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Diversity of Butterflies from District Bagh, Azad Kashmir

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Abstract: The adult butterflies were collected from ten localities of Distt. Bagh through out the year 1998. A total of 27 species belonging to 5 families and 15 genera were collected. Diversity was calculated by using Shannon-Wiener's diversity index, Shannon's equitability, Margalef's index, Simpson's index and RI index. The calculated values showed that diversity was slightly higher at Sudhan Gali and Mang Bajri, where as it was lower at Naumanpura. None of the reported species was found to be threatened to become extinct or found to be favored by enriched flora.

Key Words: Diversity, butterflies, diversity indices, Bagh, Azad Kashmir

INTRODUCTION

Since the dawn of the time the butterflies have been regarded as the symbol of the beauty and grace. Their marvelous colors, shapes and graceful flights give pleasure to every one. (Dal, 1978). Butterflies are found almost in every part of the world where ever flowering plants are found, inhabiting even very high altitude except Arctic, Anarctic and mountains covered with perpetual snow and glaciers (Hassan, 1977., Khan, *et al.*, 2000 and Rafi, *et al.*, 2000). District Bagh of Azad Kashmir is a diverse climatic region starting from very hot areas like Bagh city, Naumanpura and Mangbajri to very cold areas like Dhirkot and Sudhangali. The fauna of the area under study was completely unexplored and it is the first attempt to explore the butterfly fauna and to calculate distributional diversity of the butterflies in the area.

MATERIALS AND METHODS

The specimens were collected from ten localities of District Bagh namely: Dhirkot, Chammyati, Chamankot, Arja, Mangbajri, Sudhangali, Harigal, Bagh city, Naumanpura and Paddar (Fig.1). The localities were visited trough out the summer season, starting from mid March to end of October. The specimens were identified with the help of available literature to the species level. The rank lists were prepared from each locality according to the maximum abundance and one collective list was also prepared from the whole district (Table 2).

To calculate the diversity of the butterflies four diversity indices were used namely: Shannon and Wiener's diversity index (Shannon and Wiener, 1963), with its equitability component, Margalef's index (Margalef, 1968; 1969), Simpson's index, (Simpson, 1949) and R I index (Nakamura and Toshima, 1995).

The form of Shannon–Wiener diversity index is: $H = -\sum (p_i) (\log_2 p_i)$, Where “pi” is the proportion within the sample of the number of individuals of “ith” species and it is denoted as n_i/N , Where “ni” is the number of “ith” species and “N” is the total number of individuals. But the form of index used in present study is: $H = C \{ \log_{10} N - 1/N \sum (\log_{10} n_r \log_{10})$. Where “N” is the total number of individuals, “nr” is the rank abundance in “ith” species and “C” is the conversion factor from \log_2 to \log_{10} . The form of Shannon's equitability used is: $J = H/H_{max}$, where “H” is the Shannon–Wiener's diversity index and H_{max} is the \log_2 of the “S” where, “S” is the total number of species in the sample. The form of Margalef's index used is: $D = S - 1 / \log_e N$, Where “S” is the number of species and “N” is the number of individuals. The Simpson's index is: $D = 1 - \sum (p_i)^2$, Where, “pi” is the proportion of “ith” species and is calculated as “ n_i/N ”, where, “ni” is the number of individuals in “ith” species and “N” is the total number of individuals in the sample but the form of index used in the present study is: $D = \sum [n_i(n_i - 1) / N(N - 1)]$, where, “ni” is the number of individuals in “ith” species and “N” is total number of individuals. The last index used is RI index (Nakamura and Toshima, 1999). The form of index used is $RI = \sum / (S (M - 1))$, Where, “S” is the number of investigated species of insects, “M” is the number of rank of abundance (0, 1 and 2... M-1) and RI is the rank value of “ith” species.

RESULTS AND DISCUSSION

One of the major features of the animal communities is their diversity that it is the number of species present and their numerical composition. Diversity is niche time stability dependent meaning if a large number of niches are available, higher diversity is found, In general, homogenous conditions yield lower diversity whilst

Table 1: Calculated values of diversity indices

Name of Place	Shannon-Wiener index	Shannon's equitability	Margalef's index	Simpson's index	RI index
Dhirkot	3.397	0.954	2.856	0.085	0.059
Chammyati	3.601	0.869	3.625	0.097	0.558
Chamman Kot	3.217	0.936	2.729	0.101	0.600
Arja	3.035	0.900	2.484	0.135	0.622
Mong Bajri	3.299	0.960	2.940	0.075	0.600
Sudhan Gali	3.451	0.912	3.108	0.089	0.324
Hari Gal	3.430	0.933	2.907	0.087	0.307
Bagh	2.861	0.960	2.038	0.113	0.064
Nauman Pura	2.050	0.815	1.642	0.021	0.700
Paddar	3.269	0.951	2.692	0.180	0.536

heterogeneous conditions yield higher diversity (Sanders, 1978; Gray, 1980).

Diversity indices are a measure of way in which individuals in an ecological community are distributed among species. A coefficient of diversity is a convenient way of demonstrating the variety of species in a habitat or sample and the abundance of the individuals within species. The measure of the diversity of fauna will represent the number and availability of niches present in that environment. If niche heterogeneity is greater it will support a more diverse fauna and thus result in a higher co-efficient or index of diversity (Alatolo, 1981).

The first index calculated was Shannon-Wiener diversity index. This index is distribution dependent and suffers least from criticism of validity in application to biological data (Gray, 1980). The calculated value ranged from 2.093 (at Naumanpura) to 3.601 (at Chammyati), while from remaining all the stations this index ranged 2.861

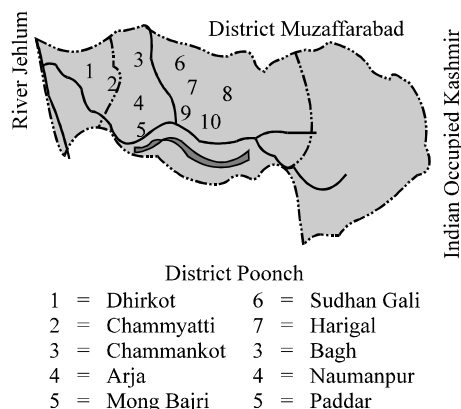


Fig. 1: Map of district Bagh, Azad Kashmir

(Bagh city) to 4.451 (Sudhangali, Table 1). This index shows that the butterflies were richly distributed at the stations where vegetation was abundant, where as the stations like Naumanpura and Bagh city due to less flowering plants and less vegetation the fauna was poorly distributed. Similarly Shannon's equitability ranged from 0.81 to 0.960 which shows that fauna was well distributed.

Margalef's index ranged from 1.642 (Naumanpura) to 3.652 (Chammyati). Where as all other stations the value of the index ranged from 2.038 to 3.102, which indicates that species richness was not very high.

Table 2: Collective Rank list along with the lists of Taxa collected from different localities of District Bagh

Name of Taxa	Abundance	Dhirkot	Chamyati	Chamman Kot	Arja	Mung Bajri	Suddan Gali	Hari Ghal	Bagh City	Numman Pura	Paddar
<i>Pieris brassicae</i>	80	6	19	6	9	4	7	6	6	10	7
<i>Junonia orithya</i>	40	3	7	6	3	3	4	2	4	4	4
<i>Pieris cinidia</i>	31	3	6	2	3	4	1	3	5	1	3
<i>Papilio philoxenus</i>	29	9	9	3	-	-	-	-	-	-	8
<i>Pontia daplidice</i>	28	-	4	4	-	4	5	-	5	-	6
<i>Gonopteryx rhamni</i>	26	4	3	-	5	2	4	8	-	-	-
<i>Danaus genutia</i>	25	-	-	-	16	-	-	9	-	-	-
<i>Eurema hecabe</i>	23	5	6	-	4	3	2	-	-	3	-
<i>Pararge schakara</i>	21	-	21	-	-	-	-	-	-	-	-
<i>Papilio demoleus</i>	21	2	8	8	-	-	-	-	-	-	3
<i>Pontia collidica</i>	20	-	4	2	3	4	-	3	4	-	-
<i>Eurema lacta</i>	18	-	5	-	4	2	-	4	3	-	-
<i>Vanessa cardui</i>	15	1	-	-	-	-	10	4	-	-	-
<i>Argynnis kamala</i>	15	-	1	1	7	-	-	3	3	-	-
<i>Precis almanac</i>	12	-	-	-	-	-	11	-	-	-	1
<i>Argynnis hyperbuis</i>	11	-	-	1	-	-	6	-	-	-	4
<i>Melanitis leda</i>	10	-	-	-	1	-	-	9	-	-	-
<i>Colias erate</i>	10	3	2	-	-	-	3	2	-	-	-
<i>Catopsila pyranthe</i>	9	2	-	-	-	2	3	-	-	2	-
<i>Papilio polyctor</i>	8	1	1	4	-	-	-	-	-	-	2
<i>Danaus chrysippus</i>	8	-	-	-	-	-	-	8	-	-	-
<i>Vanessa polychloros</i>	8	-	-	-	-	-	8	-	-	-	-
<i>Colias electo</i>	7	3	1	-	-	1	1	1	-	-	-
<i>Papilio polytes</i>	6	2	1	1	-	-	-	-	-	-	2
<i>Nepitís hylas</i>	6	-	5	-	-	-	-	-	-	1	-
<i>Catopsila florella</i>	5	-	-	-	1	1	1	-	1	-	1
<i>Lethe rohria</i>	2	-	2	-	-	-	-	-	-	-	-

The value of Simpson's index ranged from 0.075 at Mangbajri to 0.261 at Naumanpura. The calculated value of this index showed that abundance was not very high (Table 1). District Bagh of Azad Kashmir has very diverse flora. Some areas like Chammyati, Sudhangali and Dhirkot are densely rich with diverse flora and some areas has very patchy flora like Naumanpura, Arja and Mangbajri. The former areas support high diversity where as the latter areas support low diversity.

All the indices used concluded that the butterflies are normally distributed in the area and neither any species are reported to be supported by the enriched flora nor were any species threatened to become extinct. However, it is suggested that the diversity of butterflies in the area should be continuously monitored to observe if further any changes occur in the diversity of butterflies in this area.

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