

Diversity of Butterflies (Insecta: Lepidoptera) in Kasur District, Punjab, Pakistan

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Abstract: Butterflies are sensitive to temperature, solar radiation, microclimate. They are indications of a thriving ecosystem and healthy surroundings. Beyond their aesthetic appeal, butterflies are crucial pollinators, bio-indicators of climate change, sensitive to changes in ecosystems, and an essential source of data for scientific research in a wide range of biological sciences. Butterflies are the beautiful creatures and need to be conserved. The purpose of the study was to investigate the butterfly diversity in several areas of Pakistan's Punjab Province's Kasur district. This Study was conducted in April to May, 2023 at different localities like Changa Manga Forest, Rana Resort Forest and Pattoki Nurseries of Kasur district. During this survey, 106 butterfly specimens were gathered manually and with the help of an insect net. Five distinct species from four different genera and two separate families (Nymphalidae Pieridae) were found in these specimens. This is the first study to explore the butterfly diversity in district Kasur which indicated that *Danaus Chrysippus* is present in large in month of April and May. The present study added valuable information on diversity of butterfly fauna and will contribute in developing effective conservation.

Keywords: Butterfly Diversity, Kasur, Pattoki and Nymphalidae

1. Introduction

Butterflies belong to order Lepidoptera which is the second largest order of class Insecta. Moths and butterflies serve as flower pollinators and are beneficial to both humans and other animals because they help in the growth of fruits, production and seeds [1]. Butterfly larvae and other insects are the primary plant herbivores, eating the leaves of trees, shrubs, and other plants to obtain energy and build a food chain web [2]. Adult butterflies consume flower nectar, which gives them energy. Pollen, on the other hand, gives butterflies access to vitamins, proteins, and lipids. Caterpillars are the term for a butterfly or moth's larva [3]. Caterpillars are effective pests because they seriously harm a variety of plants by defoliating them [4]. Around 28,000 species of butterflies have been identified globally, with 80% of species found in tropical regions [5]. In Pakistan, there are about 5000 species of insects comprising about 400 species of moths and butterflies [6]. T. J Robert worked on the taxonomy of butterflies from different localities of Pakistan [7]. In the past research was carried out to find the diversity

of butterflies at different regions of Punjab like Haripur, Azad Kashmir and Gujrat but this district was untouched regarding butterfly diversity. This is the first effort to explore the butterfly diversity in this area.

2. Materials and Methods

2.1. Study Site

The Study Conducted on three different sites which are Changa Manga Forest, Pattoki Nurseries and Rana Resort Forest, at district Kasur, Punjab province, Pakistan. Kasur is a district of Lahore division which is situated on the border of India and Pakistan. It consists of four Tehsils which are Pattoki, Kot Radaha Kishan, Chnian, Kasur. The total land area of district Kasur is 3,995 km².

2.1.1. Changa Manga Forest

Changa Manga Park (31° 5' 0" N, 73° 58' 0" E) being maintained by the Punjab Forest Department, Kasur Forest Division is one of the very few parks for out-door recreation in Pakistan. British forestry experts planted the first trees in

the Changa Manga forest in 1866. It is located 80 kilometres to the south-west of Lahore. It covers an area of about 5,065 hectares. It contains many parks of flowers therefore it is a good habitat for butterflies.

2.1.2. Rana Resort Forest

Opened in 2007, Rana Resort and Safari Park is located next to the Bhai Pheru Head Balloki Road in Nankana Sahib, Punjab. Its coordinates are 31° 13' 48.9" N and 73° 51' 31.57" E. This resort was built with the intention of entertaining Lahore residents and safeguarding the rapidly declining rare species of wildlife. There are many parks therefore it is a good habitat for butterflies. The lavish resort is surrounded by a wildlife sanctuary comprising 14 acres of lush green flower-laden lawns and 200 acres of sprawling bamboo forest.

2.1.3. Pattoki Nurseries

In the outskirts of Lahore, Pakistan, at 31° 1' 0" North and 73° 51' 0" East, is Pattoki, a typical Punjabi rural market town famed for its flower cultivation. One of the largest collections of nurseries for flowers, fruits, and ornamental

plants in the nation may be found in the town. This makes it a suitable home for butterflies.

2.2. Collection and Preservation

Beginning in April and continuing through the end of May 2023, the locations were visited every week. The butterflies were gathered during the day, from 9 am to 4 pm, from each location. The specimens were collected by using the insect net and hand picking method. The specimens were collected by usual methods of collecting the butterflies, that is, chasing the butterflies with a net in hand. Soon after collecting the butterflies were killed by using chloroform and stretched on a stretching board, then transferred to the insect boxes. The collected specimens were identified up to the species level with help of standard available literature of already identified species, thesis, research articles [8, 9, 10] and Facebook groups like butterflies of Pakistan. Identified specimens were labelled with their scientific names and location of collection along with date properly.



Figure 1. Map of Kasur District (highlighted in red) within Punjab and map of District Kasur depicting the sampling sites, which are highlighted in black colour.

Table 1. The number of butterfly species collected from three localities of Kasur district during the study period.

S. No	Common Names	Scientific Names	Changa Manga	Pattoki	Rana Resort	Total
01	Plain tiger	<i>Danaus chrysippus</i>	13	6	9	28
02	Common leopard	<i>Phalanta phalantha</i>	9	7	6	22
03	Peacock Pansy	<i>Junonia almana</i>	6	4	0	10
04	Large White	<i>Pieris brassicae</i>	10	8	8	26
05	Common Grass Yellow	<i>Eurema hecabe</i>	7	9	4	20
06	Total		45	34	27	106

Table 2. Total number and Percentage of two families collected from the three localities of Kasur district during study period.

S. No	Families	Changa Manga	Pattoki	Rana Resort	Total
01	Nymphalidae	27	17	15	60(56.6%)
02	Pieridae	17	17	12	46(43.3%)

3. Results

The present studies were conducted on the identification and distribution of butterflies (Class, Insecta; Order, Lepidoptera) of Kasur district. Total of 106 specimens were collected from 3 different localities. The identified specimens of butterflies belonged to 5 species, 5 genera and 2 families

and the total number of collected specimens are shown in table 1. Family Nymphalidae comprises the largest number of Species and most prevalent family of 60 (56.6%) followed by Pieridae 46 (43.6%) (Table 2).

Order: Lepidoptera
 Family: Nymphalidae
 Sub Family: Danainae
 Genus: *Danaus*

Danaus chrysippus (Figure 2.)

Danaus chrysippus (Linnaeus 1758) also known as the plain tiger, is a medium-sized (roughly the size of an Oreo cookie). Its wings are orange with black margins that are speckled with white. From a distance, its orange-black-white colour scheme is distinctive, earning the tiger its name. The plain tiger is typically observed in open spaces, such as gardens and parks, close to their supporting plants. The entire continent of Africa, Mediterranean Europe, the Middle East, much of Asia, and even Australia have all reported seeing it.

Subfamily: Heliconiinae

Genus: *Phalanta*

Phalanta phalantha (Figure 3)

Phalanta Phalantha (Drury, 1773) is also known as the common leopard. Its upper surface's background coloured is consistently orange, with varying dark brown spots and streaks spread across the wings. The forewing apex and outer margins are not dark brown. The underside's colour and design can differ. The hue of the background takes on a variety of pale orange hues, with a purplish undertone visible in some newly emerging individuals. On the hindwing of certain individuals, there is additionally a middle band with scattered white spots. Its eyes have a grey colour. It is widespread over Africa and South Asia.

Subfamily: Nymphalinae

Genus: *Junonia*

Junonia almana (Figure 4)

Junonia almana (Linnaeus 1758) is also known as Peacock pansy. The hindwings of this butterfly have pronounced eyespots and an upperside that is bright orange. The eyespots are still quite noticeable despite the undersides being a little paler. Above, the wings are rich yellowish brown with darker brown edges at both termen and costal margins. It is distributed in India, Sri Lanka, Southeast Asia and further east in China and Japan.

Family: Pieridae

Subfamily: Coliadinae

Genus: *Eurema*

Eumera hecabe (Figure 5)

Eumera hecabe (Linnaeus 1758) is also known as common grass yellow. The butterfly's forewing has an outer edge that is broad, black, and irregular, while the hindwing has one that is thin and generally regular. Both its forewing and hindwing have an outer edge that is not entirely wavy or totally rounded. There are several black markings on its underside. On the ends of each cell, there is a mark that is always black with a yellow centre. When this happens, they are smaller than the Three Spot's chocolate-coloured area at the tip of the forewing. A little species of pierid butterfly called *Eurema hecabe*, sometimes known as the common grass yellow, is found in South America, Australia, and Asia.

Subfamily: Pierinae

Genus: *Pieris*

Pieris brassicae (Figure 6)

Pieris brassicae (Linnaeus 1758) is also known as large white. This butterfly has brilliant white wings and black tips to the forewings, extending down the wing edge. Females

have two spots on the forewings, which is not present in males. Two spots are present on the creamy white undersides. The forewings are white with one or two small round black spots and a sizable anterior black patch; the hindwings have a single anterior black mark. The head is blackish in coloured, these butterflies have hairy larvae with green bodies that are dotted with black spots and have yellow lateral stripes.

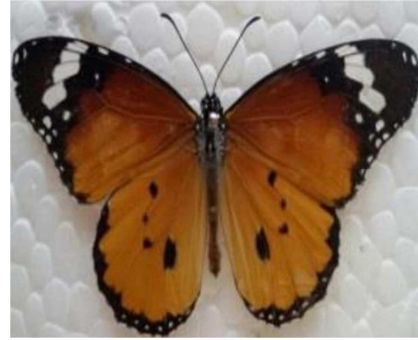


Figure 2. *Danaus chrysippus*.



Figure 3. *Phalanta Phalantha*.



Figure 4. *Junonia almana*.



Figure 5. *Eumera hecabe*.



Figure 6. *Pieris brassicae*.

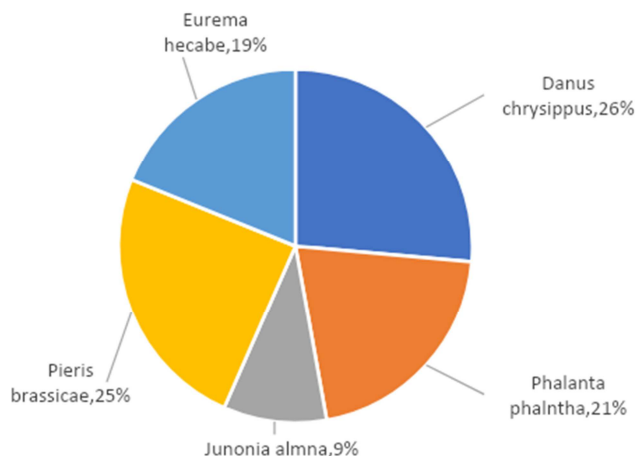


Figure 7. Species wise distribution at district Kasur.

4. Discussion

In district Kasur, a total 106 butterfly specimens were gathered from 3 distinct locations. The identification of these collected specimens show that they belong to five different butterfly species from five (05) genera, two (02) families in table 1. Nymphalidae is the family with the greatest percentage of species (56.6%), followed by Pieridae (43.6%) in table 2. In a previous study, the Haroon gathered 232 butterflies which were 13 species and belonging to 3 families to explore the diversity of butterflies in the union council of Koaz Bahram Dheri, District Charsadda, Khyber Pakhtunkhwa. Most species (49%) belong to the family Nymphalidae, followed by Pieridae (37%) and Papilionidae (14%) [11]. The present study matches up with the above mentioned study because both have the highest percentage of Nymphalidae family. Rahman had explored the diversity at Murree; a total 30 species from 9 families were recorded from Murree. Family Nymphalidae has the highest number of species [12]. A study conducted by Parveen and Haroon during this study, 506 specimens in all, belonging to 3 families, 18 genera, and 23 species, were gathered from Tehsil Tangi in Khyber Pakhtunkhwa. The analysis revealed that the family Nymphalidae has the greatest number of members in the current checklist [13]. Between September and December 2008, 21 species from 3 different families were found in Kohat, Pakistan. The reported families Nymphalidae comprised 33% of the butterfly biodiversity in

Kohat, Papilionidae 10%, and Pieridae 57% and in this study family Pieridae has the highest number of species, this study conducted by Parveen [14]. Rhe-philipe reported 5 families from Lahore, including Papilionidae (3 species), Pieridae (17 species), Lycaenidae (11 species), Nymphalidae (16 species) and Hesperioidea (7 species) and family Pieridae has highest number of species [15]. In the Gujrat district, Iqbal conducted research in various areas. From various locations, 232 adult butterfly specimens were gathered for the study. The identification of twelve species of butterflies from eight genera, four subfamilies, and three families was done using these specimens. A total of 78.44%, 8.18%, and 13.36% of the species in this study region belong to the Pieridae, Nymphalidae, and Danaidae families [16].

The current research represents the first effort to investigate the diversity of butterflies in Kasur district, Punjab, Pakistan. This is a completely new contribution to the already existing literature of the world.

5. Conclusions

From the current study it was concluded that the family Nymphalidae present in higher numbers in district Kasur, Punjab, Pakistan. It is a first effort in the district of Kasur regarding butterfly diversity estimation. If the research or survey duration increases, a number of other species may be found in this district, which indicates the environmental conditions of that region.

Conflicts of Interest

The author declares no conflicts of interest.

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