



DIVERSITY AND DISTRIBUTION OF BUTTERFLIES FROM KASHMIR HIMALAYAS

Z.H. KHAN*, RIFAT H. RAINA, MUDASIR A. DAR AND V.V. RAMAMURTHY¹

Division of Entomology

Sher-e-Kashmir University of Agricultural Sciences and Technology of Kashmir
Shalimar Campus, Srinagar- 191 121, India

¹Division of Entomology

Indian Agricultural Research Institute, New Delhi-110 012

*E-mail: KhanZakir786@rediffmail.com

ABSTRACT: The present work incorporates detailed field observations on the distribution and diversity of butterflies in Kashmir Himalayas at different altitudes in spring, summer and autumn season during 2006-2008. The study revealed that 68 species belonging to 38 genera of 7 families occur in the area. Diversity was calculated by using Shannon-Wieners Diversity Index. The calculated value showed that diversity was highest in case of family Nymphalidae and Pieridae (0.15), while it was lowest in Danaidae and Papilionidae (0.05) and no diversity was found in Libytheidae. Species richness was highest in Nymphalidae (8.75) and lowest in Danaidae (1.0). Nymphalidae was dominating with 27 species under 19 genera followed by Pieridae 21 species under 7 genera, Lycaenidae 7 species under 5 genera, Papilionidae 7 species under 2 genera, Danaidae 4 species under 3 genera, Hesperidae and Libytheidae (1) species each and none of the reported species was found to be threatened to become extinct. Thirty six species are being reported for the first time from the study area.

KEY WORDS: Butterflies, distribution, diversity, Kashmir Himalayas

INTRODUCTION

Butterflies have been systematically studied worldwide since the early 18th century and 19,238 species have been documented (Heppner, 1998). India possesses 1501 species of butterflies (Kunte *et al.*, 1999) out of which 962 species have been reported from north eastern part (Evans, 1932). India is one of the 12 'mega' biodiversity countries and holds 8.1 per cent of the world's total biodiversity. It is also one of the world's eight centres of origin of cultivated plants. Being a predominantly agriculture based country, India also has a mix of wild and cultivated habitats, giving rise to a specialized biodiversity, which is specific to the confluence of two or more habitats. India has two biodiversity hot spots i.e. north western Himalayas and western Ghats. In addition,

Kashmir Himalayan belt is identified as one of the richest biodiversity regions and often referred as "Biodiversity hot spot". The geographical location of the state and its array of ecological communities indicate that a considerable diversity of species will be found here (Raina, 1977). Ninety seven species of butterflies have been reported in Kashmir Himalayas (Bingham, 1905-07, Talbot, 1947 and Wynter Blyth, 1957).

Butterflies belong to order Lepidoptera (endopterygota) and are active fliers during the day time (diurnal). The diversity and distribution of a particular species of butterfly is dependent not only on the geography of the area and the ability of the species to move around within it, but also on the ecological demands of the species. Many species of butterflies are nectar feeders and thus, frequently visit flowers and move from one flower

to another. They undoubtedly perform beneficial role in assisting with plant pollination, on the other hand damage caused by the larvae as they feed on valuable agricultural crops is considerable. Thus, butterflies are both beneficial and detrimental to the human economy and the control of the harmful species therefore needs to be selected. Almost all butterflies are herbivores in their larval stage and would therefore compete with other herbivores for the available plant material in a particular habitat.

Therefore, it was proposed to conduct a detailed survey on the different altitudinal distribution and diversity of butterflies from Kashmir Himalayas which has a rich diversity of cropping systems, forest zones and other economically important plants at different habitats/elevations. The present study was conducted to document the butterfly species for the first time in Kashmir Himalayas. The objectives of this study were foremost to study the altitudinal distribution and diversity of butterfly species in various habitats found in the region.

MATERIAL AND METHODS

The butterfly fauna of Kashmir Himalayas was surveyed from March, 2006 to November, 2008. Sampling was conducted at sites dominated by the most representative vegetation types of the region. To understand the species diversity, transects of 500 m length and 12 m width were laid at different sites. Transects in each of the selected sites were surveyed on foot, one day in every week between 0800 and 1700 hrs for a period of 146 weeks. Collection was restricted only to those specimens that could not be identified with certainty. The butterflies were collected through insect collection net with telescopic handle consisting of strong wire ring (diameter 30 cm). These were killed by pinching their thorax by taking proper care or by killing the small specimen by

ethyl acetate and finally placed in paper envelop. The collected specimens were placed in hot air oven for about 1 hr at 40 °C and later on transferred in relaxing chamber for 24 hrs containing moist absorbent cotton and few drops of phenol to avoid any fungal growth. Later on the specimens were pinned by entomological pins of different sizes according to the size of specimen. The pinned specimens were put on the stretching board after relaxing their wings, abdomen and legs. Stretched specimens were transferred to the insect cabinets with proper labels. The storage boxes were poisoned with ethyl acetate soaked cotton and naphthalene powder filled the side grooves of boxes. The specimens were preserved in the insect cabinets by using standard preservation techniques (Borer *et al.*, 1954 and Ghosh & Sungupta 1982). The specimens were identified with the help of available literature (Doherty, 1886; Bingham, 1905-07; Antram, 1924; Evans, 1932; Talbot, 1947; Wynter Blyth, 1957; Yazai & Kitachara, 1984 and Mani, 1986). The eggs and larvae observed during the surveys were collected and reared on their respective host plants in the laboratory up to adult emergence. Species identification was done by dissecting the male/female genitalia. Diversity was calculated by using Shannon-Wieners Diversity Index, $H' = -\sum P_i (\ln P_i)$. Regions of Anantnag, Baramulla, Bandipora, Budgam, Kupwara, Pulwama, Srinagar, Ganderbal, Shopian, Kulgam, Kargil, Leh, Jammu, Rajori, Poonch, Udhampur, Doda, Kishtwar, Ramban, Reasi and Samba districts located at different habitats and elevations ranging from 400 to 5500 m above msl having dense vegetation and rich diversity in floral wealth and variety of agricultural crops were selected for the collection of butterflies. All the identified specimens have been deposited in the entomological museum of Division of Entomology, Sher-e-Kashmir University of Agricultural Sciences and Technology of Kashmir, Shalimar Campus, Srinagar for future

references. Forest Research Institute, Dehradun and Indian Agricultural Research Institute, New Delhi were consulted for references.

RESULTS AND DISCUSSION

During the study period 68 species of butterflies (Table 1) belonging to 7 families under 38 genera were found. Family Nymphalidae contributed maximum number of species (27) followed by Pieridae (21), Papilionidae (7), Lycaenidae (7), Danaidae (4), Libytheidae and Hesperidae (1 species each).

Out of 68 species recorded during the present investigation, 32 species have already been reported (Talbot, 1947, Bingham, 1905-07 and Wynter Blyth, 1957). Thirty six species have been recorded for the first time from this region (Table

3) after consulting the recently published reference book (Dar *et al.*, 2002). However, 32 species which were earlier reported could not be found during the present study period. It is likely that many more species could be added to the list on further exploration of the remotest areas of Kashmir Himalayas. Species diversity was found highest in the case of family Nymphalidae and Pieridae (0.15), while it was lowest in Danaidae and Papilionidae (0.05). Species richness was found highest in Nymphalidae (8.75) followed by Pieridae (6.73) and lowest in Danaidae (1.0). The dominant species recorded have been identified as *Danais chrysippus* (Danaidae), *Tractrocera maevius* (Hesperidae), *Lycaena phlaeas* (Lycaenidae), *Junonia orithya ocyale* (Nymphalidae), *Papilio machaon* (Papilionidae) and *Pieris brassicae* (Pieridae).




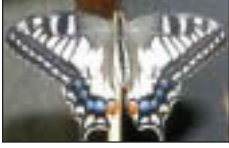





Table 1. Diversity of different butterfly species from Kashmir Himalayas



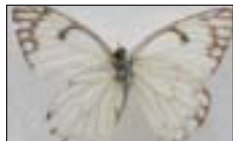


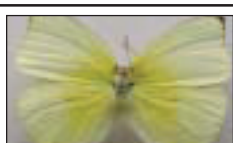


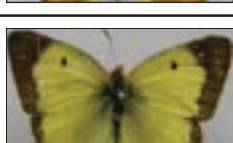

Family	Number of genera	Number of species	Number of individuals	Species diversity (H)	Species richness (R1)	Dominant species
Libytheidae	01	01	05	0.0	0.0	x
Danaidae	03	04	43	0.05	1.0	<i>Danais chrysippus</i> Linnaeus
Hesperidae	01	01	50	0.06	0.0	<i>Tractrocera maevius</i> Fabricius
Lycaenidae	05	07	160	0.12	2.02	<i>Lycaena phlaeas</i> (Linnaeus)
Nymphalidae	19	27	370	0.15	8.75	<i>Junonia orithya ocyale</i> (Linnaeus)
Papilionidae	02	07	42	0.05	2.02	<i>Papilio machaon</i> (Linnaeus)
Pieridae	07	21	280	0.15	6.73	<i>Pieris brassicae</i> Linnaeus





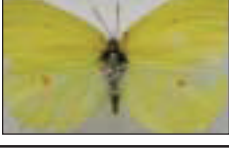





Table 2. Altitudinal distribution of different families of order Lepidoptera




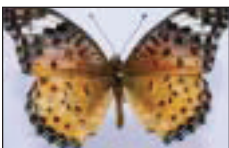

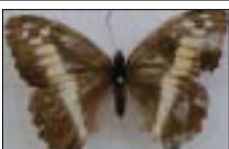




Altitudinal distribution (m above msl)	Name of the family	Number of families
0 – 1000	Danaidae, Nymphalidae, Pieridae	03
1000 – 2000	Libytheidae, Hesperidae, Lycaenidae, Nymphalidae, Pieridae, Danaidae	06
2000 – 3000	Hesperidae, Lycaenidae, Nymphalidae, Papilionidae, Pieridae, Danaidae	06
3000 – 4000	Hesperidae, Lycaenidae, Nymphalidae, Pieridae, Papilionidae, Danaidae	06
4000 – 5000	Danaidae, Hesperidae, Lycaenidae, Nymphalidae, Pieridae	05
5000 – 5500	Nymphalidae, Pieridae	02




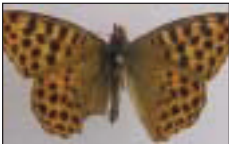






Table 3. List of butterfly species identified from Kashmir Himalayas

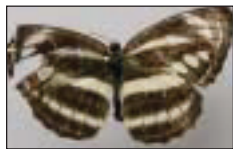



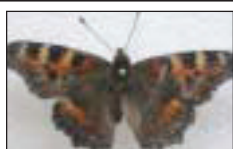
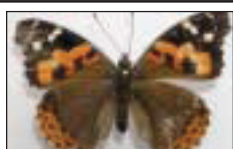




Family /Genera	Species	Common name	Ecological status	Visuals
Papilionidae <i>Papilio</i>	<i>demoleus</i> Linnaeus	Lime butterfly	C	
<i>Papilio</i>	<i>helenus</i> (Linnaeus)	Red helen	R*	
<i>Papilio</i>	<i>maackii</i> Menetries	Alpine black swallowtail	C*	
<i>Papilio</i>	<i>machaon</i> (Linnaeus)	Yellow swallow tail	C*	
<i>Papilio</i>	<i>paris</i> Linnaeus	Paris peacock	C*	
<i>Papilio</i>	<i>polytes</i> Linnaeus	Common mormon	C*	
<i>Parnassius</i>	<i>charitonius</i> (Gray)	Regal appollo	R	
Danaidae <i>Chortobius</i> (=Argynnis)	<i>pulchra</i> Guérin-Ménéville	Dusky meadow brown	R	
Danais	<i>chrysippus</i> Linnaeus	Plain tiger	C	






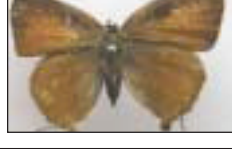
<i>Danais</i> (=Salathura)	<i>genutia</i> Cramer	Striped or Common tiger	VR*	
<i>Euploea</i>	<i>core core</i> (Cramer)	Common Indian crow	R	
Pieridae <i>Anapheis</i>	<i>aurola aurola</i> Fabricius	Pioneer or Caper white	R*	
<i>Catopsila</i>	<i>crocale</i> Cramer	Common emigrant	R*	
<i>Catopsila</i>	<i>florella</i> (Fabricius)	African emigrant	R*	
<i>Catopsila</i>	<i>pomana</i> (Fabricius)	Lemon emigrant	C*	
<i>Catopsila</i>	<i>pyranthe</i> (Linnaeus)	Mottled emigrant	C*	
<i>Colias</i> = <i>Colias</i>	<i>electo</i> (Linnaeus) <i>croceus</i> = <i>fieldii</i> (Geoffroy)	Dark clouded yellow	C	
<i>Colias</i>	<i>phiolodice</i> (Godart)	Common sulphur / Clouded sulphur	C*	
<i>Colias</i>	<i>romanovi</i> Grun- Grshimailo	NA	C*	

<i>Eurema</i>	<i>alitha</i> (C.&R. Felder)	Scalloped grass yellow	C*	
<i>Eurema</i>	<i>brigitta</i> Stoll	Small yellow or Small grass yellow	C*	
<i>Eurema</i>	<i>hecabe</i> Linnaeus	Large grass yellow	R*	
<i>Eurema</i>	<i>laeta</i> Boisduval	Spotless grass yellow	C*	
<i>Gonepteryx</i>	<i>rhamni</i> Litriella	Common brime stone	C	
<i>Ixias</i>	<i>pyrene</i> Linnaeus	Yellow orange tip	VR*	
<i>Phoebis</i>	species indet.	NA	VR*	
<i>Pieris</i>	<i>brassicae</i> Linnaeus	Large cabbage white	C	
<i>Pieris</i>	<i>canidia</i> Sparrman	Indian cabbage white	C*	
<i>Pieris</i>	<i>napi</i> (Linnaeus)	Green veined white	R*	

<i>Pieris</i>	<i>rapae</i> (Linnaeus)	Small cabbage white	C	
<i>Pontia</i> = <i>Pieris</i>	<i>daplidice</i> (Linnaeus)	Bath white	C	
Nymphalidae <i>Amecera</i> (<i>Lasiommata</i>)	<i>cashmirensis</i> Moore	NA	VR*	
<i>Argyreus</i>	<i>hyperbius</i> (Linnaeus)	Indian fritillary	C*	
<i>Ariadne</i>	<i>ariadne</i> Linnaeus	Angled castor	R*	
<i>Aulocera</i>	<i>padma</i> (Kollar)	Great satyr	C	
<i>Boloria</i>	<i>selene</i> (Devis & Schiffermuller)	Small fritillary pearl bordered	C	
<i>Callerebia</i>	<i>daksha</i> Moore	NA	C	
<i>Cepora</i>	<i>nerissa</i> Fabricius	Common gull	R*	
<i>Childrena</i>	<i>childreni childreni</i> (Gray)	Large silver stripe	UC*	

<i>Eumenis (=Nytha)</i> (=Rohana)	<i>parisatis</i> Moore	Black prince	R	
<i>Fabriciana</i>	<i>adippe</i> (Devis & Schiffermuller)	High brown fritillary	R*	
<i>Hypolimnias</i>	<i>misippus</i> (Linnaeus)	Danaid egg fly	R*	
<i>Issoria</i>	<i>lathonia</i> (Linnaeus)	Queen of spain fritillary	C	
<i>Junonia</i>	<i>almanae</i> (Linnaeus)	Peacock pansy	R*	
<i>Junonia</i>	<i>lemonias</i> (Linnaeus)	Lemon pansy	C	
<i>Junonia</i>	<i>orthya ocyale</i> (Linnaeus)	Blue pansy	C*	
<i>Lasiommata</i> (=Parage)	<i>schakra</i> (Kollar)	Common wall	C	
<i>Mycalesis</i>	<i>mineus</i> (Linnaeus)	Dark branded bush brown	R*	
<i>Neptis</i>	<i>hylas</i> Linnaeus	Common spotted sailor	R*	

<i>Neptis</i>	<i>sankara</i> Moore	Broad -branded sailor	VR	
<i>Neptis</i>	<i>soma</i> Moore	Sullied sailor	VR*	
<i>Phalantha</i>	<i>phalantha</i> (Drury)	Common leopard	UC*	
<i>Vanessa</i> (= <i>Cynthia</i>)	<i>cardui</i> (Linnaeus)	Painted lady	C	
<i>Vanessa</i>	<i>cashmirensis</i> (Kollar)	Indian tortoiseshell	C	
<i>Vanessa</i>	<i>indica</i> Herbst	Indian red admiral	C	
<i>Ypthima</i>	<i>hubneri</i> Kerby	Common four ring	R	
Libytheidae <i>Libythea</i>	<i>celtis</i> Laicharting	European beak or Nettle tree butterfly	R	
Hesperiidae <i>Tractocera</i>	<i>maevius</i> Fabricius	Common grass dart or iens	C*	
Lycaenidae <i>Deudorix</i>	<i>epijarbas</i> Moore	Cornelian	C	

<i>Lampides</i>	<i>boeticus</i> (Linnaeus)	Pea blue	C	
<i>Lycaena</i>	<i>pavana</i> (Kollar)	White-bordered copper	R	
<i>Lycaena</i>	<i>phlaeas</i> (Linnaeus)	Common copper or Small copper	C	
<i>Polyommatus</i>	<i>eros</i> (Fawcett)	The Common meadow blue	R	
<i>Polyommatus</i>	<i>icarus</i> (Rottemburg)	Common blue or icary blue	C	
<i>Virachola</i> (=Deudorix)	<i>isocrates</i> Fabricius	Common guava blue	C	

Abbreviations used: - C= common, UC = un common, R = rare, VR = very rare, * = New report , NA = not available

Family Libytheidae was found only once in Srinagar district at an altitudinal distribution ranging from 1500-1950 m above msl and has not been detected from other collection sites. The number of butterfly families varied with the altitude and showed a reduction at 4000 m above msl (Table 2). Maximum diversity of families was found between 1000 – 4000 m above msl.

The present study is the first study of this type in the area. It is very difficult to say whether any species are supported by the rich flora or species are at the verge of extinction. Therefore, it is suggested and recommended that the area under

study should be continuously monitored to observe any change in the diversity of butterflies because the changes in the diversity can only be observed through continuous monitoring and comparing the data of every year.

Overall species diversity in the study area was found to be very low. This is due to the natural climate which is generally cold, temperate and arid. This is rather unsupportive of great butterfly diversity. Thus, the lack of butterfly diversity is not entirely due to the climate but is more directly a result of low diversity of flora upon which to support greater butterfly diversity.

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