STUDY OF AVIAN DIVERSITY WITH REFERENCE TO SEASONAL CHANGES IN CHITWAN NATIONAL PARK, NEPAL

A Thesis

Submitted

In Partial Fulfillment of the Requirements for

the Degree of

DOCTOR OF PHILOSOPHY

Supervisor
Dr. Chetan Kumar Sharma
Professor
Mewar University
Rajasthan, India

Co- Supervisor
Dr.Trilok Chandra Majupuria
Retd. Professor
Tribhuvan University
Kathmandu, Nepal

Research Scholar
Praveen Kumar Jha

DEPARTMENT OF ZOOLOGY
FACULTY OF SCIENCE AND TECHNOLOGY
MEWAR UNIVERSITY, GANGRAR, CHITTORGARH
RAJASTHAN, INDIA

2018

CERTIFICATE

I, hereby, declare that the work presented in this thesis, entitled "STUDY OF AVIAN DIVERSITY WITH REFERENCE TO SEASONAL CHANGES IN CHITWAN NATIONAL PARK, NEPAL" in fulfillment of the requirements for the award of Degree of Doctor of Philosophy of Mewar University, Chittorgarh, Rajasthan is an authentic record of my own research work carried out under the supervision of Prof. Dr. Chetan Kumar Sharma (Supervisor) and Prof. Dr. Trilok Chandra Majupuria (Co-Supervisor) .

I, also declare that the work embodied in the present thesis is my original rwork and has not been submitted by me for any other Degree or Diploma in any University/Institution.

Date

(Praveen Kumar Jha)
Research Scholar

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This is to certify that the thesis entitled "STUDY OF AVIAN DIVERSITY WITH REFERENCE TO SEASONAL CHANGES IN CHITWAN NATIONAL PARK, NEPAL" submitted by Mr. Praveen Kumar Jha embodies the findings of his original research work carried out under our supervision and it fulfills all the conditions prescribed by Mewar University, Chittorgarh, Rajasthan for the award of Doctor of Philosophy Degree in Zoology. To the best of our knowledge, the matter embodied in this thesis has not been submitted elsewhere for the award of any other degree or diploma.

Supervisor
Dr. Chetan Kumar Sharma
Professor
Mewar University,
Chittorgarh, Rajasthan, India

Co- Supervisor
Dr. Trilok Chandra Majupuria
Retd. Professor
Tribhuvan University,
Kathmandu, Nepal

Date

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Supervisor
Prof. Dr. Chetan Kumar Sharma

Co- Supervisor
Prof. Dr. Trilok Chandra Majupuria

Research Scholar
Praveen Kumar Jha

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Research Scholar

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Supervisor

Dr. Chetan Kumar Sharma

Co- Supervisor

Dr. Trilok Chandra Majupuria

Research Scholar

Praveen Kumar Jha

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PRAVEEN KUMAR JHA

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Preface

Nepal is a beautiful country with greatly varied geographical, geo-morphological, and climatic conditions. Due to the diverse topography, Nepal has the most diverse ecosystem in the world (most of the ecosystem, besides desert and ocean are found in Nepal), which enhances the richness of biodiversity. Several conservation areas have been established to manage this richness of biodiversity intact. Nepal has separated 18% of the total areas for the national parks, conservation areas, wildlife reserve and hunting areas. Among these conservation areas, Chitwan National Park, formerly known as Royal Chitwan National Park, is the first national park in Nepal. It was established in 1973 and granted the status of a World Heritage site in 1984. It has outstanding assemblages of flora and fauna, certainly avifauna is no exception.

Birds a warm-blooded egg-laying vertebrate distinguished by the possession of feathers, wings, and a beak and (typically) by being able to fly, which mesmerize the viewers with their beautiful flights and glides, and always have direct or indirect impact on biodiversity of Chitwan National Park. There are hundreds of bird species, which prefer Chitwan National Park as their natural habitat and few hundreds of migratory birds have chosen CNP as habitat in transit.

Despite the importance of avifauna in biodiversity of Chitwan National Park, many bird species have been driven toward extinction, some migratory birds have changed their flying route, many are decreasing in numbers. Science of ornithology has a long history and studies on birds have helped to develop several key concerns in evolution, behavior, and ecology. Several research papers, based on ornithology have been published. Most of the publications strongly back the current issues. Evidently, there have been minor

studies carried out on bird species in Chitwan National Park randomly but not significantly. By studying the ecology of birds in wild and identifying the key threats will enhance the survival rates, there is no doubt, better the lifestyle of any species, better the wholesome of ecosystem.

Focusing on current issues, researcher has urged to conduct a research believing on the basis of hypotheses that there is significant difference in seasonal diversity, distribution pattern, migratory pattern, population density of different birds in Chitwan National Park, which might be major factors to manage the bird's community.

Direct observation method was applied to record the number of bird species, where names of all species and number of individual were recorded throughout the survey on a daily basis with the help of highly reliable visual and sound equipment. Birds were identified and confirmed by using Red Data book of birds of Nepal as well as Field guide birds of Nepal. For case study, the MacKinnon's species richness counting method was used to assess spatial or temporal changes in abundance using diverse survey data. Diversity was determined by using Shannon-Weiner Diversity Index and species evenness to compare the bird diversity in different seasons as well as in different sites. Shannon- Weiner Diversity Index was used for the inspecting, cleansing, transforming, and modeling data with the goal of discovering useful information, suggesting conclusions, and supporting decision-making. Additionally, Oneway - ANOVA was also used to calculate the species diversity and order of diversity in sites. The highest Shannon-Weiner Diversity Index (H'=4.497) was recorded from the winter season while the lowest was from the autumn season (H'=4.228) in comparison to other seasons (summer and spring). Evenness index showed that birds were evenly distributed in summer season (E=0.850) in comparison to any other seasons (autumn, winter and

spring). The result also indicates that the highest Shannon-Weiner Diversity Index (H'=1.631) was recorded from the site 2 while the lowest was from the site 1 (H'=1.395). Whereas the value of E is highest (0.728) in site 4 and lowest (0.544) in site 1 in comparison to any other sites, hence bird species are evenly distributed in site 4. However, there were no statistically significant difference ($p>0.05$) in diversity of birds at four sites.

On the basis of vegetation distribution in Chitwan national Park, study area was divided into 4 sites after preliminary survey and final consultation with local field guides and park officers. Balkmiki Ashram to Temple tiger area was considered site 1, Temple tiger to Kasara was considered site 2, Kasara to Sauraha was considered site 3, and Sauraha to Sunachari was considered site 4. Survey was carried out from November 2013 to August 2014 and covered all fours seasons using line transect method. During the study period, total 378 species of birds were recorded, representing 15 orders and 55 families. The highest number of birds species i.e. 248 (65.60%) was represented by order Passeriformes along with 14 families. During this study period, 281 (74.33%) birds species were recorded from the winter season, 230 (60.84%) species were recorded from the spring season, 173 (45.76%) species were recorded from the summer season, and 166 (43.91%) birds species were recorded from the autumn season.

Ten globally threatened birds species were also recorded. Spiny Babbler (*Turdoides nipalensis)* the only endemic bird to Nepal was recorded too. Highest number (86) of birds species were recorded only in winter season, 24 birds species were seen in only spring season, 22 birds species were recorded only in summer, and only 9 bird species were recorded in autumn season. During this research period, seven bird species were recorded after 10 to 15 years. The analysis of data on residential status revealed that 217

species were residents, 121 species were winter visitors, 26 species were summer visitors and 14 species were passage visitors. Among winter visitors, Ruddy Shelduck (*Tadorna ferruginea*) was the most abundant species. Among these recorded birds species, 23 were considered as very common, 170 as common, 49 as uncommon, and 136 as occasional. Beside these, six species of vultures were also recorded. The analysis of feeding habits showed that a maximum number of species (128 species) were omnivorous, 123 species were insectivorous, 97 species were carnivorous, 21 species were frugivorous and 9 species were herbivorous. According to the International Union for the Conservation of Nature, 295 species were in the Least Concern category, 35 species were in the Near Threatened category, 22 species were in the Vulnerable category, 11 species were in the Critically Endangered category, 10 species were in the Endangered category and 5 species were in the Data Deficient category. In site (1), 34 Mackinnon lists were prepared and 164 (43.38%) bird species were recorded. Similarly, in site (2), 51 lists and 258 (68.25%) species, in site (3) 45 lists and 271 (71.69%) species and in site (4) 8 list was prepared and 66 (17.46%) species were recorded. According to the data, site 2 and 3 were densely populated and rich in bird diversity, whereas site 4 is the lowest in term of bird diversity in compare to other sites.

During the study period, it was also clearly noticed that human encroachments and natural disaster has huge contribution to disturb the living pattern of bird species in Chitwan National Park. People living close to buffer zone enter the park to fulfill their daily needs like fodder, grass for domestic animals, timber for construction buildings etc. Everybody is well aware of decade long civil war, which force insurgent to take shelter inside the park by cutting trees, which is natural habitat to bird species.

Definitely there were some natural calamities, which is beyond the control of human beings play a major role to adverse the survival rate of bird species.

According to the data available and ecological nuisances to birds of this study area, it demonstrated that there is a significant difference in seasonal diversity, distribution pattern, migratory pattern, and population density of different birds in Chitwan National Park. In an effort to increase the accessibility of bird data and information, which are useful in planning and evaluation of bird conservation strategies, valuable recommendations are recommended to concern authorities.

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ABBREVIATIONS

BCN	Bird Conservation Nepal
BES	Bird Education Society
BLI	Bird Life International
CNP	Chitwan National Park
DHM	Department of Hydrology and Meteorology
DNPWC	Department of National Parks and Wildlife Conservation
GoN	Government of Nepal
IUCN	International Union for the Conservation of Nature
MoFSC	Ministry of Forests and Soil Conservation, Nepal
NTNC	National Trust for Nature conservation
OCNP	Office of Chitwan National Park
RSPB	Royal Society for the Protection of Birds
UNESCO	United Nations Educational Scientific and Cultural Organization
VCAP	Vulture Conservation Action Plan
WWF	World Wide Fund for Nature
ZSL	Zoological Society of London