

**GENERAL BEHAVIOUR AND MANAGEMENT PRACTICES OF
SPOTTED DEER [*Axis axis*, Erxleben, 1777]
AT MRIGASTHALI (DEER PARK), KATHMANDU, NEPAL.**



Narayan Baral

T.U. Registration No: 5-2-49-131-2007

T.U. Examination Roll No: 21663

Batch: 2068/069

**A Thesis Submitted in partial fulfillment of the
Requirement for the award of the degree of Master's of
Science in Zoology with special paper Ecology**

**Submitted to
Central Department of Zoology
Institute of Science and Technology
Tribhuvan University
Kirtipur, Kathmandu
Nepal
December, 2015**

DECLARATION

I hereby declare that the work presented in this thesis entitled “**GENERAL BEHAVIOUR AND MANAGEMENT PRACTICES OF SPOTTED DEER** [*Axis axis*, Erxleben, 1777] **AT MRIGASTHALI (DEER PARK), KATHMANDU, NEPAL**” has been done by myself, and has not been submitted elsewhere for the award of any degree. All the sources of the information have been specifically acknowledged by reference to the author(s) or institution(s).

Date: _____

2007

Narayan Baral

T.U. Registration No: 5-2-49-131-

T.U. Examination Roll No: 21663

Batch: 2068/069

RECOMMENDATIONS

This is to recommend that the thesis entitled “GENERAL BEHAVIOUR AND MANAGEMENT PRACTICES OF SPOTTED DEER [*Axis axis*, Erxleben, 1777] AT MRIGASTHALI (DEER PARK), KATHMANDU, NEPAL” has been carried out by Narayan Baral for the partial fulfillment of Master’s Degree of Science in Zoology with special paper “Ecology”. This is the candidate’s original work and has been carried out under my supervision. To the best of my knowledge, this thesis has not been submitted for any other degree in any institutions.

Date: _____

Zoology

Dr. Mukesh Kumar Chalise
Associate Professor
Central Department of
Tribhuvan University
Kirtipur, Kathmandu, Nepal

LETTER OF APPROVAL

On the recommendation of Supervisor Dr. Mukesh Kumar Chalise, Associate Professor, Central Department of Zoology, Tribhuvan University, this thesis submitted by Narayan Baral entitled “GENERAL BEHAVIOUR AND MANAGEMENT PRACTICES OF SPOTTED DEER [*Axis axis*, Erxleben, 1777] AT MRIGASTHALI (DEER PARK), KATHMANDU, NEPAL” is approved for the examination and submitted to the Tribhuvan University in partial fulfilment of the requirements for Master's Degree of Science in Zoology with special paper “Ecology”.

Date: _____

Zoology

Prof. Dr. Ranjana Gupta
Head of Department
Central Department of

Tribhuvan University
Kirtipur, Kathmandu, Nepal

CERTIFICATE OF ACCEPTANCE

This thesis work submitted by Narayan Baral entitled “GENERAL BEHAVIOUR AND MANAGEMENT PRACTICES OF SPOTTED DEER [*Axis axis*, Erxleben, 1777] AT MRIGASTHALI (DEER PARK), KATHMANDU, NEPAL”, has been accepted as a partial fulfilment for the requirements of Master’s Degree of Science in Zoology with special paper “Ecology”.

EVALUATION COMMITTEE

Supervisor

Dr. Mukesh Kumar Chalise

Associate Professor

Central Department of Zoology

Tribhuvan University

Kirtipur, Kathmandu

Prof. Dr. Ranjana Gupta

Head of Department

Central Department of Zoology

Tribhuvan University

Kirtipur, Kathmandu

External Examiner

Internal Examiner

Date of Examination: _____

ACKNOWLEDGEMENTS

I express my sincere honour and special thanks to my academic supervisor, Associate Professor Dr. Mukesh Kumar Chalise for his guidance, encouragement and brilliant insight throughout this research work.

I am highly obliged to Professor Dr. Ranjana Gupta, Department Head, Central Department of Zoology; TU. for her kind support, suggestions and encouragement. I express my sincere thanks to my respected teachers of Central Department of Zoology; Tribhuvan University.

I would like to thank Pashupati Area Development Trust (PADT) for granting me permission to carry out this research work at Mrigasthali. I express my thanks to the Officer Mr. Gauri Parajuli who looking after Mrigasthali, Administrative assistant Mr. Ghanshyam Parajuli and Caretaker Mr. Om Ghimire who assisted in my field work. I am thankful to security guard of PADT Mr. Krishna Bahadur Giri who provided me valuable information, support and suggestions in my field work. I am heartily indebted to the whole family of PADT who provided family environment during my field visits.

I appreciate the encouragement and enthusiastic support with suggestions that I got from my friend Mr. Jeevan Somai throughout the course of study. Friends, Mr. Sanjay Kharel, Mr. Sunil Khatiwada and Mr. Anuj Ghimire are equally thankful for their interest and support.

I am thankful to my lovely sister Sarita Baral for her interest and continuous support in my work. I express my honour to my respected sister-in-law, Chanda Shah for her abiding interest, inspirations and financial support in my study. My loving mother Bishnu Kumari Baral deserves the credit of completion of this work for her keen interest and company in every moments of my study. I am grateful to my parents for encouragement and support throughout the course of study and I would like to dedicate this thesis to my loving parents.

Narayan Baral

T.U. Examination Roll No: 21663

TU Registration No: 5-2-49-131-

ABSTRACT

The Mrigasthali deer park, situated in the Pashupati World Heritage Site, at a distance on 5km, northeast of Kathmandu, Gaushala. The general behavior and management practices of the most attractive mammal spotted deer (*Axis axis*) at Mrigasthali deer park, Kathmandu, was studied by direct observation, survey, focal and scan sampling, questionnaire, interviews and discussion method to meet the objectives of the study. The field work was conducted between March 2014 to January 2015 to explore the general behaviour with diurnal activities and management practices in Mrigasthali.

The social organization of the spotted deer were loose aggregation which could be changed by climatic, food and disturbances factor. The most common herds were mixed herds followed by female-fawn herd and breeding herds. The male herds, isolated male/female herds were occasionally seen. Spotted deer are true grazers and seasonal browser. They preferred supplementary food given by caretaker on feeding. Long range of vision, high capacity of escape and greater sensitivity and alertness towards danger were major defense measures from their predators. The adult and dominant male showed dominancy towards both territorial and sexual behaviour.

The feeding was peaked up in the evening, they took rest under trees-shade during the mid-day of April. Feeding was the most common diurnal activity followed by walking, resting, alert and other activities like chasing, sparring, mounting, suckling etc.

The management practices of spotted deer done in the Mrigasthali were fencing, water hole construction, plantation and non-palatable species removal. Therefore, provision of artificial water holes, expand area, increase plantation, effective implementation of facilities provided by PADT are the main recommendation of this study for the better management of the spotted deer in Mrigasthali. This study shows that by knowing general behavior of any species, management of the species can be enhanced.

CONTENTS

S. N. No.	Content	Page
	Declaration	I
	Recommendation	II
	Letter of Approval	III
	Certificate of Acceptance	IV
	Acknowledgement	V
	Abstract	VI
	Contents	VII-IX
	List of Tables and Photo Plates	X
	List of Figures	X
	List of Abbreviations and Acronyms	XI
1.	INTRODUCTION	1-10
	1.1 Background	1-2
	1.2 Spotted Deer	2
	1.2.1 Evolution of Spotted deer	2
	1.2.2 Physical Description	3-5
	1.2.3 Habitat and Food Habit	5-6
	1.2.4 Social Structure	6-7
	1.2.5 Reproduction and Lifespan	7-8
	1.3 Distribution of Spotted deer	8-9
	1.4 Value of Spotted deer	9
	1.5 Rationale of the Study	9
	1.6 Research Objectives	10
	1.7 Limitations of the Study	10
2.	LITERATURE REVIEW	11-12
3.	MATERIALS AND METHODS	13-19
	3.1 Materials	13-

	3.1.1 Physical Description	13-
16		
	3.1.1 .1 Location, Boundary and History of Mrigasthali	13
	3.1.1.2 Topography and Geology	14
	3.1.1.3 Hydrology and Drainage	14
	3.1.1.4 Climate	14-16
	3.1.2 Biological Description	16-17
	3.1.2.1 Flora	16-17
	3.1.2.2 Fauna	17
	3.2. Methods	18-
19		
	3.2.1 Preliminary Field Survey	18
	3.2.2 Field Survey	18
	3.2.3 Diurnal Activity and General Behaviour	18-19
	3.2.4 Questionnaire Survey	19
	3.2.5 Interviews and Discussions	19
4. RESULTS		20-
29		
4.1 General Behaviour and Diurnal Activity Pattern		20-
27		
	4.1.1 General Behaviour	21-
24		
	4.1.1.1 Social Behaviour	20
	4.1.1.2 Territorial Behaviour	21
	4.1.1.3 Feeding Behaviour	22
	4.1.1.4 Sexual Behaviour	23
	4.1.1.5 Anti-predatory Behaviour	23-24
	4.1.1.5.1 Alert Posture	23
	4.1.1.5.2 Alarm Call and Foot Stamping	24
	4.1.1.5.3 Alert Flight	24
	4.1.2 Diurnal Activity pattern	24-27
	4.1.2.1 Late Morning Activities of Mixed Herds	24-25

4.1.2.2	Afternoon Activities of Mixed Herds	25
4.1.2.3	Evening Activities of Mixed Herds	25-26
4.1.2.4	Diurnal Activities Spotted Deer in Mrigasthali	26-27
4.2	Management practices	27-
29		
4.2.1	Habitat manipulation	27-
28		
4.2.1.1	Fencing	28
4.2.1.2	Water holes construction	28
4.2.1.3	Plantation and ploughing	28
4.2.1.3	Non-Palatable Species Removal	28
4.2.2	Management committees	28
4.2.3	Involvement of Local NGOs	29
4.2.4	Perception of Local people	29
5.	DISCUSSION	30-33
5.1	General Behaviour and Diurnal Activity Pattern	30-
32		
5.2	Management Practices	32-
33		
6.	CONCLUSION	34-35
7.	RECOMMENDATIONS	36
8.	REFERENCES	37-44
9.	APPENDIXES	45-49
I.	Questionnaire Survey with Park Authorities and Visitors	45-
46		
II.	Monthly Maximum Temperature of Mrigasthali, Kathmandu	47
	Monthly Minimum Temperature of Mrigasthali, Kathmandu	47
III.	Photo-plates	48-
49		

LIST OF TABLES

S. N. No.	Page
Table 1: Daily routine of diet provided to Spotted deer in Mrigasthali	
22	

LIST OF FIGURES

S.N. No.	Page
Figure 1: Map of Study Area	13
Figure 2: Annual Rainfall at Mrigasthali, Kathmandu.	14
Figure 3: Average Monthly Rainfall at Mrigasthali, Kathmandu.	15
Figure 4: Annual Mean Max. /Min. Temperature in Mrigasthali, Kathmandu.	15
Figure 5: Monthly Variation of Max. /Min. Temperature in Mrigasthali, Kathmandu.	16
Figure 6: Annual Relative Humidity in Mrigasthali, Kathmandu (2010 – 2014).	16
Figure 7: Late Morning Activities of Mixed Herds of Spotted deer in Mrigasthali.	25
Figure 8: Afternoon Activities of Mixed Herds of Spotted deer in Mrigasthali.	25
Figure 9: Evening Activities of Mixed Herds of Spotted deer in Mrigasthali.	26
Figure 10: Diurnal Activities of Mixed Herds of Spotted deer in Mrigasthali.	26
Figure 11: Percentage of Diurnal Activities of Spotted deer in Mrigasthali.	27
Figure 12: Perception of Local people.	29

LIST OF PHOTO PLATES

S.N. No.		Page
Photo Plates 1-6. 48	Behavioural Study and Different Behaviour of spotted deer	
Photo Plates 7-12 49	Management practices done in Mrigasthali	

ABBREVIATIONS/ACRONYMS

B.S.	Bikram Samvat
BC	Before Christ
CBS	Central Bureau of Statistics
CITES	Convention on International Trade in Endangered Species of Wild Flora and Fauna
⁰ C	Degrees Celsius
DNPWC	Department of National Parks and Wildlife Conservation
GPS	Geographic Positioning System
ha	Hectare
hrs	Hours
INGO	International Non-Governmental Organization
IUCN	World Conservation Union
Km	Kilometer
Km ²	Square Kilometer
Kg	Kilogram
m.	Meter
mm.	Millimeter
NG	Nepal Government
NGO	Non-Governmental Organization
No.	Number
NTNC	National Trust for Nature Conservation
PADT	Pashupati Area Development Trust
%	Percentage
RBNP	Royal Bardia National Park
RCNP	Royal Chitwan National Park
Rs.	Rupees
TU	Tribhuvan University
USA	United States of America
USSR	United States of Soviet Russia

WWF

World Wildlife Fund