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Community structure and diversity of butterfly of Kondajji Forest, Harihar Taluk, Davanagere District, Karnataka, India

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Abstract

Butterflies were enumerated during February 2007 to January 2008 using Pollard walk method to assess the species diversity in the scrub jungle habitats of Kondajji forest, Harihar, Davanagere District, Karnataka. A total of 53 butterfly species belonging to Hesperidae, Papilionidae, Pieridae, Lycaenidae and Nymphalidae families were recorded. Six species of butterflies recorded from this region have a protected status under the Indian Wildlife (Protection) Act, 1972. Habitat destruction in terms of anthropogenic activities can be a potential threat to this area and is suggested to be the reason for the reduction of species richness and abundance of butterflies in the study site.

Keywords: Butterfly diversity, Community Structure, Kondajji forest, Nymphalidae, *Hypolimnas misippus*, Harihar, Threatened species.

1. Introduction

More than half of earth's diversity comprises the insects. Worldwide there are more than 28,000 species of butterflies, of which about 80 percent found in tropical regions. The Indian subcontinent with a diverse terrain, climate and vegetation hosts about 1,504 species of butterflies [1]. Butterflies are commonly referred to as "insects of the sun" with their eye catching colour and delicate charisma and play a significant role in both ecological and economical benefits to human beings. Butterflies enhance aesthetic value due to their diverse colors on their wings, behavioral display and actively involved in pollination thus help in seed setting of plants [2,3]. Changes in their abundance and distribution have been linked to a various factors, including habitat loss and fragmentation, land use and climate change [4].

Butterflies attracted the attention of researchers, ecologists and conservationists by their community assemblage and the influencing factors. The occurrence of butterflies is habitat specific and seasonal [5]. Thereby butterflies are considered as the potent ecological indicators of habitat quality and are sensitive to habitat disturbance caused by both manmade anthropogenic activities and natural factor including the temperature, humidity, and light levels [6-9].

Some workers have subsequently worked on the species composition, richness, diversity and distribution of butterflies in different parts of the world [10-17]. Thus the present study aimed to explore the species richness and diversity of butterflies in Kondajji forest of Davanagere District, Karnataka, India which might be helpful to improve the habitat, pave the way for future research and formulation of an effective strategy for conservation of this important group of insects.

2. Materials and methods

2.1. Study Area

Kondajji forest is situated 13 km from Davanagere District, a minor hilly tropical scrub jungle, well known as recreational spot and for a major scout and guide training center in South India and also a famous wetland called Kondajji Lake present in the mid of the forest, which provide irrigation to surround agricultural lands and for aqua-cultural activities, which attracts many tourist for water sports activities like boating, etc., and also attracts many wetland and wetland dependent birds in different seasons throughout the year. The wind power generation plant has also been implemented on the hills by the state government. The forest is located between 14°34'25.8" N latitude and 75°53'07.8" E longitude and belongs to Deccan Plateau scrub jungle characterized by vast stretches of undulating plains with intermittent parallel chains of hills, mostly bare and stony boulder outcrops.

2.2. Sampling of butterflies and their identification

A survey on butterfly diversity was conducted during February 2007 to January 2008 at an interval of once in a month for a period of one year to record their status and abundance. Pollard line transect method developed by the Institution of Terrestrial Ecology was followed to monitor the diversity [18]. Butterflies were encountered along the fixed line transect route (approximately 600 m in length) in the Kondajji forest, carried out between 0700 hr and 1000 hr and identified by using various field guides [2, 8, 19, 20]. The presence-absence scoring method was made during the entire study period. On the basis of percentage of occurrence, the status of butterflies was determined and categorized into three groups, 1-6% as rare (R), 7-18% as Common (C) and >18% as very common (VC).

3. Results and Discussion

During the study a total of 53 species of butterflies, belonging to five families were recorded (Table 1). Among the 53 species recorded, the analysis on the status of butterflies shows that 11 were rare, 28 were common and 14 were very common, which contributed 21%, 26% and 53% of species wise frequency of occurrence of butterfly fauna of the study area (Fig.1). Similar pattern was reported in and around the Jogimatti state forest of Chitradurga [11], Daroji Sloth Bear Sanctuary of Bellary district [12] and in Kundavada Lake of Davanagere district [13] in Karnataka.

During the study period, the family Nymphalidae, a largest group of butterflies was found to be the most dominant with highest number of butterflies (18 species), contributed 34% of total family wise frequency of occurrence of butterfly fauna from the study area and few of them are distributed throughout the year (Fig.2). Among them, Danaid Eggfly *Hypolimnas misippus* is endemic to Peninsular India and Sri Lanka. This predominance of Nymphalids was reported by earlier workers also [5, 8, 12, 21] from Western Ghats to Eastern Ghats and Deccan plateau.

The Pieridae with the most familiar butterflies, which includes of about 35 butterfly species of Peninsular India, out of which 33 species are found in Western Ghats, was found to be the second most dominant family with 15 butterfly species, which contributed 28% of total family wise frequency of occurrence of butterfly fauna from the study area (Fig.2). Among them, Common Jezebel *Delias eucharis* is endemic to Peninsular India and Sri Lanka.

The family Lycaenidae with a group of smallest butterflies, represented with 10 species, contributed 19% of total family wise frequency of occurrence of butterfly recorded from the study area (Fig.2), which includes the most commonly sighted butterfly species such as, Common Pierrot *Castalius rosimon*, Common Cerulean *Jamides celeno* and Dark Grass Blue *Zizeeria karsandra*.

The family Papilionidae, which include over 105 species of swallowtails recorded in India, among them 19 species are found in Peninsular India, was represented with minimum number of butterflies (6 species) which contributed 11% of total family wise frequency of occurrence of butterfly were recorded from the study area (Fig.2), which includes two important species like, Crimson Rose *Pachliopta hector*, endemic to Western Ghats and Blue Mormon *Papilio polymnestor*, endemic to Peninsular India and Sri Lanka.

The family Hesperidae represented very less and found to be the least contributor (8%) with four species when compared to the other families from the study area (Fig.2). This may be partly due to the sampling bias or since they exhibit crepuscular habit, i.e. they are active in the early morning and to a less in the evening [21].

The level of endemism varies from southern India to the Indian sub-continent, which depends upon the accessibility of larval as well as adult food resources as the limiting factor to determine the occurrence and migration of butterflies [22]. The study area harbours four endemic butterfly species, viz- one species, *Pachliopta hector*, endemic to Western Ghats and three species, viz- *Papilio polymnestor*, *Hypolimnas misippus* and *Delias eucharis* were recorded are endemic to Peninsular India and Sri Lanka [11, 12, 16]. Among the 53 butterflies, six specie viz- *Pachliopta hector*, *Hypolimnas misippus*, *Lampides boeticus*, *Castalius rosimon*, *Euthalia aconthea* and *Euploea core*, were recorded in this region have a protected status under the schedule I part IV, Schedule II part IV of Indian Wildlife Protection Act, 1972 [2, 8, 23, 24].

Butterflies are susceptible to habitat disturbance and environment alternation, a little change in this influence on their distribution and abundance pattern [6]. The anthropogenic pressure like, habitat fragmentation, grazing pressure, firewood collection and change in land use patterns are main cause for loss of diversity of both butterflies and plants and leads to local extinctions of species [12].

The diversity and abundance of butterfly species is greatly associated with the availability of food plants in the surrounding habitat [21], consequently the lack of butterfly diversity is not entirely due to the climate but is more directly a result of low floral diversity leading to support greater butterfly diversity [12].

Occurrence of all these schedule and endemic species in the study area indicates that the this area is rich in butterfly diversity; hence there is an urgent need to protect this habitat by adapting long term monitoring programs to manage and conserve the diversity of butterfly in Kondajji forest of Davanagere District.

Table 1: List of butterflies along with their status in the Kondajji Forest, Davanagere.

Sl. No	Common name	Scientific name	Status
Family: Papilionidae			
1	Common Blue Bottle	<i>Graphium sarpedon</i> (Linnaeus)	R
2	Crimson Rose*	<i>Pachliopta hector</i> (Linnaeus)	C
3	Common Rose	<i>Pachliopta aristolochiae</i> (Fabricius)	R
4	Tailed Jay	<i>Graphium agamemnon</i> (Linnaeus)	C
5	Blue Mormon**	<i>Papilio polymnestor</i> (Cramer)	R
6	Common Mormon	<i>Papilio polytes</i> (Linnaeus)	C
Family: Lycaenidae			

7	Common Silverline	<i>Spindasis vulcanus</i> (Fabricius)	C
8	Common Pierrot	<i>Castalius rosimon</i> (Fabricius)	VC
9	Common Cerulean	<i>Jamides celeno</i> (Cramer)	VC
10	Dark Cerulean	<i>Jamides bochus</i> (Stoll)	C
11	Dark Grass Blue	<i>Zizeeria karsandra</i> (Moore)	VC
12	Pea Blue	<i>Lampides boeticus</i> (Linnaeus)	C
13	Large Oak Blue	<i>Arhopala amantes</i> (Hewitson)	C
14	Indian Oak Blue	<i>Arhopala atrax</i> (Hewitson)	C
15	Oriental Grass Jewel	<i>Freyeria putli</i> (Kollar)	C
16	Red Pierrot	<i>Talicauda nyseres</i> (Guerin-Meneville)	C
Family: Nymphalidae			
17	Common Castor	<i>Ariadne merione</i> (Cramer)	C
18	Tawny Coaster	<i>Acraea violae</i> (Fabricius)	VC
19	Blue Tiger	<i>Tirumala linniaee</i> (Cramer)	VC
20	Plain Tiger	<i>Danaus chrysippus</i> (Linnaeus)	R
21	Striped Tiger	<i>Danaus genutia</i> (Cramer)	C
22	Indian Common Crow	<i>Euploea core</i> (Cramer)	VC
23	Danaid Eggfly**	<i>Hypolimnas misippus</i> (Linnaeus)	C
24	Lemon Pansy	<i>Junonia lemonias</i> (Linnaeus)	VC
25	Peacock Pansy	<i>Junonia almana</i> (Linnaeus)	C
26	Yellow Pansy	<i>Junonia hierta</i> (Fabricius)	VC
27	Chocolate Pansy	<i>Junonia iphita</i> (Cramer)	C
28	Grey Pansy	<i>Junonia atlites</i> (Linnaeus)	R
29	Common Evening Brown	<i>Melanitis leda</i> (Linnaeus)	VC
30	Common Sailor	<i>Neptis hylas</i> (Moore)	VC
31	Common Leopard	<i>Phalanta phalantha</i> (Drury)	R
32	Common Four Ring	<i>Ypthima baldus</i> (Fabricius)	VC
33	Common Baron	<i>Euthalia aconthea</i> (Cramer)	C
34	Common Bushbrown	<i>Mycalesis perseus</i> (Fabricius)	VC
Family: Pieridae			
35	Indian Cabbage White	<i>Pieris canidia</i> (Linnaeus)	C
36	Crimson Tip	<i>Colotis danae</i> (Linnaeus)	C
37	Pioneer	<i>Anaphaeis aurota</i> (Fabricius)	VC
38	Common Emigrant	<i>Catopsilia pomona</i> (Fabricius)	C
39	Common Jezebel**	<i>Delias eucharis</i> (Drury)	C
40	Common Grass Yellow	<i>Eurema hecabe</i> (Linnaeus)	VC
41	Great Orange Tip	<i>Hebomoia glaucippe</i> (Linnaeus)	C
42	Plain Orange Tip	<i>Colotis aurora</i> (Cramer)	C
43	White Orange Tip	<i>Ixias marianne</i> (Cramer)	C
44	Yellow Orange Tip	<i>Ixias pyrene</i> (Linnaeus)	C
45	Large Salmon Arab	<i>Colotis fausta</i> (Olivier)	R
46	Small Salmon Arab	<i>Colotis amata</i> (Fabricius)	R
47	Common Wanderer	<i>Paretonia valeria</i> (Joicey & Talbot)	R
48	Western Striped Albatross	<i>Appias libythea</i> (Fabricius)	R
49	Common gull	<i>Cepora nerissa</i> (Fabricius)	C
Family: Hesperiiidae			
50	Indian Skipper	<i>Spialia galba</i> (Fabricius)	C
51	Oriental Grass Dart	<i>Taractrocera maevius</i> (Fabricius)	R
52	Rice Swift	<i>Borbo cinnara</i> (Wallace)	C
53	Chestnut Bob	<i>Iambrix salsala</i> (Moore)	C

VC-Very common; C-Common; R-Rare, *-Endemic to Western Ghats; **-Endemic to Peninsular India and Sri Lanka

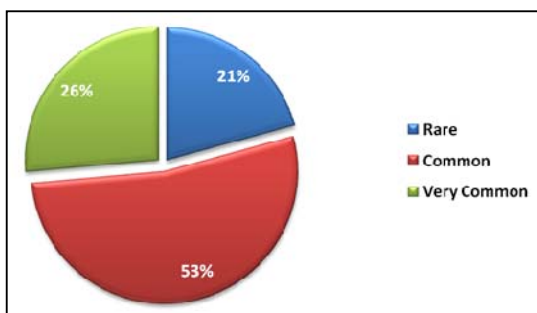


Fig 1: Species frequency of occurrence of butterflies in Kondajji forest

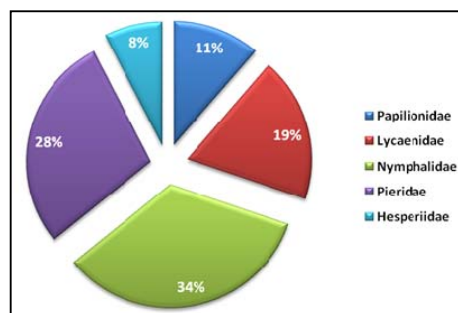


Fig 2: Family wise frequency of occurrence of butterflies in Kondajji forest

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