

Species Diversity and Occurrence of Butterflies in Nat–Yae –Kan environs

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Abstract

A total of 2561 butterflies representing 38 species, confined to 26 genera, and five families were recorded from the study site of Nat–Yae–Kan environs lasted from June, 2017 to May, 2018. The five families of butterflies recorded were Papilionidae, Pieridae, Nymphalidae, Lycaenidae and Hesperidae and among them, the highest number of species and individuals were Nymphalidae and the lowest number of species and individuals were that of Hesperidae. The highest diversity index ($H' = 3.4757$) was revealed was in April, 2018 and lowest in June, 2017 ($H' = 3.0312$) at the study site.

Keywords; Butterflies, Nat–Yae–Kan, families, genera, species, subspecies

Introduction

Butterflies are suitable for biodiversity studies as the taxonomy and geographic distribution (Kunte, 1997).

The present study has been undertaken with the following objectives:

- to identify the species of butterflies at Nat–Yae–Kan environs
- to investigate occurrence of butterflies at Nat–Yae–Kan environs
- to assess various diversity indices of butterflies in the study area

Materials and Methods

Study Area and Study Period

Nat–Yae–Kan is located in Amarapura Township at Mandalay Region. It is between $21^{\circ} 51' 40''$ North and $96^{\circ} 04' 58''$ East. The Study was conducted from June 2017 to May 2018 in Nat–Yae–Kan environs.

Collection and Identification of the Specimens

The adult butterfly specimens were captured by using butterfly net from the selected study site. Classification was followed after Corbet and Pendlebury (1992).

Analysis of the Data

Shannon–Weiner's Diversity Index (1949) formula is given as follows:

$$H' = - \sum_{i=1}^S (P_i \ln P_i)$$
$$P_i = \left[\frac{n_i}{n} \right]$$

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P_i = Total number of "i" species

n_i = Number of individuals in the i^{th} species of the sample

n = Total number of individuals in the sample

Simpson's diversity index (1949) is given as follows:

$$D = \sum_{i=1}^S \frac{n_i(n_i - 1)}{n(n - 1)}$$

D = Simpson's index of diversity

n_i = Number of individuals in the i^{th} species in the sample

n = Total number of individuals in the sample

Margalef's species Richness Index (1958) is given as follows:

$$d = \frac{S-1}{\log(N)}$$

d = Margalef's Species Richness Index

S = number of species

N = Total number of individuals

Hill's diversity numbers (1973) is given as follows:

Number 1: $N_1 = e^{H'}$

H' = Shannon-Weiner's index

N_1 = number of abundant species in the sample

Number 2: $N_2 = 1/D$

D = Simpson's index

N_2 = Number of very abundant species in the sample

. Measure the butterfly species evenness or equitability (or relative species abundance) was determined by the evenness index of modified Hill's ratio (1973) which is given as follows:

$$E = \frac{(1/D)^{-1} - 1}{e^{H'} - 1} = \frac{N_2 - 1}{N_1 - 1}$$

E = Hills' evenness index (which approaches zero)

D = Simpson's index of diversity

H' = Shannon-Weiner's index of species diversity

N_1 = Number of abundant species in the sample

N_2 = Number of very abundant species in the sample

Results

Species Occurrence and Composition of Recorded Butterflies

In studying the site under the family Papilionidae, *Papilio demoleus* (71.09%) was the most abundant species of the whole year according to the study from June, 2017 to May, 2018. The second highest species was *Papilio polytes* (14.84%). When family Pieridae was considered the highest species was observed to be *Ixias pyrene verna* (13.56%). The

second highest species was *Eurema hecabe* (13.04%). In Nymphalidae, *Junonia lemonias* (18.22%) was the highest species and the second highest species was *Phalanta phalantha* (12.75%). According to the family Lycaenidae, *Catochrysops strabo* (40.43%) was the highest species of the year from June 2017 to May 2018. The second highest species was *Everes lacturnus* (37.69%). In Hesperidae, *Potanthus trachala* (77.22%) was the highest species and second highest species was *Suastus gremius* (22.78%).

Species Diversity

At study site of Nat-Yae-Kan, the highest values for H' , D , N_1 and N_2 were (3.4757, 0.0316, 32.3204, 31.6451) in April, 2018. The highest value for d was (6.5499) in May 2018 and the highest value for E was (0.9946) in November 2017. The lowest values for d , H' , D , N_1 and N_2 were (4.6216, 3.0312, 0.0502, 20.7221 and 19.9135) June, 2017. The lowest value for E was (0.9323) in March, 2018 (Table.6).

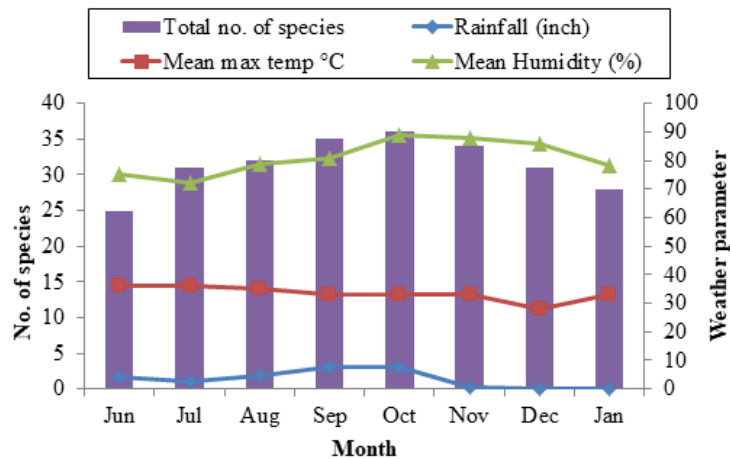


Fig 1 Relation between species and weather conditions of temperature, humidity and rainfall of the study area (June 2017 – May 2018)

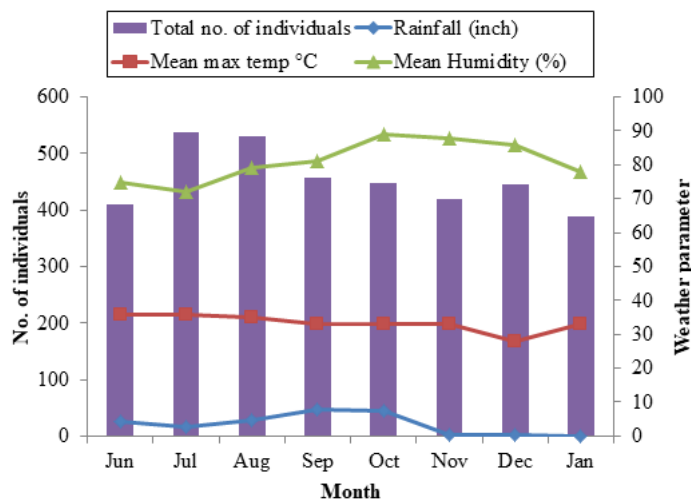


Fig 2 Relation between Individuals and weather conditions of temperature, humidity and rainfall of the study area (June 2017 – May 2018)

Table 1 Monthly occurrence and population percentage of Papilionid butterfly species at Nat-Yae-Kan environs (June, 2017 to May, 2018)

Sr. No.	Species	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Total no. of individuals	Population (%)
1.	<i>P.aristolochiae</i>	2	3	1	2	3	1	0	0	0	1	3	2	18	14.06
2.	<i>P. demoleus</i>	7	8	9	7	8	7	6	5	7	8	9	10	91	71.09
3.	<i>P. polytes</i>	1	2	1	3	2	0	0	0	0	2	3	5	19	14.84
Total		10	13	11	12	13	8	6	5	7	11	15	17	128	99.99

Table 2 Monthly occurrence and population percentage of Pierid butterfly species at Nat-Yae-kan environs (June, 2017 to May, 2018)

Sr. No.	Species	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Total no. of individuals	Population (%)
1.	<i>L. nina</i>	1	2	1	3	4	7	9	11	9	13	15	8	83	8.59
2.	<i>C. nerissa</i>	9	7	6	5	5	1	3	3	2	5	7	6	59	6.11
3.	<i>A. libythea</i>	8	11	11	4	3	5	11	7	5	7	9	8	89	9.21
4.	<i>I.pyrene verna</i>	5	6	7	3	2	13	17	18	14	17	18	11	131	13.56
5.	<i>I.pyrene birdi</i>	3	5	6	7	6	7	6	6	4	7	9	8	74	7.66
6.	<i>P. anais</i>	0	0	1	1	3	6	5	5	3	5	7	6	42	4.35
7.	<i>C. pyranthe</i>	7	9	7	3	9	1	6	4	2	3	5	4	60	6.21

8.	<i>C. pomona</i>	8	11	6	4	2	2	5	3	1	2	3	2	49	5.07
9.	<i>E. hecabe</i>	9	9	13	11	7	7	11	12	9	13	14	11	126	13.04
10.	<i>E. simulatrix</i>	0	11	11	5	9	6	9	10	8	10	11	9	99	10.25
11.	<i>E. blanda</i>	6	5	5	7	8	5	5	4	3	5	8	6	67	6.94
12.	<i>E. ada</i>	9	11	9	6	7	4	7	6	4	7	9	8	87	9.01
Total		65	87	83	59	65	64	94	89	64	94	115	87	966	100

Table 3 Monthly occurrence and population percentage of Nymphalid butterfly species at Nat Yae Kan environs (June, 2017 to May, 2018)

Sr. No.	Species													Total no. of	Population
		Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	individuals	(%)
1.	<i>D. chrysippus</i>	7	9	11	4	5	0	0	0	9	10	11	9	75	7.08
2.	<i>D. genutia</i>	2	4	5	3	4	2	0	0	5	6	7	8	46	4.34
3.	<i>T. limniace</i>	3	3	6	7	8	5	5	6	3	7	8	8	69	6.52
4.	<i>P. aglea</i>	0	1	0	1	3	2	1	1	1	3	3	3	19	1.79
5.	<i>E. aglea</i>	0	0	0	0	3	6	3	5	4	6	5	4	36	3.40
6.	<i>E. mulciber</i>	0	0	0	0	0	1	1	2	1	1	2	1	9	0.85
7.	<i>L. europa</i>	0	0	0	0	1	2	1	1	0	2	2	1	10	0.94
8.	<i>M. perseoides</i>	0	10	15	11	13	11	6	7	5	14	15	12	119	11.24
9.	<i>A. violae</i>	8	9	5	3	0	0	0	0	2	10	9	8	54	5.10

10.	<i>P. phalantha</i>	21	21	9	5	4	0	0	0	8	23	20	24	129	12.75
11.	<i>C. cyane</i>	0	0	1	0	1	0	0	0	1	2	3	1	9	0.85
12.	<i>J. almana</i>	13	10	7	2	0	0	0	0	7	9	10	9	67	6.33
13.	<i>J. lemonias</i>	16	19	23	18	19	12	11	10	13	21	17	14	193	18.22
14.	<i>J. orithya</i>	5	4	2	1	0	0	0	0	3	4	5	4	28	2.64
15.	<i>J. hierta</i>	6	2	0	0	0	0	0	0	4	5	6	5	28	2.64
16.	<i>H. misippus</i>	8	8	6	5	7	5	4	5	6	9	7	7	77	7.27
17.	<i>H. bolina</i>	0	9	11	8	9	8	3	4	3	10	9	11	85	8.03
Total		89	109	101	68	77	54	35	41	75	142	139	123	1053	99.99

Table 4 Monthly occurrence and population percentage of Lycaenid butterfly species at Nat-Yae-Kan environs (June, 2017 to May, 2018)

Sr. No.	Species													Total no. of individuals	Population (%)
		Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May		
1.	<i>C. rosimon</i>	0	0	0	0	5	2	1	0	0	0	1	2	11	3.34
2.	<i>E. lacturnus</i>	10	12	11	9	10	11	11	9	10	7	13	11	124	37.69
3.	<i>S. plinius</i>	0	0	0	6	8	8	5	5	7	5	9	8	61	18.54
4.	<i>C. strabo</i>	6	23	13	3	7	13	9	8	9	11	15	16	133	40.43
Total		16	35	24	18	30	34	26	22	26	23	38	37	329	100

Table 5 Monthly occurrence and population percentage of Hesperiid butterfly species at Nat-Yae-Kan environs (June, 2017 to May, 2018)

Sr. No.	Species													Total no. of individuals	Population(%)
		Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May		
1.	<i>S. gremius</i>	0	0	0	0	2	1	1	0	2	3	4	5	18	22.78
2.	<i>P.trachala</i>	0	0	0	0	5	10	3	0	13	11	10	9	61	77.22
Total		0	0	0	0	7	11	4	0	15	14	14	14	79	100

Table 6 Comparison of diversity indices at Nat-Yae-Kan environs (June, 2017 to May, 2018)

	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May
Total no. of individuals	180	244	219	157	192	171	165	157	187	284	321	284
Total no. of species	25	29	29	30	33	30	28	25	34	37	38	38
d	4.6216	5.0935	5.1957	5.7355	6.0865	5.6402	5.2880	4.7466	6.3084	6.3728	6.4109	6.5499
H'	3.0312	3.1700	3.1481	3.1974	3.3082	3.1711	3.1145	3.0497	3.3114	3.3965	3.4757	3.4581
D	0.0502	0.0446	0.0447	0.0426	0.0376	0.0422	0.0453	0.0482	0.0370	0.0358	0.0316	0.0325
N ₁	20.7221	23.8075	23.2918	24.4688	27.3359	23.8337	22.5222	21.1090	27.4235	29.8594	32.3204	31.7566
N ₂	19.9135	22.4082	22.3931	23.4598	26.5739	23.7113	22.0718	20.7559	27.0467	27.9069	31.6451	30.7703
E	0.9590	0.9386	0.9597	0.9570	0.9711	0.9946	0.9791	0.9824	0.9857	0.9323	0.9784	0.9679



Papilio demoleus



Papilio polytes



Junonia lemonias



Phalanta phalantha



Discussion

During the study period of June, 2017 to May, 2018, a total number of 38 butterfly species confined to 26 genera and distributed among five families were collected and identified. In the study site of Nat-Yae-Kan environs, among the five families, Nymphalidae 1059 butterflies were the most dominant, followed by Pieridae 966, Lycaenidae 329, Papilionidae represented by 128 individuals and Hesperidae 79 individuals were recorded.

In the study site of Nat-Yae-Kan environs, family Nymphalidae has the highest individuals and the second highest in family Pieridae. Three species under two genera of Papilionidae, 12 species under seven genera, 17 species under 11 genera, four species under four genera, two species under two genera were recorded.

In the study site of Nat-Yae-Kan environs, the peak number of butterflies occurred in April, 2018 with a number of 321 individuals. The lowest number occurred in September 2017 and January, 2018 with 157 individuals. Very few butterflies have been recorded in December, 2017 with 165 individuals.

In measuring the species diversity, two methods were applied, Simpson's diversity (D) and Shannon-Weiner's diversity (H'). The highest value for D and H' were observed in April, 2018 at the study site of Nat-Yae-Kan environs.

In conclusion, long term monitoring is needed for more accurate information.

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