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Diversity and distribution of butterflies in Pakistan: A review

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Abstract
The main purpose of this review paper is to check the diversity and distribution of butterflies in different areas of Pakistan. The main study areas included Bhawalpur, Multan, Tolipir national park, Azad and Jamu Kashmir, Union Council Koaz Bahram Dheri Khyber Pakhtunkhwa, Faisalabad, Districts (Kotli, Mirpur and Bhimber) of Azad Kashmir, Sindh, Jamshoro district(Sindh), District Muzaffarabad, Azad Kashmir, Karachi, Lahore, West Pakistan, Rawalpindi and Islamabad, Northwest Himalaya (Galgit and Azad Kashmir), Islamabad and Murree, Poonch division of Azad Kashmir, Kabal, Swat, Tehsil Tangi (Khyber Pakhtunkhwa), Hazara University(garden campus, Mansehra), Kohat (Khyber Pakhtunkhwa), Murree, Chitral. The highest diversity of butterflies present in Bhawalpur. The total number of 4397 specimens, which were recognized into 19 families and 70 species from Bhawalpur. The areas rich in plant diversity show high butterfly diversity.

Keywords: Diversity, butterfly, Pakistan, distribution

Introduction
Butterflies belong to Order Lepidoptera which is the second-largest order of insects. Lepidoptera is one of the most widespread and widely recognizable insect order in the world [1]. More than 28,000 species of butterflies present worldwide and about 80% found in tropical regions. More than 5,000 species of insects including 400 species of butterflies and moths have been reported from Pakistan. Butterflies exist in every continent except Antarctica [19]. The distribution of butterflies depends upon the availability of host plants. The area with undisturbed vegetation and high floral diversity support large butterfly communities. Butterflies and their caterpillars are dependent on specific host plants for foliage, nectar and pollen as their food. Butterflies are often deliberated opportunistic foragers, which visit a wide variety of available flowers. So plant diversity reflects overall butterfly diversity [3].

Diversity and distribution of butterflies in different localities of Pakistan
Bhawalpur
The research was conducted to check the biodiversity of butterflies in cropped and forest areas from August to October, 2004 at the Lal Sohanra National Park, Bahawalpur. The overall number of 4397 specimens, which were recognized into 19 families and 70 species. The maximum specimens were obtained for the family Noctuidae which had no major difference with Pyralidae. The least specimens were achieved in the family Bombycidae, which was statistically comparable to most of other families [9].

Multan
The overall number of 456 specimens, which were recognized into 5 families and 14 species. The most abundant species of butterflies in Multan are *Danaus chrysippus*, *Polyommatus eros* and *Anaphaeis aurota* [8].

Tolipir national park, Azad and Jamu Kashmir
A total of 3017 specimens of 22 butterfly species belonging to two Nymphalidae and Pieridae families were recorded. Family Nymphalidae have highest number of species. And *Junoniaorithya* species have more number of specimens as compared to other species [4].

Sr. No	Family	Total number of specimens
1	**Family Nymphalidae**	
	Argyreus hyperbius	9
	Nymphalis xanthomolus	10
	Junonia hierta	16
	Vanessa indica	19
2	**Family Papilionidae**	
	Papilio polyctor	8
	Papilio demoleus	51
	Papilio polytes	54
	Papilio Macham	5
	Atrophaneura philoxenus	4
3	**Family Hesperiidae**	
	Parnara guttata	24
	Badamia excelamatonis	30
	Gomalia albofasciata	21
	Hasoraalexis	28
4	**Family Pieridae**	
	Pieris canidia	35
	Catopsilia femora	18
	Pieris brassicae	82
	Pieris napi	41
	Colias crocea	18
	Colias erate	44
	Catopsilia crocale	12
	Pieris rapae	12
5	**Family Gelechiidae**	
	Anarsia melanoplecta	2
	Pectinophora gossypiella	15
	Anarsia melanochropa	7
	Anarsia idioptela	9
6	**Family Lymantriidae**	
	Pericallia ricini	17
	Cosmophila erosa	15
	Euproctis fraternae	14
7	**Family Sphingidae**	
	Acherontia atropos	11
	Acherontia sytx	5
	Agrius convolvuli	6
8	**Family Tineidae**	
	Tinea pellionella	8
	Tineola bisselliella	11
9	**Family Noctudiae**	
	Agrotis flammatra	35
	Agrotis ipsilon	44
	Agrotis segetum	31
	Helicoverpa armigera	35
	Sopdoptera litura	44
	Autographa nigrisigna	20
	Plusia orichalcea	27
	Sylepta dercogata	13
	Earis insulana	95
	Sesmia inferens	9
	Euproctis lunata	14
	Trache notabilis	16
	Earis vitella	45
10	**Family Pyralidae**	
	Ostrinia nubilalis	4
	Cnaphalocrosis medinlis	3
	Syleptra derogate	2
	Scirpophaga novel	7
	Chilo partellus	9
	Chilo infuscatellus	24
	Emmalocera depressella	28
	Acigona steniella	18
11	**Family Lycaenidae**	
	Virachola isocrates	81
	Zizeerea knysna	4
	Zizeerea maha	2
	Azanus ubaldus	7
	Heliophous bakeri	6
	Aphnaeus ictis	10
12	**Family Danaidae**	
	Danaus chrysippus	44
	Danaus genutia	6
13	**Family Epipyropidae**	
	Epipyrope melanoleuca	31
14	**Family Arctiidae**	
	Amsacta moorei	3
15	**Family Plutellidae**	
	Plutella xylostella	44
16	**Family Bombycidae**	
	Bombyx mori	3
	Eupterote fabia	1
17	**Family Saturniidae**	
	Attacus atlas	4
18	**Family Geometridae**	
	Acontia groelsi	10
19	**Family Styridae**	
	Aulocera padma	4

Sr. No	Family/species	Total # of specimens
1	**Family: Pieridae**	
	Colitis amata	**7**
	Colitis vestalis	16
	Anaphaeis aurota	64
	Eurema hecabe	18
	Colitis etrida	13
	Pieris brassicae	28
2	**Family Lycaenidae**	
	Tarucussp	26
	Polyommatus eros	81
	Lampides boeticus	52
3	**Family Nymphalidae**	
	Junonia almanac	12
	Vanessa cardui	1
4	**Family Danadidae**	
	Danaus chrysippus	102
	Danaus genutia	1
5	**Family Papilionidae**	
	Papilio demoleus	35

Sr. No	Family	Total # of specimens
1	**Family Nymphalidae**	
	Argynnishyperbius	175
	Danausgenutia	180
	Danauschrysippus	161
	Junoniaorithya	183
	Lethe rohria	118
	Melanitesleda	99
	Neptishylas	122
	Papiliophiloxenus	134
	Papiliopolytes	146
	Papiliodemoleus	123
	Precis almanac	104
	Vanessa cardui	123
	Danauschrysippus	119
	Junoniaorithya	173
2	**Family Pieridae**	
	Coliaserate	99
	Coliasfeldi	73
	Euremahecabe	175
	Gonepteryxrhamni	145
	Pierisbrassicae	99
	Pierisrapae	138
	Pieriscanidia	153
	Pontiadaplidice	175

Union Council Koaz Bahram Dheri Khyber Pakhtunkhwa

A Total of 232 butterflies were collected which belonged to 13 species and 3 families. The family Nymphalidae comprises largest number (49%) followed by Pieridae (37%) and Papilionidae (14%) [6].

Sr. No	Species	Total # of specimens
1	*Danaus chrysippus*	72
2	*Eurema hecabe*	39
3	*Papilio demoleus*	32
4	*Catopsilia pyranthe*	16
5	*Junonia orithya*	15
6	*Catopsilia ponoma*	12
7	*Pieris canidia*	12
8	*Cynthia cardui*	11
9	*Junonia almana*	5
10	*Catopsilia pomona,*	8
11	*Colias croceus*	5
12	*Phalantha phalantha*	3
13	*Colitis amata*	2

Faisalabad

A total of 2811 specimens belonging to 14 species and 6 families were recorded.

Pieris brassicae (29%) was the dominant species followed by *Trichoplusia ni* (19%), *Helicoverpa zea* (11%), *Helicoverpa armigera* (11%), *Spodoptera exigua* (6%), *Pseudoplusia includens* (5%), *Spodoptera litura* (3%), *Agrotis ipsilon* (4%), *Plutella xylostella* (2%), *Lymantria dispar* (2%), *Pieris rapae* (0.92%), *Galleria mellonella* (0.71%), *Evergestis rimosalis* (0.53%) and *Manduca sexta* (0.14%) [11].

Sr. No	Family	Total # of specimens
1	Noctuidae	1773
2	Pieridae	854
3	Pyralidae	19
4	Lymantridae	63
5	Plutellidae	82
6	Sphingidae	20

Districts Kotli, Mirpur and Bhimber, Azad Kashmir

A total of 16 species from Kotli, 20 species from Mirpur and 19 species from Bhimber belonging to 7 families and 30 genera were collected [12]

Sr. No	Species/ name of taxa	Total.# of specimens
1	*Pieris brassicae*	229
2	*Papilio philoxenus*	173
3	*Gonepteryx rhamni*	113
4	*Argynnis kamala*	79
5	*Argynnis hyperbius,*	67
6	*Colias erate*	64
7	*Pontia daplidice*	47
8	*Vanessa cardui*	43
9	*Papilio machaon*	41
10	*Danaus chrysippus*	31
11	*Catopsilia crocale*	26
12	*Colias electo*	19
13	*Colias fieldi*	17
14	*Aglais urticae*	12
15	*Phalantha phalantha*	6
16	*Papilio polyctor*	2

Sindh

Among collected specimens, 67 species belonging to 41 genera of 16 subfamilies falling in 6 families were identified. Results showed that Lycaenidae was the richest family; comprising 19 species [16].

Sr. No	Family	Total.# of species
1	Danaidae	5
2	Pieridae	18
3	Papilionidae	3
4	Nymphalidae	11
5	Lycaenidae	19
6	Hesperiidae	11

Jamshoro district, Sindh: Diversity of Pieridae Family

The total 655 specimens of Pierid butterflies were collected. Among these specimens, ten species of Pierid butterflies belonging to four genera (*Anapheis, Catopsilia, Colitis* and *Eurema*) of two subfamilies (Pierinae and Coliadinae) were identified [10].

Sr. No	Species	Jamshoro	Kotri	T. Bola khan	Sehwan	Manjh	S.U Campus	Total
1	*Anapheis aurota*	15	14	12	21	13	15	90
2	*Catopsilia florella*	13	4	14	11	5	12	59
3	*Catopsilia pomona*	9	12	10	6	14	10	61
4	*Catopsilia pyranthe*	6	10	1	8	2	9	36
5	*Colitis amata*	14	9	14	13	10	8	68
6	*Colitis danae*	5	0	2	9	6	5	27
7	*Colitis etrida*	17	13	14	8	3	14	69
8	*Colitis protractus*	10	3	13	12	10	16	64
9	*Colitis vestalis*	16	13	19	14	11	14	87
10	*Eurema hecabe*	24	14	21	10	13	12	94
11	Total	129	92	120	112	87	115	655

District Muzaffarabad, Azad Kashmir

A total of 25 species belonging to 7 families were collected from district Muzarrarabad, Azad Kashmir [2].

Sr. No	Species name	Total # of specimens
1	*Pieris brassicae*	51
2	*Catopsilia pyranthe*	20
3	*Colias erate*	19
4	*Papilio philoxenus*	18
5	*Colias fieldi*	18
6	*Junonia orithya*	16
7	*Pontia daplidice*	14
8	*Pieris canidia*	13

9	*Papilio polyoctor*	12
10	*Phlantha phlantha*	12
11	*Danuis chrysippus*	11
12	*Deudorys epijarbus*	10
13	*Catopsilia crocale*	10
14	*Celastrina ladonides*	9
15	*Genopteryx rhamni*	8
16	*Lampides boeticus*	8
17	*Papilio machaon*	5
18	*Terias hecabe*	5
19	*Danuis genutia*	4
20	*Catopsilia pomana*	4
21	*Aglais cashmirensis*	3
22	*Venessa cardui*	2
23	*Trimula linniace*	1
24	*Junonia almanac*	1
25	*Rapala selira*	1

Karachi

The total 46 species from 4 families were recorded from Karachi. Family Lycaenidae have highest number of species [19].

Sr. No	Families	Total # of species
1	Papilionidae	4
2	Lycaenidae	18
3	Nymphalidae	17
4	Hesperioidea	7

Lahore

The total 54 species from 5 families were recorded from Lahore. Family Pieridae have highest number of species [17].

Sr. No	Families	Total # of species
1	Papilionidae	3
2	Pieridae	17
3	Lycaenidae	11
4	Nymphalidae	16
5	Hesperioidea	7

West Pakistan

The total 71 species from 9 families were recorded from West Pakistan. Family Pieridae and Lycaenidae have highest number of species [19].

Sr. No	Families	Total # of species
1	Papilionidae	9
2	Pieridae	21
3	Lycaenidae	21
4	Nymphalidae	19
5	Satyridae	1
6	Danaidae	9
7	Acaeridae	1
8	Erycinidae	2
9	Hesperioidea	9

Rawalpindi and Islamabad

The total 51 species from 8 families were recorded from Rawalpindi and Islamabad. Among these families Nymphalidae family have highest number of species [17].

Sr. No	Families	Total # of species
1	Papilionidae	3
2	Pieridae	12
3	Lycaenidae	7
4	Nymphalidae	11
5	Satyridae	6
6	Danaidae	3
7	Erycinidae	3
8	Hesperioidae	5

Northwest Himalaya (Galgit and Azad Kashmir)

The total 71 species were identified from 9 families. Family Lycaenidae have highest number of species. And only one species were recognized from family Libytheidae and Erycinidae [17].

Sr. No	Families	Total # of species
1	Papilionidae	6
2	Pieridae	15
3	Lycaenidae	17
4	Libytheidae	1
5	Nymphalidae	15
6	Satyridae	8
7	Danaidae	3
8	Erycinidae	1
9	Erycinidae	5

Islamabad and Murree

The total 49 species were identified from 6 families. Family Nymphalidae have highest number of species. And only one species were recognized from family Libytheidae [17].

Sr. No	Families	Total # of species
1	Papilionidae	4
2	Pieridae	13
3	Lycaenidae	11
4	Libytheidae	1
5	Nymphalidae	17
6	Danaidae	3

Poonch division of Azad Kashmir

The fully-grown butterflies were collected from 28 different areas from three districts of Poonch Division of Azad Kashmir. The areas visited were 10 from district Bagh, 10 from district Poonch, and 8 from district Sudhnoti, throughout the summer season (April to October) from 1998 to 2001. A total of 32 species belonging to 3 families (5 Sub-Families), under 15 genera were recognized from 28 localities. Out of these 32 species, 27 species from district Bagh, 28 species from district Poonch and 19 species from district Sudhnoti were identified. The climate of these areas is very hot in summer and very cold in winter. Azad Kashmir is one of the beautiful place of Pakistan due to the green vegetation, very high alpine trees and the flowering plants of all kinds [18].

Sr. No	Name of Family/Sub-species	Poonch Division	District Poonch	District Bagh	District Sudhnoti
1	*Pieris brassicae*	493	80	269	144
2	*Junonia orityha*	360	40	187	133
3	*Papilio machaon*	262	21	124	117
4	*Gonepteryx rahmni*	259	26	135	98
5	*Pieris canidia*	199	31	156	12
6	*Papilio demoleus*	183	29	64	90
7	*Pontia daplidice*	175	28	147	0
8	*Pieris ajaka*	156	0	131	25
9	*Argynnis kamala*	134	12	36	86
10	*Argynnis hyperbius*	122	11	33	78
11	*Eurema hecabe*	119	23	96	0
12	*Danaus genutia*	113	25	88	0
13	*Colias erate*	99	10	44	45
14	*Pontia chloridice*	96	20	76	0
15	*Junonia almans*	80	12	48	20
16	*Venessa cardui*	74	15	59	0
17	*Colias fieldi*	66	7	25	34
18	*Melitaea lukto*	47	10	37	0
19	*Papilio Polytes*	45	6	9	30
20	*Nepits hylas*	42	6	8	28
21	*Catopsilia pyranthe*	39	9	30	0
22	*Junonia hierta*	38	0	0	38
23	*Parage schakara*	33	21	0	12
24	*Graphium cloanthus*	30	0	5	25
25	*Danaus chrysippus*	28	8	20	0
26	*Papilio polyctor*	23	8	8	7
27	*Vanessa polychloros*	20	8	12	0
28	*Eurema laeta*	18	18	0	0
29	*Catopsilia crocale*	12	5	7	0
30	*Belenois aurota*	11	0	0	11
31	*Lethe verma*	8	2	6	0
32	*Phalantha phalantha*	5	0	5	0

Kabal, Swat

A total of 170 specimens were collected from 13 species, and were identified belonging to 3 different families [5].

Sr. No	Family/species
1	**Family Papilionidae**
	Papilio memnon
	Papilio bianor
	Papilio anactus
	Papilio demoleus
2	**Family Pieridae**
	Eumera hecab
	Colitis etrida
	Pieris ajaka
3	**Family Nymphalidae**
	Argynnis hyperbius
	Cynthia cardui
	Junonia orithya
	Danaus chrysippus
	Phalantha phalantha
	Neptis hylas

Tehsil Tangi, Khyber Pakhtunkhwa

A total of 506 specimens were collected from Tehsil Tangi, Khyber Pakhtunkhwa belong to 3 families with 18 genera and 23 species. It was concluded that the family Nymphalidae has the highest numbers of individuals in the present checklist [7].

Sr. No	Species
1	*Catopsilia ponoma*
2	*Catopsilia pyranthe*
3	Colias fieldii
4	*Eurema hecabe*
5	*Colias erate*
6	*Pieris canidia*
7	*Colitis etrida*
8	*Belonias aurota*
9	*Danaua chrysippus*
10	*Tirumala liminniace*
11	*Junonia almanac*
12	*Argyreus hyperbius*
13	*Venesa indica*
14	*Junonia hierta*
15	*Junonia orytha*
16	*Hipparchia parisatis*
17	*Lethe confuse*
18	*Ariadne merione*
19	*Caynthia cardui*
20	*Neptis mahendra*
21	*Euthalia garuda*
22	*Papilio demoleus*
23	*Papilio polytes*

Hazara University, Garden Campus, Mansehra

A total of 170 specimens were collected, 10 species from 8 genera were identified belonging to 3 different families [13].

Sr, No	Fanily/species
1	**Family Nymphalinae**
	Cynthia cardui
	Junonia orithya
2	**Family Danainae**
	Danaus chrysippus
3	**Family Papilionidae**
	Papilio demoleus
	P. polytes
4	**Family Pieridae**
	Colias croceus
5	**Family Coliadinae**
	Eumera hecab
6	**Family Pierinae**
	Pieris ajaka Moore
	P. napi
	Pontia daplidice

Kohat, Khyber Pakhtunkhwa

21 species were identified belonging to 3 different families from Kohat, Pakistan during September-December 2008. The reported families Namphalidae covered 33%, Papilionidae 10%, and Pieridae 57% biodiversity of butterflies of Kohat [15].

Sr. No	Family/species
1	**Family Nymphalidae** *Argynnis hyperbius* *Ariadne merione* *Cynthia cardui* *Junonia almanac* *J. orithya* *Phalantha phalantha* **Subfamily:** Satyrinae *Hipparchia parisatis*
2	**Family:** Papilionidae *Papilio demoleus* *P. polytes*
3	**Family:** Pieridae **Subfamily:** Coliaclinae *Colias croceus* **Subfamily:** Coliadinae *Catopsilia Pomona* *Colitis etrida* *C. protractus* *Eumera hecab* *Gonepteryx rhamni* *Ixias pyrene* **Subfamily:** Pierinae *Belenoi aurota* *Pieris brassicae* *P. ajaka* *P. napi* *P. rapae*

Murree

The total 30 species from 9 families were recorded from Murree. Family Nymphalidae have highest number of species [14].

Sr.	Family/species
1	**Family Nymphalida**
	Argynnis paphia *Athyma asura* *Vanessa cardui* *Pyronia tithonus* *Pararge schakra* *Erebia nirmala* *Vanessa cashmiriensis* *Junonia orithy* *Cynthia cardui* *Vanessa indica* *Argynnis hyperbius* *Argyreus hyperbius*
2	**Family Papilionidae**
	Papilio machaon *Battus polydamas*
3	**Family Pieridae**
	Gonepteryx farinosa *Pieris napi* *Pieris angelika* *Colias crocea* *Gonepteryx rhamni* *Pieris canidia* *Colias fieldii* *Catopsilia pomona*
4	**Family Lycaenidae**
	Polyommatus sp. *Heliophorus sena*
	Tarucus sp.
5	**Family Riodinidae**
	Dodona durga
6	**Family Hesperiidae**
	Parnara colaca
7	**Family Geometridae**
	Biston sp.
8	**Family Arctiidae**
	Creatonotos sp.
9	**Family Zygaenidae**
	Epizygaena caschmirensis

Chitral

Total 15 species were recorded from Chitral belonging to different families [19].

Sr. No	Species
1	*Maniola davendra*
2	*Maniola cheena*
3	*Junonia orithya*
4	*Argynnis hyperbius*
5	*Libythea lepita*
6	*Colias fieldi*
7	*Colias erate*
8	*Gonepteryx rhamni,*
9	*Pieris brassicae*
10	*Pieris rape*
11	*Pieris canidia*
12	*Pontia daplidic*
13	*Papilio machaon*
14	*Papilio demoleus*
15	*Papilio polyctor*

Conclusion

The diversity of butterfly has a predominantly distribution in Pakistan. Occurrence of a variety of insects, particularly beautiful butterflies in above mentioned areas shows that the environmental conditions are favorable for the butterflies in these areas. However, impact of the possible environmental pollution on the fauna of butterflies cannot be ignored. Further studies are needed to record more species of butterflies from other areas of Pakistan. It is proposed that the areas under study should be continuously monitored to notice any variations in the diversity of butterflies, because the changes in diversity can only be observed by continuous checking and comparing the data of each year. This study will be helpful for the future policy makers, planners and researchers working on biodiversity of butterflies in Pakistan.

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