

COMMUNITY STRUCTURE AND DIVERSITY OF BUTTERFLIES IN TOLIPIR NATIONAL PARK, AZAD JAMMU AND KASHMIR (AJK) PAKISTAN

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ABSTRACT

Present study on Lepidopteran diversity was conducted over some 52 km² of Tolipir National Park during summer, 2014 using line transects sampling method. A total of 20 butterfly species belonging to two Nymphalidae and Pieridae families were recorded. The Various diversity indices, i.e. Simpson Index (0.09), Shannon Winner Index (3.05), Berger-Parker Dominance Index (0.06), Margalef's Index (3.27), Menhinick Index (0.89), Buzas and Gibson's Index (0.96) were also calculated. The Lepidoptera diversity decreased along elevation gradient (1,400 – 2,600 m asl). This study will help in understanding the total energy flow in the ecosystem and in ensuring the soil fertility of Tolipir National Park.

Keywords: Biodiversity, Conservation, National parks, soil fertility.

INTRODUCTION

Butterflies have a great aesthetic value as a symbol of beauty, awe, joy wonder, pleasure and grace on earth. These are widespread from frozen Antarctica to scorching sun of the tropics and represents nearly 80% of the total species of the Kingdom Animalia (Khan, 2004). The diverse ecological role performed by butterflies are pollinator, herbivores, and bio indicators of ecosystem (Uniyal, 1998; Tiple *et al.* 2006). Agricultural intensification, destruction, fragmentation of habitats, anthropogenic activities are directly effecting butterflies communities and alarming to global ecosystems of the world (Winfree *et al.* 2009). Their role as pollinators helps in production of food crops, seeds, fruits, sexual reproduction and genetic variation of the vascular plants, therefore, they are essential for the survival of man and animals (Maheshwari, 2003). The key role of butterflies as pollinator communities has been documented in many studies of agro-ecosystem (Biesmeijer *et al.* 2006). Butterflies are highly sensitive to climatic changes in vegetation composition and structure and their composition, community structure varies with vegetation and climate (Sawchik, 2005; Imholt, 2006). The nature of vegetation determines the dependence and survival of butterflies' communities on a particular habitat so positive relationships have been found between butterfly diversity and plant diversity (Leps and Spitzer, 1990). Sensitive butterfly species are highly specific for ovipositing, larvae feedings to specific species of plants and are more affected by urbanization than other species (Clark, 2007).

A number of studies about butterfly fauna in Azad Jammu and Kashmir are present such as those of Khan *et*

al. (2007) but no specific study is present about Tolipir area. The main objective of this research study was to document, identify and calculate diversity, species richness and evenness of butterfly fauna of Tolipir area for conservation and management purposes. The present study was conducted to prepare check list, calculate diversity, species richness of butterfly fauna of Tolipir National Park.

MATERIALS AND METHODS

Study Area: The Tolipir area is fertile with small agriculture fields scattered around the towns/ villages in patches at suitable terraces, especially in the south facing slopes (received better sun light to support growth of agricultural crops). The north facing slopes have a thicker forested growth of tall gymnosperm trees, which is associated with different shade-loving plants requiring higher humidity levels. There are fewer human habitations and agricultural fields on the north slopes of these hills, while the south slopes have scattered human populations with agricultural fields appearing at suitable slopes and terraces. Small perennial springs appear at different places and continuous flow of water from these springs maintains a continuous flow of water in small perennial stream passing through ravines, ultimately draining the water into the river Poonch. The spring/ stream water is harvested in different ways at different places and remains the main source of water for human drinking and other household activities, livestock utilization, and limited irrigation at places. The survey of butterfly sampling was conducted by line transects method along elevation gradients to enumerate the butterfly species in different vegetation types. Transects

were taken on existing patrolling paths with in fixed distance of one km in a day time from 7.00 am to 11.00 am. The captured specimen was kept in ethyl acetate bottle and subsequently identified by following keys (Roberts, 2001). For rare species of butterflies we also conducted opportunistic sampling in rare habitats.

Statistical analysis: The diversity of butterflies was calculated by following Simpson's Diversity Index(1964), Shannon – Wiener diversity index (1949), Berger-Parker Dominance Index (1970), Menhinick Index (1964).Margalef index (1958) and Buzas and Gibson's Index (1969).

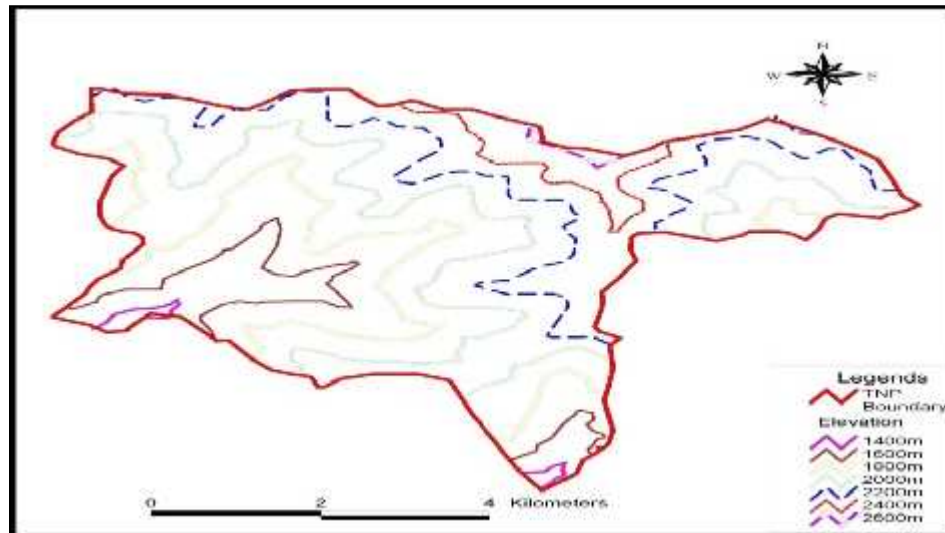


Fig. 1: Boundary marking of study area with elevation gradients of Tolipir National Park.

RESULTS AND DISCUSSION

The present survey of Tolipir National Park resulted in identification of 22 butterfly species, from samples collected from the area in/ around the national park. *Precis almanac*, *Coliaserate* and *Pieriscanidia*, have common status, and *Coliasfeldi* has uncommon status in Tolipir National Park. The rest species have abundant status (Table 2). The family Nymphalidae contain 9 genus (*Argynnis*, *Danaus*, *Junonia*, *Lethe*, *Melanites*, *Neptis*, *Papilio*, *Precis*, *Vanessa*). The family Pieridae has genus (*Colias*, *Eurema*, *Gonepteryx*, *Pieris*, *Pontia*) respectively. The genus *Argynnis* contain one species Indian fritillary (*Argynnis hyperbius*), genus *Danaus* contain two species Common tiger (*Danaus genutia*) Lesser wanderer (*Danaus chrysippus*), genus *Junonia* contain one species Blue pansy (*Junonia orithya*), genus *Lethe* contain one species Common tree brown (*Lethe rohria*), genus *Melanites* contain one species Common evening brown (*Melanites leda*), genus *Neptis* contain one species Common sailor (*Neptis hylas*), genus *Papilio* contain three species Black swallowtail (*Papilio philoxenus*), The common Mormon (*Papilio polytes*), Lemon butterfly (*Papilio demoleus*), genus *Precis* one contain species (*Precis almanac*), genus *Vanessa* contain one species Painted lady (*Vanessa cardui*). The genus *Colias* contains two species Eastern pale clouded yellow butterfly (*Colias erate*) and *Coliasfeldi*). The genus

Eurema contain one species Common grass yellow (*Eurema hecabe*), genus *Gonepteryx* contain one species brimstone butterfly (*Gonepteryx rhamni*), genus *Pieris* contain three species, Large white (*Pieris brassicae*), Small white (*Pieris rapae*) and *Pieriscanidia*. The genus *Pontia* have one species Bath white (*Pontia daplidice*).

The calculated values of different diversity index are in (Table 1). These are Simpson index (0.09), Shannon Index (3.05), Berger-Parker Dominance Index (0.06), Margalef Richness Index (3.27), Menhinick Index (0.89), Buzas and Gibson's (0.96).

Table 1. Diversity index of butterflies in Tolipir area

Diversity index	Index Range
Simpson Index	0.09
Shannon Index	3.05
Berger-Parker Dominance Index	0.06
Margalef Richness Index	3.27
Menhinick Index	0.89
Buzas and Gibson's Index	0.96

The percentage composition of different species viz. *Argynnis hyperbius*, *Danaus genutia*, *Junonia orithya*, *Eurema hecabe*, *Pontia daplidice* are 6%, *Danaus chrysippus*, *Papilio polytes*, *Gonepteryx rhamni*, *Pieris rapae*, *Pieriscanidia* are 5%, *Lethe rohria*, *Neptis hylas*, *Papilio philoxenus*, *Papilio demoleus*, *Vanessa cardui*, *Danaus chrysippus*, are 4 %,

Melanitesleda, *Precis almanac*, *Coliaserate*, *Pierisbrassicac* are 3% and *Coliasfeldi* is 2% (Fig 2). The species diversity and composition of Tolipir National Park is greater than Pir Lasura National Park of

Azad Jammu and Kashmir which has 15 butterfly species (Manzoor *et al.* 2013). Ayubia National Parks has greater biodiversity (23 butterflies) than Tolipir National Park (ANP, Management Plan 2002).

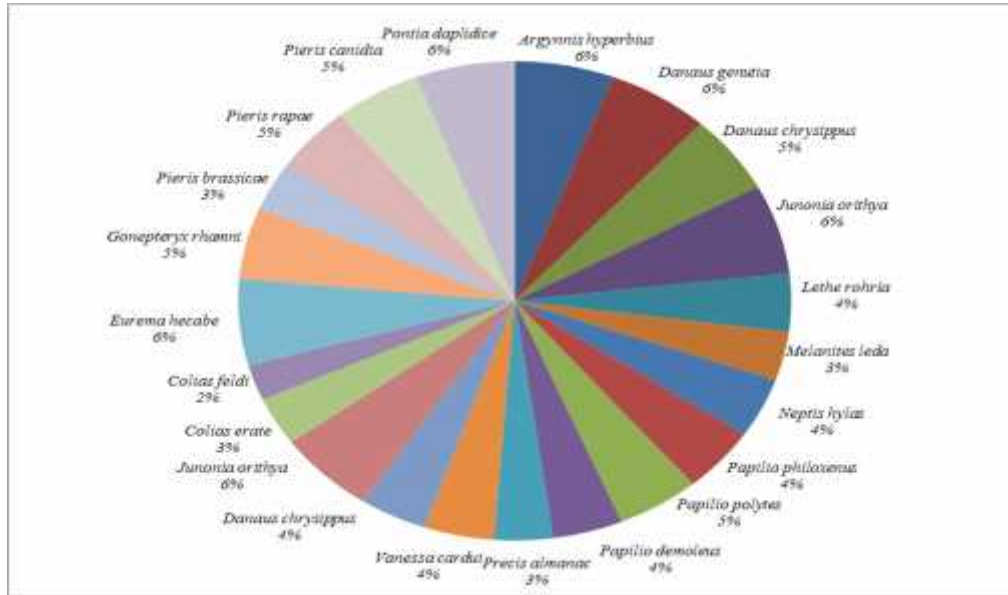


Fig 2: Percentage composition of butterflies

Table 2: Population Density with elevation gradients

Area Division	Grid1	Grid2	Grid3	Grid4	Grid5
Elevation	1369m- 669m	1801m -1998m	2078- 2188m	2202m-2395m	2406m-2633m
Family Nymphalidae	Density	Density	Density	Density	Density
<i>Argynnis hyperbius</i>	35	40	45	30	25
<i>Danaus genutia</i>	35	40	45	35	25
<i>Danaus chrysippus</i>	28	35	40	35	23
<i>Junonia orithya</i>	32	37	47	40	27
<i>Lethu rohria</i>	21	25	30	25	17
<i>Melanitesleda</i>	18	20	26	20	15
<i>Neptis hylas</i>	19	25	31	27	20
<i>Papilio philoxenus</i>	22	27	35	28	22
<i>Papilio polytes</i>	25	30	37	32	22
<i>Papilio demoleus</i>	22	25	32	25	19
<i>Precis almanac</i>	20	22	27	20	15
<i>Vanessa cardui</i>	23	27	32	22	19
<i>Danaus chrysippus</i>	23	23	31	26	16
<i>Junonia orithya</i>	30	35	42	41	25
Family Pieridae					
<i>Coliaserate</i>	17	15	22	20	25
<i>Coliasfeldi</i>	20	15	14	13	11
<i>Euremahecabe</i>	45	40	35	30	25
<i>Gonepteryxrhamni</i>	35	30	35	25	20
<i>Pierisbrassicac</i>	25	23	20	17	14
<i>Pierisrapae</i>	35	32	28	24	19
<i>Pieriscanidia</i>	40	35	30	25	23
<i>Pontiadaplidice</i>	45	40	35	30	25

There are various factors such as food, breeding habitat, co-existing species, climate, vegetation and disturbance level which shape community structure and assemblage of butterfly species. A study has been conducted on the biodiversity of butterflies from District Poonch. Few Tolipir tracts as of ours concerned study was studied by Khan *et al.* (2004). This study also not target Tolipir for its study yet the list generated under this study runs in considerable uniformity of the present one. The presently proposed list includes all species of Khan *et al.* (2004). The present list has also been confirmed through data gathered from literature (Rafi *et al.* 2000; Antram, 2002). The difference in the relative abundance of different species can be attributed to difference in the mode of collection, the sampling period, and seasonal variation in the climatic conditions. The present study was conducted in the spring season, due to which this much number of butterflies have been observed. No study is available on the host selection of these butterfly species, which needs to be studied. Such studies can help in the analysis of the role of these species in ecosystem management.

The studies on the lower chordate and invertebrate diversity and abundances are not available for this tract. Such studies are more time consuming and remain out of the scope of the present attempt. Such studies are definitely required to understand the total energy flow in the ecosystem and in ensuring the soil fertility.

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