

**DIVERSITY OF BUTTERFLIES IN DIFFERENT SEASONS IN NORTH-EASTERN
TAMILNADU, INDIA**

***¹Veeramuthu Anbalagan, ²Savarimuthu Ignacimuthu, ¹Shanmugam Chandran and
²Jonas Gunasekaran.**

^{*1}PG.Research and Department of Zoology, TBML College, Porayar.

²Entomology Research Institute, Loyola College, Chennai, 600034, India

Article History: Received 2nd September, 2015, Accepted 31st October, 2015, Published 1st November, 2015

ABSTRACT

Study on the seasonal diversity of the Butterfly order Lepidoptera. The data obtained by trapping and net sweeping from January 2011 to December 2013 showed the diversity of butterflies, their diversity richness and evenness. The 4,644 individuals were recorded, 101 different species were identified. A member belonging to the Nymphalidae and Hesperidae was the most common with the 53 species being recorded accounting for 28.71% and 23.76% of total number of individuals collected. Their richness, dominance and evenness were statistically analyzed.

Keywords: Butterfly, Northeastern Tamilnadu, Diversity, Shannon's index, Simpson index, Pollinators.

1. INTRODUCTION

Butterflies are one of the most admired insects because they present brilliant patterns of coloration, metamorphic birth and striking reproduction, nutritional behavior and death (Weger, 2002). Butterflies are taxonomically well studied group, which have received a reasonable amount of attention throughout the world (Ghazoul, 2002). Many butterfly species are strictly seasonal and prefer only a particular set of habitats (Kunte, 1997) and they are good indicators in terms of anthropogenic disturbance and habitat quality (Kocher and Williams, 2000). Butterfly community assembly and the factors which influence it, have long been a topic of interest to ecologists and conservationists. These modified habitats often negatively influence butterfly species and their dynamics (Gascon et al., 1999; Rickets et al., 2001). The presence of butterflies in a particular area, however, speaks of a healthy environment. There is a great need of conservation of butterfly species which can help in process of crop production by affecting pollination and in fact many plants totally depend upon these insects for this purpose. More than half of the world's known animal species are insects (Wilson, 1992) in which Lepidoptera is the second largest and the most diverse order in the class Insecta (Benton, 1995). Up to now more than 100,000 species of lepidopterous insects have been studied (Richards and Davies, 1977).

Among the butterflies is the most studied group in southern India, butterfly species have been documented since the turn of the 19th century (Bingham, 1905, 1907, Williams, 1927). Later, Larsen (1987) made a detailed survey of butterflies of Nilgiri Mountains and recorded nearly 300 species including endemic species. Many researchers have been significantly contributed to our understanding of butterfly diversity and abundance (Kunte et al., 1999; Arun and Azeez, 2003; Eswaran and Pramod, 2005; Xavier, 2006; Pramod kumar et al., 2007; Krishnakumar et al., 2008) on aspects such as habitat association, effect of disturbance and area clearance (Soubadra Devy and Priya, 2001; Sreekumar and Balakrishnan, 2001; Dolia et al., 2008); seasonal abundance and migration patterns (Kunte, 1997; Arun, 2002; Kunte, 2005; Padhye et al., 2006) and on conservation (Mathew and Binoy, 2002; Mathew and Anto, 2007; Kunte, 2008) from Western Ghats. However, very little attention has been given to eastern plain areas of southern India. Species richness provides an extremely useful measure of diversity when a complete catalogue of species in the community is obtained (Magurran, 1988). The purpose of present investigation is to understand the effects of habitat characteristic on butterfly diversity, community composition and density.

2. MATERIALS AND METHODS:

The present communication is preliminary and generalized report on the butterflies of northern east part of Tamilnadu with an aim to appraise the readers about the diversity and richness of butterfly fauna of this region. In the area Kanchipuram and Thiruvallur district is situated on the

**Corresponding author: Dr. Veeramuthu Anbalagan, PG.Research and Department of Zoology, TBML College, Porayar*

northern-east part of Tamilnadu and is adjacent to Bay of Bengal and Chennai city. It lies between 11° 00 to 12° 00', North attitudes and 77° 28 to 78 ° 50' East longitudes. Tiruvallur district is located between 12° 15 and 13° .5'N Latitude and 79° 15' and 80° 20' E Longitude. Kancheepuram district lies between 11° 00' to 12 ° 00' North latitudes and 77° 28' to 78° 50' East longitudes. The insects were collected undertaken in Sweeping net, light trap and hand picking method from the different field and different location in north eastern Part of Tamilnadu .The study was conducted in January 2011 to December 2013. Sampling was done for weekly four days in every month, then all the collected specimens were manually stored and identified to species level and total populations per year two seasons (January to June) (July to December) was also calculated. They are total 8 families include the 101 species were recorded. Most species only occurred as adults in our samples. The species diversity, richness and evenness were calculated by Shannon Weaver Index. This index considers both the number of species and the distribution of individuals among the species.

Ecological indices Data Analysis

Collected insects were sorted out into families, genera and species. Total number of individuals collected under each family was used for diversity analysis. Species richness, evenness and diversity indices such as Shannon's index and Simpson index were calculated by using diversity anlysis software (PAST)

3.RESULTS

A total of 101 species belonging to 8 families of order Lepidoptera were recorded. Out of these, Nymphalidae were the most common with 29 species, followed by the Hespriidae 24 species, Pieridae 21 species, Lycaenidae 12 species, Papilionidae 9 species, Danidae 4 species and the least number of species was observed in Acraeidae, Satyridae each one species observed. A member belonging to the Nymphalidae and Hespriidae was the most common with the 29 and 24 species being recorded accounting for 28.71 % and 23.76 % of total number of individuals collected. India has more than 1,400 species of butterflies, 330 of them in the Western Ghats alone, and of which 37 are endemic (Kunte, 2008). In total, 4,644 individuals from 101 species were observed and identified. *Telchinia violae* species was highly abundant 247 (5.31%) in all the years observed and very less numbers were recorded in the *Cepora nerissa* species 208 (4.47%) in all the study period observed. Papilionidae family 6 species in individuals 954, *Graphium agamemnon* individuals 193 (4.15%) were observed. In three years studied the year of 2011 total number of individuals (January to June) second season was high less than in 2013 first season were observed. The diversity value (3.32) is high 2013 first season (Jan to July). In 2012 second season, 2011 first season, were respectively. In the year of 2013 first season highest richness (Margalef) value in (4.59) dominance is (0.06) in second season in 2011 first season 2012 respectively. During the lowest diversity value in 2012 first seasons (2.80), richness (2.91) and dominance index in (0.03) were respectively.

Fig: 2 No of individuals recorded from 2011 to 2013

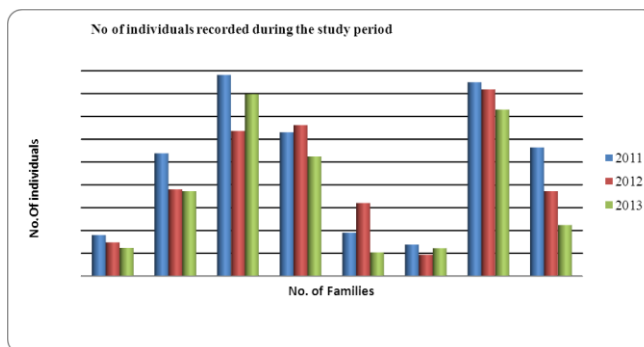


Table: 1. Diversity of Butterfly fauna in Kancheepuram and Tiruvallur District in Tamil Nadu during (January 2011 to December 2013).

Parameters	During the study period					
	2011		2012		2013	
	January- June	July - December	January- June	July - December	Januar y-June	July - December
Total no. of Taxa	73	95	62	85	68	81
Total no. Individuals	845	1157	338	770	551	983
Simpson index (λ)	0.95	0.93	0.93	0.95	0.96	0.95
Shannon	3.19	3.05	2.80*	3.23	3.32*	3.21
Diversity(H)						
Margalefs (R1)	4.15	3.68	2.91	4.21	4.59*	4.06
Menhinick (R2)	0.99	0.79	0.97	1.04	1.27	0.92
Evenness	0.84	0.78	0.92	0.87	0.92	0.85
Dominance	0.04	0.06*	0.06*	0.04	0.03	0.04

4.DISCUSSION:

Butterflies are one of the conspicuous insects, these are particularly useful in monitoring changes in both ecological and economic terms, and butterflies are useful in pollinators (Ragaei et al., 1997). Butterflies are an excellent choice in terms of indicator organisms for biodiversity studies. They are almost everywhere, attractive and easy to observe, many species both common and rare, can be easily and reliably identified in the field without killing, they are also amongst the better studied groups of organisms, with availability of field guides (Krushnamegh kunte et al., 1999). The diversity and community composition are depended on that of plants, as their caterpillars have strict dependence on specific host plants. As they undergo metamorphosis, ecologically they contribute more to local diversity because of their dual fundamental role than monomorphic organisms.

Our sampling localities present transition zones from manmade ecosystems. (i.e) grass land, agriculture ecosystems, vegetational plantation, gardens, grassland, that we have sampled represent assemblages enriched species neighboring natural ecosystems. This may minimize of cases of villages and towns, situated away from the grass land, agricultural ecosystems located at more remote places

Figure: 1 Butterfly insects collected from different agro ecosystems in north eastern Tamilnadu

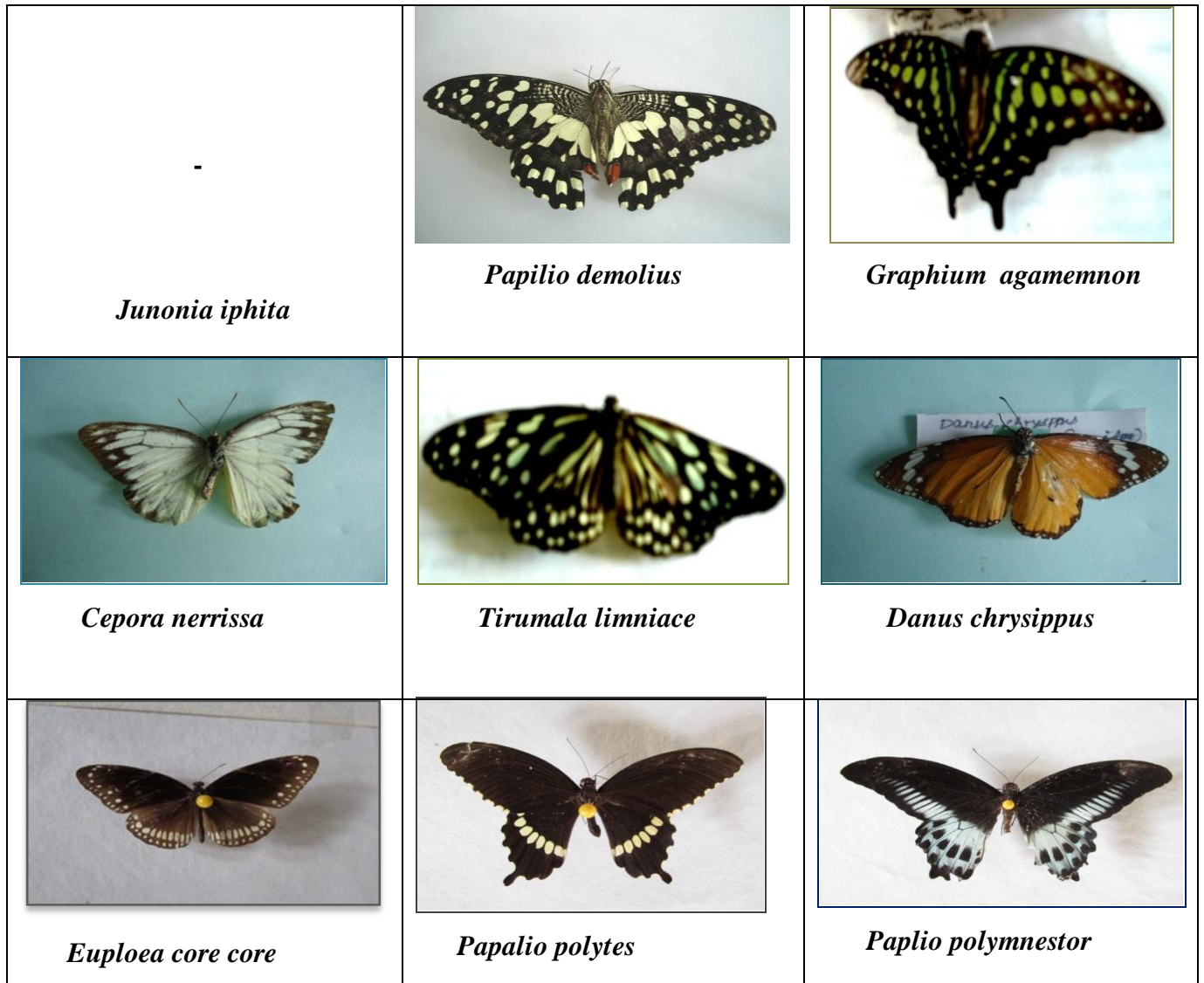


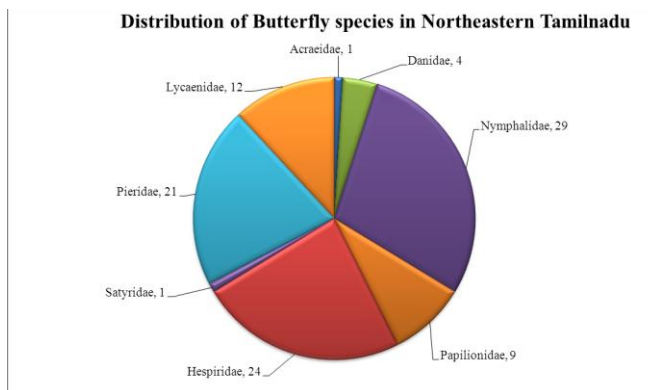
Table: 2 Butterflies recorded from north eastern Tamilnadu:

S. No	Species Name	Common Name		
			16	<i>Hypolimnas missippus</i> Danaid Egg fly
			17	<i>Hypolimnus bolina</i> Great Eggfly
			18	<i>Junonia atlites</i> Gray Pansy
			19	<i>Junonia hierta</i> Yellow Pansy
			20	<i>Junonia lemonias</i> Lemon Pansy
			21	<i>Junonia iphita</i> Chocolate Pansy
			22	<i>Junonia stygia</i> Brown Pansy
			23	<i>Junonia almana almana</i> Peacock Pansy
			24	<i>Junonia orithya</i> Blue Pansy
			25	<i>Melanitis leda</i> Common Evening Brown
			26	<i>Mycalasis subdita</i> Tamil Bush Brown
			27	<i>Mycalasis mineus</i> Dark Branded Bush Brown
			28	<i>Neptis hylas</i> Common Sailer
			29	<i>Libythea myrrha</i> Club Beak
			30	<i>Parantica aglea</i> Glassy Tiger
			31	<i>Phalanta phalantha</i> Leopard
			32	<i>Ypthima baldus</i> Common Fivering
			33	<i>Orsotriaena medus</i> Nigger
			34	<i>Rohana parisatis</i> Black Prince
			Papilionidae	
			35	<i>Graphium agamemnon</i> Tailed Jay
1	<i>Telchinia violae</i>	Tawny Castro		
2	<i>Danaus genutia</i>	Striped Tiger		
3	<i>Danaus chrysippus</i>	Plain Tiger		
4	<i>Tirumala septentrionis</i>	Dark Blue Tiger		
5	<i>Tirumala limniace</i>	Blue Tiger		
	Nymphalidae			
6	<i>Acraea violae</i>	Tawny Coster		
7	<i>Acraea terpsicore</i>	Tawny Coster		
8	<i>Ariadne merione</i>	Common Castor		
9	<i>Cethosia nieteri</i>	Tamil Lacewing		
10	<i>Cirrochroa thais</i>	Tamil Yeoman		
11	<i>Cupha erymanthis</i>	Rustic		
12	<i>Junonia iphita</i>	Chocolate pansy		
13	<i>Euploea core core</i>	Common Indian Crow		
14	<i>Euploea klugii</i>	Blue King Crow		
15	<i>Hypolymnas bolina</i>	Great Egg fly		

36	<i>Graphium doson</i>	Common Jay
37	<i>Graphium sarpedon</i>	Common Bluebottle
38	<i>Pachliopta aristolochiae</i>	Common Rose
	<i>Pachliopta hector</i>	Crimson Rose
40	<i>Papilio polytes</i> (♂)	Common Mormon
41	<i>Papilio polymnestor</i>	Blue Mormon
42	<i>Papilio crino</i>	Common Banded Peacock
43	<i>Papilio demoleus</i>	Lime Butterfly
Hespiridae		
44	<i>Hypsa alciphron</i>	Booklice Skipper
45	<i>Aeromachus dubius</i>	Dingy Scrub-Hopper
46	<i>Aeromachus pygmaeus</i>	Pygmy Grass,
47	<i>Ampittia dioscorides</i>	Bush Hopper
48	<i>Hylephila phyleus</i>	Fiery Skipper
49	<i>Hasora badra</i>	Common Awl
50	<i>Hasora chromus</i>	Common Banded Awl
51	<i>Halpe homolea</i>	Indian Ace
52	<i>Halpe porus</i>	Moores Ace
53	<i>Badamia exclamationis</i>	Brown Awl
54	<i>Celaenorrhinus ruficornis</i>	Tamil Spotted Flat
55	<i>Gerosis bhagava</i>	Common Yellow breasted Flat
56	<i>Caltoris canaraica</i>	Kanara Swift
57	<i>Caltoris kumara</i>	Blank Swift
58	<i>Lambrix salsala</i>	Chestnut Bob
59	<i>Notocrypta curvifascia</i>	Restricted Demon
60	<i>Pelopidas agna</i>	Dark Branded Swift
61	<i>Pelopidas conjuncta</i>	Conjoined Swift
62	<i>Potanthus confucius</i>	Chinese Dart
63	<i>Potanthus pava</i>	Pava Dart
64	<i>Psolos fuligo</i>	Coon
65	<i>Suastus gremius</i>	Indian Palm Bob
66	<i>Taractocera ceramics</i>	Tamil Grass Dart
67	<i>Thoressa honorei</i>	Madras Ace
Satyridae		
68	<i>Melanitis leda</i>	Common Evening Brown
Pieridae		
69	<i>Cepora nerissa</i>	Common Gull
70	<i>Appias albina</i>	Common Albatross
71	<i>Colotis danae</i>	Crimson-Tip
72	<i>Colotis fausta</i>	Large Salmon Arab
73	<i>Colotis eucharis</i>	Plain Orange -Tip
74	<i>Colias nilgiriensis</i>	Nilgiri Clouded Yellow
75	<i>Catopsilia pomona</i>	Lemon Emigrant
76	<i>Catopsilia pyranthe</i>	Mottled Emigrant
77	<i>Delias eucharis</i>	Common Jezebel
78	<i>Catopsilia pyranthe</i>	Mottled Emigrant
79	<i>Eurema brigitta</i>	Small Grass Yellow
80	<i>Eurema hecabe</i>	Common Grass Yellow
81	<i>Eurema blanda</i>	Three-Spot Grass Yellow
82	<i>Eurema nilgiriensis</i>	Nilgiri Grass Yellow
83	<i>Hebomoia glaucippe</i>	Great Orange-Tip
84	<i>Ixias pyrene</i>	Yellow Orange Tip
85	<i>Ixias marianne</i>	White Orange- Tip
86	<i>Pareronia valeria</i>	Common Wanderer
87	<i>Pieris canidia</i>	Indian Cabbage White
88	<i>Prioneris sita</i>	Painted Sawtooth
89	<i>Eurema hecabe</i>	Common Grass Yellow
Lycaenidae		
90	<i>Spalgis epius</i>	Ape fly
91	<i>Azanus ubaldus</i>	Bright Babul Blue
92	<i>Azanus jesous</i>	African Babul Blue
93	<i>Acytolepis pusa</i>	Common Hedge Blue
94	<i>Chilades laius</i>	Lime Blue
95	<i>Chilades contracta</i>	Small Cupid
96	<i>Zizeera otis</i>	Lesser Grass Blue
97	<i>Catochrysops</i>	Forget-me-not

98	<i>Tajuria cippus</i>	Peacock Royal
99	<i>Virachola perse</i>	Large Guava Blue
100	<i>Virachola isocrates</i>	Common Guava Blue
101	<i>Rapala varuna</i>	Indigo Flash

Fig: 3 Distribution of Butterfly species in Northeastern Tamilnadu



in the areas, when comparison with more human influenced ecosystems in this investigation.

In our study, butterflies from eight families were recorded; among them, family Nymphalidae outnumbered with the maximum species throughout the study period; this because of their ecological adaptation (Jiggins et al., 1996), speciation and high dispersal ability (Adler et al., 1994). Family Nymphalidae is the largest family representing nearly one-third of the known butterflies of the world. Family Nymphalidae was followed by Pieridae, Papilionidae, and Hesperidia in the total number of species observed. Similar findings were reported by Mathew and Rahamathulla (1993) from Western Ghats. We also observed maximum species diversity and abundance in the months of Jan to June, and October-November and there was a gradual increase during the early summer from the month of March and it reached maximum in the month of May; Butterflies in all the habitats have flight periods, and their abundance strongly correlates with their different flight periods (Leather 1984; Norris 1935). Almost all butterflies are abundant in short peak in particular seasons, and may or may not appear in other seasons. Diversity and abundance of butterflies correlate with the flowering phenology of plants (Gutierrez et al., 1995; Watt et al., 1974; Kunte, 2000). which was found in all sites. *Pachliopta hector* (Papilionidae) was highly abundant in June to august month. *Tirumala limniace* emerged in rainy season during the October was the period of peak emergence of adults. *Eulopea core core* (Nymphalidae) larva emerged in adults during the march to April season. *Acraea violae* was maximum occurrence during may and September. Papilionidae species which was found in June to August periods, at other families Hesperidae, Acraidae, Satyridae, were usually common but there were also uncommon and rare species. The occurrence of rare species may provide important information for conservation, but a more accurate and rapid assessment of the condition of the habitat may be obtained by monitoring a carefully selected group of locally common species.

The relationship between the Lepidoptera families and biotic factors such as temperature and area is important to understand the ecosystems dynamics. The relative abundance of butterflies at closely related to the wide range of temperature to other spaces pretty similar, The Lepidoptera families among all the open grassy areas and the fields.

Butterflies are more structure heterogeneity and feeding resources and consequently to an increase in their abundance and species richness. A key issue to Agro ecosystems is the enhancement of vegetation heterogeneity, so that policy framework and management practices that promote the diversity of farming systems and landscape heterogeneity have been seen as the key to restore and sustain biodiversity in livestock farming systems (Benton et al., 2003)

Butterfly families site selection could be determine by the availability of some factors such as; food available, access to solar light to regulate their body temperature also open space to flight away from predators or some others to use the breeze to flight to other places (Gilbert et al., 1975). Butterflies at can indicate, anticipate and monitor chemicals and physical changes in the environment, especially in the open grassy areas, because butterflies are sensible to different a biotic factors especially temperature they will restrict their biological activities.

5.CONCLUSION:

The comparison of the above results in six different seasons shows the butterflies diversity and species richness has significantly declined in the agro ecosystem habitats. In this probably due to the destruction of host plant in crop area habitat, use of synthetic pesticides, human disturbance and heavy vehicle pollution. The disintegration of agricultural land field could certainly destroy the host plant and could greatly influence of the biodiversity of butterflies. It is very significant to understand the relation between that the host plant and the butterflies to conserve them. North eastern part of Tamilnadu is one of the rich biodiversity areas, now days the sources reduces day by day between that the many industrial occupy, awareness of agricultural practices illness, human disturbance, so need for more attention for effective conservation of butterflies faunas.

6.ACKNOWLEDGEMENT

The authors thank to the Entomology Research Institute for financial support.

7.REFERENCES:

- Arun, P. B and P. A. Azeez, 2003. On the butterflies of puyankutty forest, Kerala, India. Zoo's print. J. 18(12): 1276-1279.
- Benton, T.G., J. A Vickery and J. D. Wilson. 2003. Farmland biodiversity: is habitat heterogeneity the key. Trends in Ecology and Evolution 18: 182-188.
- Benton, T.G., 1995. Biodiversity and biogeography of Handerson Island insects. Biol.J.Linn. Soc., 56: 245-59.
- Bingham, C.T, 1905. Fauna of British India, Butterflies Vol. 1. Taylor and Francis, London.
- Blair, R. B, 1991. Birds and Butterflies along an Urban Gradient: Surrogate Taxa for Assessing Biodiversity. Ecological Applications 9 (1): 164-170.
- Eswaran, R and P. Pramod. 2005. Structure of butterfly community of Anaikatty hills, Western Ghats, Zoo's print. J. 20(8): 1939-1942.
- Gascon C, T.E. Lovejoy, R.O. Bierregaard, J.R. Malcolm, P.C. Stouffer, H.L. Vasconcelons, W.F. Laurance, B. Zimmerman, M. Tocher, S. Borges. 1999. Matrix habitat and species richness in tropical forest remnants. Biol. Conserv. 91: 223-229.
- 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.
- Gilbert, L.E and M.C. Singer. 1975. Buterfly Ecology. Unknown 4098: 365-397.
- Gutierrez, D., R. Mendez. 1995. Phenology of butterflies in a mountain area in northern Iberian Peninsula. Ecography. 18: 209-219.
- Jiggins, C.D. W.O McMillan, W. Neukirchen, J. Mallet. 1996. What can hybrid zones tell us about speciation? Biol. J. Linn. society. 59:221-242.
- Krishnakumar, N. A. Kumaraguru, K. Thiyagesan, S. Asokan, 2008. Diversity of papilionid butterflies in the Indira Gandhi wildlife sanctuary, Western Ghats, southern India. Tiger Paper 35:1-8.
- Krushnamegh kunte, Ajit joglekar, Ghate utkarsh and P. Pramod. 1999. Patterns of butterfly, bird and tree diversity in the Western Ghats, Curr. Science, 25: 1-14.
- Kunte, K. A. 2000. lifecycle of butterflies of peninsular India. University Press Hyderabad.
- Kunte, K. 1997. Seasonal patterns in butterfly abundance and species diversity in four tropical habitats in the northern Western Ghats. J. Biosci. 22: 593-603.
- Kunte, K. A. Joglekar, G. Utkarsh, P. Pramod. 1999. Patterns of butterfly, bird and tree diversity in the Western Ghats. Curr. Sci. India, 29:1-14.
- Larsen, T.B. 1987. The butterflies of the Nilgiri Mountains of Southern India (Lepidoptera: Rhopalocera). BNHS, 84: 291-316.
- Leather, S.R. The effect of adult feeding fecundity Wight loss and survival of the fine beauty moth panolis flammea. Oecologia. 1984 (81): 249-257.
- Mathew and Rahamathulla. 1993. Studies on the butterflies silent valley National park. Entomon. 18: 185-192.
- Mathew, G. C.F Binoy. 2002. Migration of butterflies (Lepidoptera: Rhopalocera) in the new Amarambalam reserve forest of the Nilgiri biosphere reserve. J.Zoo's print. 17 (8): 84-847.
- Norris, M. J. 1935. A feeding experiment of adult pieris rapae. Entomol.68:125-127.
- Pramod, K.M.P.M, B.B. Hosetti, H.C. Poomesha, G.H.T. Raghavendra. 2007. Butterflies of the tiger lion safari, Thyavarekoppa, Shioga, Karnataka.J. Zoo's print. 22(8): 2805.
- Ragai, M and M. Allam. 1997. Review and views insect conservation and journal of Diversity. Academy of sciences 10: (2) 43-48.
- Richards, O.W and R.G. Davies. 1977. Imms General Textbook of Entomology. Pp: 1139- 40. Chapman and Hall, London.
- Rickets, T.H, G.C. Daily, P.R. Ehrlich and J.P, Fay. 2001. Countryside biogeography of moths in a fragmented landscape: biodiversity in native and agricultural habitats. Conserv. Biol., 15: 378-388.
- Soubadra, D.M and D. Priya. 2001. Response of wet forest butterflies to selective logging in Kalakad-Mundanthurai Tiger Reserve: Implications for conservation. Curr. Sci. India 80(3): 400-405.
- Watt, W.B, P. C. Hoch and S.G. Mills. 1974. Nectar source use by Colias butterflies chemical and visual aspects. Oecologia. 14: 353-374.
- Weger, L. 2002. Butterflies of the North Woods. Kollath-Stensaas Publishing, Minnesota.
- Williams, C.B. 1927. A study of butterfly migration in south India and Ceylon, Green, J.C.F. Fryer and W.Ormiston. Trans. Ent. Soc. Lond. 75: 1-33.
- Wilson, W.O. 1992. The Diversity of life. Norton, NY., USA.
- Xavier, A. 2006. Butterflies fauna of Government arts and science college campus, Kozhikode, Kerala. Zoo's Print. J. 21(5): 2263-2264.
