

**AQUATIC INSECTS OF THE 'NA PUKHU' POND,
BHAKTAPUR, NEPAL**



SAVITA OJHA

T.U. Registration No: 5-2-3-1262-2007

T.U. Examination Roll No: 18284

Batch: 2067/68

A thesis submitted

In partial fulfillment of the requirements for the award of the degree of Master of Science
in Zoology with special paper Entomology

Submitted to

Central Department of Zoology
Institute of Science and Technology
Tribhuvan University
Kirtipur, Kathmandu
Nepal

September, 2016

RECOMMENDATION

This is to recommend that the thesis entitled “**AQUATIC INSECTS OF THE ‘NA PUKHU’ POND, BHAKTAPUR, NEPAL**” has been carried out by Miss Savita Ojha for the partial fulfillment of Master’s Degree of Science in Zoology with special paper Entomology. This is her original work and has been carried out under my supervision. To the best of my knowledge, this thesis work has not been submitted for any other degree in any institutions.

Date:

.....
Urmila Dyola
Lecturer and Supervisor
Central Department of Zoology
Tribhuvan University
Kirtipur, Kathmandu, Nepal

LETTER OF APPROVAL

On the recommendation of supervisor Lecturer Urmila Dyola, this thesis submitted by Miss Savita Ojha entitled **“AQUATIC INSECTS OF THE ‘NA PUKHU’ POND, BHAKTAPUR, NEPAL”** is approved for examination and submitted to the Tribhuvan University for the partial fulfillment of the requirements for the Master’s Degree of Science in Zoology with special paper Entomology.

Date.....

.....
Ranjana Gupta, Ph.D.
Professor and Head
Central Department of Zoology
Tribhuvan University
Kirtipur, Kathmandu, Nepal

CERTIFICATE OF ACCEPTANCE

This thesis work submitted by Miss Savita Ojha entitled “**AQUATIC INSECTS OF THE ‘NA PUKHU’ POND, BHAKTAPUR, NEPAL**” has been accepted for the partial fulfillment of the requirements for the requirements of Master’s Degree of Science in Zoology with special paper Entomology.

EVALUATION COMMITTEE

.....
Urmila Dyola
Lecturer and Supervisor
Central Department of Zoology
Tribhuvan University
Kirtipur, Kathmandu, Nepal

.....
Ranjana Gupta, Ph. D.
Professor and Head
Central Department of Zoology
Tribhuvan University
Kirtipur, Kathmandu, Nepal

.....
External Examiner
Ishan Gautam Ph. D.
Lecturer
National History Museum
Tribhuvan University
Swayambhu, Kathmandu, Nepal

.....
Internal Examiner
Indra Prasad Subedi
Lecturer
Central Department of Zoology
Tribhuvan University
Kirtipur, Kathmandu, Nepal

Date of Examination:

DECLARATION

I hereby declare that the work presented in this thesis entitled “**AQUATIC INSECTS OF THE ‘NA PUKHU’ POND, BHAKTAPUR, NEPAL**” has been done myself and has not been submitted elsewhere for the award of any degree. All sources of information have been specifically acknowledged by references to the authors and institutions.

Date.....

.....

SAVITA OJHA

ACKNOWLEDGEMENTS

It is my great opportunity to carry out this thesis for the partial fulfillment of the degree of Master of Zoology. I would like to express my sincere gratitude to my supervisor, Mrs. Urmila Dyola, Lecturer, Central Department of Zoology for her supervision, suggestions, feedbacks and encouragement throughout the study.

I am grateful to Prof. Dr. Ranjana Gupta, Head of Central Department of Zoology, T.U., for her kind support, inspirations and encouragement. My cordial thanks go to Dr. Anand Shova Tamrakar for providing me her guidance related to my study. I am very pleased to all teaching and non-teaching staffs and laboratory staffs of CDZ for providing me essential equipments for laboratory analysis.

I am indebted to Natural History Museum for providing me literatures related to my work. My special thanks go towards my friends Gyanu Chaguthi, Purna Man Shrestha, Pradip Subedi and my sister Nabina Bhandari for their support in field study and data analysis period.

I would like to extend my dedication to my loving parents Mr. Ram Prasad Ojha, Mrs. Rama Ojha, my loving brother and sister Vishwa and Sachchida for their generous support throughout the work. I am most thankful to my dear husband Mr. Nabin Lamichhane for his support, suggestions and encouragements in each and every step of my research work. I should not forget my in laws Mr. Tanka Mani Lamichhane, Mrs. Ananta Devi Lamichhane, Namrata Lamichhane and all family members for their familiar support to complete this study.

Lastly but not least, I would like to thank to all contributors who helped me throughout this work.

ABSTRACT

The study of the aquatic insects was carried out in the 'Na pukhu' pond of Bhaktapur Municipality during March 2014 to August 2014 in pre monsoon and monsoon. A total of 4181 insects belonging to five genera under five families and three orders were identified including individuals of one unidentified species. During the study period the most abundant order was Diptera in pre monsoon and Hemiptera in monsoon. The diversity index, species richness and evenness of the insects were recorded higher in the monsoon in comparison to pre monsoon. The relation of diversity with physical parameters was correlated by using Karl Pearson's Correlation Coefficient which shows positive relation with temperature, pH and alkalinity but negative with DO in pre monsoon. In monsoon, diversity shows positive correlation with alkalinity but negative with temperature, pH and DO. The analysis showed *Chironomus* sp. as most abundant during the study period.

TABLE OF CONTENTS

	PAGES
DECLARATION	i
RECOMMENDATIONS	ii
LETTER OF APPROVAL	iii
CERTIFICATE OF ACCEPTANCE	iv
ACKNOWLEDGMENTS	v
TABLE OF CONTENTS	vi
LIST OF TABLES	viii
LIST OF FIGURES	viii
LIST OF ANNEXES	viii
ABBREVIATIONS	ix
ABSTRACT	x
1. INTRODUCTION	1
1.1. General Background	1
1.2. Aquatic Insect Diversity	1
1.3. Importance of Insect Fauna	2
1.4. Objectives	3
1.5. Rationale	3
1.6. Limitations	3
2. LITERATURE REVIEW	4
2.1. Studies of Aquatic Insects in Nepal	4
2.2. Studies in the Global Context	5
3. MATERIALS AND METHODS	7
3.1. Study Area	7
3.1.1. Location	7
3.2. Field Survey	9
3.2.1. Reconnaissance Survey	9
3.2.2. Site Selection	9
3.2.3. Sampling Frequency	9
3.3. Materials Used	9
3.4. Species Collection Method	9
3.5. Preservation, Identification and Photography	10
3.6. Physico-chemical Analysis of pond water	10
3.6.1. Hydrogen Ion Concentration	10
3.6.2. Temperature	10
3.6.3. Dissolved Oxygen	10
3.6.4. Alkalinity	10

3.7. Statistical Analysis	11
4. RESULTS	12
4.1. Monthly Collection of Aquatic Insects	13
4.2. Monthly fluctuations of Species Diversity, Species Richness and Species Evenness of the Pond	14
4.3. Abundance of the Aquatic Insects	15
4.4. Physical Parameters of the Pond	16
4.4.1. Temperature	16
4.4.2. Hydrogen Ion Concentration	16
4.4.3. Dissolved Oxygen	17
4.4.4. Alkalinity	17
4.5. Correlation of Insect Diversity with Physical Parameters	17
5. DISCUSSION	18
6. CONCLUSION AND RECOMMENDATIONS	21
6.1 Conclusion	21
6.2 Recommendations	21
7. REFERENCES	22
ANNEXES	
ANNEXES I Photo Plates of Collected Species	i
ANNEXES II Photo Plates of Study site and Research Activities	viii
ANNEXES III Data Analysis	x
ANNEXES IV Field Record Sheet	xii

LIST OF TABLE

Table	Title of table	Pages
Table 4.1	Insect species collected during March to August 2014	12

LIST OF FIGURES

Figure	Title of figures	Pages
Figure 3.1	Map of study area Na pukhu pond	8
Figure 4.1	Monthly Collections of Insect species	13
Figure 4.2	Variations in Diversity Index, Species Richness and Evenness	14
Figure 4.3	Monthly Abundance of Insect Orders	15
Figure 4.4	Pie-chart showing Pre-monsoon Abundance of Insect Orders	15
Figure 4.5	Pie-chart showing Monsoon Abundance of Insect Orders	16
Figure 4.6	Monthly variations in Physical Parameters	16
Figure 4.7	Correlations between Diversity Index and Physical Parameters	17

LIST OF ANNEXES

Annexes	Title of Annexes	Pages
Annexes I	Photo Plates of Collected Species	i
Annexes II	Photo Plates of Study site and Research Activities	viii
Annexes III	Data Analysis	x
Annexes IV	Field Record Sheet	xii

LIST OF ABBREVIATIONS

Abbreviated form	Details of Abbreviations
%	Percentage
Σ	Summation
$\sqrt{\quad}$	Square root
<	Lesser than
e. g.	Example
km	Kilometer
km ²	Square Kilometer
sq. ft.	Square feet
m	Meter
cm	Centimeter
μm	Micrometer
ml	Milliliter
sp.	Species
mg/l	Milligram per liter
BOD	Biological Oxygen Demand
CDZ	Central Department of Zoology
DO	Dissolved Oxygen
DOAD	Department of Agriculture Development
IUCN	International Union for Conservation of Nature