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Research Article

CONSERVATION STATUS OF BENGAL FLORICAN *HOUBAROPSIS BENGALENSIS* IN DUDWA TIGER RESERVE, UTTAR PRADESH, INDIA

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ABSTRACT
Surveys for Bengal Florican were conducted in 2000 and 2001to assess the status and distribution of the species in Dudhwa National Park and Kishanpur WLS. The different grasslands were surveyed and from 26 different grassland sites 36 floricans were recorded. Males were most of the time in display and females were recorded from four different grasslands walking in *Saccharum narenga* and *Sachharum sponteneum* grass patches. The present study also recorded 36 different individuals thus a population of 72 floricans in the Dudwa Tiger Reserve The grasslands in Dudhwa after burning practices provides a good display ground for the floricans and a mosaic of upland grasslands *Impreta cylindrica – Sacchrum spontaneum* and low land *Sacchrum narenga – Themeda arundancea* provides ideal habitat for floricans in the Dudhwa NP and Kishanpur WLS.

INTRODUCTION
The Bengal Florican, *Houbaropsis bengalensis* (Gmelin 1789) is identified as critically endangered among the bustards by IUCN and global population is estimated at fewer than 400 individuals in the Indian subcontinent (Anon 2011). The Bengal Florican is listed in the Schedule I of the Indian Wildlife Protection Act. Distributed in the subcontinent in Assam, Bangladesh, Bhutan, Nepal, West Bengal and the *terai* of Bihar and Uttar Pradesh (Ali and Ripley 1987), it is now considered one of the most endangered bustards of the world. It is believed that its population has declined sharply in recent years and it is now extinct in Bangladesh (Karim 1985, Khan 1982).
Currently, the Bengal Florican is found only in U.P., Assam and Arunachal Pradesh in India. Its population in the India is estimated at less than 350 birds (Anon 2011). About 40 of them survive in Nepal (Bird Life 2010, 2011) and the bird may be extinct in Bangladesh (Anonynous, 2011). There is little doubt that the populations continue to decline everywhere. Even at the turn of the century, it was estimated that its population in India and Nepal was close to 500. It may be noted that last decade has also seen sharp decline in the population of southeast Asian sub-species and the estimates in Cambodia indicate that it has dropped from over 600 to about 300 (Bird Life 2010).
In UP, the current estimated population is around 70-80 and the bird is found in the Dudhwa NP, North Pilibhit and Kishanpur WLS (Anon 2011). Occasionally birds are also seen in Katerniaghat and Lagga-Bagga, and probably in Sohagi-Barwa. The latter two adjoin Bengal Florican areas in Nepal, Sukla Phanta and Chitwan National Parks respectively.
In Assam, there are about 180-220 Bengal Floricans, mainly in Manas, Kaziranga, Orang, and Dibru Saikhowa National Parks, and in Burachapori and Laokhowa Wildlife Sanctuaries. A few birds are found in *chapories* (river islands and sandbanks) of Brahmaputra outside the PA network in Tinsukia, Dibrugarh, Dhemaji, Lakhimpur and Sonitpur districts of the state. The estimates for Arunachal Pradesh are around 40-50. It is found in D'Ering Memorial WLS, *chapories* of Lohit River and grasslands in Dibang district. Apparently the Bengal Florican populations are stable and well-protected but the critical factor for their long term survival is the presence of optimal habitat. The patches of short grasses throughout the *terai* need to be managed very carefully. Undue alteration in habitat by wrong management practices without proper scientific input may weaken the chances of its long term survival. Prescribed burning and harrowing should be done well before the birds start displaying.

Study Area

The Dudwa Tiger Reserve comprises of the Dudwa National Park, Kishanpur Wild life Sanctuary and the Katerniaghat WLS (Fig. 1). The Dudwa Tiger Reserve is located on the Indo-Nepal border in the Nighasen and Gola Tehsils of district Lakhimpur-Kheri and Nanpara Tehsil of Bahraich district and lies between 28° 18´N and 28° 42´N latitudes and 80° 28´E and 80° 57´E longitudes. The Indo-Nepal border forms much of the northern border of the Dudhwa Tiger Reserve, particularly the Dudwa National Park and Katerniaghat WLS.

The area of DNP is 490.3 sq km with an adjoining 190 sq km of reserved forests as a designated buffer zone. The area of KWLS is 203.4 sq km. Katerniaghat WLS lies towards the eastern side of Dudwa National Park. It has an area of 400.09 sq km with the adjoining 150.03 sq km of Reserve Forests, which serves as buffer, constitutes one ecological unit. The area is on the flat alluvial flood plains of the Suheli, Mohana and Sharda rivers. The general aspect is north-west to south-east. The altitude ranges from 182 m a.m.s.l. in the north to 150 m a.m.s.l. in the south-east. The altitude at Dudwa is 163 m, 183 m at Gauriphanta and 143 m at Mailani. The soils the forests are a recent alluvial formation (Singh, 1965) of the Gangetic Plains. A soil profile showed a succession of sand and loam beds, varying in depth according to the configuration of the ground. The surface soil is sandy, in more

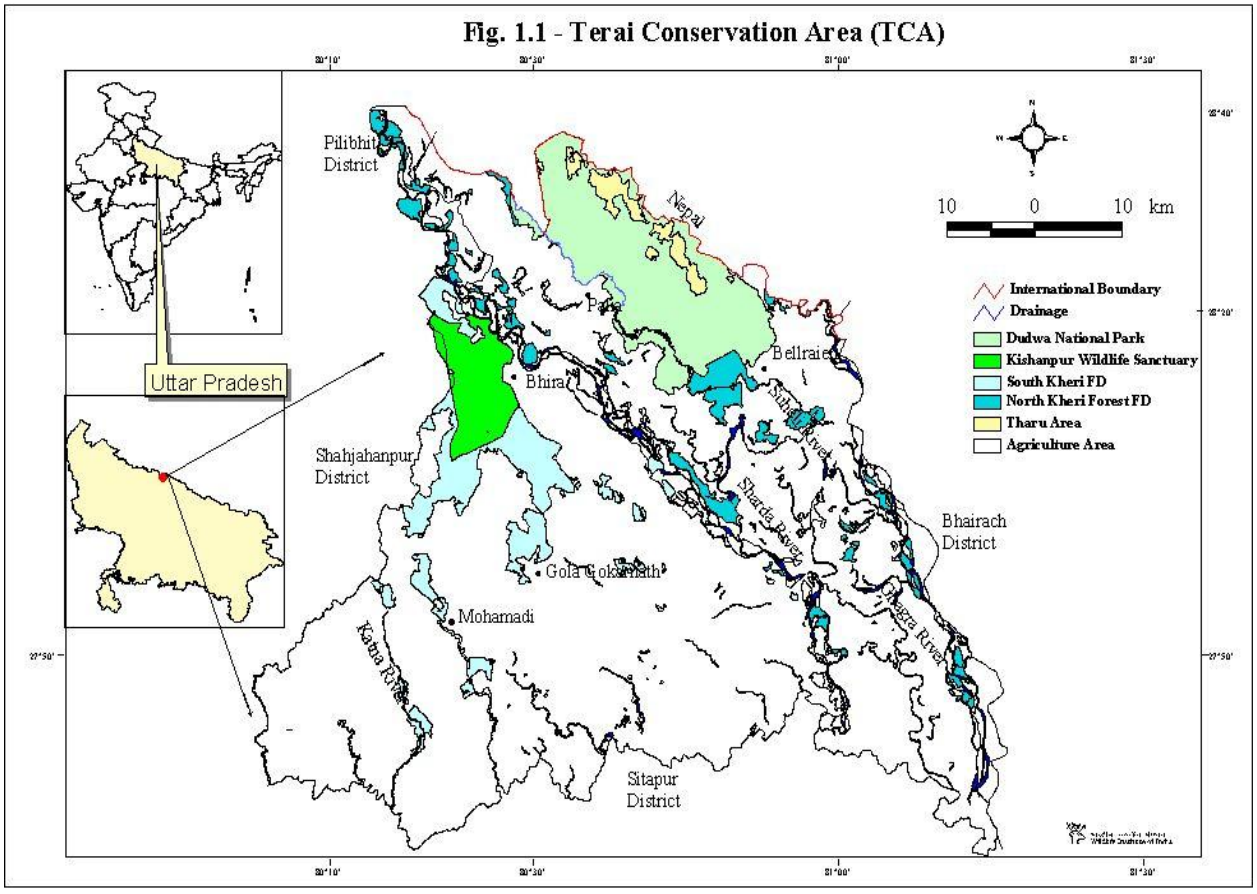

Figure 1: Dudwa National Park, Uttar Pradesh, India

elevated portions and along the high banks of the river to loamy in the level uplands, and clayey in depressions. There is no boulder formation as in Bhabar sal tracts.

METHODS

Areas of suitable habitat were visited during the breeding season when displaying territorial males are most visible. Floricans are very territorial during the breeding season (Ali and Rahmani 1982–1984, Sankaran and Rahmani 1986, Manakadan and Rahmani 1986), so different display sites were assumed to belong to different males. As females are more difficult to locate, population estimates were based on the assumption of an equal sex ratio. Observations were carried out in the early morning (06h30 to 10h00) and late afternoon (16h30 to 19h00) when the species is most active (Ali and Ripley 1969). Observations were made using binoculars from machans (towers) for a better view of the grasslands, generally with minimal disturbance to floricans. The different sites were visited during the morning and evening hours and scanned by 2-3 field staff for direct sighting of the floricans. Some areas were also surveyed on elephant back and from vehicles. For each sighting of floricans, the number and sex of individuals, their activity, time, and weather was recorded, and the time spent in each area was noted, together with a general impression of the habitat. Group discussions were held with field staff and researchers to glean information on the presence of Bengal Florican and its conservation The different grasslands of Dudhwa National Park and Kishanpur Wildlife Sanctuary were visited during March to June month of 2000 and 2001 to get an estimate of Bengal Florican in Dudwa Tiger Reserve. All the possible grasslands in the reserve were visited by vehicle, elephant back and on foot to have idea of Bengal Floircans in the Tiger Resere. All Bengal Florican sightings were logged, along with information on habitat use, numbers and activity. Bengal Florican numbers were estimated based on these records and discussion with the Reserve staff.

RESULTS

The total area of grasslands in Dudhwa NP is125 sq km and Kishanpur WLS is 31 sq km provides an ideal habitat for the floricans (Kumar et al., 2002). The maximum patch size of upland grassland in Dudwa National Park is 14.6 sq km, low land grassland is 19.6 sq km and minimum patch size is 4 ha (Kumar et al., 2012). The nine different communities were indentified in Dudhwa NP (Kumar et al., Kumar 2002). The floricans preferred the communities dominated by Impreta cylindrical and *Saccharum spontaneum* and the grass height up to 110 cm. The grasslands occupied by floricans are free from grazing and other biotic pressure and are well protected.

The Bengal Florican was reported from 26 different grasslands sites in Dudhwa Tiger Reserve. In Dudwa National Park the floricans were reported from twenty four different sites. Three males were recorded from each Kusumbha Phanta and Bhadi Phanta of Belreiyen Range of Dudwa National Park. Two males were recorded from NavalKhand Phnata Sarota Phanta in Dudhwa Range, Sonaripur Grasslands in South Sonaripur Range and Pachpera Phanta under Belreiyen Range of Dudhwa National Park and Jhadi Phanta of Kishanpur Wildlife Sanctuary. Five individuals of the florican were recorded from Rhino enclosures (Kaimaya, Kurmania, Chetua, Parbatia, Bela Phnata). Two female floricans were sighted from Sarota – Masankhamb and near Pacca Machan Grassland of Dudhwa National Park.

The size of the grasslands where floricans were found varied from 0.05 km2 to nearly 1 km2. The larger patches were within the reserve and some of these were islands with a mosaic of various grass species. All sightings with dates, number and localities are presented in the table.

Table 1: Details of Bengal Florican during March to June 2000 and 2001 from Dudhwa National Park and Kishanpur WLS

Date	Range	Phanta Name	Time	Male	F	Habitat
01-05-2001	Bankati	Navalkhad	07:25 AM	2		*Impreta cylindrica* and *Sachharum spontaneum* grassland
21-05-2011	Dudwa	Chhaparh	06:15 AM	1		Pure *Impreta cylindrica* patch
07-05-2000		100m from Makkan boghi to Pacca Machan	08:45 AM		1	*Impreta cylindrica* and *saccharum spontaneum*
05-05-2001		Purana Kawaghati	09:15 AM	1		*Impreta cylindrica* and

						Saccharum spontaneum grassland
24-03-2000		While going from Sarota phanta to Masankhamb after the dismantled railway line	06:15 AM		1	*Sachharum narenga and Sachharum spontaneum*
25-03-200		Sarota Phanta		2		*Impreta cylindrica* and *Sacchrum spontaneum*
23-04-2001		Dudwa Chandan Chowki Road after second Railway crossing	05:25 AM	1	1	*Impreta cylindrica* and *Sacchrum spontaneum*
03-04-2001	North Sonaripur	Khajua Phanta	06:15 AM	1		*Impreta cylindrica* and *Saccharum spontaneum*
02-04-2000		Seetagadia phanta on road no. 64	06:25 AM	2		*Impreta Sachhrum* and *Desmostachya biippanata*
22-05-2000	South Sonaripur	Bankey Tal	05: 15 PM	1		*Impreta cylindrica*
21-04-2001		FRH & Railway Station	07:30 AM	1		*Impreta cylindrica* and *Sachharum narenga*
30-04-2001		West of FRH	06:15 AM	2		*Impreta cylindrica* and *Sachharum spontaneum*
30-05-2000		Lauki	05:35 PM	1		*Impreta cylindrica* and *Saccharum spontaneum*
22-04-2001		Kaimaya	05:40 PM	1		*Impreta cylindrica* and *Saccharum spontaneum*
22-04-2001		Kurmania	05:40 PM	1		*Impreta cylindrica* and *Saccharum spontaneum*
28-05-2000		Chetua	06:30 AM	1		*Impreta cylindrica* and *Saccharum spontaneum*
29-05-2000		Parbatia	07:30 AM	1		*Impreta cylindrica* and *Saccharum spontaneum*
29-05-2000		Bela Phanta	07:45 AM	1		*Impreta cylindrica* and *Saccharum spontaneum*
						Impreta cylindrica and *Saccharum spontaneum*
04-04-2001	Belreiyen	Bhadi Tal	05:05 PM	3	1	*Impreta cylindrica* and *Saccharum spontaneum*
04-04-2000		Churela Phanta	05:35 PM		1	*Impreta cylindrica* and *Saccharum narenga*
16-06-2001		Laudria Phanta	05:45 PM	1		*Impreta cylindrica* and *Saccharum spontaneum*
18-06-2001		Pachpera Phanta	05:25 PM	2		*Impreta cylindrica* and *Saccharum spontaneum*
17-04-2000		Nagra Phanta	05:10 PM	1		*Impreta cylindrica* and *Saccharum spontaneum*
17-04-2000		Kusumbha Phata	05:45 PM	3		*Impreta cylindrica* and *Saccharum spontaneum*
30-04-2000	Kishanpur Range	Ghadi Phanta	7.15 AM	2		*Impreta cylindrica* and *Saccharum spontaneum*
29-04-2000	Mailani Range	Marha Phant	5.45 PM	1		*Impreta cylindrica* and *Saccharum narenga*

Table 2: Sightings of male Bengal Florican in 1988-89 in Dudhwa National Park (Rahmani A.R. 1996)

S.N.	Range	Region	Location of males	No. of territorial males	Other males
1	Dudhwa	Sathiana FRH	West of old Kowaghatti bridge, on southern side of road	1	-
2	-do-	-do-	In Chapra phanta on the southern side of road	1	-
3	-do-	-do-	In Madraiya near "pakka machan" (watch tower)	-	1
4	Bankatti	Sarota Beat	Phulvaria phanta: southern side of Dudhwa-Masankhamb road	1	-
5	Sonaripur (North)	Sonaripur FRH	Navalkhad phanta	2	1

6	Sonaripur (South)	-do-	Seethagaddaria phanta on road no. 64 between FRH and Dudhwa Chandan-Chowki metalled road	2	1
7	-do-	-do-	In grassland just west of FRH, between FRH and Railway station	2	-
8	-do-	-do-	Bankey Taal area	-	2
9	-do-	-do-	In a phanta east of FRH on road no, 64 going to Salukapur	1	-
10	-do-	Salukapur Rhino enclosure	Chetwa phanta near Kakraha taal	1	-
11	-do-	-do-	Kurmania phanta	1	-
12	-do-	-do-	Parbatia machan phanta	1	-
13	-do-	-do-	Bela phanta	1	-
			Total	**14**	**5**

Table 3: Sightings of male Bengal Florican in 1996 in Dudhwa National Park and Kashinpur Wildlife Sanctuary (Rahmani A.R. 1996)

S.N.	Range	Region	Location of males	No. of territorial males	Other males
Dudhwa National Park					
1	Dudhwa	Sathiana FRH	West of old Kowaghatti bridge, on southern side of road	1	-
2	-do-	-do-	In Chapra phanta on the southern side of road	1	-
3	-do-	Sarota Beat	Phulvaria phanta southern side of Dudhwa-Masankhamb road	3	-
4	Bankatti	Sathiana FRH	Navalkhad phanta	2	1
5	Bankatti	Karnia Chowki	Kamiaya phanta near Nepal border	1	-
6	Sonaripur (North)	Sonaripur FRH	Seethagaddaria phanta on road no. 64 between FRH and Dudhwa Chandan-Chowki metalled road	1	-
7	Sonaripur (South)	-do-	In grassland just west of FRH, between FRH and Railway station	2	-
8	-do-	-do-	Bankey Taal area	-	
9	-do-	-do-	In a phanta east of FRH on road no, 64 going to Salukapur	1	1
10	-do-	-do-	Phanta close to to Sonaripur FRH on Qila road	1	-
11	-do-	Salukapur Rhino enclosure	Chetwa phanta near Kakraha taal	1	-
12	-do-	-do-	Kurmania phanta	2	-
13	-do-	-do-	Parbatia machan phanta	1	-
14	Balraien	Bhadi Taal	Bhadi taal phanta	1	-
15	Balraien	Qila	Nagraha phanta near Qila	2	1
				1	-
Kashinpur Wildlife Sanctuary					
16	Kishanput	Jhadi Taal	Phanta adjoining Jhadi taal	2	-
			Total	**22**	**3**

Total Popluation

We recorded 36 different individual from 26 different grasslands sites in Dudwa National Park and Kishapur WLS. There mosaics of upland and low land grassland patches and large grasslands area of Sonaripur, Rhino enclosues, Bhadi, Kusumbha in Dudhwa National Park and Ghadi. Total five different individual areas were recorded from rhino enclsosure.

Assuming an equal sex ratio of florican the population of 72 individuals in Dudwa NP and Kishnapur WLS. The well protected grasslands and timely burning of grasslands provides an ideal condition for the birds.

DISCUSSION

The status of Bengal Florican and its habitat in Dudhwa National Park has maintained the same as 1996 level. A population of 68-70 individuals were recorded by Rahmani in 1996. In 2000 – 2001 we estimated a population of 72 individuals in Dudwa National Park and Kishanpur WLS. There is no

sighting of floricans from the adjoining sancatuary of Katernighat WLS. The population of Bengal Florican in Dudwa NP park has been maintained because of mosic of upland and lowland grassland and timely grassland burning practices. However in some florican areas *Randia ulinginosa* species is coming. This species should be either removed or 5-7 ha tree should be left from preventing the encroachment of grasslands.

Systematic, centrally organized status & distribution survey has to be implemented at the landscape scale at an initial stage for benchmark information. Satellite telemetry program has to be scientifically undertaken to understand seasonal movement patterns & life-history and habitat requirements. Movements for Migration certainly occur in the Brahmaputra valley, as much breeding habitat is seasonally flooded, but it is not known where floricans from these areas then move to (Narayan 1992, Choudhury, 2000c). The conservation requirements of the species should be viewed in combination with the needs of a variety of other threatened grassland birds within its range, so that a programme of habitat management and research can be implemented with benefits to each of these species.

Grasslands are the richest and unique ecosystem which supports large number of endangered species (White *et al.,* 2000) and at the same time, the grassland ecosystem perhaps is the most threatened ecosystem in the Indian subcontinent at present (Grimmett *et al.,* 1998). The tall moist alluvial grasslands occur on east-west stretch of the northern alluvial lowland of Nepal and floodplains of river Ganges and Brahmaputra, known as the Terai region and classified as one of the highest priority regions for conservation action (CEPF, 2005). The alluvial grassland of terai is an unique habitat of Bengal florican and supports number of globally threatened and endangered species like Great Indian one horned rhinoceros *(Rhinoceros unicornis)*, pygmy hog *(Parcula salvanius)*, Hispid hare (*Caprolagus hispidus*). The survival of these threatened species' is ensured by the presence of grassland.

Bengal Florican is the only species among the Bustards which are exclusively found inside the protected areas. Their breeding areas have to be excluded from all kind of human disturbances excepting low intensity traditional pastoralism, that too not during the breeding season. This includes restriction on infrastructural development and land–use diversion (ban on roads, high tension electric poles, intensive agriculture, wind power generators and construction). Active protection must be given to these areas by Forest Department staff. As the Bengal Florican nesting specificity is vague over the years, except the preferential tall grass patches; these high priority spots and relevant surroundings within the breeding areas have to be freed from the above problem species prior to breeding. For this, coordination with competent Forest Department authority is required. Alternative livelihoods have to be provided to traditional hunters in some areas. Lagga Bagga is contiguous with Sukla Phanta Wildlife Sanctuary in Nepal and would be better protected through a cooperative agreement between the two countries (Rahmani 1989). Visits to the area a decade ago revealed it to be deteriorating rapidly and urgently in need of conservation intervention (Rahmani and Qureshi 1991).

Management practices commonly fail to consider the ecological requirements of the species, an oversight that can lead to local extinctions. Grassland management for floricans should aim to maintain areas of intact grassland that are not cut or burnt, on a rotational basis, whilst allowing other areas to be harvested by local people, and hence creating a mosaic of tall and short grass patches (Peet 1997, Peet *et al.,* 1999, Baral 2001). Further alternatives to grass harvesting should be promoted in communities currently dependent on grassland resources (Peet 1997).

Jnawali and Wegge (1999) have proposed clear-felling small blocks of *Shorea robusta* and *Terminalia tomentosa*
forest to develop new areas of grasslands.

CONSERVATION PERSPECTIVE MANAGEMENT ACTIVITIES

Management activities in Dudwa are largely aimed at improvement of habitat for endangered species. As grasslands are preclimax they are maintained by annual burning, grazing and floods. Grasslands in Dudwa

are managed by the annual prescribed burning at the beginning of the dry season and this is the most important and crucial management activity. However, burning may be harmful to grassland birds, especially if it is carried out too frequently or too intensively. The removal of understory and thinning of Sal forest are done on an irregular basis and hence do not significantly influence the distribution and abundance patterns of birds.

Intensive study on Bengal Florican (*Houbaropsis bengalensis*) undertaken by Sankaran & Rahmani (1991) in Dudhwa National Park revealed that the floricans start arriving in the grasslands some time after the burning is completed in February. Males are highly territorial, and the breeding season can be said to have commenced once the display has begun. The breeding season of Bengal Florican at Dudhwa National Park extends from March to end

June with April and May being the peak season. The authors inferred that late burning of grasslands and particularly harrowing in the grasslands during the breeding season were detrimental to floricans and other nesting birds (Swamp Partridge *Francolinus gularis* and Peafowl *Pavo cristatus*) as they had begun their nesting in March. The study specifically recommends that the grasslands traditionally used

by floricans for their territories and breeding must not be harrowed. Evidently, patch cutting and burning of both types of grassland and a mosaic of habitats created by cut, uncut, burned and unburned patches, would provide

suitable habitats for persistence of diverse faunal species in *Terai*. Staggered cutting and burning would also create different patches providing varying forage and cover conditions. Lehmkuhl (1989) has indicated

that staggered burning fosters the pasture like grazing lawns. Staggered burning of grasslands in small patches could provide tender and palatable forage for longer periods during the lean season. Grazing lawns would produce high quality forage year round, and might decrease crop depredation by attracting herbivores away from agricultural land. Patch size would be critical for success: a patch too large would be hard for herbivores to crop fast enough to keep the grass short, and a patch too small might be overgrazed and may not produce adequate benefits to warrant management. Thus, a design for patch management should consider grassland type, patch size, quality, and distribution, the ability of different species to disperse to neighbouring or newly created patches, temporal and spatial heterogeneity and dynamics of the landscape

and disturbance factors, in particular uncontrolled fires and flooding (Rodgers 1986, Lehmkuhl, 1989, Peet

et al., 1997). A planned strategy for using different burning practices in case of TCA and elsewhere in the *Terai* keeping these facts in mind would be desirable (Kumar 2002, Kumar *et al*. 2002). Likewise, a long-term monitoring system to investigate changes in composition of the upland and lowland grassland is an essential component. Harrowing would have to be completely avoided or judiciously used for an interval of 2-3 years.

RECOMMENDATIONS

Whatever remnant tall wet grasslands which are occupied by florican in UP Terai should be protected from grazing, encroachment and disturbance.

Grasslands should be protected from overgrazing and overexploitation (e.g., harvesting and extraction of lemon grass) especially outside the Pas (i.e., Pilibhit Forest Division, North Kheri and South

Kheri Forest Divisions of Uttar Pradesh).

Grasslands should be protected from succession from short grasses to tall grasses.

Grassland burning should be completed by February 15, because the nesting of the birds starts after that.

Grassland burning should be according to the moisture gradient and the grass species composition,

keeping in mind site-specific requirements of different species present in the particular grassland patch.

In recent years, the *Terai* of Uttar Pradesh has become prone to highly destructive flash floods which affect the grasslands. These grasslands are managed by burning and the effects of flooding, therefore monitoring protocols should be developed

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