SEASONAL ABUNDANCE OF BUTTERFLY DIVERSITY IN PAKHAL WILDLIFE SANCTUARY WARANGAL, TELANGANA, INDIA

Abstract

Butterflies are one of the most attractive colorful insect in the nature. In the present study was carried out to in the butterfly diversity in Pakhal wildlife sanctuary Warangal district Telangana India from June 2015 to May 2016. A total of 44 butterflies species belonging to 27 species genera and four families were recorded during the study period. Nymphalidae family was the richest family that comprised (17and 38.63%) of the total species of butterfly recorded in the study area followed by Piriedae family (16 and 36.36%), Papilionidae family (6 and13.63%) and Lycaenidae family were the lowest recorded (5 and 11.36%) each respectively. Among these 44 butterfly species three species were found to be protecting under the Indian wildlife (protection) Act (1972).

Keywords:.Lepidoptera, Family, Species, Wildlife Reserve

Introduction

Butterflies are one of the most attractive colorful insect in the nature. It is make up a large group of insects known as the order Lepidoptera in phylum Arthropod. There are about approximately 18,000 butterfly species in the world wide. Butterflies occupy a vital position in ecosystems and their occurrence and diversity are considered as good indicators of the health of any given terrestrial biotope [1-2]. They have clear taxonomy, and their life history and biology are well defined[3]. Their ability to adapt to any climatic condition made them the most successful. Butterflies are considered as flagship species for insect conservation [4]. They are being considered as important in environmental quality assessment under terrestrial ecosystem[4]. Indicator species signal the presence of other species, and indicates chemical/physical changes in the environment through changes in their own presence or abundance[5-6]. In addition to this they are important components of almost all ecosystems. They are part of food chain and servers of food for a number of arthropods, birds, reptiles etc. As they depend upon plants for larval food, they are said to be symbiotic with plants. Abiotic and biotic factors such as vegetation including

UNDER PEER REVIEW

host plants, food availability, temperature and wind exposure influence the patterns of the butterfly diversity [7,8,9]. Grassy habitats were enriched in diet, which include flower nectar, sap, fruit juices, carrion and wetland moisture [10]. Most of them are pollinators of flowering plants and exhibit mutualism.

Materials and Methods:

Study Area:

Pakhal Lake is an artificial lake spread in the Pakhal Wildlife Sanctuary in the Warangal district of Telangana, a state in Southern India. Pakhal Lake is situated at 17.57N and 79.89E. It is located in the Pakhal Wildlife sanctuary and it is an artificial lake. It was declared as Wildlife Sanctuary on 4-3-1952. It is near to Warangal City in Telangana, constructed in 1213 A.D by Kakatiya ruler Ganapathideva, spread over an area of 30 sq km. During the study period the butterfly species were surveyed, collected from three different sites Madaguda, Gangaram and Pandhem respectively Pakhal wildlife sanctuary. Each study sites visited to once in a week and observation were made from morning 9:00 am to evening 5:00 pm., then butterfly species are identified and scientific names were confirmed with the help of the field [11-12].Butterfly species were collected by using aerial insect net and preserved to the insect box with in the naphthalene ball kept inside the box to prevent pest and fungal attack. Photograph of digital type were taken in the field many times by cyber shot, DSC-HX20V Digital camera.

Statistical Analysis of Data

The diversity was calculated by using diversity indices namely: Simpson's index (D), and Shannon-Wiener index (H'). The number of butterfly species (S), the number of individuals for each species (N), α- and β-diversity indexes were calculated. The α-diversity was calculated from various indices including the Shannon-Wiener diversity index (H) [13] that measures the species diversity within the community of an ecosystem [14]. Pielou"s equitability index (J) which consider the distribution of individuals within the various species that make up a community. Margalef index (d) that provides a measure of species richness. Simpson index (D) that gives the species dominance. As the D index increases, the diversity decreases.

SHANNON- WIENER DIVERSITY INDEX (H)

The formula for calculating Simpson's index (H) is

UNDER PEER REVIEW

$H = -\Sigma Pi \ln Pi$

In the Shannon index, P is the proportion (n/N) of individuals of one particular species found (n) divided by the total number of individuals found (N), ln is the natural log, Σ is the sum of the calculations, and s is the number of species.

SIMPSON'S INDEX (D)

The formula for calculating Simpson's index (D) is

$D = n (n-1)/ N (N-1)$

The Simpson index is a dominance index,

In the Simpson index, Pi is the proportion (n/N) of individuals of one particular species found (n) divided by the total number of individuals found (N). Σ is the sum of the calculations, and s is the number of species.

MEASUREMENT OF EVENNESS (J)

For calculating the evenness of species, the Pielou's Evenness index (J) was used.

J = H / In where.,

H= Shannon- Wiener diversity index

S = total number of species in the sample

In = natural logarithm

RESULTS AND DISCUSSION

During the investigation, the diversity and abundance was observed seasonally. Madagudem was identified as site I, and Pandhem, Gangaram was regarded as site II and III respectively. A total of 765 butterflies were recorded in this period belonging to 44 species and 4 families. During the entire study, the diversity and abundance was observed seasonally. A total of 372 butterflies belonging to 37 species belonging to 4 families were recorded during rainy season (table-1). Site I recorded 87 butterflies belonging 24 species and 4 families recorded. At site-II 162 butterflies belonging to 34 different species and 4 families and at site III 123 butterflies belonging to 33 species and 4 families were recorded respectively. In winter a total of 241 butterflies belonging to 39 species of 4 families were collected; at site I, 93 butterflies belonging to 33 species and 4 families, at site II 83 butterflies belonging to 29 species and 4 families were recorded. At site III 65 butterflies belonging to 24 species and 4 families were recorded. In summer a total of 152 butterflies belonging to 40 species of 4 families were collected; at site I,

UNDER PEER REVIEW

67 butterflies belonging to 33 species and 4 families, at site II 42 butterflies belonging to 21 species and 4 families and at site III 43 butterflies belonging to 24 species and 4 families were recorded. During the study period, Nymphalidae is the most dominant family with 17 species,10 genera and with 38.63 % species richness of the total species, followed by Pieridae (16 species, 9 genera and 36.36%, Lycaenidae (5 species,5 genera and 11.36 %), Papillonidae (6 species, 3 genera and 13.63 %). *Junonia* genera are the most dominant genera followed by *Euremia*. Lycaenidae family is more evenly distributed among all. The relative abundance of different families was presented in figure 1. Three species of butterflies , *Pachiliopta hector* (crimson rose) of Papillonidae, *Castalius rosimon* (common pierrot) and *Deudorix isocrotes* (Fabricius), Guava blue of Lycaenidae recorded during the study period are listed in schedule IV of Wildlife (Protection) Act 1972. They are covered under legal protection; violation is punishable with penalty under this category.

Table 1: Checklist of the Butterfly species seasonal abundance recorded in study area

				Seasonal			
Family		**Common name**	**Scientific name**	**Rainy**	**Winter**	**Summer**	**Total**
Papilionidae (6)	1	Spot swardtail	*Graphiumnomius spp. (Esper,1793)*	01	00	06	07
	2	Common lime	*Papilio demoleus (Linnaeus,1758)*	38	14	06	58
	3	Common rose	*Pachlipta aristolochiae (Fabricius,1775)*	06	08	05	19
	4	Crimson rose	*Pachiliopta hector (Linnaeus,1758)*	08	08	02	18
	5	Blue Mormon	*Papilio polymnester (Cramer,1775)*	03	06	00	09
	6	Commo Mormone	*Papilio polystor*	00	03	01	04
Nymphalidae (17)	7	Common Indian crow	*Euplioea core (cramer,1780)*	46	19	02	67
	8	Plain Tiger	*Danaus chrysippus*	11	07	05	23

UNDER PEER REVIEW

			(Linnaeus,1758)				
	9	Common Tiger	*Danaus geutia (Cramer,1779)*	06	09	04	19
	10	Blue Tiger	*Tirumala limniace (Linnaeus,1775)*	07	05	02	14
	11	Common leopard	*Phalanta phalantha (Dury,1773)*	05	04	01	10
	12	Common eveningBrown	*Melanitis leda (Linnaeus,1758)*	03	04	00	07
	13	Tawny Coster	*Acraea terpscore (Linnaeus,1758)*	35	31	14	80
	14	Common sailer	*Neptis hylas*	00	07	03	10
	15	Baronet	*Ethalia nails (Forster,1774)*	09	11	04	24
	16	Lemon pansy	*Junonia lemonias (Linnaeus,1758)*	14	10	11	35
	17	Blue pansy	*Junonia orithya*	06	00	01	07
	18	Peacock pansy	*Junonia almona*	06	02	04	12
	19	Chocolate pansy	*Junonia iphita*	03	01	04	08
	20	Gray pansy	*Junonia atlites*	00	03	02	05
	21	Yellow pansy	*Junonia hierta*	04	01	00	05
	22	Danaind eggfly	*Hypolimnas misippus (Linnaeus,1764)*	09	10	01	20
	23	Blue moon Great eggfly	*Hypolimnas bolina (Linnaeus,1758)*	05	07	03	15
Pieridae (16)	24	One spot grass yellow	*Eurema andersoni (Moore,1886)*	04	11	02	17
	25	Small grass yellow	*Eurema brigtta*	13	14	08	35
	26	Grass yellow	*Eurema andersoni Rubbela*	03	11	02	16
	27	*Spotless grass yellow*	*Eurema laeta (Bioduval)*	05	01	01	07

UNDER PEER REVIEW

	28	Common grassyellow	*Eurema hecabe (Linnaeus,1758)*	23	04	06	33
	29	Pioneer(Copperwhi)	*Belenois aurota*	05	00	05	10
	30	Common Jezebel	*Delias eucharis (Drury,1773)*	06	05	01	12
	31	Common Emmigrant	*Catopsilia pomana (Fabricius,1775)*	21	06	04	31
	32	Molted Emmigrant	*Catopsilia pyranthe (Latreille,1758)*	08	03	04	15
	33	Cloudless sulpher	*Phoebis sennae*	08	01	00	09
	34	Cabbage white butterfly	*Pieris rape (Linnaeus,1758)*	22	04	05	31
	35	*Small orange tip*	*Catotis etrida*	00	01	05	06
	36	*Crimson tip*	*Colotis danae*	00	02	06	08
	37	*Yellow orange tip*	*Ixias pyrene*	03	02	01	06
	38	White orange tip	*Ixias Marianne*	02	02	02	06
	39	*Large salman arab*	*Colotis fausta (oliver)*	00	01	02	03
Lycaenidae (5)	40	Gram blue	*Eucrysops cnejus (Fabricus)*	11	00	07	18
	41	Common pierrot	*Castalius rosimon*	08	00	05	13
	42	Dark judy	*Abissara fylla (westwood)*	00	01	02	03
	43	Common blue	*Pollymmatus icarus (Rottemburg,1775)*	04	01	01	06
	44	Common Banded Awl	*Hasora chromus*	01	01	02	04

UNDER PEER REVIEW

1

3

4

5

6

8

9

10

11

12

13

14

15

16

17

18

19

20

21

22

23

24

25

26

27

28

29

30

31

32

33

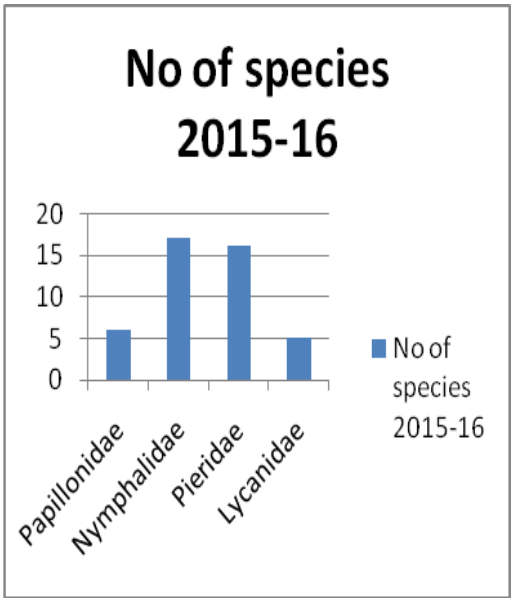
34

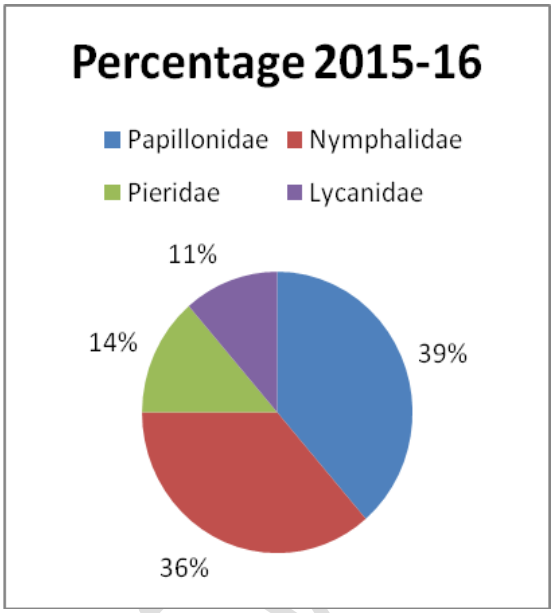
35

36

Figure 1: Butterfly species seasonal abundance recorded in study area 1) *Graphiumnomius spp.*, 2) *Papilio demoleus*

UNDER PEER





A **B**

Figure 2. A and B: The Relative Abundance of different families and genera were presented in the study period.

Seasonal Diversity Indices of present in the Study area: The Seasonal abundance of Diversity in the study area is present in (Table2).

Table 2. Seasonal Diversity Indices of present in the Study area

Pakhal wild life sanctuary 2015-16			
Indices	**Rainy**	**Winter**	**Summer**
Shannon weiner H	3.215	3.283	3.454
Simson D	0.050	0.045	0.032
Equitability E	00.88	00.89	00.93

UNDER PEER REVIEW

The Shannon evenness index calculated is 0.467. It was calculated as 3.215, 3.283 and 3.454 for the rainy, winter and summer seasons respectively for 2015-16 study period. The Simpson index ranged from 0.040. It was 0.050 in the rainy season, 0.045 for the winter and 0.032 for the summer season.

CONCLUSION:

A total of 765 butterfly species were observed from various sites of Pakhal wildlife sanctuary Warangal District. They were identified under the 44 species 27 genera belonging to 5 families. Nymphalidae family was recorded to be the highest in number and percentage followed by Papilionidae, Pieridae and Lycaenidae families, which may be due to adaptation and habitat preference of the species. In this concluded present study area some butterflies are endangered so they are protected and conservation species.

REFERENCES

1.Kunte Butterflies of Peninsular India. Indian Academy of Sciences, Universities Press (India) 2000; Limited; 254 pp.

2.Nelson, S.M. and Anderson, D.C. An assessment of riparian environmental quality by using butterflies and disturbance susceptibility scores. The Southwestern Naturalist, 1994, 39: 137-142.

3.Smetacek, P. 1996. Restoring past glory(1996): Sanctuary Asia XVI, 6: 26-29.

4.Ghazoul, J. Impact of logging on the richness and diversity of forest butterflies in a tropical dry forest in Thailand. Biodiversity and Conservation.2002: 11: 521–541.

5.Landres, P.B., Verner, J. and Thomas, J.W. Ecological uses of vertebrate indicator species. 1988. a critique. Conservation Biology, 2: 316-328.

6.Simberloff, D. Flagships, umbrellas, and keystones: is single-species management passe in the landscape era? Biological Conservation(1998): 83: 247-257.

7.Khan, M.R., Khurshid, A., Ikram, B., Malik, A.I. and Mir, A Biodiversity of butterflies from district Pooch and Sudhnoti, Azad Kashmir(2004): Asian Journal of Plant Sciences 3(5): 556-560.

8.Jain, N. and Jain, A. Butterfly diversity of Hadoti Region, Rajasthan, India. Flora and Fauna 18(2) (2012): 274-278.

9.Kumaraswamy, S., and K. Kunte Integrating biodiversity and conservation with modern agricultural landscapes(2013): Biodiversity and conservation, 22: 2735-2750.

10.Weber, L. Butterflies of the north Woods(2002): Kolath Sten Soas Publishing, Minnesota.

UNDER PEER REVIEW

11.Kehimkar I The Book of Indian Butterflies. Bombay natural History Society and Oxford University Press, Mumbai (2008).

12.Padhey AD, Dahanukar N, Paigankar M, Deshpande M, Deshpande D Season and landscape wise distribution of butterflies in Tamhini, Northern Western Ghats India(2006): Zoo's Print Journal.; 21:2175-2181.

13.Shannon CE, Wiener W. Communication. Univ. of Illinois Press. Urbana, U.S.A, (1949):.

14. Sharma, M. and Sharma, N. Suitability of Butterflies as Indicators of Ecosystem Condition: A Comparison of Butterfly Diversity across four habitats in Gir Wildlife Sanctuary(2017): Int. J. Adv. Res. Biol. Sci. 4(3): 43-53.

UNDER PEER REVIEW