Article

Checklist of butterfly (Insecta: Lepidoptera) fauna of Tehsil Tangi, Khyber Pakhtunkhwa, Pakistan

Farzana Khan Perveen, **Haroon**

Department of Zoology, Shaheed Benazir Bhutto University (SBBU), Main Campus, Sheringal, Dir Upper (DU), Khyber Pakhtunkhwa (KP), Pakistan

E-mail: farzana_san@hotmail.com

Received 22 August 2015; Accepted 30 September 2015; Published online 1 December 2015

Abstract

The butterflies (Insecta: Lepidoptera)are well known insects, play an important role in the ecosystem as bio-indicators and pollinators. They have bright colours, remarkable shapes and supple flight. The present study was conducted to prepare the checklist of butterfly fauna of Tehsil Tangi during August, 2014 to May, 2015. A total of 506 specimens were collected belong to 3 families with 18 genera and 23 species. The collected species are the common or lemon emigrant, *Catopsila ponoma* Fabricius; mottled emigrant, *Catopsilia pyranthe* Linnaeus; *clouded yellow*, *Colias fieldii* Fabricius; common grass yellow, *Eurema hecabe* Linnaeus; eastern pale clouded yellow butterfly, *Colias erate* Esper; Indian cabbage white**,** *Pieris canidia* Sparrman; Indian little orange tip, *Colotis etrida* Boisduval; pioneer white or African caper white, *Belonias aurota*Fabricius; plain tiger, *Danaua chrysippus* Linnaeus; blue tiger, *Tirumala liminniace* Cramer; peacock pansy,*Junonia almanac* Linnaeus; Indian fritillary, *Argyreus hyperbius* Linnaeus; Indian red admiral, *Venesa indica* Herbst; yellow pansy, *Junonia hierta* Fabricius; blue pansy, *Junonia orytha* Linnaeus; white edged rock brown, *Hipparchia parisatis* Kollar; banded tree brwon, *Lethe confuse* Aurivillius; common castor, *Ariadne merione* Cramer; painted lady, *Caynthia cardui* Linnaeus; Himalayan sailer, *Neptis mahendra* Moore; common boran, *Euthalia garuda* Hewitson; lime butterfly, *Papilio demoleus* Linnaeus and great black mormon butterfly, *Papilio polytes* Linnaeus. It was concluded that the family Nymphalidae has the highest numbers of individuals in the present checklist. It is recommended that butterfly fauna of the study area should be conserved and their habitat should be protected.

Keywords butterfly fauna; Nymphalidae; Papilionidae; Pieridae; Tehsil Tangi.

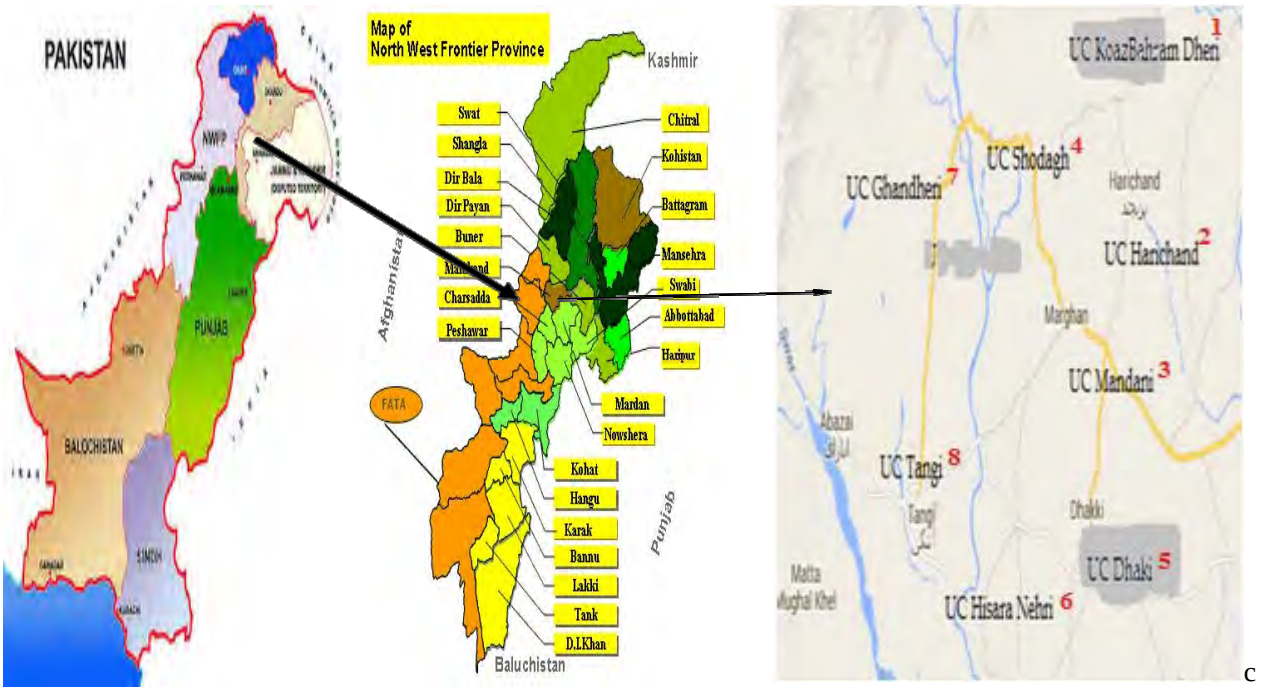
Arthropods
ISSN 2224-4255
URL: http://www.iaees.org/publications/journals/arthropods/online-version.asp
RSS: http://www.iaees.org/publications/journals/arthropods/rss.xml
E-mail: arthropods@iaees.org
Editor-in-Chief: WenJun Zhang
Publisher: International Academy of Ecology and Environmental Sciences

1 Introduction

The Lepidoptera is one of the most important order comprises environmental insects, pests, pollinators, silk producers and food for other animals (Haroon et al., 2013). They take sunbath and warm up in cool weather.

However, Lepidoptera means scaly wings insects, are very well known for their beauty as they bear beautiful wings of various colours. The wings are held vertically when at rest, moreover, their wings rage, wilt scales and colours disappear (Perveen et al., 2014). Furthermore, they were found in every environment and serve as a bio-indicator for health and beauty (Perveen and Fazal, 2013). They are the best accredited insects due to their daylight territories and willingly predictable by their optimistic colours, spectacular shapes and supple flight stretch desire to everyone. They are useful and harmful, have great aesthetic and commercial values (Khan and Perveen, 2015). They have slim bodies, the antennae are slender and club-like at the tips. The degree of diversity depends upon the adaptability of a species to a particular micro-habitat, population size and variety of the species, which most significant biological elements of an ecosystem (Kumar et al., 2013). It undergoes 4 different life stages, egg, larva, pupa, and adult. Each life stage needs specific habitat, such as a particular host plant, flower and nectar. Adult butterflies are relatively larger (compared to the other life stages), easy to identify and occupy in a wide variety of different habitats (Daniels et al., 2014). Their larvae play important roles in ecosystem functioning, including: nutrient cycling, foliage plants and pollination (Bonebrake et al., 2010). More than 53% of insects and 1.4 million of species were present on the earth surface (Perveen et al., 2012). However, from Pakistan more than 5,000 species of insects were reported recently (Khan et al., 2014). Although, they are projected 126 families, 46 superfamilies and 174,250 species (Perveen and Ahmad, 2012b) up to date.

The Tehsil Tangi is situated in the District Charsadda, Khyber Pakhtunkhwa (KP), Pakistan. According to census report of 2000, the population of Charsadda was 1.7 million. However, the total area of the District is about 996 km^2 (243753 acres). Moreover, it was the capital of Gandhara from the 6^{th} century BCE to the 2^{nd} century CE (Fig. 1). Further, the ancient name of Charsadda was Pushkalavati, which means Lotus City, because it is famous for the lotus roots, *Nelumbo nucifera* Gaertin known as barsanday. Furthermore, it was the administrative centre of the Gandhara kingdom. In addition, the main crops of Charsadda are the tobacco, *Nicotiana tabacum* Linnaeus, 1758; sugarcane, *Saccharum officinarum* Jewiet, 1935; sugar beet, *Beta vulgaris* Linnaeus, 1758; wheat, *Triticum turgidum* Linnaeus, 1758 and maize, *Zea mays* Linnaeus, 1758. Although, vegetables include the potato, *Solanum tuberosum* Gasper Bauhin, 1596; tomato, *Solanum lycopersicum* Linnaeus, 1753; cabbage, *Brassica oleracea* Linnaeus, 1753; brinjals, *Solanum melongena* Linnaeus, 1753; okra, *Abelmoschus esculentus* Linnaeus, 1753 and spinach, *Spinacia oleracea* Linnaeus, 1753. Accordingly, among fruits, the orchards, *Phalaenopsis schilleriana* Rchb, 1860; apricot, *Prunus armeniaca* Linnaeus, 1753; citrus, *Citrus medica* Linnaeus, 1753; plum, *Prunus mume* Piebold and Zucc, 1820; strawberry, *Fragaria ananassa* Duchesne, 1764 and pears, *Pyruscommunis* Linnaeus, 1753 are famous. Additionally, it is home to a number of wildlife species including mammals, such as the pangolin, *Manis javanica* Desmarest, 1822; porcupine, *Hystrix indicus* Kerr, 1792; cow, *Bos indicus* Linnaeus, 1758; donkey, *Equus asinus* Linnaeus, 1758; sheep, *Ovis aries* Linnaeus, 1758; goat, *Capra hircus*Linnaeus, 1758,buffalo, *Bubalus, bubalis* Linnaeus, 1758.Although, Himalayan monal pheasant, *Lophophorus impejanus* (Latham, 1790); Himalayan snow cock, *Tetraoggallus himalayensis* (Gray, 1848); snow partridge, *Lerwa lerwa* (Hodgson, 1837) and pigeon, *Columbia livia* Gmelin, 1789 are some of the key bird species found here.As well, in Charsadda there are 3 rivers: the Jindi, Kabul and Swat are main source of irrigation for it. Then they merge and join in the Indus River. While, the area surrounded by River Swat and River Kabul is called Doaaba and has a great importance in the District. Although, River Swat merges with Kabul at Shahbara near to District Peshawar, and Kabul River merges with River Indus at Attack (Fig. 1; Haroon et al., 2013). The object of the present research is to prepare the checklist of butterfly fauna of Tehsil Tangi, KP, Pakistan for awareness and education of the community.



a b

Fig. 1 Map of Tehsil Tangi, Khyber Pakhtunkhwa, Pakistan in which the present survey on butterfly fauna was conducted during August 2014-May 2015: a) map of Pakistan; b) map of Khyber Pakhtunkhwa; c) map of Charsadda showing Tehsil Tangi with the 8 quadrates of the study area, *viz*.: 1) Union Council (UC) Koaz Bahram Dheri; 2) UC Harichand; 3) UC Mandani; 4) UC Shodagh; 5) UC Dhaki; 6) UC Hisara Nehri; 7) UC Ghandheri and 8) UC Tangi;(Online, 2015)

2 Materials and Methods

2.1 Study area

The study was conducted in 8 quadrates of Tehsil Tangi, District Charsadda (CHD), Khyber Pakhtunkhwa (KP), Pakistan, *viz*.: 1) Union Council (UC) Koaz Bahram Dheri; 2) UC Harichand; 3) UC Mandani; 4) UC Shodagh; 5) UC Dhaki; 6) UC Hisara Nehri; 7) UC Ghandheri and 8) UC Tangi, during, August 2014 to May 2015. However, it is located at the 34°8'43N and 71°43'51E with an altitude of 276 m (908 feet) and situated 29 km from the provincial capital Peshawar. Moreover, most of the people in the study area are Agriculturists, furthermore, literacy rate is 56.9% (Fig. 1).

2.2 Collection and preservation of butterflies

For the present research, the butterfly fauna of Tehsil Tangi was surveyed from August, 2014-May, 2015. The specimens were collected from the locations subject of the most representative agriculture lands for cultivation of vegetables and fruits in the quadrates of the study area. For the collection of specimens, an insect net (length: 3 m; net cloth length: 1 m; diameter (dm): 0.9144 m), transect net (length: 3 m; width: 1 m; height: 2 m) with attractants as well as they were picked with naked hand. They were brought to the laboratory, Department of Zoology (DOZ), SBBU. The collected live specimens were faint in cotton soaked chloroform bottles for short time. However, if chloroform was not available, they were killed carefully by pinching transversely at the thorax that all parts of the body may not be spoiled. Then they were pinned by insect pins according to their body size. They were preserved by stretching and set their wings at 180° on thermopile setting board for 2 days. They were tagged for their locations and date of collection. Finally, they were mounted in the insect boxes with naphthalene balls to keep the specimens safe from the pests.

2.3 Identification of butterflies

Collected butterflies were identified with the help of keys (Layberry et al., 1998), available literature, internet, already identified specimens [National Insect Museum (NARC), Islamabad, Pakistan and laboratory, DOZ], pictures and expert, Dr Muhammad Athar Rafi, Senior Scientist, NARC. All specimens were deposited in the National History Museum (NHM), DOZ, SBBU, Pakistan.

3 Results

The present study were conducted to make the checklist of butterfly (Class: Insecta; Order: Lepidoptera) fauna collected from Tehsil Tangi, KP, Pakistan. The specimens (total: n_t=506) belong to 3 families under 18 genera and 23 species. Family Nymphalidae contributed 49.8%, ($n_{Nymphalidae}$: 252), followed by Pieridae42.89% ($n_{Pieridae}$: 217) and minimum % was recorded of family Papilionidae 7.31% ($n_{Papilionidae}$: 37) (Fig.2). However, most of the species were collected from different biotopes, e.g., scrub, grassland, plantation, botanical and nursery gardens randomly (Table 1). The families, Nymphalidae covered 49.8%, Pieridae 42.89% and Papilionidae 7.31%.

Systemic classification

Kingdom : **Animalia**

Phylum : **Arthropoda**

Class : **Insecta**

Subclass : **Pterygota**

Infraclass : **Neoptera**

Superorder : **Endopterygota**

Order : **Lepidoptera**

Suborder : **Glossata**

Inferaorder : **Acanthoctesia**

Family: Pieridae

Reported species 1: **Common or Lemon Emigrant, *Catopsila ponoma* Fabricius**

Reported species 2: **Mottled Emigrant,*Catopsilia pyranthe* Linnaeus**

Reported species 3: **Clouded yellow, *Colias fieldii* Fabricius**

Reported species 4: **Common grass yellow, *Eurema hecabe* Linnaeus**

Reported species 5: **Eastern pale clouded yellow butterfly, *Colias erate* Esper**

Reported species 6: **Indian cabbage white, *Pieris canidia* Sparrman**

Reported species 7: **Indian little orange tip, *Colotis etrida* Boisduval**

Reported species 8: **Pioneer white or African caper white, *Belonias aurota* Fabricius**

Family: Nymphalidae

Reported species 9: **Plain tiger, *Danaua chrysippus* Linnaeus**

Reported species 10: **Blue Tiger, *Tirumala liminniace* Cramer**

Reported species 11: **Peacock pansy, *Junonia almanac* Linnaeus**

Reported species 12: **Indian fritillary, *Argyreus hyperbius* Linnaeus**

Reported species 13: **Indian red admiral, *Venesa indica* Herbst**

Reported species 14: **Yellow pansy, *Junonia hierta* Fabricius**

Reported species 15: **Blue pansy, *Junonia orytha* Linnaeus**

Reported species 16: **White edged rock brown, *Hipparchia parisatis* Kollar**
Reported species 17: **Banded treebrwon, *Lethe confuse* Aurivillius**
Reported species 18: **Common Castor, *Ariadne merione* Cramer**
Reported species 19: **Painted lady, *Caynthia cardui* Linnaeus**
Reported species 20: **Himalayan sailer, *Neptis mahendra* Moore**
Reported species 21: **Common boran, *Euthalia garuda* Hewitson**

Family: Papilionidae

Reported species 22: **Lime butterfly, *Papilio demoleus* Linnaeus**
Reported species 23: **Great black Mormon butterfly, *Papilio polytes* Linnaeus**

Table 1 Checklist of butterfly fauna were collected from the Tehsil Tangi, Khyber Pakhtunkhwa, Pakistan, during August 2014 to May 2015.

Family	Sub Family	RS*	Common names	n*	Scientific names	Authority	Year	Biotope*
Pieridae	Coliadinae	1	Common or Lemon Emigrant	58	*Catopsila ponoma*	Fabricius	1775	B, S, G, P
		2	Mottled Emigrant	35	*Catopsilia pyranthe*	Linnaeus	1758	B, S, G, P
		3	Clouded yellow	7	*Colias fieldii*	Fabricius	1807	B, S, G, P
		4	Common grass yellow	7	*Eurema hecabe*	Linnaeus	1758	B, S, G, P
		5	Eastern pale clouded yellow butterfly	2	*Colias erate*	Esper	1805	B
	Pierinae	6	Indian cabbage white	64	*Pieris canidia*	Sparrman	1768	B, S, G, P
		7	Indian little orange tip	4	*Colotis etrida*	Boisduval	1836	G, P
		8	Pioneerwhite or African caper white	40	*Belonias aurota*	Fabricius	1793	B, S, G, P
Nymphalidae	Danainae	9	Plain tiger	122	*Danaua chrysippus*	Linnaeus	1758	B, S, G, P
		10	Blue Tiger	3	*Tirumala liminniace*	Cramer	1775	P
	Nymphalinae	11	Peacock pansy	11	*Junonia almana*	Linnaeus	1758	B, S, G, P
		12	Indian fritillary	14	*Argyreus hyperbius*	Linnaeus	1763	B, S, G, P
		13	Indian red admiral	2	*Venesa indica*	Herbst	1794	S
		14	Yellow pansy	1	*Junonia hierta*	Fabricius	1798	G
	Vespidae	15	Blue pansy	60	*Junonia orytha*	Linnaeus	1758	B, S, G, P
	Satyrinae	16	White edged rock brown	21	*Hipparchia parisatis*	Kollar	1849	B, S, G, P
		17	Banded treebrwon	2	*Lethe confuse*	Aurivillius	1897	S
	Biblidinae	18	Common Castor	9	*Ariadne merione*	Cramer	1777	B, S, G, P
	Trogidae	19	Painted lady	4	*Caynthia cardui*	Linnaeus	1758	B, G
	Limenitidinae	20	Himalayan sailer	2	*Neptis mahendra*	Moore	1872	B, S
		21	Common boran	1	*Euthalia garuda*	Hewitson	1874	P
Papilionidae	Papilioninae	22	Lime butterfly	36	*Papilio demoleus*	Linnaeus	1758	B, S, G, P
		23	Great black Mormon	1	*Papilio polytes*	Linnaeus	1758	G

*RS: reported species; n: number of individual collected; Biotope: (S: scrub; G: grassland; P: plantation; B: botanical and nursery gardens).

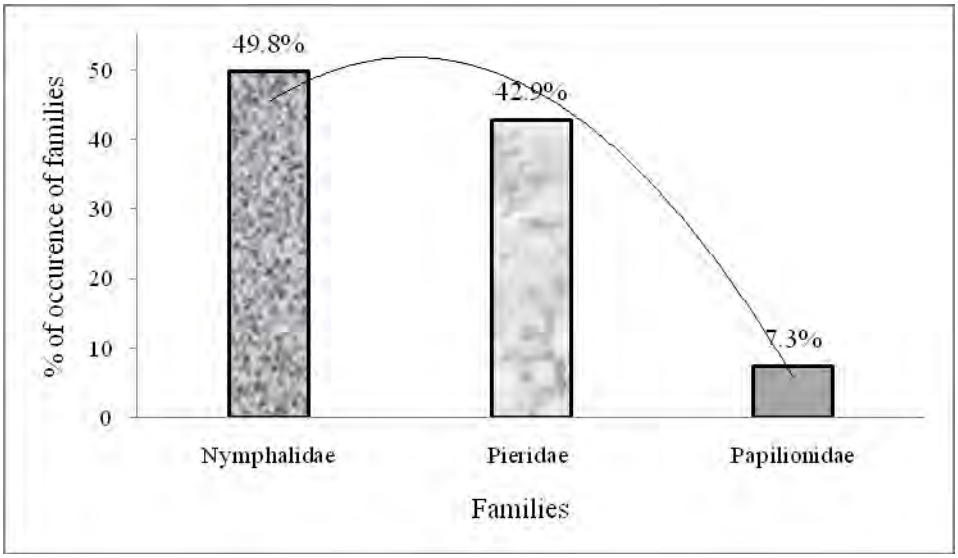


Fig. 2 Distribution of the butterfly (Insecta: Lepidoptera) fauna families wise in Tehsil Tangi, Khyber Pakhtunkhwa, Pakistan, in which the present survey was conducted during August 2014-May 2015; polynomial line: trend line; sample size: n=506; %: percentage

4 Discussion

In this paper, the checklist has been prepared for butterflies collected from Tehsil Tangi, Khyber Pakhtunkhwa, Pakistan during August 2014-May 2015. However, this is the first documentary report of the said area. Moreover, the study was conducted 8 quadrates of Tehsil Tangi, Khyber Pakhtunkhwa, Pakistan, namely: Union Council Koaz Bahram Dheri; Union Council Harichand; Union Council Mandani; Union Council Shodagh; Union Council Dhaki; Union Council Hisara Nehri; Union Council Ghandheri and Union Council Tangi. Further, the collected species are belonging to 3 families, 18 genera and 23 species. Furthermore, the collected family was Pieridae with species: *C. ponoma*, *B. aurota*, *C. pyranthe*, *E. hecabe*, *C. fieldii*, *C. etrida*, *C. erate* and *P. canidia*. While, the species of family Nymphalidae were *D. chrysippus*, *J. orytha*, *H. parisatis*, *A. hyperbius*, *J. almana*, *A. merione*, *C. cardui*, *T. liminniace*, *V. indica*, *L. confuse*, *N. mahendra*, *E. garuda* and *J. hierta*. Additionally, the family Papilionidae with species were *P. demoleus* and *P. polytes*.

Different scientists work on distribution and documentation of butterflies in KP, Pakistan. Shah et al. (2001) first time explore the butterfly fauna of Kohat and reported 10 species belong to only family Pieridae from 7 different localities. During the present research, similar species of family Pieridae were also recorded from Tehsil Tangi, which shows the great resemblance in both areas.

Naz et al. (2001) analysed the diversity of butterfly fauna of Buner, KP, Pakistan and reported a total of 450 specimens were collected and identified, however, all specimens were belong to family Pieridae. While, in the present study, the most of specimens were belong to family Nymphalidae followed by family Pieridae. However, there was the greatest difference in both areas. Furthermore, the Buner was a hilly and Tehsil Tangi was a plain area.

Perveen and Ahmad (2012) explore the butterfly fauna of Kohat and 21 species were identified belong to 3 families, Pieridae covered 57%, Nymphalidae 33% and Papilionidae 10%. Similarly these 3 families were also reported in the present survey. Where the families, Nymphalidae covered 49.8%, Pieridae 42.89% and Papilionidae 7.31%. However, from Kohat and Tehsil Tangi reported the same families but the percentage of the families were different in both areas because of the climatic conditions and vegetation.

Haroon et al. (2013) conducted a survey for identification and distribution of butterflies in Union Council

Koaz Bahram Dheri, KP, Pakistan and collected 232 specimens from 12 localities. Moreover, the identified specimens of butterflies belong to 13 species, 11 genera and 3 families. Family Nymphalidae comprised the largest number of butterflies 49% followed by Pieridae 37% and 14% of Papilionidae. However the similar families were reported from the present research, family Nymphalidae covered 49.8%, Pieridae 42.89% and Papilionidae 7.31%. Although, both study areas having the same type of cultivation land, climatic condition and flora.

Perveen (2012) reported a total of 21 species belong to 3 families and 6 sub families from Kohat, KP, Pakistan. Additionally, 2 subfamilies of Nymphalidae: Nymphalinae covered 28% and Satyrinae 5% species. Furthermore, family Pieridae including 3 subfamilies, *viz*., Pierinae covered 24%, Coliaclinae 5% and Coliadinae 28%. While the family Papilionidae including only one subfamily, Papilioninae covered 10% species. However, at the present, reported 3 families; Nymphalidae and their subfamilies are: Danainae 25%; Nymphalinae 6%; Vespidae 12%; Satyrinae 4%; Biblidinae 2%; Trogidae 1 % and Limenitidinae 1%; Pieridae: Coliadinae 22%; Pierinae 21% and Papilionidae: Papilioninae 7%. Moreover, the Tehsil Tangi flora and fauna is mostly dominant as compared to Kohat due to large amount of agriculture land.

Perveen and Khan (2013) reported 170 specimens from Kabal, Swat belonging to 10 genera and 3 families. Although, in the present research 506 specimens were reported from the said area, which belonging to 3 families, 18 genera and 23 species. However, both study areas are very dissimilar to each other, because the climatic condition of Kabal, Swat is mostly cold, while in the Tehsil Tangi have moderate and warm condition.

Perveen and Fazal (2013) reported the butterfly fauna of Hazara University during 2013 and collected 170 specimens, however, % of collected specimens from each 3 quadrants was in descending order: Residential area: 53% > main campus: 34% > administration area: 12%. The collected specimens are belonging to 3 families 8 genera and 10 species. The reported families covers collected specimens in descending order; Pieridae: 5 > Nymphalidae: 3 > Papilionidae: 2. However, from the present study, a total of 506 species were collected from 8 quadrates, these are as follows: Union Council Koaz Bahram Dheri: 29% > Mandani: 14% > Ghandheri: 12% > Dhaki: 11% = Hisara Nehri: 11% > Harichand: 10% > Tangi: 7% and Shodagh: 6%. The weather condition of Hazara University was cold and hilly, while Tehsil Tangi was a plain and warm area, which were suitable environment for butterflies.

Gaonkar (1996) recorded 1501 specimens from the Indian region. These species were dissimilar with the study area of the present research, due the weather condition and land of the countries. Verma et al. (2004) collected 15 genera of Papilionidae, 25 of Pieridae and 6 of family Danaidae from the Indian region. While in the present research collected butterflies belong to 3 families including 18 genera. Although, both countries of the study areas were dissimilar from each other with respect of climatic and weather conditions etc. The land of Tehsil Tangi was well fertile and rich for agriculture practices. During the present research some skippers, moths and sharp flight butterflies were also sighted.

The flora and fauna of Tehsil Tangi is rich and well cultivated land. The study area are amusing from water, soil and climatic conditions. Local population are uneducated, used the pesticide more than requirement and unaware of the integrated pest management (IPM), therefore, the flora and fauna were highly disturbed. The study area is populated and urbanization day by day, which interrupt the flora and fauna. The duration of the present research was 10 months, however, the large number of butterflies (n=506) have been collected. In future, if duration of collection will be extended then more species of butterflies may be recorded, additionally, research may be conducted in the lighting of the hot issues of Tehsil Tangi, e.g., miss use of pesticides, urbanization and unawareness.

5 Conclusions

From the present study, it was concluded that the family Nymphalidae covered 49.8%, Pieridae 42.9% and Papilionidae 7.3%., family Nymphalidae 49.8% was significantly dominant and a checklist has been prepared for the species collected from Tehsil Tangi.

6 Recommendation

To explore the whole butterfly fauna of Charsadda, Khyber Pakhtunkhwa, Pakistan, further research is recommended. However, the researchers and students should be expanded their cooperation and collaboration for the same. Moreover, the seminars, conferences, congresses, workshops and symposiums may be conducted for awareness and education of local community of Tehsil Tangi.

Acknowledgments

This paper is based on MPhil research of the 2nd author. The authors are grateful to the Department of Zoology, Shaheed Benazir Bhutto University (SBBU), Main Campus, Sheringal, Dir Upper (DU), Khyber Pakhtunkhwa (KP), Pakistan for providing laboratory facilities. They are also grateful to all people, who assisted in conducting the present research. They would like to thanks Dr Muhammad Athar Rafi, Senior Scientist, National Insect Museum (NARC), Islamabad for his kind assistance, suggestion and cooperation in the present research. The authors declare no conflict interest. The present research complies with the current laws of the institute and country in which they were performed.

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