

Population Status and Distribution of Bengal Florican (*Houbaropsis bengalensis*) in Royal Chitwan National Park, Nepal



TAMANG et al.
(2001)



Report Submitted to
Oriental Bird Club, UK
2001

Cover Photo (Top to Bottom):

Male Bengal Florican by Ravi Sankaran and Female Bengal Florican by Goutam Narayan
(Source: Rahmani *et al.*, 1990)

Sukebhar (West site) and Dumaria grassland by Bijay Tamang

**POPULATION STATUS AND DISTRIBUTION OF BENGAL FLORICAN
(*Houbaropsis bengalensis*) IN ROYAL CHITWAN NATIONAL PARK, NEPAL**

Report Submitted to
Oriental Bird Club, UK
2001

By
Bijay Tamang
Nabin Baral
Nilesh Timilsina

Contact Address:
PO Box 907, Kathmandu, Nepal.

ACKNOWLEDGEMENT

First of all we would like to thank almighty for his divine support. Thanks go to Oriental Bird Club, UK for providing fund to explore this spectacular bird.

We would like to thank Department of National Parks and Wildlife Conservation for permitting this study. Our special appreciation goes to the staff of Royal Chitwan National Park for providing us valuable information and co-operating this study. Thanks are due to the local bird watchers and naturalists for sharing their knowledge. Special thanks go to the naturalists of Chitwan Jungle Lodge.

Special thanks to Tim and Carol Inskipp for providing us valuable information and data they recorded during their trip in April, 2001. We would also like thank Marcus Kohler, Andy and Susie Clements for their prompt reply.

We would also like to thank Trilok Chitrakar and Radha Krishna Shrestha, owner and manager of Royal Park Hotel for providing vehicle and other supports. We are extremely grateful to the drivers (Resham and Man Bahadur) of Royal Park Hotel for their continuous presence and support during our study. We really appreciate the help of all the other staffs of Royal Park Hotel.

Finally, we would like to thank the people of Skyline Jungle Camp for their logistic support.

August 2001

LIST OF TABLES

	Page No.
Table 1: Details of Bengal Florican observations in Chitwan, 2001.	9
Table 2: Search effort and records of Bengal Florican in Chitwan, 2001.	10
Table 3: Population and distribution of Bengal Florican in 1982 and 2001 in RCNP.	10
Table 4: Population of Bengal Florican in Nepal in 2000-01.	16

LIST OF FIGURES

	Page No.
Figure 1: Monthly variations in mean maximum, mean minimum, absolute maximum, absolute minimum temperature for the year 1980-1998 recorded at Rampur, Chitwan.	4
Figure 2: Monthly variations in average monthly rainfall (mm) for the year 1980-1998, recorded at Rampur, Chitwan.	4
Figure 3: Total annual rainfall (mm) for the year 1980-1998 recorded at Rampur, Chitwan.	5
Figure 4: Location of Royal Chitwan National Park and its Bufferzone.	7
Figure 5: Land use pattern of Royal Chitwan National Park.	12

LIST OF APPENDIX

	Page No.
Appendix 1a: Overall land use change in park between 1978-1992.	20
Appendix 1b: Dynamics of land use change in park between 1978-1992.	20

LIST OF ABBREVIATIONS & ACRONYMS

DNPWC	- Department of National Parks and Wildlife Conservation
RSWR	- Royal Suklaphanta Wildlife Reserve
IUCN	- World Conservation Union
CITES	- Convention on International Trade of Endangered Species
ICBP	- International Center for Bird Preservation
RCNP	- Royal Chitwan National Park
RBNP	- Royal Bardia National Park
KTWR	- Koshi Tappu Wildlife Reserve
UNDP	- United Nations Development Programme
PPP	- Park and People Project
HMG	- His Majesty the Government
PWR	- Parsa Wildlife Reserve
GIS	- Geographical Information System
°C	- Degree Celsius
mm.	- Millimeter
sq. km.	- Square Kilometer
ha.	- Hectare
cm.	- Centimeter
m.	- Meter

CONTENTS

	Page No.
Acknowledgement	i
List of Tables	ii
List of Figures	iii
List of Appendix	iv
List of Abbreviations & Acronyms	v
Abstract	vii
1. Introduction	1-2
1.1 Background	1
1.2 Objectives	2
2. Study Area	3-7
2.1 Location and Boundaries	3
2.2 History	3
2.3 Climate	3
2.4 Flora	5
2.5 Fauna	6
3. Methodology	8
4. Result & Discussion	9-15
4.1 Population Status	9
4.2 Habitat Condition	11
4.3 Management Practices	15
5. Summary of National Status	16
6. Conclusion & Recommendations	17
References	18-19
Appendix	20

ABSTRACT

Survey of endangered bird, Bengal Florican (Houbaropsis bengalensis) was done in the grasslands of Royal Chitwan National Park Nepal. Direct count was done with the help of binocular. Altogether nine grasslands were surveyed, only four grasslands hold the population of florican. Three males and one female were recorded. The total population is estimated to be 4-11. A sharp decline (50%) in the population of florican since 1982 was noted. Most of the surveyed grasslands seemed unsuitable for the florican. Reduction in the area of grassland and improper management intervention were identified as the main problem for the decline in the population.

1. INTRODUCTION

1.1 Background

The Bengal Florican is perhaps the most endangered among the world's 22 species of bustards. It is included under the endangered species list of IUCN Red Data Book, Appendix I of CITES and one of the nine protected birds under National Park and Wildlife Conservation Act of 1973 of His Majesty the Government of Nepal. Its past distribution ranged from southern Uttaranchal or northwestern Uttar Pradesh in the west to Upper Assam in the east, through Nepal terai, Bengal duars and Brahmaputra Valley (Ali and Ripley 1969, Rahmani *et al.*, 1991). In Nepal, it is found in Royal Chitwan National Park (RCNP), Royal Suklaphanta Wildlife Reserve (RSWR), Koshi Tappu Wildlife Reserve (KTWR) and Royal Bardia National Park (RBNP) (Inskipp and Inskipp, 1982).

In Nepal, a survey initiated by ICBP in 1982, located 35-50 floricans distributed between five sites; RCNP, RBNP, RSWR, KTWR and an unprotected area near Koshi Barrage in the east of the country (Inskipp and Inskipp, 1983). There is a lack of information about the floricans in Koshi Tappu. There has been only one confirmed record from Koshi Tappu since 1986, a single in 1989 (Weaver, 1991). But the other three lowland areas of Nepal have shown the presence of floricans. Weaver (1991) observed total of 23 floricans between the two sites RSWR and RBNP. Similarly, Tamang and Baral (2000) observed 12 floricans in RSWR and Timilsina *et al.*, (2000) observed 5 floricans in RBNP. The total population between the two sites in 2000 was 17 floricans. All these records suggest the decline in the florican population in the successive years.

The root cause of the population decline is the loss of habitat. Decrease in the extent of grasslands and their improper management could be attributed as the main cause for its decline. Though, efforts have been made to protect the grasslands inside the protected areas through all the years, the population is still declining. The decline in the population can also be attributed to the deterioration of the habitat condition and encroachment. Overgrazing might have affected some of the grasslands. Grassland management practices in Nepal targeted the larger mammals but least attention has been given to birds and other animals.

Timely verification of the status, distribution and factor responsible for change of any population is important for conservation of any species. This study aims at studying population and distribution of Bengal Florican in Chitwan as part of the study in RSWR (Tamang and Baral, 2000) and RBNP (Timilsina *et al.*, 2000). The outcome of this study along with the results of RSWR and RBNP provides estimation of the population of florican in Nepal.

This study recorded four floricans (3 males and 1 female) and the total population is estimated to be 4-11. The records of florican in 2000 and 2001 show that, the total population in all the three protected areas of Nepal is less than 30. This is not a viable population and could pose problems in the long run. So, this study strictly draws the attention of the concerned authorities to do more research on florican and immediately act for their survival.

1.2 Objectives

1. To estimate the population of Bengal Florican in the study area.
2. To find out its distribution in the study area.
3. Analyze the factors affecting their survival.

2. STUDY AREA

2.1 Location and Boundaries

RCNP lies in the south-central part of the country in the subtropical lowlands of the terai. It is located between 84° and 84°3' East longitude and 27°30' North latitude. According to official records, the boundary of the national park was calculated to be 932 sq.km. However, from the present GIS map, the area has been calculated as 1,182 sq.km. (DNPWC, 2000). Churia hills and flood plains of Rapti, Reu and Narayani rivers lie within the park.

Rapti river demarcates the northern boundary from the intensively cultivated area and Nepal-India border in the south. The western boundary is formed by Narayani river, while it abuts Parsa Wildlife Reserve (PWR) in the east.

2.2 History

RCNP is the first national park established in the country. Formally, the area was well known for big game and until 1950 the area was exclusively managed as hunting reserve for the Rana rulers and their guests.

In 1963, the area south of Rapti river was demarcated as "rhino sanctuary" (DNPWC, 1996) and more than 22,000 people were moved and resettled outside the present park boundary (Mishra, 1982). The remaining forests and savannas south of Rapti river, including part of the churia range covering an area of 544 sq.km. was finally gazetted and declared a national park by His Majesty the Government in 1973. Later it was extended to a total area of 932 sq.km. in 1977/78 (Jnawali, 1989). The park stands today as a successful testimony of nature conservation in south Asia. It was included in the list of World Heritage Sites of UNESCO in 1984.

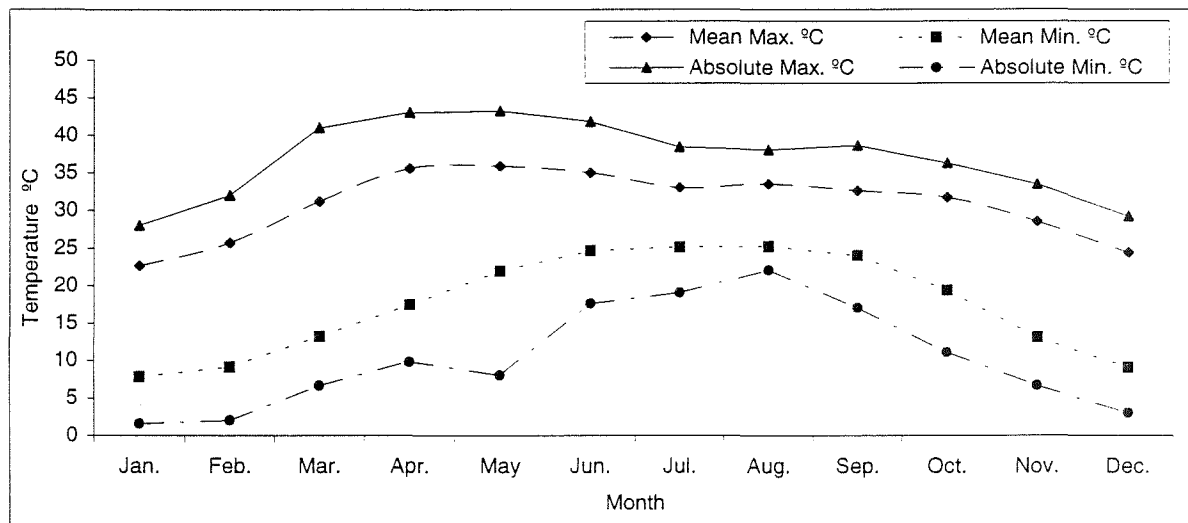
2.3 Climate

The climate of this lowland park is typically monsoonal. The park has three main seasons: cool-dry, hot-dry and monsoon. Cool-dry occurs from mid-October to mid-February. Hot-dry occurs from mid-February to mid-June and monsoon occurs from mid-June to mid-October.

During the year 1980-1998, the highest average annual maximum and minimum temperature of 31.94°C and 16.6°C were recorded in the year 1994 and 1981, respectively. The absolute maximum temperature of 43.2°C and minimum temperature of 1.6°C were recorded in May 1989 and January 1997, respectively.

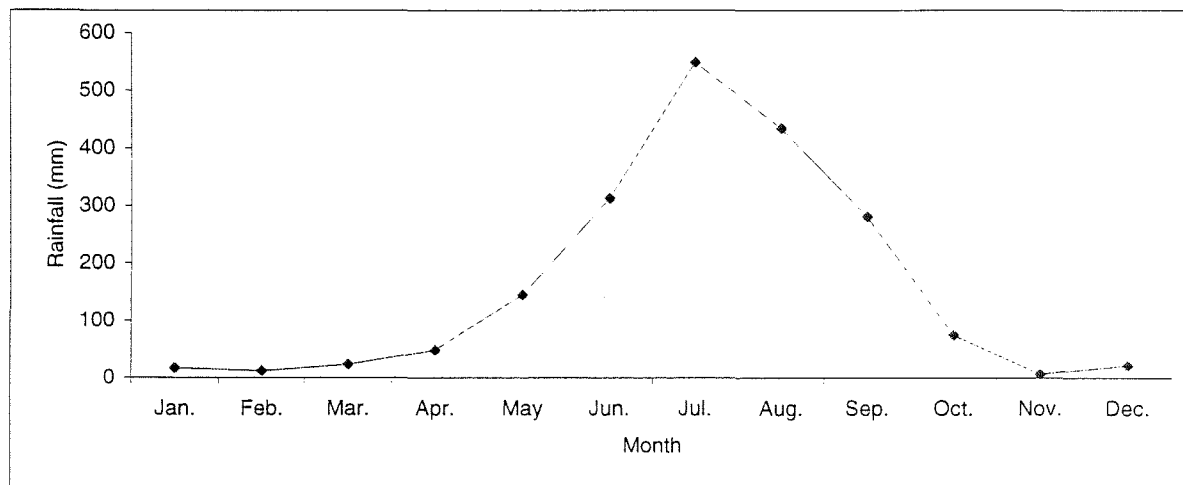
The highest annual rainfall of 2,644.9 mm. and lowest annual rainfall of 1,584 mm. occurred in 1998 and 1980, respectively. The highest average monthly rainfall of 548.5 mm. occurred in July and lowest of 6.42 mm. in November.

Figure 1: Monthly variations in mean maximum, mean minimum, absolute maximum, absolute minimum temperature for the year 1980-1998 recorded at Rampur, Chitwan.



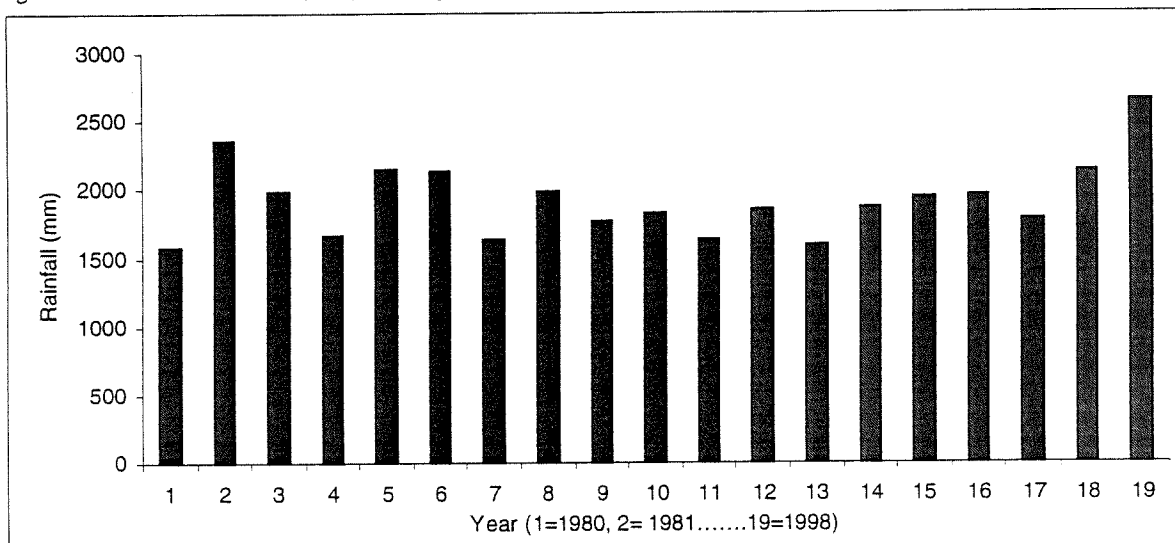
(Source: HMG/Dept. of Hydrology and Meteorology).

Figure 2: Monthly variations in average monthly rainfall (mm) for the year 1980-1998 recorded at Rampur, Chitwan.



(Source: HMG/Dept. of Hydrology and Meteorology).

Figure 3: Total annual rainfall (mm.) for the year 1980-1998 recorded at Rampur, Chitwan.



(Source: HMG/Dept. of Hydrology and Meteorology).

2.4 Flora

More than 600 plant species have been recorded in the park (DNPWC, 2000). The major vegetation types of the park include Sal forest, Riverine forest and Grassland.

Sal forest:

Sal (*Shorea robusta*) forest covered about 70 percent of the park but the Resource Profile (2000) of Department of National Park and Wildlife Conservation (DNPWC) shows the percent forest area coverage to be 84.63 (including sal and riverine forest). It occurs in almost pure stands in association of other tree species like *Terminalia* sp., *Bauhinia* sp., *Bridelia retusa*, *Syzigium cuminii* and *Phyllanthus emblica*. The grass species found in the sal forest is mainly *Themeda caudata*. Phoenix palms and chir pine (*Pinus roxburghii*) occurs in the hills.

Riverine forest:

Riverine forest occupied about seven percent of the park along water courses (Rapti, Reu and Narayani river), swamps and streams but the recent record suggests increase in area. The most common tree species found are Veller (*Trewia nudiflora*), Simal (*Bombax ceiba*), Khair (*Acacia catechu*), Sissoo (*Dalbergia sissoo*) and Sindure (*Mallotus philippinensis*). Based on the stages of succession, the forests are found in double associations- the association of *Acacia catechu* and *Dalbergia sissoo* in the earlier stages and association of *Bombax ceiba* and *Trewia nudiflora* in the later stage. Shrubs such as *Murraya paniculata*,

M. koenigii, *Callicarpa macrophylla*, *Colebrookia oppositifolia* are also found associated. Tall grass species such as *Vetivera zizanoides*, *Saccharum munja* and *Saccharum spontaneum*, and shorter species such as *Cyanodon dactylon*, *Seteria pallidifusca*, *Paspalidium flavidum* and *Digiterium setigera* occurs in the clearings and at forest edges.

Grassland:

Grasslands, extending along the rivers and those surrounded by forest patches are the most preferred habitats by most of the wildlife in the park (Jnawali, 1989). Grassland covers 4.67 percent of the total park area (DNPWC, 2000). Grasslands are found in three major areas of the park- the moist places, old agricultural sites and alluvial flood plains.

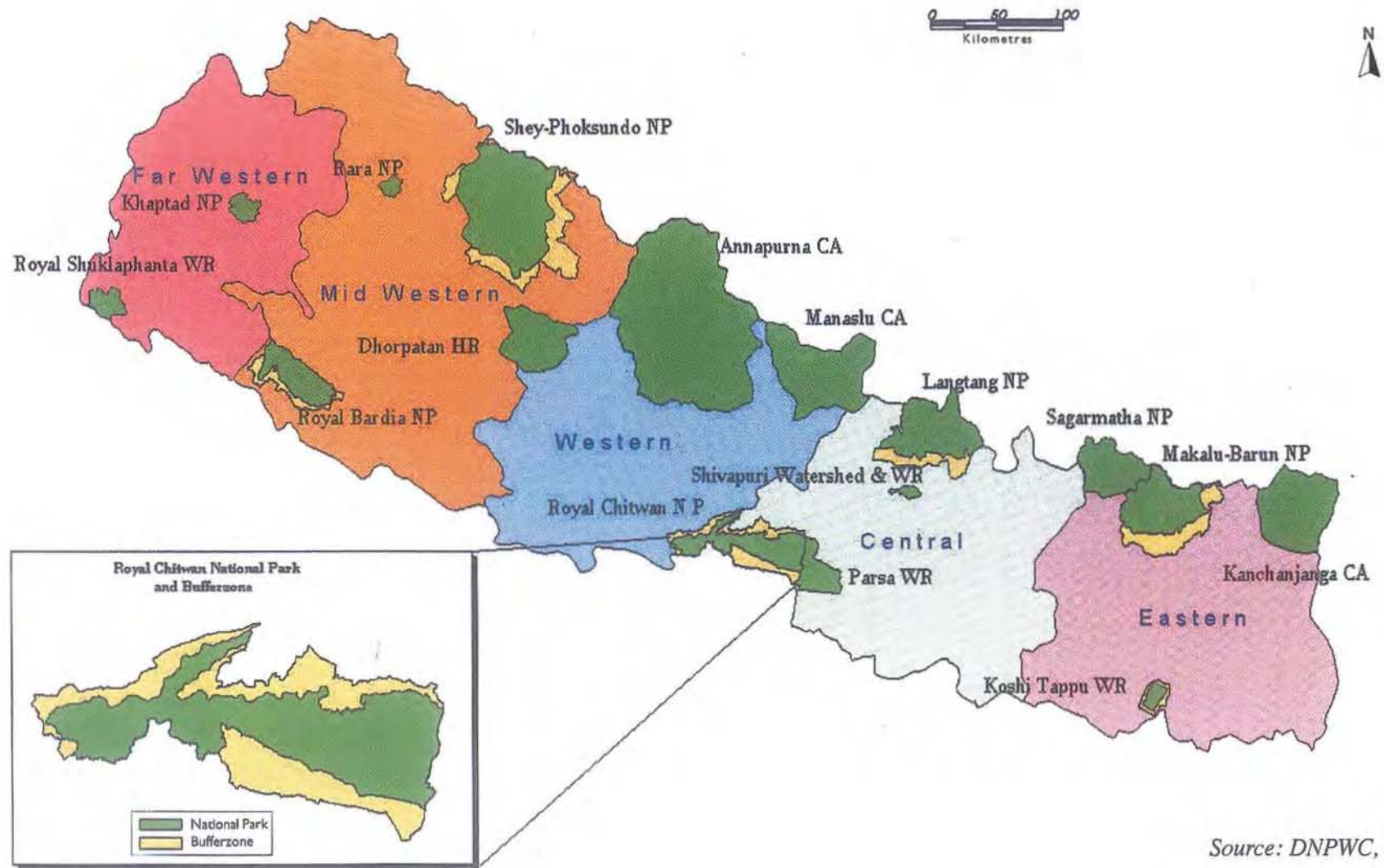
Saccharum bengalensis, *Narenga porphyracorma*, *Themeda arundinesia*, *Phragmitis karka*, *Typha elephantina*, *Saccharum spontaneum*, *Erianthus munja* are the tall grass species that grow in the new alluvial flood plains. Short grasses like *Imperata cylindrica* occur in old agricultural sites. Other short grasses such as *Seteria* sp., *Paspalidium flavidum*, *Chrysopogon aciculatus*, *Cynodon dactylon*, *Eragrostis japonica* are found underneath the tall grasses and in open fields. The common aquatic plants found in the pools are: *Hydrilla* sp., *Ceratophyllum* sp. and *Utricularia* sp.

2.5 Fauna

More than 50 mammals, 526 birds and 49 herpetofauna have been recorded in the park (DNPWC, 2000). The park holds a good population of endangered species like One-horned Rhinoceros (*Rhinoceros unicornis*) and Tiger (*Panthera tigris*). Other mammals found in the park include Leopard (*Panthera pardus*), Sloth Bear (*Melursus ursinus*), Gaur (*Bos gaurus*), Chital (*Axis axis*), Hog Deer (*Axis porcinus*), Sambar (*Cervus unicolor*), Barking Deer (*Muntiacus muntjak*) and Wild Boar (*Sus scrofa*). Two species of crocodiles: Gharial (*Gavialis gangeticus*) and Marsh Magar (*Crocodilus palustris*) are also found in the rivers and lakes of the park.

Endangered avifauna such as Bengal Florican (*Houbaropsis bengalensis*), Giant Hornbill (*Buceros bicornis*), Black Stork (*Ciconia nigra*), White Stork (*Ciconia ciconia*), Sarus Crane (*Grus antigone*), Lesser Florican (*Sypheotides indica*) are found in the park.

Figure 4: Location of Royal Chitwan National Park and its Bufferzone



Source: DNPWC, 2000

3. METHODOLOGY

Known and potential florican habitats were visited during the breeding season (April-May), when the territorial males are easily seen during their aerial display. As Bengal Floricans are most active in the early mornings and evenings (Ali and Ripley, 1969), observations were carried out mainly in the early mornings and late afternoon. Since the floricans are territorial during the breeding season when each individual male defends a patch of grassland (Ali and Rahamani, 1982-84; Sankaran and Rahamani, 1986; Mankadan and Rahamani, 1986), the number of territories or display sites in an area indicates the population of adult male floricans. As hens are not easy to locate, the population estimates are based on the assumption of equal sex ratio. Observation was done using binoculars from machans and treetops for a better view of the grasslands. Care was taken not to disturb the floricans. The number of floricans seen, their sexes, activity, time, weather and time spent in each area were noted. Notes on general condition of the grasslands and disturbances were also maintained.

The study focussed mainly on the seven major grasslands of the RCNP where the floricans have been previously sighted. The grassland studied were Kachuwani, Dumaria, Jarneli, Ghatgain, Sukebhar, Bhimle and Khorla Mohan. But brief visits were given to other potential sites like Jay Mangala and Khagendra Malli. Altogether 9 days were spent for the observation of Bengal Floricans. In some places, the grass was already tall, so viewing was rather difficult and the distance between the grasslands also posed problems for accurate population estimation. Machans were used for overlooking the grasslands, wherever possible and in its absence a nearby tree or the roof of the vehicle was used. Observations were done with the help of 10x50 binocular.

A Land rover was hired to cover the distance to the grasslands. It was logistically impractical to return to the base each time and come back again in the evening, so a whole day was spent in most of the grasslands surveyed, from 0700-1800hrs. But the active viewing for the floricans occurred only between 0700-1000hrs. and 1500-1800hrs. Detailed notes were made on florican numbers, activity and on the habitat characteristics of the sites. Factors influencing the local population were also given attention.

4. RESULT & DISCUSSION

4.1 Population Status

During nine days survey, four (3 adult males and 1 female) Bengal Floricans were recorded from four grasslands of RCNP. Sub-adults, chicks and eggs were not recorded. Two adult males had distinct territories: one in Sukebhar and other in Khagendra Malli. Both the birds were seen in aerial as well as in ground displays. One male at Jarneli was seen in flight. A female was recorded feeding on the grassland at Dumaria on April 3 for five minutes. On 5th April, a female came flying from tall grass to an open field at Dumaria. Female bird was continuously observed for 45 minutes. We couldn't assess whether it was the same bird previously recorded or a new one. We recorded the female, as best count one and maximum counts two.

Table 1: Details of Bengal Florican observation in Chitwan, 2001

Date	Site	Time	Males	Females	Activity
March 31	Ghatgain	0800-0900	-	-	-
	Jarneli	1500-1630	-	-	-
	Dumaria	1730-1815	-	-	-
April 1	Sukebhar (Machan site)	0700-1030	-	-	-
		1200-1400	-	-	-
		1500-1700	-	-	-
April 2	Sukebhar (West site) (Machan site)	0745-1000	1	-	Aerial display/Feeding
		1500-1600	-	-	-
		1615-1745	-	-	-
April 3	Dumaria	0700-1030	-	1	Feeding
		1500-1730	-	-	-
April 4	Ghatgain	0730-1030	-	-	-
		1500-1730	-	-	-
April 5	Sukebhar (West site) Bhimle Jarneli Dumaria	0700-0815	1	-	Feeding
		0830-0930	-	-	-
		1500-1615	-	-	-
		1630-1730	-	1	Flying/Feeding
April 6	Khoria Mohan	0800-0900	-	-	-
		1530-1700	-	-	-
	Bhimle	0930-1030	-	-	-
		1730-1830	-	-	-
April 7	Jarneli	0715-0830	1	-	Flying
	Dumaria	0845-1000	-	-	-
	Kachuwani	1500-1700	-	-	-
April 8	Kachuwani	0645-1000	-	-	-
	Khagendra Malli	1500-1700	1	-	Feeding

In Dumaria, most of the naturalists and drivers referred frequent sightings of female florican. At Khagendra Malli, Chitwan Jungle Lodge naturalists had recorded three adult males and one female last year. Some of the naturalists had recorded a male florican by the river side, northwest of Bhimle. We also strongly suspect the presence of florican as it seemed good habitat. Kaloram, naturalist at Tiger Tops had recorded a female from Sukebhar. Compiling all, the maximum number of Bengal Florican was eleven. So, total Bengal Floricans recorded in Chitwan was 4-11. Inskipp and Inskipp (1982) recorded 8-21 birds from Chitwan. There was a sharp decline (50%) in the population of Bengal Florican since 1982.

Table 2: Search effort and records of Bengal Florican in Chitwan, 2001

Grasslands	No. of visits	Time spent Hr./Min.	Males	Females	Sub-adults
Ghatgain	3	0630	-	-	-
Jarneli	3	0400	1	-	-
Dumaria	5	0745	-	1-2*	-
Sukebhar	7	1330	1	1*	-
Bhimle	3	0300	-	-	-
Khoria Mohan	2	0230	-	-	-
Kachuwani	2	0415	-	-	-
Khagendra Malli	1	0200	1-3*	1*	-

*Indicates records from other bird watchers. So, we referred these data as maximum count.

Out of seven phantas surveyed in 1982, five phantas held population of Bengal Florican. Out of five phantas where the floricans were sighted in 1982, only two Sukebhar and Dumaria hold population at present. Previously, Bengal Florican was not recorded from Jarneli. Grasslands which were not surveyed in 1982, like Jay Mangala and Khagendra Malli were covered this time. A male florican was recorded in Khagendra Malli. It may suggest that Bengal Floricans are shifting their habitat in Chitwan. So, extensive survey should be done in other grasslands not covered in this study.

Table 3: Population and distribution of Bengal Florican in 1982 and 2001 in RCNP.

Grassland	Maximum No. of counts in 1982 (Source: Inskipp & Inskipp, 1983)		Maximum No. of counts in 2001	
	Male	Female	Male	Female
Ghatgain	1	-	-	-
Jarneli	-	-	1	-
Dumaria	2	-	1	1
Sukebhar	7	1	-	-
Bhimle	3	-	-	-
Khoria Mohan	-	-	-	-
Kachuwani	1	-	-	-
Khagendra Malli	x	x	1	-
Jay Mangala	x	x	-	-
Total	8-21		4-11	

(X: Not surveyed)

In Chitwan, sub-adults were not seen. This may indicate some recruitment problem either due to poor breeding or low survival rate of young, but the availability of suitable habitat could be the main problem.

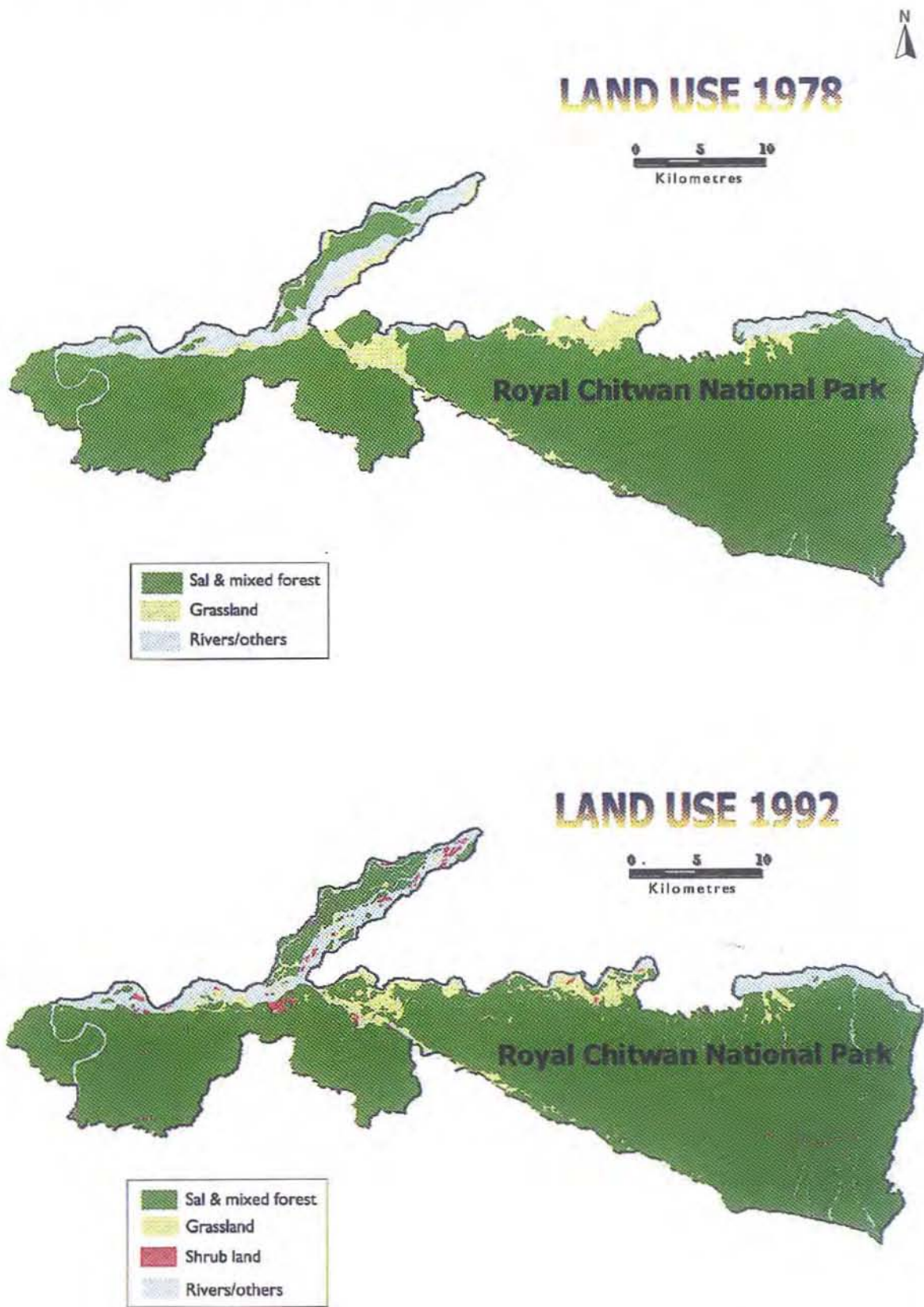
Bengal Florican prefers the grassland where there is adequate interspersed of short grass species with tall grass species. Most of the surveyed grasslands seemed unsuitable for the florican. In some places the tall grasses were still not harvested. The succession of grasslands in Chitwan into other habitats is alarming, as there is a danger of conversion of more and more grassland in absence of suitable management intervention. According to Lemkhul (1989), after 25 years, nearly all short grassland could disappear under tall grasses and within just 10 years, 66% of the short grassland area will revert to tall grass under natural condition in RCNP. Peet (1997) also points out that most of the *Imperata* dominated grassland, the prime habitat of the bird, is succeeding to tall grassland or forest under current disturbances region.

The area of grassland in the park decreased from 7,051ha. to 5,521ha. during two periods, 1978 and 1992 (DNPWC, 2000). If the total area of the grassland in 1992 remains unchanged, the area is still 16 times more than the area of grassland in RBNP and nearly equal to the area of grassland in RSWR. But the number of Bengal Floricans recorded in the park was nearly equal to the floricans recorded in RBNP (3 males and 2 females) and less than that recorded in RSWR (10 adult males and 2 sub-adults) in 2000. Though, the park holds large grassland area, the less number of floricans in the park is due to unsuitable habitat, as main focus is given to larger mammals like rhino and tiger during grassland management. The decline in the population may also be due to the reduction in the area of grassland.

4.2 Habitat Condition

In all the grasslands surveyed, there were small patches of grasslands interspersed with tall grasses. The small open patches were hardly sufficient for aerial displays. The scanty patches of *Imperata* largely reduced the preferred habitat of Bengal Florican. All the grasslands of Chitwan were in advance succession.

Figure 5: Land Use Pattern of Royal Chitwan National Park



Source: DNPWC, 2000

The eastern part of country receives more precipitation than the western part. Excessive precipitation also hastens the advance succession of grasslands. Due to advance succession, most of the open grasslands are turned into wooded grasslands. *Bombax ceiba*, *Syzygium cuminii*, *Bauhinia purpurea*, *Trewia nudiflora*, *Ficus glumoreta* and *Dalbergia sissoo* were the major tree species found in the grasslands of RCNP. The short grass species were mostly *Imperata cylindrica* and *Setaria* sps. where as tall grass species were *Themeda caudata*, *Saccharum spontaneum*, *Saccharum bengalensis* and *Narenga* sps.

Khoria Mohan:

The area was dominated by tall *Saccharum spontaneum*. The height of the grass ranged from few centimeters to more than a meter. *Imperata cylindrica* was scanty. Trees such as *Syzygium cuminii* and *Bombax ceiba* were also scattered in the grassland. The area seemed unsuitable for the floricans.

Bhimle:

Grass in most of the areas was not harvested. *Saccharum* sp. dominated most of the areas. Only a small area near the post was harvested. There were few small patches of grassland dominated by *Imperata* on either side of the road. Though the patches seemed suitable for florican, no florican was recorded. It was assumed that the patches were too small to hold floricans.

Sukebhar:

Grass in the machan area was harvested and maintained by Tiger Tops for the observation of Bengal Florican. It is a closed area surrounded by forest in all directions. The area was dominated by *Saccharum* sp. The ground around the machan was almost bare and seemed unsuitable for floricans. Scattered *Syzygium cuminii* and *Bombax ceiba* were present in the area.

Few *Imperata* dominated patches were present on either side of the road, west of Sukebhar post. A male florican was recorded in one of the patches. Other grasses such as *Saccharum* sp. and *Vetivera* sp. were also present. The height of grass ranged from 10cm.-1m. Other species present were *Grewia* sp. and *Bombax ceiba*.

Ghatgain:

The grassland was dominated by *Saccharum* sp. with scattered *Syzygium cuminii* and *Bombax ceiba*. The height of the grass ranged from few centimeters to 75cms. *Imperata* was scanty. The vehicles carrying tourists for jungle drive have disturbed the grassland. No florican was recorded during the study.

Jarneli:

It is big island grassland in the sal forest. The area had the mixture of *Saccharum* sp. and *Imperata cylindrica* with few scattered small trees. The average height of the grass was one meter and the area seemed suitable for floricans. Only a male was seen flying over the grassland. This grassland too was quite disturbed by vehicles.

Dumaria:

Narenga, *Themeda* and *Saccharum* sp. as well as riverine forest gradually invaded Dumaria. The grass of only a small area by the side of the road was harvested for the observation of Bengal Florican. The grassland was composed of smaller patches of scattered *Imperata cylindrica*. This was the most disturbed grassland. Though the grassland seemed suitable for florican, only a female was recorded during present study. The height of the grass ranged from few centimeters to 1.3m. The height of the grass in the area favoured the female, as the tall grasses provide good habitat to female floricans for nesting and egg laying.

Kachuwani:

The grassland was harvested and maintained by Gaida Wildlife Camp. It was a big grassland surrounded by forest in all directions. It was dominated by *Saccharum* sp. with scattered small patches of *Imperata cylindrica*. Scattered *Syzygium cuminii* and *Bombax ceiba* were also present. The average height of the grass was one meter. Though the grassland seemed quite suitable, no floricans were recorded during the study. Even the Gaida Wildlife Camp naturalists haven't seen the florican at Kachuwani for the last two years.

Jay Mangala:

It is an area opposite to Sauraha and previously inhabited by people. It is bounded by village in the south, forest in the west & north and Rapti river in the east. After the villagers were resettled outside the park, it was converted into an open area. Most of the area was covered by short *Imperata cylindrica* measuring hardly upto four centimeters in height. The area

near the forest consists of mixture of *Saccharum* and *Imperata cylindrica*. If properly managed, this area could serve as additional habitat for floricans in future.

Khagendra Malli:

This area lies in the eastern part of the park near to Chitwan Jungle Lodge. The grassland in the area seemed the most suitable for florican among the grasslands visited during the study. The grassland had the equal mixture of *Saccharum* sp. and *Imperata cylindrica* with *Vetivera* sp., *Grewia* sp. and scattered *Dalbergia sissoo*, *Bombax ceiba* and *Syzygium cuminii*. The average height of the grass was one meter. Trees were absent along the river bank. A male florican was recorded from the area during the study. Chitwan Jungle Lodge naturalists recorded 3 males and 1 female last year. We strongly suspect that the area holds more population than recorded in this study. We might have overlooked some of the floricans.

4.3 Management practices

Annually, the grasslands are opened for collection of thatching material (Khar khadai) from late December to early January. Park authority used to open grasslands for local people to harvest grass for 15 days. Later, the time was reduced to 10 days and at present grass cutting is opened only for five days. Within five days, local people do not harvest most of the grasses. Park management generally does not cut grass. So, when grass is not harvested, it increases the chances of uncontrolled forest fires in dry season. On the other hand, more amount of nutrition is left after burning which encourage profuse growth of tall grasses in the coming year. From the management perspectives, first grasses should be harvested and then only, burning should take place. Fire should be cautiously used as management tool and it should never coincide with the breeding season of the bird. Dumaria and Jarneli grasslands were artificially maintained by using power tractor. Inadvertently, such practice coincides with breeding season of the bird. Naturalists and tourist guides believed that less sightings of Bengal Floricans in these phantas was due to disturbance created by tractor. The late harrowing in the season of February in the grassland of Dudhwa National Park caused abandonment of the area by a male florican at the time of displaying (Javed, 1998). Such case may happen in RCNP, if great deal of precautions is not taken in time of implementing management practices. Bengal Florican is very sensitive bird and it requires specific habitat. So, grasslands especially managed for big mammals like rhino and tiger could not sustain viable population of Bengal Floricans. Bengal Florican could be the flagship species of grassland ecosystem of terai, where it is formerly distributed.

5. SUMMARY OF NATIONAL STATUS

Tim and Carol Inskipp observed Bengal Florican in Nepal's lowland protected areas during their birding trip in April 2001. During their trip they recorded 5-6 males and 2 females from the main grassland (Sukila Phanta) in RSWR and 4 males and 1 female in RBNP. Local naturalist and conservationist, Col. Hikmat Bista saw 12 males in the main grassland of RSWR in March 2001 (Inskipp and Inskipp *pers. comm.*).

Table 4: Population of Bengal Florican in Nepal in 2000-01.

RSWR		RBNP		RCNP
Tamang & Baral, 2000	Inskipp & Inskipp, 2001 (<i>pers. comm.</i>)	Timilsina <i>et al.</i> , 2000	Inskipp & Inskipp, 2001 (<i>pers. comm.</i>)	This study
10 adults 2 sub-adults	5-6 males 2 females 12 males (Col. H. Bista)	3 males 2 females	4 males 1 female	3 males 1 female
12	14	5	5	4
Maximum No. of florican in 2001: 23				

(*pers. comm.*: personal communication).

These records also confirm our florican records in 2000 from RSWR (Tamang and Baral, 2000) and RBNP (Timilsina *et al.*, 2000). During our present survey, we recorded 3 males and 1 female from RCNP. Combining all these records and assuming that Koshi Tappu no longer holds florican at present as no confirmed record has been made after 1989, the maximum number of floricans in Nepal in 2001 is 23. This shows that the number of florican is decreasing in Nepal compared to the record of Inskipp and Inskipp (1983). These records also show that there is slight decrease in florican population in RSWR and RBNP compared to Weaver (1991).

6. CONCLUSION AND RECOMMENDATIONS

The nine days survey recorded four (3 adult males and 1 female) Bengal Floricans. It has been found that the population decreased by 50% following the 1982 survey. Some of the grasslands, where the florican were found in the 1982 survey, showed their absence this time, and the ones (Jarneli & Khagendra Malli) showing their absence during 1982, showed their presence. So, it is assumed that the Bengal Floricans are shifting their habitat in Chitwan. All the grasslands in Chitwan were in advance succession. This has induced a sharp reduction in the favourable habitat for the florican. Unsuitable management intervention may be the cause of population decline. Proper scientific management with strictly regulated harvesting and burning regimes may be required to make more grassland areas suitable for floricans and other grassland species. The following points are recommended for the survival of the florican population in Chitwan.

1. Bengal Florican should be the flagship species for all grassland management practices.
2. Burning and harvesting of the grasses should be done in all the grassland. While doing this, the breeding season of the florican should be taken into consideration.
3. To prevent the grassland from the advance succession, necessary steps should be taken.
4. Burning and harvesting should be done in patches.
5. Annual monitoring of florican population in all prime habitats should be done.
6. Interaction of Bengal Florican with other grassland species could be studied, and conservation strategy should include ways to conserve all grassland species originally found in the area.

REFERENCES

- Ali, S. and Rahamani, A.R. (1982-84). Study of ecology of certain endangered species of wildlife and their habitats: The Great Indian Bustard. Annual report 2, Bombay Natural History Society.
- Ali, S. and Ripley, S.D. (1969). Handbook of the birds of India and Pakistan. Vol. 2. Oxford University Press, Bombay.
- DNPWC. 1996. Royal Chitwan National Park. A brochure published by Department of National Parks and Wildlife Conservation, Kathmandu, Nepal.
- DNPWC. 2000. Royal Chitwan National Park and Bufferzone resource profile. Department of National Parks and Wildlife Conservation/Park People Programme. 52p.
- Inskipp, C. and Inskipp, T. (1983). Report on a Survey of Bengal Floricans (*Houbaropsis bengalensis*) in Nepal and India, 1982. ICBP Study Report No. 2.
- Jnawali, S.R. 1989. Park people conflict: Assessment of crop damage and human harassment by Rhinoceros (*Rhinoceros unicornis*) in Sauraha area adjacent to the Royal Chitwan National Park, Nepal. M.Sc. Thesis, Agricultural University of Norway. 101pp.
- Lemkhul, J.F. 1989. The ecology of a south-Asian tall grass community. Ph.D. Thesis. University of Washington, Seattle.
- Manakadan, R. and Rahamani, A.R. (1986). Study of ecology of certain endangered species of wildlife and their habitats: The Great Indian Bustard. Annual report 3. Bombay Natural History Society. 50p.
- Mishra, H. 1982. Balancing human needs and conservation in Nepal's Royal Chitwan National Park. *Ambio* 11 (5): 246-251p.
- Peet, N.P.; Watkinson, A.R.; Bell, D.J. and Brown, K. 1997. The management of tall grassland for the conservation of biodiversity and sustainable utilization. Scientific and Management report.
- Rahamani, A.R.; Narayan, G.; Rosalind, L.; Sankaran, R. and Ganguli, U. (1991). Status of the Bengal Florican *Houbaropsis bengalensis* in India. *J. of Bombay nat. hist. soc.* Vol. 88 (3): 349-375p.

- Sankaran, R. and Rahamani, A.R. (1986). Study of ecology of certain species of wildlife and their habitats: The Lesser Florican. Annual report 2, 1985-86: Bombay Natural History Society. 41p.
- Tamang, B. and Baral, N. 2000. Population status and distribution of Bengal Florican (*Houbaropsis bengalensis*) in Royal Suklaphanta Wildlife Reserve, Nepal. Report submitted to Oriental Bird Club, UK. 18pp.
- Timilsina, N.; Tamang, B. and Baral, N. 2000. Population status and distribution of Lesser Florican (*Sypheotides indica*) in the Royal Bardia National Park, Nepal, with report on Bengal Florican. Report submitted to WWF Nepal Program. 29pp.
- Weaver, D.J. (1991). A survey of Bengal Floricans (*Houbaropsis bengalensis*) at Royal Suklaphanta Wildlife Reserve and Royal Bardia National Park, Western Nepal. A report to Oriental Bird Club, UK. 15pp.

APPENDIX 1

a. Overall land use change between 1978-1992.

Land use	1978 Area (ha.)	%	1992 Area (ha.)	%	Change area (ha.)	%
Forest land	100,286.2	84.84	100,036.2	84.63	-250	-0.21
Grassland	7,051	5.96	5,521	4.67	-1,530	-1.29
Shrub land	-	-	558	0.47	+558	+0.47
Others (River/Sand)	10,863.4	9.19	12,085.4	10.22	+1,222	+1.03
Total	118,200	100	118,200	100		

(Source: DNPWC, 2000)

b. Dynamics of land use change in park between 1978-1992.

From	To	Area (ha.)
Forest land	Forest land	96,257.2
Forest land	Shrub land	200.0
Forest land	Grassland	1,394.0
Forest land	Others (River/Sand)	-
Grassland	Grassland	4,127.0
Grassland	Forest land	2,261.0
Grassland	Shrub land	-
Grassland	Others (River/Sand)	1,591.0
Others (River/Sand)	Others (River/Sand)	10,463.0
Others (River/Sand)	Forest land	1,518.0
Others (River/Sand)	Shrub land	358.0
Others (River/Sand)	Grassland	-
Total		118,200

(Source: DNPWC, 2000)