



ISSN NO. 2320-5407

Journal homepage: <http://www.journalijar.com>

INTERNATIONAL JOURNAL
OF ADVANCED RESEARCH

RESEARCH ARTICLE

Diversity of butterflies and their habitat association in four different habitat types in Kanha-Pench corridor, Madhya Pradesh, India

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Manuscript Info

Manuscript History:

Received: 22 November 2014

Final Accepted: 26 December 2014

Published Online: January 2015

Key words:

Habitat, Relative abundance, Diversity, Wildlife (Protection) Act, 1972

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Abstract

The study was carried out in four different habitat types in Kanha - Pench corridor in Central India during months of October and November, 2014. A total of 1092 individuals of 59 species belonging to six families – Hesperidae, Papilionidae, Pieridae, Nymphalidae, Lycaenidae and Riodinidae - were recorded in the survey. The relative abundance was highest for Nymphalidae (26 species, 44.1%) and lowest for Riodinidae (1 species, 1.7%). Nymphalidae was found to be the dominating family in study area with maximum individuals (465) and species (26) registered under this family. 7 species were found to be listed under different schedules in Wildlife (Protection) Act, 1972. Shannon-Weiner index was used for calculating diversity of butterflies which was found to be highest in forest area (3.87), and least was recorded from human affected area (3.09). For understanding their population status and ecological needs, it's important to conduct studies on monitoring of species diversity and their association with habitat.

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INTRODUCTION

About three quarters of all known animals on earth are comprised of insects and it is estimated that it is a very small fraction of large number of insect species that still remain to be discovered (Wijesekara & Wijesinghe, 2003). Among these insects, butterflies being a good indicator of the health of terrestrial biome (Kunte, 2000; Aluri & Rao, 2002) and environmental quality (Varshney, 1993; Kremen, 1994; Kocher & Williams, 2000; Koh & Sodhi, 2004) occupy an important position in ecosystem (Ghazoul, 2002; Robbins & Opler, 1997) and are ideal subject for ecological studies of landscapes (Thomas & Malorie, 1985).

The adult butterflies act as pollinators and help in pollination of many native plants. To a large extent, butterflies (being a pollinating agent) contribute to the growth, maintenance and expansion of flora in the tropical regions where these insects show high abundance and species diversity (Bonebrake et al., 2010). For many predators like birds, lizards these butterflies both in larvae and adult stage act as their prey species. In the present day scenario, due to fragmentation of habitat and depletion of natural cover many species of butterfly are facing threat to their existence. For assessing large scale biodiversity trends, it's important to keep assessing the change in their abundance and distribution.

India is home to about 1504 species of butterflies (Tiple, 2011) which is about 8.74% of total butterfly species of world and constitute 65% of total Indian fauna. Different species of butterfly are supported by different ecosystems of our country. Many studies have been documented on the butterflies of central India starting from 1880s

(Forsayeth, 1886; Betham, 1890, 1891; Wit, 1909). 177 species were recorded by D'Abreu in 1931 in the erstwhile Central Provinces which are now Madhya Pradesh and Vidarbha.

Appropriate abiotic and biotic factors such as climate condition, temperature and wind exposure, availability of host and larval plants (Barlow et al., 2007), food and vegetation (Ravindra et al., 1996; Khan et al., 2004; Jain & Jain, 2012; Kharat et al., 2012; Kumaraswamy & Kunte, 2013), topographic features (Amala et al., 2011), habitat quality (Barlow et al., 2007) are some of the most important parameters to determine butterfly composition in a community. The present study was conducted to estimate diversity and habitat association of butterfly community across four different habitat types along Kanha-Pench corridor in Central India.

STUDY AREA

The study was conducted along Kanha - Pench Corridor (79°30' 05" to 80° 32' 55" and 21° 45' 15" to 22° 24' 20") in Madhya Pradesh during months of October and November, 2014.

The area is rich in biodiversity with Teak dominating the forest followed by Sal forests and mixed deciduous forest. The large mammal assemblage consists of large carnivores like tiger, leopard, sloth bear, dhole, hyena, jackal and wolf and large bodied herbivores such as gaur, nilgai and sambar. Chital, barking deer, blackbuck, and four horned antelopes are also found in this forest area. The area also supports a rich avian fauna (Jaypal et al., 2005).

MATERIALS AND METHODS

Field survey of butterfly fauna was conducted across 4 sites in corridor covering 4 different types of habitat –across river bed (Site 1), forest area (Site 2), near human settlement (Site 3) and open scrub land (Site 4). The sites were decided in such a way that a minimum distance of 15 km was maintained in between them. The observers walked for 4 km and looked for butterflies in 5m wide area on both side of transects. The study was carried out during morning from 7 am to 10 am. The photographs were taken on the fields which were later identified using The Book of Indian Butterflies (Kehimkar, 2008) and Common Butterflies of India (Gay et al., 2008).

The Shannon diversity index was used to estimate butterfly species diversity along the habitats (Shannon & Wiener, 1949).

The species were further divided into 4 categories: Very Common (VC), Common (C), Not Rare (NR) and Rare (R) on the basis of their count from the study area. Any species with count less than 10 times were placed in rare category, count between 10 and 15 were placed in not rare category, count between 15 and 20 were categorized as common while species with count more than 20 times were placed in very common category.

RESULT

During study, species from 6 families were recorded, details about which can be found in Table 1.

The status of different families on the basis of their count can be seen in Figure 1 and Figure 2 shows percentage of each category in the study area.

Shannon-Weiner index component ranged from 3.87 in site 2 to 3.09 in site 3 (Table 2).

DISCUSSION AND CONCLUSION

During the survey, a total of 1092 individuals of 59 species of butterfly belonging to 44 genera and 6 families were recorded from four habitat types of corridor. Occurrence of maximum number of species was recorded in the family Nymphalidae and Lycaenidae which could be attributed to the presence of their larval and host plants.

Among the families Nymphalidae was dominant in terms of species composition and abundance with 26 species covering about 44.1 % of all the species in area followed by Lycaenidae (13 species, 22%), Pieridae (9 species, 15.3%), Hesperidae (6 species, 10.2%), Papilionidae (4 species, 6.8%) and Riodinidae (1 species, 1.7%). Out of 1092 individuals 465 individuals were identified from Nymphalidae family followed by Pieridae with 357 individuals, Lycaenidae with 177 members, Papilionidae with 49 individuals, Hesperidae with 34 individuals and least 10 individuals were recorded in Riodinidae family. Total 44 genera were identified during study with Nymphalidae (16 genera, 36.4%) being the dominant one followed by Lycaenidae (11 genera, 25%), Hesperidae and Pieridae (both 6 genera, 13.6%), Papilionidae (4 genera, 9.1%) and least in Riodinidae family with 1 genera (2.3%).

Highest diversity of site 2 (3.87) can be explained on the basis of availability of wide range of larval and host plants favorable to several species of butterflies and having just the right canopy allowing appropriate sunlight to penetrate through it on to the ground. Site 4's (3.63) diversity can be attributed to the presence of open area and shrub species along with exotic species like *Lantana camara*. Raju and Reddy in 1995 showed that urbanized and degraded habitat

harbors the exotic species of *Lantana camara* which is an important source of nectar for several species of butterflies. While site 1 (3.16) satisfied the water requirement of many species that were observed performing mud puddling during the study and were also harboring certain larval and host plants for butterflies (Prajapati & Prajapati, 2013). The least diversity was recorded from site 3 (3.09) owing to disturbance from humans which have degraded the forest and reduced food and vegetation requirement of several species of butterflies. Increased human activities have already been associated with decreased butterfly species (Clark et al., 2007). Human activities and reduction in vegetation of an area have a strong impact on butterfly population since it directly influences their food availability (Ricketts & Imhoff, 2003).

Many studies have documented the dominance shown by members of the Nymphalidae family in tropical region owing to its polyphagous nature which helps to inhabit all the habitats (Parasharya, 2007). They are also comparatively more strong, good and active fliers that can search a large area for resources (Eswaran & Pramod 2005; Krishnakumar et al., 2007; Raut & Pendharkar 2010; Padhye et al., 2006). It avoids shade and dense vegetation but frequents openings in all vegetation types, including clearing in evergreen forest (Mali et al., 2014).

All Pieridae are attracted to sunlight and they quickly move inside foliage in a cloudy weather that obscures the sun (Mali et al., 2014). This family has great affinity to flowers (Gay & Punetha, 1992) which account for their presence in site 3 and site 4. As far as Lycaenidae are concerned, owing to their preference for open deciduous forest and scrub land grasslands near the human habitations (Mali et al., 2014) they were more abundant in site 4 and site 3. This family can easily be seen in semi-arid region.

Among the 59 species of butterflies, about 25%(15) came under very common category, 24% of species (14) were common, 34% (20) were categorized as not rare and 17% were rare (10) as shown in Figure 1.

All the recorded species are widely distributed in India. However, 7 species: viz. Danaid Eggfly, Common Crow, Common Gull, Common Pierrot, Crimson Rose, Gram Blue and Common Wanderer are listed in the Indian Wildlife Protection Act of 1972 (Anonymous, 2006) (Table 3).

CHECKLIST

S.No.	Species	Scientific Name	Family	Abundance	Occurrence
1	Common Banded Awl	<i>Hasora chromus</i>	Hesperiidae	3	R
2	Malabar Spotted Flat	<i>Celaenorhynchus ambareesa</i>		9	R
3	Indian Skipper	<i>Spialia galba</i>		2	R
4	Tricoloured Pied Flat	<i>Coladenia indrani</i>		7	R
5	Bevan's Swift	<i>Pseudoborbo bevani</i>		4	R
6	Small Branded Swift	<i>Pelopidas mathias</i>		2	R
7	Common Mormon	<i>Papilio polytes</i>	Papilionidae	11	NR
8	Common Lime	<i>Papilio demoleus</i>		11	NR
9	Spot Swordtail	<i>Graphium nomius</i>		9	R
10	Common Rose	<i>Atrophaneura aristolochiae</i>		8	R
11	Small Grass Yellow	<i>Eurema brigitta</i>	Pieridae	74	VC
12	Common Grass Yellow	<i>Eurema hecabe</i>		158	VC
13	Spotless Grass Yellow	<i>Eurema laeta</i>		40	VC
14	Common Emigrant	<i>Catopsilia pomona</i>		11	NR
15	Mottled Emigrant	<i>Catopsilia pyranthe</i>		9	R
16	Plain Orange Tip	<i>Colotis eucharis</i>		4	R
17	Common wanderer	<i>Pareronia valeria</i>		8	R
18	Common Gull	<i>Cepora nerissa</i>		7	R
19	Common Jezebel	<i>Delias eucharis</i>		8	R
20	Striped Tiger	<i>Danaus genutia</i>	Nymphalidae	12	NR

21	Blue Glassy Tiger	<i>Parantica aglea</i>		13	NR
22	Dark Glassy Tiger	<i>Parantica agleoides</i>		30	VC
23	Painted Lady	<i>Vanessa cardui</i>		18	C
24	Common FiveRing	<i>Ypthima baldus</i>		17	C
25	Common Rose	<i>Pachliopta aristolochiae</i>		18	C
26	Common Sailor	<i>Neptis hylas</i>		20	VC
27	Common Threering	<i>Ypthima asterope</i>		14	NR
28	Common Bush brown	<i>Mycalesis perseus</i>		42	VC
29	Dark Evening Brown	<i>Melanitis phedima</i>		44	VC
30	Plain Tiger	<i>Danaus chrysippus</i>		9	R
31	Common Crow	<i>Euploea core</i>		11	NR
32	Common Evening Brown	<i>Melanitis leda</i>		21	VC
33	Common Palmfly	<i>Elymnias hypermnestra</i>		33	VC
34	Long Brand Bushbrown	<i>Mycalesis visala</i>		36	VC
35	Tawny Coster	<i>Acraea violae</i>		8	R
36	Common Leopard	<i>Phalanta phalantha</i>		11	NR
37	Commander	<i>Moduza procris</i>		41	VC
38	Baronet	<i>Euthalia nais</i>		23	VC
39	Blue Pansy	<i>Junonia orithya</i>		22	VC
40	Yellow Pansy	<i>Junonia hierta</i>		6	R
41	Lemon Pansy	<i>Junonia lemonias</i>		21	VC
42	Chocolate Pansy	<i>Junonia iphita</i>		20	VC
43	Grey Pansy	<i>Junonia atlites</i>		8	R
44	Great Eggfly	<i>Hypolimnas bolina</i>		9	R
45	Danaid Eggfly	<i>Hypolimnas misippus</i>		9	R
46	Lime Blue	<i>Chilades lajus</i>	Lycaenidae	9	R
47	Gram Blue	<i>Euchrysops cnejus</i>		14	NR
48	Lesser Glass Blue	<i>Zizina otis</i>		8	R
49	Pale Grass Blue	<i>Pseudozizeeria maha</i>		6	R
50	Common cerulean	<i>Jamides celeno</i>		7	R
51	Zebra Blue	<i>Leptotes plinius</i>		2	R
52	Forget Me Not	<i>Catochrysops strabo</i>		14	NR
53	Small Cupid	<i>Chilades parrhassius</i>		6	R
54	Dark Pierrot	<i>Tarucus nara</i>		2	R
55	Rounded Pierrot	<i>Tarucus ananda</i>		6	R
56	Indian Cupid	<i>Chilades parrhasius</i>		25	VC
57	Common Pierrot	<i>Castalius rosimon</i>		16	C
58	Tiny Grass Blue	<i>Zizula hylax</i>		10	NR
59	Plum Judy	<i>Abisara echerius</i>	Riodinidae	19	C

TABLES

Family	Genus	Species	Individuals
Hesperiidae	6 (13.6%)	6 (10.2%)	34 (3.1%)
Papilionidae	4 (9.1%)	4 (6.8%)	49 (4.5%)
Pieridae	6 (13.6%)	9 (15.3%)	357 (32.7%)
Nymphalidae	16 (36.4%)	26 (44.1%)	465 (42.6%)
Lycaenidae	11 (25%)	13 (22%)	177 (16.2%)
Riodinidae	1 (2.3%)	1 (1.7%)	10 (0.9%)
Total	44	59	1092

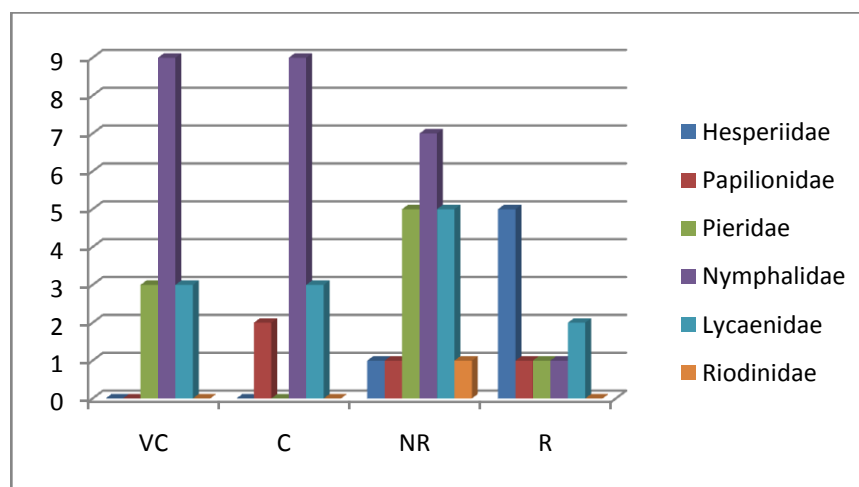
Table 1 Total Number and percentage of genera, species and individuals in different family

Habitat	Site 1	Site 2	Site 3	Site 4
Diversity Index	3.16	3.87	3.09	3.63

Table 2 Value of diversity index of different sites

Common Name	Scientific Name	WPA 1972
Danaid Eggfly	<i>Hypolimnys misippus</i>	Sch I & II
Common Crow	<i>Euploea core</i>	Sch IV
Common Gull	<i>Cepora nerissa</i>	Sch II
Common Pierrot	<i>Castalius rosimon</i>	Sch I
Crimson Rose	<i>Atrophaneura hector</i>	Sch I
Gram Blue	<i>Euchrysops cnejus</i>	Sch II
Common Wanderer	<i>Pareronia valeria</i>	Sch II

Table 3 Schedule of different species under Wildlife Protection Act, 1972

Figure 1 Status of butterflies recorded in study area
Note: VC- Very Common, C- Common, NR- Not Rare, R- Rare

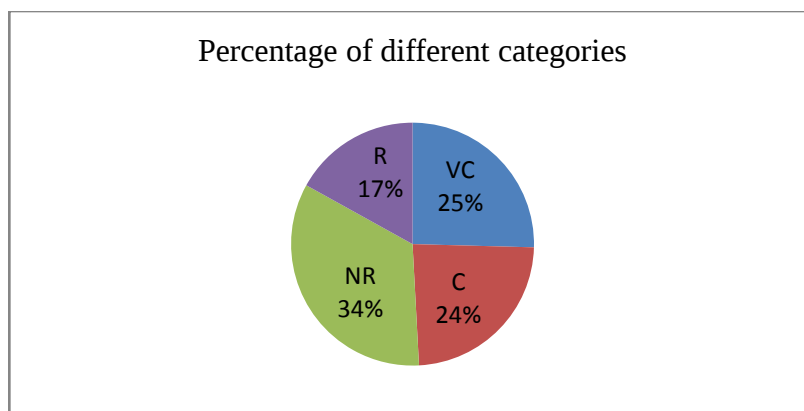


Figure 2 Percentage of different categories in study area.
Note: VC- Very common, C- Common, NR- Not rare, R- Rare

CONCLUSION

The concept of umbrella species has helped in championing the conservation need of vertebrates all over the world. However, the invertebrates even though being at a very vulnerable situation still need a globally appealing flagship species to attract attention towards their conservation and funding. The butterfly species being a good indicator of health of their environment can become an ideal subject for this purpose. In present scenario, many butterfly species have already become endangered and extinct. In order to understand their present ecological status and need, it is very important to conduct different studies which will not only assess their population status in their natural settings but will also evaluate whether these species can thrive in man-made structures. Since in today's circumstance, it is impossible to control urbanization and development, steps have to be taken to provide them a suitable environment to keep their population from dwindling.

REFERENCES

- Aluri, J.S.R. and Rao, S.P. (2002): Psychophily and evolution consideration of *Cadaba fruticosa* (capparaceae). Journal of the Bombay Natural History Society, 99(1): 59-63.
- Amala, S., Rajkumar, M. and Anuradha, V. (2011): Species richness of butterflies in the selected areas of Siumalai Hills. Int. J. Pure Appl. Sci. Technol., 6(2):89-92.
- Anonymous. (2006): The Wildlife (Protection) Act 1972. Dehradun. Natraj Publishers, 235 p
- Barlow, J., Overal, W.L., Araujo, I.S., Gardner, T.A. and Carlos, A.P. (2007): The value of primary, secondary and plantation forests for fruit-feeding butterflies in the Brazilian Amazon. Journal of Applied Ecology, 44: 1001-1012.
- Betham, J.A. (1890): The butterflies of the Central Provinces. Journal of the Bombay Natural History Society, 5:19-28; 151-161; 279-286.
- Betham, J.A. (1891): The butterflies of the Central Provinces. Journal of the Bombay Natural History Society, 6:175-183; 318-331.
- Bonebrake, T.C., Ponisio, L.C., Boggs, C.L. and Ehrlich, P.R. (2010): More than just indicators: A review of tropical butterfly ecology and conservation. Biological Conservation, 143(8): 1831-1841.
- Clark, P.J., Reed, J.M. and Chew, F.S. (2007): Effect of urbanization on butterfly species richness, guild structure and rarity. Urban Ecosystem, 10:321-337.
- D'Abreu, E.A. (1931): The Central Provinces Butterfly List. Records of the Nagpur Museum Number VI, Government Printing City Pres, 39p.
- Eswaran, R. and Pramod, P. (2005): Structure of butterfly community of Anaikatty hills, Western Ghats. Zoo's print Journal, 20(8): 1939-1942.
- Forsayeth, R.W. (1884): Life history of sixty species of Lepidoptera observed in Mhow, Central India. Transactions of the Entomological Society of London, 3: 377-419, 14-15.
- Gay, T. and Punetha, I. K. (1992): Common Butterflies of India. Mumbai: WWF, Oxfors University Press.
- Gay, T., Kehimkar, I. D. and Jagdish, P. (2008): Butterflies of India. Oxford University Press, Hyderabad, 71pp.
- Ghazoul, J. (2002): Impact of logging on the richness and diversity of forest butterflies in a tropical dry forest in Thailand. Biodivers. Conserv., 11:521-541.
- Jain, N. and Jain, A. (2012): Butterfly diversity of Hadoti Region, Rajasthan, India. Flora and Fauna, 18(2): 274-276.
- Jaypal, R., Qureshi, Q. and Chellam, R. (2005): Some significant records of birds from the

- central Indian highlands of Madhya Pradesh. *Indian Birds*, 1:98-102.
- Kehimkar, I. (2008): *The Book of Indian Butterflies*. Mumbai: Bombay Natural History Society / Oxford University Press. 497 p.
- Kerr, J. (1997): Species richness, endemism and choice of areas for conservation. *Conserv. Biol.*, 11:1094-1100.
- Khan, M.R., Khurshid, A., Ikram, B., Malik, A.I. and Mir, A. (2004): Biodiversity of butterflies from district Pooch and Sudhnoti, Azad Kashmir. *Asian Journal of Plant Sciences*, 3(5): 556-560.
- Kharat, A., Nikam, S. and Gurule, S. (2012): Pattern of butterfly diversity from Nashik and Dhule Districts, Maharashtra. *Flora and Fauna*, 18(2): 243-252.
- Kocher, S.D. and Williams, E.H. (2000): The diversity and abundance of North American butterflies, vary with habitat disturbance and geography. *J. Biogeogr.*, 27:785-794.
- Koh, L.P. and Sodhi, N.S. (2004): Importance of reserves, fragments and parks for butterfly conservation in a tropical urban landscape. *Ecol. Appl.*, 14:1695-1708.
- Kremen, C. (1994): Biological Inventory using target taxa: a case study of butterflies of Madagascar. Value of the countryside for forest birds in central Sulawesi (Indonesia). *Biol. Conserv.*, 122:547-558.
- Krishnakumar, N., Kumaraguru, A., Thiyagesan, K. and Asokan, S. (2008): Diversity of papilionid butterflies in the Indira Gandhi Wildlife Sanctuary, Western Ghats, Southern India. *Tiger Paper*, 35: 1-8.
- Kumaraswamy, S. and Kunte, K. (2013): Integrating biodiversity and conservation with modern agricultural landscapes. *Biodiversity and conservation*, 22: 2735-2750.
- Kunte, K. (2000): *Butterflies of Peninsular India*, Universites Pres Limited, Hyderabad, India, 254p.
- Mali, M.S., Khokhariya, B.P. and Dabgar, Y.B. (2014): Biotic interrelationship of plants and butterflies in surrounding of Gandhinagar, Gujarat. *International Journal of Scientific Research*, 3(4):420-422.
- Padhye, A.D., Dahanukar, N., Paingankar, M., Deshpande, M. and Deshpande, D. (2006): Season and Landscape wise distribution of butterflies in Tamhini, Northern, Western Ghats, India. *Zoo's Print Journal*, 21(3): 2175-2181.
- Parasharya, B. M. (2007): *Butterflies of Gujarat*. Anand: Anand Agricultural University, Anand, India.
- Prajapati, S.H. and Prajapati, R.P. (2013): Classified guilds in avian community with respect to food and feeding Behaviour. *Ind. J. Sci. and Tech.*, 1(2):1-7.
- Raju, A.J.S. and Reddy, C.S. (1995): Flower color shifts and pollination in *Lantana camara* L. *Verbenaceae*. *J. Palynol.*, 31:275-289.
- Raut, N.B. and Pendharkar, A. (2010): Butterfly (Rhopalocera) fauna of Maharashtra Nature Park, Mumbai, Maharashtra, India. *Journal of species lists and distribution*, 6 (1): 22-25.
- Ravindra, M., Viswanathan, S. and Ram, G.M. (1996): Checklist of butterfly species of Osmania University Campus, Hyderabad. *Zoo's Print J.*, 11(10): 5.
- Ricketts, T. and Imhoff, M. (2003): Biodiversity, urban areas, and agriculture: locating priority ecoregions for conservation. *Ecology and Society*, 8(2):1.
- Robbins, R.K. and Opler, P. A. (1997): Butterfly diversity and preliminary comparison with bird and mammal diversity. In: *Biodiversity II, understanding and protecting our biological resources*, D.E. Wilson, M.L. Reaka-Kudla and E.O. Wilson (eds). Joseph Henry Press, Washington, DC.
- Shannon, C. E. and Wiener, W. (1949): *The Mathematical Theory of Communication* Urban. University of Illinois Press; 125.
- Thomas, C.D. and Malorie, H. C. (1985): Rarity, species richness and conservation: Butterflies of the Atlas Mountains in Morocco. *Biological Conservation*, 33: 95-117.
- Tiple, A.D. (2011): Butterflies of Vidarbha region, Maharashtra State, central India. *Journal of Threatened Taxa*, 3(1): 1469-1477.
- Varshney, R.K. (1993): Index Rhopalocera indica part II. Common names of butterflies from India and neighbouring countries. *Orient. Insects*, 27:347-372.
- Wijesekara, A. and Wijesinghe, D.P. (2003): History of insect collection and a review of insect diversity in Sri Lanka. *Ceylon J. Sci. Biol. Sci.*, 31:43-59.
- Whittaker, R.H. and Levin. (1977): The role of mosaic phenomena in natural communities. *Conservation Biology*, 117-139.
- Witt, D.O. (1909): The butterflies (Rhopalocera) of the Nimar district, Central Provinces. *Journal of the Bombay Natural History Society*, 19(3):564-571.