

**POPULATION STATUS, AND BREEDING SUCCESS OF LESSER
ADJUTANT STORK(*Leptoptilos javanicus*Horsfield,1821) IN KOSHI
TAPPU WILDLIFE RESERVE, NEPAL.**



Jitendra Kumar Bishwas

T.U. Registration No: 5-3-28-20-2008

T.U. Examination Roll No: 6197

Batch: 2065-2066

**A thesis submitted in partial fulfilment of the requirements for the award of
the degree of master of Science in Zoology with special paper Ecology.**

Submitted to

Central Department of Zoology

Institute of Science and Technology

Tribhuvan University

Kritipur, Kathmandu

Nepal

March, 2017



TRIBHUVAN UNIVERSITY
CENTRAL DEPARTMENT OF ZOOLOGY

Kirtipur, Kathmandu, Nepal

DECLARATION

I hereby declare that the work presented in this thesis entitled “**POPULATION STATUS, AND BREEDING SUCCESS OF LESSER ADJUTANT STORK (*Leptoptilos javanicus* Horsfield, 1821) IN KOSHI TAPPU WILDLIFE RESERVE, NEPAL**”. has been done by myself, and has not been submitted elsewhere for the award of any degree. All sources of information have been specifically acknowledged by reference to the author or institution.

Date.....

.....

Jitendra Kumar Bishwas



TRIBHUVAN UNIVERSITY
CENTRAL DEPARTMENT OF ZOOLOGY

Kirtipur, Kathmandu, Nepal

RECOMMENDATIONS

This is recommended that the thesis entitled “**Populatoion Status, and Breeding Success of Lesser Adjutant Stork (*Leptoptilos javanicus* Horsfield, 1821) in Koshi Tappu Wildlife Reserve, Nepal**” has been carried by **Mr. Jitendra Kumar Bishwas** for the partial fulfilment of Master’s Degree of Science in Zoology with special paper **Ecology and Environment**. This is his 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.

.....

Lecturer

Laxman Khanal

Central Department of Zoology

Tribhuvan University

Kirtipur, Kathmandu, Nepal

Date.....



TRIBHUVAN UNIVERSITY
CENTRAL DEPARTMENT OF ZOOLOGY

Kirtipur, Kathmandu, Nepal

LETTER OF APPROVAL

On the recommendation of supervisor “**Lecturer Laxman Khanal**”, this thesis submitted by **Mr. Jitendra Kumar Bishwas** entitled “**Populatoion Status, and Breeding Success of Lesser Adjutant Stork (*Leptoptilos javanicus* Horsfield, 1821) in Koshi Tappu Wildlife Reserve, 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 and Environment**.

Date.....

.....

Prof. Dr. Ranjana Gupta

Head of Department

CentraDepartment of

Zoology

Tribhuvan University

Kirtipur,

Kathmandu, Nepal



TRIBHUVAN UNIVERSITY
CENTRAL DEPARTMENT OF ZOOLOGY

Kirtipur, Kathmandu, Nepal

CERTIFICATE OF ACCEPTANCE

This thesis work submitted by Mr. Jitendra Kumar Bishwas entitled **“Populatoion Status, Habitat Preferences and Breeding Success of Lesser Adjutant Stork *Leptoptilos javanicus* (Horsfield, 1821) in Koshi Tappu Wildlife Reserve, Nepal”** has been accepted as a partial fulfilment for the requirements of Master’s Degree of Science in Zoology with special paper **Ecology and Environment.**

EVALUATION COMMITTEE

.....

Supervisor

Laman Khanal

Central Department of Zoology

Kirtipur, Kathmandu, Nepal

.....

External Examiner

Date of Examination.....

.....

Head of Department

Prof. Dr. Ranjana Gupta

Central Department of Zoology

Kirtipur, Kathmandu, Nepal

.....

Internal Examiner

ACKNOWLEDGEMENTS

I would like to express my sincere thanks to Lecturer Laxman Khanal as my research supervisor, for his expert guidance, supervision, encouragement and support to carry on thesis in this form. My gratitude goes to Prof. Dr. Bharat Raj Subba P.G. Campus, Biratnagar for precious suggestion and providing literature and methods that have been implemented in the study field.

I am grateful to Prof. Dr. Ranjana Gupta, Head, Central Department of Zoology and my teachers for their kind support and encouragement. I am thankful to all the staffs of CDZ, TU. for providing me an administrative and department facilities. My special thanks goes to Mr. Ashok Ram, warden and all the staffs of KTWR for guidance and questionnairing support in the study area. My grateful thanks to Mr. Arjun Karki member of Community forest of KTWR for his precious support and guidance in first my preliminary field visit. I grateful thanks to DNPWC to provide permission to work in my study area, KTWR and I also want to say thanks to librian of DNPWC for providing recent literatures that have Completed my thesis.

My gratitude goes to Mr. Anand Chaudhary, Menuka Basnyat, Bird Conservation Nepal (BCN), for kind support and encouragement. I grateful thanks to Ms. Prativa Kaspal, Himalayan Resource, for her expert guidance and completion my thesis writing. Also, My Sincere thanks goes to Mr. Nir Sing Rai, Deepak, Mr. Sanjan Thapa, Arjun Thapa, Robin Rana, Dikpal Krishna Karmacharya, for their kind suggestion to prepare my thesis. Also My Sincere thanks go to Mr. Janardan Mainali , Research Solution Nepal and all my friends of CDZ, TU., for their co-operation to prepare my thesis.

Finally, My Sincere thanks go to Prof. Dr. Ram Bdr. Thapa, P.G. Campus, Biratnagar for continuous suggestion and help to discussion partt my thesis. And last, I indebted my Parents, family members for continuous supporting and research activities.

ABSTRACT

The Koshi Tappu Wildlife Reserve is outstanding bird hot-spots area, more than 50% of bird species of Nepal is recorded here. This research highlights on population, habitat preferences and breeding success in different months with respect to different habitat sites. For analysis of Population Size, used line transect method i.e. fixed 20 points, each point that the distance demarked about 500m covering in area of 100 ha. R- software to perform all the statistical analysis was used. Altogether, 95 individuals of Lesser Adjutant Stork in different months was recorded. Using Jackknife technique for the estimation of population was found 22 individuals. There was significance difference ($P(\chi^2) < 0.00000146$ in distribution pattern of Lesser Adjutant Stork in different months due to seasonal variations. Chi-square χ^2 for 10df at $\alpha_1=0.01$ and $\alpha_2=0.05$ were found 23.209 and 18.307 respectively, were very smaller than calculated value 45.96. Hence H_0 is rejected, thus It was concluded the Lesser Adjutant Stork LAS should be clumped or random distribution over the different months. Like wise another analysis One-Way ANOVA was used. There was significance difference ($P > F = 0.000159$) in numbers of Lesser Adjutant Stork along with different habitat types, due to effect of habitat heterogeneity and their preferences in different seasons. One-way anova for df ($v_1=3, v_2=8$) at $\alpha=0.05$ revealed 4.07 which was less than that of calculated value 26.8. hence, H_1 is accepted and concluded that Lesser Adjutant Stork prefers wetland comparison to other habitat sites. For the breeding success, nest searching programme was conducted September to December 2011. five nests were observed in Kamalpur ward no. 3 and 4. Among them only one nest was active i.e. 3 hatchlings were seen on Karam Tree (*Adina cardifolia*). breeding success in KTWR Seems very low. Based on active nest as primary unit the breeding success was found 33% while based on occupied nest as primary unit the breeding success was found 20% only. Population frequency was high in February and March in prenesting period, and during the nesting period the frequency of LAS was very low. because all the storks should come back to breeding site to make nest for copulation. Lesser adjutant Stork prefers winter season, they were seen in plenty of number in wetland than others habitat sites. The major threats to decline the LAS was due to habitat loss and modification, hunting and persecution, pollution and disturbances

CONTENTS

Topic	Page No.
DECLARATION.....	I
RECOMMENDATION.....	II
LETTER OF APPROVAL.....	III
CERTIFICATE OF ACCEPTANCE.....	IV
ACKNOWLEDGEMENT.....	V
ABSTRACT.....	VI
CONTENTS.....	VII
LIST OF TABLES.....	VII-VIII
LIST OF FIGURES.....	X
ABBREVIATIONS / ACRONYMS.....	XI
1. INTRODUCTION.....	1
1.1 Background.....	1-3
1.2 Objectives of the Study.....	3
1.3 Rational of the Study.....	3
2. LITERATURE REVIEW.....	4
2.1 Population Status.....	4
2.2 Population Distribution.....	4-5
2.3 Habit and Habitat.....	5
2.4 Breeding Season.....	6
2.5 Courtship and Nest Structure.....	6
2.6 Migration.....	6-7
3. MATERIALS AND METHODS.....	8
3.1 Study Area.....	8

3.1.1 Physiography and Location.....	8-9
3.2 Climate.....	9-11
3.3 Research Methods.....	11
3.3.1 Pilot Survey.....	11-13
3.3.2 Line Transect Method.....	13-14
3.3.3 Jackknife Technique.....	14
3.3.4 Direct Count Method for Nest Census.....	14
3.3.5 Questionnaire Survey.....	14-15
3.4 Analysis of Data.....	15
3.4.1 Hypothesis Setting.....	15
3.4.2 Chi- Square χ^2 Test for Goodness of fit.....	16
3.4.3 Analysis of Variance (ANOVA).....	16
3.4.4 Software used.....	16
4. RESULT.....	17
4.1 Population Size.....	17-18
4.2 Habitat Preferences and Distribution.....	18-21
4.3 Breeding Success.....	21-23
5. DISCUSSION.....	24-26
6. CONCLUSION AND RECOMMENDATION.....	27-28
7. REFERENCES.....	29-33
8. APPENDICES.....	34-46

LIST OF TABLES

Table 1: The Lesser Adjutant Stork Prefers to forage at different habitat sites in the study area.....	19
Table 2: One-way ANOVA table between the number of Lesser Adjutant Stork and different habitat sites.....	21
Table 3: Nest Census of LAS in the study area for field session 2010-2011.....	22

LIST OF FIGURES

Fig 1: Major Global fly ways for Stork.....	1
Fig 2: Number of Lesser Adjutant Storks recorded in different months.....	7
Fig 3: Habitat Use by Lesser Adjutant Stork at different nestin stages.....	9
Fig 4: Comaparison of Maximum Temperature.....	10
Fig 5: Comparison of Minimum Temperature.....	10
Fig 6: Comparison of Rain fall.....	11
Fig 7: No. of LAS recorded at different habitat sites.....	17
Fig 8: Habitat Use by LAS at different nesting sites.....	18
Fig 9: Box Plot for LAS.....	20
Fig 10: Breeding Success of LAS in KTWR.....	22

ABBREVIATIONS/ ACRONYMS

AGF	Agriculture field
ANOVA	Analysis of variance
BCN	Bird Conservation Nepal
Df	Degree of Freedom
DNPWC	Department of National Parks and Wildlife Conservation
GL	Grassland
H ₀	Null Hypothesis
H ₁	Alternative Hypothesis
Ha	Hectare
IUCN	International Union for Conservation and Nature
Km	Kilometer
KTWR	Koshi Tappu Wildlife Reserve
LAS	Lesser Adjutant Stork
M	Meter
MF	Mixed forest
No.	Number
P	Probability Value
CNP	Chitwan National Park
VDC	Village Development Committee
WL	Wetland
χ^2	Chi-Square