



## Checklist of Butterfly Fauna From Kabal, Swat, Pakistan

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### ABSTRACT

The butterflies are beautiful creature of nature with great economic importance as pollinator as well as bio-indicator of environments. The present survey was conducted to determine the characteristics of butterfly fauna from Kabal, Swat, Pakistan during March-June 2013. The study area was divided into 4 quadrates. A total of 170 specimens were collected of 13 species, falling in 10 genera and were identified belonging to 3 different families. The species identified, the Indian fritillary, *Argynnis hyperbius*; painted lady, *Cynthia cardui*; blue pansy, *Junonia orithya*; plain tiger, *Danaus chrysippus*; common leopard, *Phalantha phalantha* and common sailor, *Neptis hylas* were belonging to family Nymphalidae. The great black mormon, *Papilio memnon*; Chinese peacock black swallowtail emerald, *Papilio bianor*; dingy swallowtail, *Papilio anactus* and lime butterfly, *Papilio demoleus* were belonging to family Papilionidae. The common grass yellow, *Eumera hecab*; little orange tip, *Coloti etrida* and Murree green-veined white, *Pieris ajaka* were belonging to family Pieridae. Butterfly fauna from Kabal have been presented here for awareness, education and research. Proper preventive measures should be taken in order to minimize the natural habitat loss, as butterfly fauna is dependent upon proper environmental conditions.

**KEYWORDS:** Butterfly fauna, Kabal, Nymphalidae, Papilionidae, Pieridae.

### ACADEMIC DISCIPLINE AND SUB-DISCIPLINES

Entomology

### SUBJECT CLASSIFICATION

Zoology

### TYPE (METHOD/APPROACH)

Collection and Identification

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## INTRODUCTION

Butterflies are found all over the world and in all types of environments: hot and cold, dry and moist, at sea level and high in the mountains. Most their species, however, are found in tropical areas, especially tropical rainforests. They are beautiful, flying insects with large scaly wings. Like all insects, they have a pair of antennae and an exoskeleton. Compound eyes are comparatively large with a large number of facets. Their 3 body parts are the head, thorax and abdomen (the tail end). Tiny sensory hairs cover their body. The 3 pairs of jointed legs are attached to the thorax, which contains the muscles that make the legs and wings move. Butterflies are very good fliers. They have two pairs of large wings cover with colorful, iridescent scales in overlapping rows. Lepidoptera (butterflies and moths) are the only insects that have scaly wings. The wings are attached to the butterfly's thorax (mid-section). Veins support the delicate wings and nourish them with haemolymph. They can only fly if their body temperature is above 86 °C. They take sunbath themselves to warm up in cool weather. As they age, the color of the wings fades and the wings become ragged. The speed varies among butterfly species (the poisonous varieties are slower than non-poisonous varieties). The fastest butterflies (some skippers) can fly at about 30 mile/h or faster. Slow flying butterflies fly about 5 m/h. Many them migrate in order to avoid adverse environmental conditions (like cold weather). Most of them migrate relatively short distances, like the painted lady, *Vanessa cardui* (Linnaeus, 1758); red admiral, *Vanessa indica* (Linnaeus, 1758) and common buckeye *Junonia coenia* Hübner, 1822, but a few like some Monarchs, *Danaus plexippus* (Linnaeus, 1758) migrate thousands of miles. There are about 28,000 butterfly species worldwide [1].

Butterflies show remarkable mimicry in different forms, which is still a challenge for evolution. Batesian mimicry is between palatable and non-palatable butterfly species, however, Mullerian mimicry, several equally unpleasantly tasting species share a color pattern and all species are mutually benefited, not only the mimic [2]. The constituents of wing arrangement and morphology that contribute to an impression of a head, though, differ prominently amongst lycaenid species. seven species of clearwing butterflies, *Melinaea* Bates, 1862 a genus of butterflies in Peru, and seven morphotypes of numata longwing, *Heliconius numata* (Cramer, 1780), a distantly related in coloration, wing shape and precise locations of bars, stripes and spots [3].

Butterflies have significant economic importance and are the most efficient pollinators of flowers in addition to moths and bees. They help in production of food crops, seeds and fruits; therefore, they are essential for the survival of man and animals [4]. Mouthparts of a butterfly are adapted for sucking. Proboscis is usually long and coiled. Larva is called caterpillar, usually eruciformes with a well-developed head. It has well developed silk glands [5]. The antennae of butterflies are either slender or knobbed at the tip and in the family Hesperidae (Skippers) are hooked at the tip. In some butterflies genera such as *Taractrothera* and common snout butterfly *Libythea carinenta* (Cramer) the knob is hollowed underneath [6].

Several characters of the butterflies make them good candidates for indicator species. They have a widespread distribution, are comparatively easy to sample and recognize, and both as individuals and as species, they show significant numbers in different ecosystems. They are strongly influenced by local weather and highly sensitive to environmental changes besides being charismatic insects that could fascinate the public attention. Butterflies are extremely sensitive to changes in vegetation composition and structure, and different types of vegetation show different butterfly species composition [7]. Therefore, they are frequently used as bio indicators of ecosystem health and as surrogates for whole biodiversity [8]. Increased urban features, including roads, buildings, and mowed lawns, correspond with decreases in butterfly species richness, diversity and abundance. As might be predicted, butterfly species that specialize on particular plant species for ovipositing and disturbance sensitive species are more affected by urbanization than are generalist species [9].

Kabal, also spelt Kabbal, is a town in Swat district in Khyber Pakhtunkhwa (KP) province of Pakistan. Swat is a valley and an administrative district in KP near the Pakistan-Afghanistan border. It is the upper valley of the Swat river, which rises in the Hindu Kush range. It was a princely state in KP until it was dissolved in 1969. The valley is almost entirely populated by ethnic Pashtun. The predominant language spoken in the valley is Pashto, while the languages spoken by natives of Swat Kohistan include Torwali and Kalami. The capital of Swat is Saidu Sharif, but the main towns in the Swat valley are Kabal and Mingora (Figure 1) [1]. The quaternary stream channel deposits and the weathering products of the rocks cover most part of Kabal. It has the heavy metals (HMs) distribution in soils and their uptake by wild plants grown in the soils derived from the mafic and ultramafic terrains. Greater variability was found in the uptake of HMs by various plants grown on the studied soils. High concentrations of Cu and Zn in seft hemp, *Cannabis sativa* L.; Pb in ailanto, *Ailanthus altissima* (Mill.); Ni and Cr in sage, *Indigofera gerardiana* Wall and in plume grass, *Saccharum griffithii* Munro were found. The excessive concentrations of Cr and Ni in these plants can be used for mineral prospecting but their main concern could be of serious environmental problems and health risks in the inhabitants of the study areas [10]. The objective of present research is to determine the characteristics butterfly fauna from Kabal, Swat, KP, Pakistan for awareness and education.

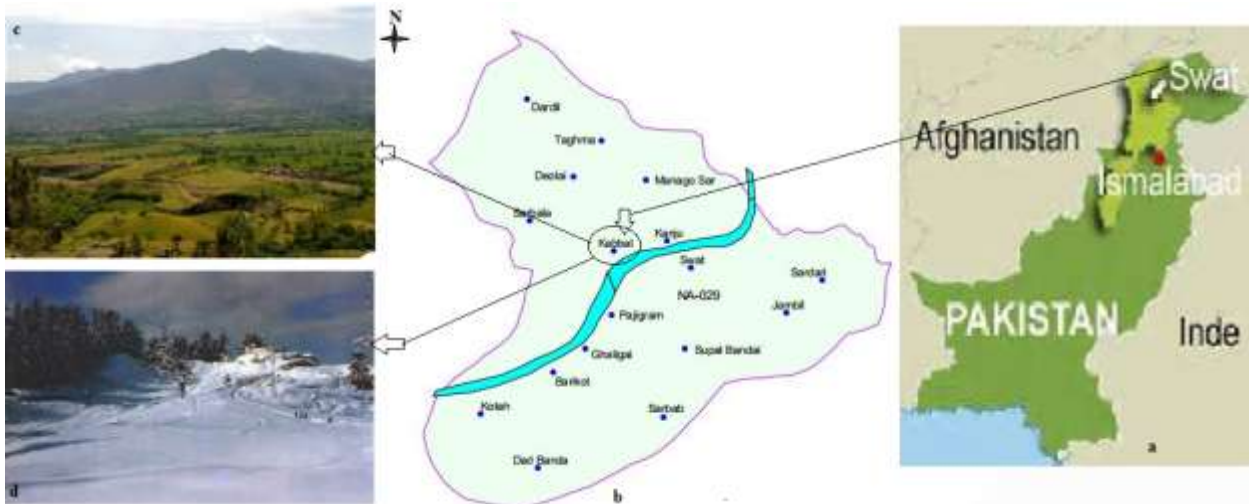


Figure 1: Map of Swat, Pakistan in which the survey area Kabal is located where from butterflies were collecting: a) map of Pakistan showing Swat; b) map of Swat showing Kabal (encircle); two views of Kabal in Spring (c) and in winter (d: snow falling) [1].

## MATERIALS AND METHODS

### Study Area

Kabal is also known as Tehsil Kabal. It is a golfer's paradise, an 18-hole course is open all year round and anyone can play there by paying the green fees. It is located at 34°47' North, 72°17' East, 34.783° North and 72.283° East coordinates and has an average elevation of 845 m (2,775 ft). It is the most attractive town in Swat [1] (Figure 1). For the present research, it was divided into 4 quadrants to facilitate the study.

### Methods

The checklist of butterflies of Kabal, Swat, Pakistan was prepared. Each quadrant was visited daily twice or thrice in a day during March-June 2013 for collection of butterflies by sweep-net. Then they were killed, stretched, pinned and identified by already preserved specimen, internet, literature available [11, 12, 13], keys [12, 13] and entomologists on the bases of their characteristics. The literature about the species of butterflies was also collected [14, 15, 16, 17, 18, 19, 20] for identification. All specimens were tagged and placed one by one on a white paper for photography with digital camera, Kodak (8.2 megapixels), Tokyo, Japan. Then they were arranged in the wooden box with the phenolphthalein balls and submitted to the Zoological Museum, Shaheed Benazir Bhutto University, Main Campus, Sheringal, Khyber Pakhtunkhwa, Pakistan.

## RESULTS

The present study was conducted to prepare the checklist of the butterfly fauna of Kabal, Swat, Pakistan. The specimens 170 were collected from 4 quadrates of Kabal (n=170). Identification of these butterflies showed that 13 different species from 10 genera belonging to 3 different families were present in the area as shown below (Table 1):

<b>Phylum :</b>	Arthropoda
<b>Class :</b>	Insecta
<b>Sub class :</b>	Pterygota
<b>Infra class :</b>	Neoptera
<b>Super order :</b>	Endopterygota
<b>Order :</b>	Lepidoptera
<b>Sub order :</b>	Glossata
<b>Infra order :</b>	Acanthothesia
<b>Super family :</b>	Papilionoidea
<b>Family :</b>	Papilionidae
<b>Sub family :</b>	Papilioninae
<b>Reported species 1:</b>	Great black mormon Butterfly, <i>Papilio memnon</i> Linnaeus
<b>Reported species 2:</b>	Chinese peacock black swallowtail emerald, <i>Papilio bianor polyctor</i> Cramer



- Reported species 3:** Dingy swallowtail butterfly, *Papilio anactus* Macleay  
**Reported species 4:** Lime butterfly, *Papilio demoleus* Linnaeus  
**Family :** Pieridae  
**Sub family :** Coliadinae  
**Reported species 5:** Common grass yellow, *Eumera hecab* (Linnaeus)  
**Reported species 6:** Little orange tip, *Colotis etrida* (Boisduval)  
**Sub family :** Pierinae  
**Reported species 7:** Murree green-veined white, *Pieris ajaka* Moore  
**Family :** Nymphalidae  
**Sub family :** Nymphalinae  
**Reported species 8:** Indian fritillary, *Argynnis hyperbius* (Linnaeus) (male and female)  
**Reported species 9:** Painted lady, *Cynthia cardui* (Linnaeus)  
**Reported species 10:** Blue pansy, *Junonia orithya* Linnaeus  
**Subfamily :** Danainae  
**Reported species 11:** Plain tiger, *Danaus chrysippus* (Linnaeus)  
**Subfamily :** Heliconiinae  
**Reported species 12:** Common leopard, *Phalantha phalantha* (Drury)  
**Sub family :** Limenitidinae  
**Reported species 13:** Common sailor butterfly, *Neptis hylas* (Linnaeus)

**Table 1** The butterfly fauna were collected from the survey area, Kabal is located in Swat, Khyber Pakhtunkhwa, Pakistan during March-June 2012.

Family	Sub family	SNo	Common names	Genus and species	Authority	Year
Papilionidae	Papilioninae	i	great black mormon	<i>Papilio memnon</i>	Linnaeus	1758
		ii	Chinese peacock black swallowtail emerald	<i>Papilio bianor polyctor</i>	Cramer	1777 (female)
		iii	dingy swallowtail	<i>Papilio anactus</i>	Macleay	1826
		iv	Lime	<i>Papilio demoleus</i>	Linnaeus	1758
Pieridae	Coliadinae	v	common grass yellow	<i>Eumera hecab</i>	(Linnaeus)	1758
		vi	little orange tip	<i>Colotis etrida</i>	(Boisduval)	1836
	Pierinae	vii	Murree green-veined white	<i>Pieris ajaka</i>	Moore	1865
Nymphalidae	Nymphalinae	viii	Indian fritillary (male and female)	<i>Argynnis hyperbius</i>	(Linnaeus)	1763
	Trogidae	ix	painted lady	<i>Cynthia cardui</i>	(Linnaeus)	1758
	Vespidae	x	blue pansy	<i>Junonia orithya</i>	Linnaeus	1758
	Danainae	xi	plain tiger	<i>Danaus chrysippus</i>	(Linnaeus)	1758
	Heliconiinae	xii	common leopard	<i>Phalantha phalantha</i>	(Drury)	1773
	Limenitidinae	xiii	Common sailor	<i>Neptis hylas</i>	(Linnaeus)	1758



## DISCUSSION

The present study is among the 1<sup>st</sup> documented report for the butterfly fauna surveyed in Kabal, Swat, Pakistan. A total of 170 specimens were collected and preserved from 4 different study sites of Kabal. Identification revealed that 13 different species in 10 genera belonging to 3 families were present in this area. These species are *P. memnon*, *P. bianor*, *P. anactus*, *P. demoleus*, *E. hecabe*, *C. etrida*, *P. ajaka*, *A. hyperbius*, *C. cardui*, *J. orithya*, *D. chrysippus*, *P. phalantha*, *N. hylas*.

Shah et al. [21] made a survey of Kohat and collected 10 species belonging to only family Pieridae from 7 different localities over a period of 7 months during 1999. Perveen and Ahmed [15,16] surveyed Kohat, Pakistan, species belonging to different families were reported. At the present, 170 specimens were collected of 13 species, falling in 10 genera and were identified belonging to 3 different families. *E. hecabe* was recorded from all 3 surveys whereas *P. ajaka* was recorded from the present and Perveen and Ahmed [15, 16] surveys. It may be due to differences in climatic conditions of 3 different areas.

Perveen and Ahmad [15, 16] evaluate the butterfly fauna of Kohat, Pakistan during September-December 2008. Pieridae is reported as dominant family during survey. Similarly, these 3 families were also reported from Hazara University. Family Pieridae constitute the largest number of individuals followed by Nymphalidae and Papilionidae as reported in Kohat fauna [18, 19, 20]. However, in the present survey with respect to the numbers of species and specimens, family Nymphalidae was the 1<sup>st</sup> followed by Papilionidae and then by family Pieridae.

Martinez et al. [22] reported biodiversity and biogeography of butterfly's fauna in Mexico. About 1800 species of butterflies were documented, constituting about 10% of the butterfly fauna of the world. The 21 sites were acknowledged in Mexico for the abundance of butterfly fauna and comparisons were made between these sites. Perveen et al. [17] reported the characterization and Perveen [14] described the distribution of butterflies of 5 sites of Kohat, Khyber Pakhtunkhwa, Pakistan. About 21 species of butterflies were documented. The collected species covered families Nymphalidae, Papilionidae and Pieridae yielded 33, 10, and 57% butterfly diversity of the area, respectively. In contrast, only 10 species were recorded from the survey did by [18, 19, 20]. In contrast, only 13 species were recorded from the present survey from Kabal, therefore, difference was due differences in area covered in 4 studies. Comparison cannot be possible, however, almost same ecological conditions were found in the study areas.

Khan et al. [23] reported 16 species from Kotli, 20 from Mirpur and 19 from Bhimber, which showed great resemblance with species collected from Hazara University [18, 19, 20]. The research of butterfly fauna of Skardu region by Khan et al. [24, 25] had revealed 16 species belonging to 5 families. Ahson and Iqbal [26] surveyed butterfly fauna of Lahore from a number of localities. In another study, 21 species were identified belonging to 3 different families from Kohat, Pakistan during September-December 2008. The reported families Nymphalidae covered 33%, Papilionidae 10%, and Pieridae 57% biodiversity of butterflies of Kohat [14, 15, 16, 17]. The butterfly species from fore mentioned studies, i.e., *P. demoleus*, *D. chrysippus* and *E. hecabe* were recorded showed resemblance with the presently reported 13 species of butterflies from Kabal, Pakistan.

Ambrose and Raj [27] evaluated Kalakad-Mundanthurai Tiger reserve Southern India butterfly fauna. Survey of about 7 months was done from September 2002-March 2003. Study revealed 24 species of butterflies. Reported species of India belongs to 9 families but only 4 families were studied in detail. However, from the Hazara University, only 10 species of 8 genera belonging to 3 families were recorded in restricted small areas administration and main campus and residential area [18, 19, 20]. Moreover, from the present research, only 13 species of 10 genera belonging to 3 families were recorded in restricted small area of Kabal, Pakistan.

Hiller [28] studied the male genital structures of 3 species of butterflies from Rio Grande do Sul, Brazil. Same area was resided by 3 species at the same time of the year and their external morphology did not vary greatly, therefore, genital structures were taken into consideration for their identification. In the present research, species identified by distinguishable external morphology, therefore, genital structures were not studied.

Borang et al. [29] yielded 134 species of butterflies from area of Dihang Dibang Biosphere Reserve of Arunachal Pradesh, India. Recorded butterflies belong to 81 genera and 8 families whereas in the present research 13 genera belonging to 3 families were reported. Nymphalidae comprises 28 genera, Papilionidae 9 and Pieridae 10 genera from the India. In contrast, from the present survey, it was found that Nymphalidae comprised of 6 genera, Papilionidae 4 and Pieridae 3 genera from the Kabal. Sharma et al. [30] collected butterflies from new campus area of Punjab from June-September, study was based on the relationship of temperature, humidity and population of butterflies. The occurrence of butterflies was more in moderate temperature but in June and September there were decline. Relationship between temperature and population of butterflies was positive. However, Fitzherbert et al. [31] studied that the diversity and distribution of butterflies in the context of ecological preference and altitude range. There 90 species were recorded between Gilgit and Khunjerab at high altitude. Some of them were highly distributed but other are less tolerant species present in colonies. Therefore, isolation plays a very important role in evolution of many species and ecological races. Species composition and abundance is always dependent upon maintenance of natural habitat. Another reason is shortage of time, i.e., survey was carried out only for 4 months. If survey was done for long time there would have been a substantial increase in number of butterflies. In the future, further research should be conducted with respect to the mention factors in Kabal.



## CONCLUSION

The present survey was conducted to prepared checklist of the butterfly fauna of Kabal, Swat, Pakistan during March-June 2013. Total number of specimens was 170. The 10 genera comprised 13 different species belonging to 3 families were recorded. These species were *P. memnon*, *P. bianor*, *P. anactus*, *P. demoleus*, *E. hecabe*, *C. etrida*, *P. ajaka*, *A. hyperbius*, *C. cardui*, *J. orithya*, *D. chrysippus*, *P. phalantha*, *N. hylas*.

## RECOMMENDATION

Proper preventive measures should be taken in order to minimize the natural habitat loss, as butterfly fauna is dependent upon proper environmental conditions. Frequent similar surveys on large scales are recommended to fully evaluate the butterfly fauna of Kabal (Swat).

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### Author' biography with Photo



**Dr. Farzana Perveen** is born in Karachi, Pakistan. She is BSc (Hons) in Biochemistry, Microbiology and Zoology and MSc in Zoology specialized in Entomology (Toxicology) from University of Karachi. She was selected for Cultural Exchange Scholarship for Nagoya University, Japan. In Japan, she did 6 months Japanese language course; 2 years Master in Agricultural Sciences (MAS) and 4 years Monbusho Scholar Research Fellow (MSRF) in Agronomy. She is Ph.D. from Karachi University specializes in Integrated Pest Management, did course and research work from Nagoya University, Japan. HEC scholarship was awarded for Post-Doctorate at Auckland University, New Zealand. She has started his professional career as Research Fellow from University of Karachi. She also served as Teaching and Research Associate in the Laboratory of Applied Entomology, Nagoya University, Japan. After returning from Japan, she served as Research Fellow and Teaching Associate in University of Karachi.

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