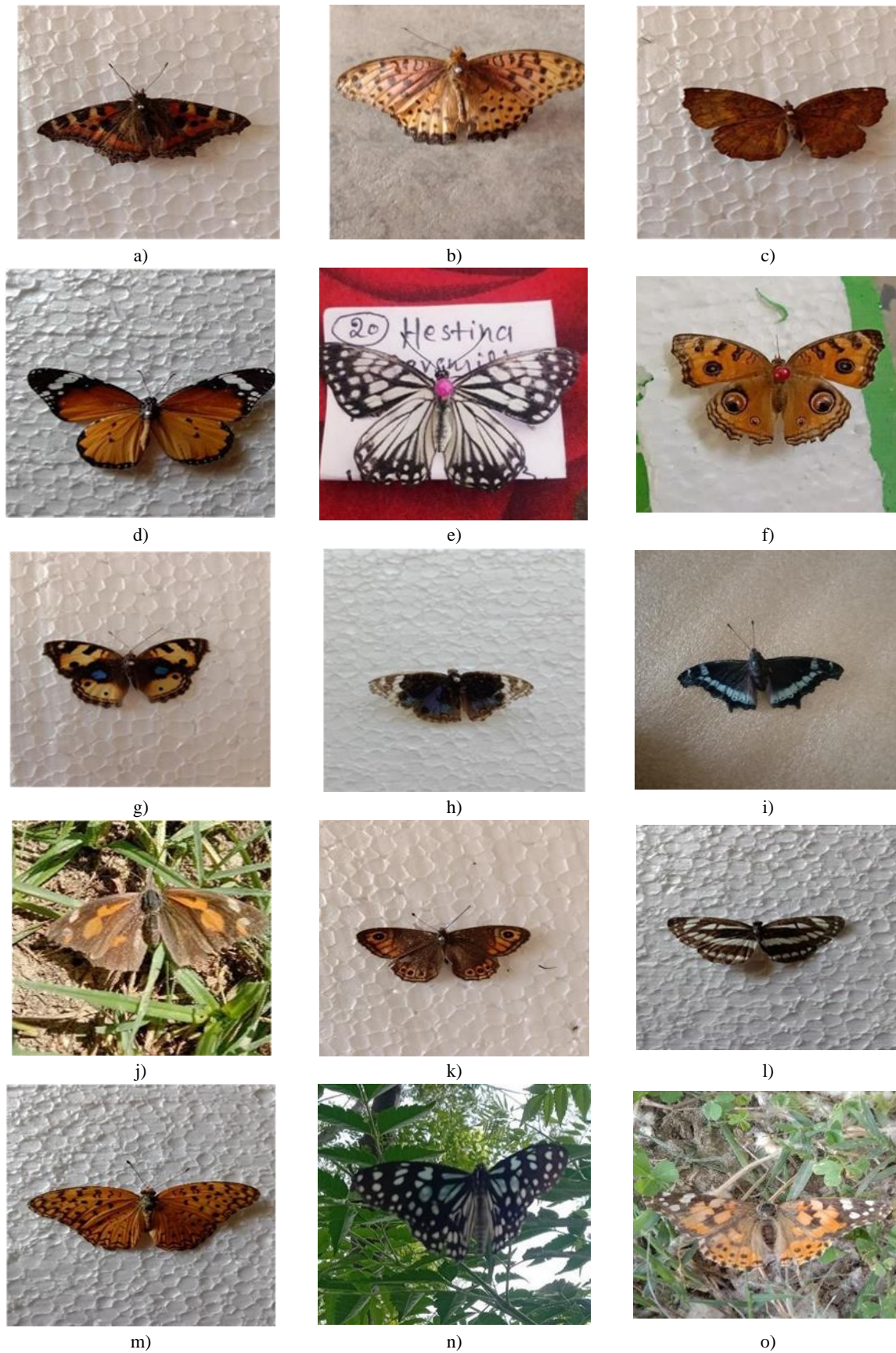


Figure 2. a) *Aglais cashmiriensis*, b) *Argynnis hyperbius*, c) *Ariadne merino*, d) *Danaus chrysippus*, e) *Hestina persimilis*, f) *Junonia almana*, g) *Junonia hierta*, h) *Junonia orithya*, i) *Kaniska canace*, j) *Libythea lepita*, k) *Lasiommata schakra*, l) *Neptis sappho*, m) *Phalanta phalantha*, n) *Tirumala limniace*, o) *Vanessa cardui*

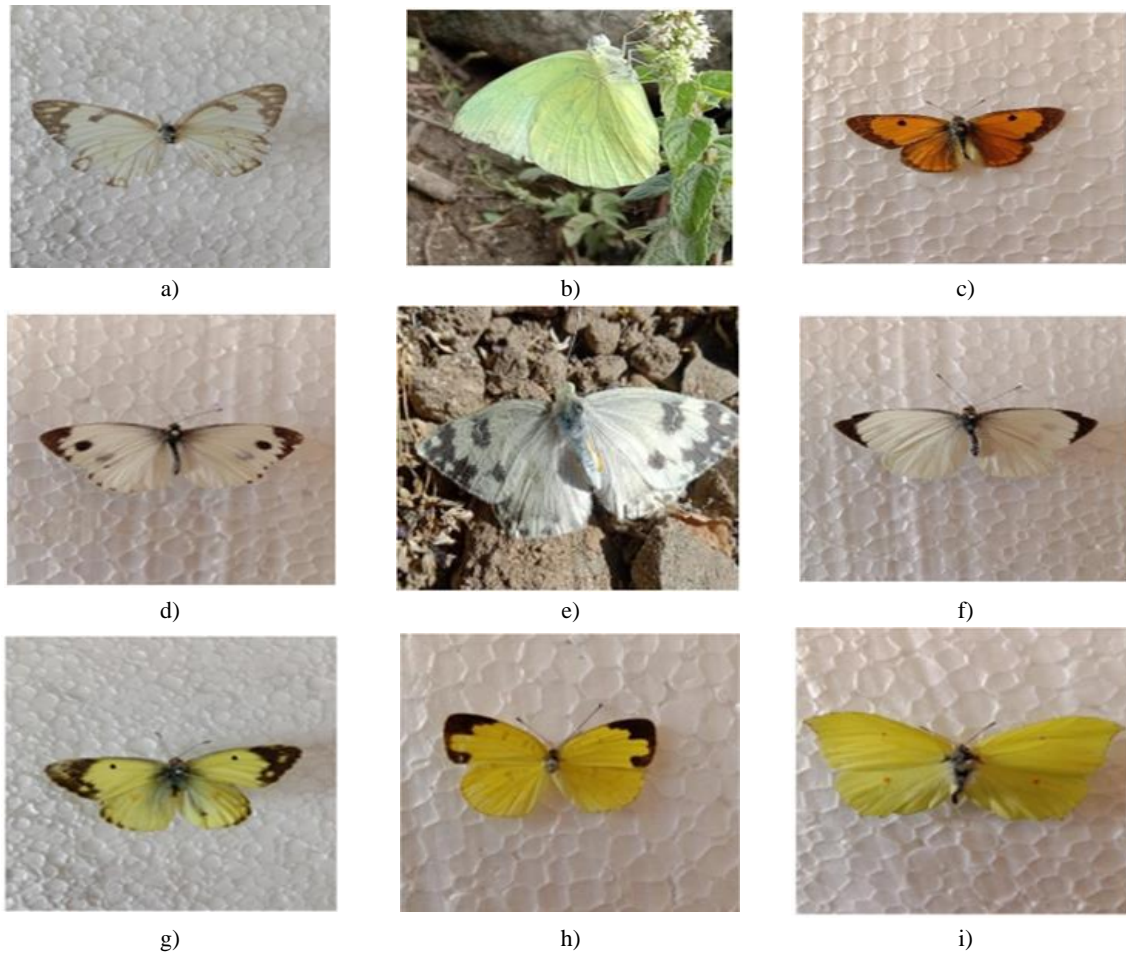


Figure 3. a) *Belenois aurota*, b) *Catopsilia pomona*, c) *Colias fieldii*, d) *Pieris canidia*, e) *Pontia daplidice*, f) *Pieris rapae*, g) *Colias erate*, h) *Eurema hecabe*, i) *Gonepteryx rahmni*,

Papilionidae was represented by three species: *Papilio bianor*, *Papilio demoleus*, and *Papilio polytes*. Finally, the family Hesperidae was represented by a single species, *Celaenorrhinus leucocera*. Skippers, although generally

overlooked in collections, can provide valuable insights into the region's ecosystem health due to their sensitivity to habitat changes (**Figure 4**).

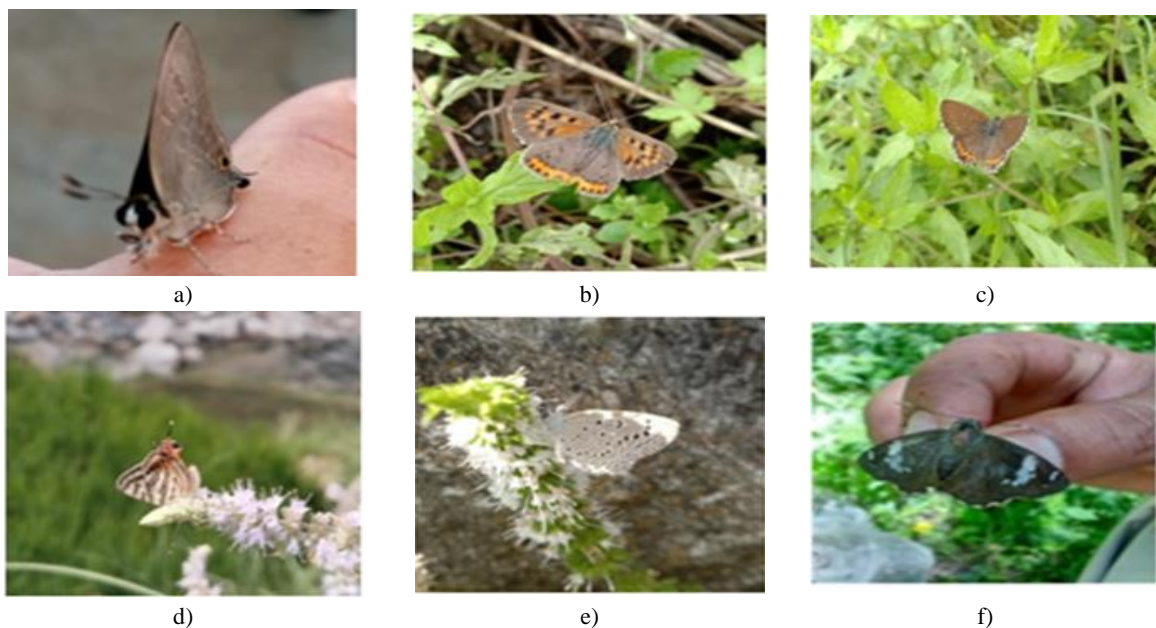




Figure 4. a) *Deudorix epijarbas*, b) *Heliophorus sena*, c) *Lycaena phleasa*, d) *Cigaritis ictis*, e) *Zizeeria karsandra*, f) *Celaenorrhinus leucocera*, g) *Papilio polytes*, h) *Papilio bianor*, i) *Papilio demoleus*

The peak collection periods were recorded in June, July, August, and September 2023–2024, which coincides with the active flight period of many butterfly species in the region. This seasonal variation in butterfly abundance and diversity emphasizes the importance of conducting surveys across multiple months to capture a comprehensive picture of local butterfly fauna.

From the previous study [18] a total of 24 species were reported, including notable species such as *Papilio polyctor*, *Papilio demoleus*, *Junonia almana*, and *Vanessa cashmiriensis*. This foundational research laid the groundwork for further exploration of butterfly diversity in the area. The presence of common families such as Nymphalidae and Pieridae in the previous findings reflects a robust assemblage of butterflies well-adapted to the local habitats.

The present study identified 38 species, thereby significantly enhancing the documented butterfly diversity in District Lower Dir. New additions, such as *Aglais caschmirensis*, *Ariadne merione*, *Danaus chrysippus*, *Neptis sappho*, and *Tirumala limniace*, not only increase the species count but also introduce new genera to the region. The discovery of *Kaniska canace*, *Hestina persimilis*, and *Libythea lepita* indicates that the region supports a more diverse range of butterfly species than previously documented.

The overlapping species between the two studies, such as *Argyreus hyperbius*, *Junonia almana*, *Danaus chrysippus*, and *Vanessa cardui*, highlight the stability of certain populations in the area. The repeated occurrence of these species may suggest suitable habitats and conditions that support their continued presence.

The current study identified additional species within the families Nymphalidae, Pieridae, and

Lycaenidae, which are essential for maintaining ecological balance. For example, the identification of *Colias erate*, *Eurema hecabe*, *Belenois aurota*, and *Pieris brassicae* in both studies indicates these species are prevalent across different seasons and environmental conditions, further emphasizing their ecological importance.

The new study's large increase in species richness can be attributed to a more comprehensive survey methodology that included different seasons and habitats within the study area. This emphasizes the importance of continued monitoring and data collecting to adequately capture the diversity and dynamics of Butterfly populations in District Lower Dir.

Furthermore, the ecological implications of this expanded diversity cannot be understated. A greater variety of butterfly species can indicate healthy ecosystems and serve as essential pollinators, contributing to the reproductive success of many plant species. Additionally, the presence of various host plants and microhabitats supports larval development, thereby promoting species survival.

CONCLUSION

This study identifies 34 butterfly species across five families in District Lower Dir, significantly expanding the region's known diversity. These findings highlight the ecological importance of ongoing seasonal surveys and underscore the necessity for continuous monitoring and conservation efforts to safeguard butterfly populations, which are crucial for ecosystem health and pollination.

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