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COMMUNICATION

STATUS OF THE CRITICALLY ENDANGERED BENGAL FLORICAN *HOUBAROPSIS BENGALENSIS* (GMELIN, 1789) IN KOSHI TAPPU WILDLIFE RESERVE, NEPAL

Hem Sagar Baral, Tek Raj Bhatt, Sailendra Raj Giri, Ashok Kumar Ram, Shyam Kumar Shah, Laxman Prasad Poudyal, Dhiraj Chaudhary, Gitanjali Bhattacharya & Rajan Amin

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Status of the Critically Endangered Bengal Florican *Houbaropsis bengalensis* (Gmelin, 1789) in Koshi Tappu Wildlife Reserve, Nepal

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Abstract: The Bengal Florican is one of the rarest bustard species and is listed ‘Critically Endangered’ by the IUCN. The species is restricted to the lowland grasslands of India, Nepal, and Cambodia with fewer than 1,000 mature individuals. To assess the species status in Koshi Tappu Wildlife Reserve, Nepal, we repeated our first comprehensive survey conducted during the 2012 breeding season. In spite of a larger area coverage we recorded only 41 adult Bengal Floricans in 2017 compared to 47 individuals in 2012. Detectability of this rare species is low in its *Imperata-Saccharum* grasslands. We, therefore, used a long pole with black and white clothing to mimic Bengal Florican’s display flight to stimulate male Bengal Florican. The number of adult males recorded was the same as in the 2012 survey and the adult male density remains one of the highest in the Indian subcontinent. Management recommendations for the long-term conservation of the species in Koshi Tappu include maintenance of *Imperata-Saccharum* grasslands in the reserve favoured by the Bengal Florican and working with farmers and communities adjacent to the reserve where the birds breed in order to maintain some agricultural lands with vegetation height suitable for the species especially during the species’ breeding season.

Keywords: Otidiformes, Otididae, bustard, abundance, terai grasslands, bird, flagship species, threats.

Abbreviations: CITES—Convention on International Trade in Endangered Species of Wild Fauna and Flora | GPS—Global Positioning System | IUCN—International Union for Conservation of Nature | NGOs—Non-Governmental Organisations.

खरमुजुर विश्वमै अति संकटापन्न अवस्थामा रहेको लोपोन्मुख बस्टर्ड जातिको चरा हो। यो प्रजाति नेपाल, भारत र दक्षिणी इन्डोचाइनाको कम उचाईमा भएका घाँसेमैदानहरूमा सीमित छ। हाल भारतीय उपमहाद्वीप र कम्बोडियाको टोल्ले साप तालका घाँसेमैदान क्षेत्रहरूमा १००० भन्दा कम वयस्क खरमुजुर रहेको अनुमान गरिएको छ। सन् २०१२ मा कोशी टप्पु क्षेत्रमा यस प्रजातिको वृहत सर्वेक्षण गरिएको थियो। सोही विधि अपनाएर यो सर्वेक्षण सम्पन्न गरिएको हो। यस सर्वेक्षणमा पहिलेको भन्दा बढी क्षेत्र ओगटिएको भए पनि पहिले (४७ वटा) भन्दा अहिले (४१ वटा) कम वयस्क खरमुजुरहरू भेटियो। अग्ला घाँसे प्रजाति र यिनको लजालु स्वभावले गर्दा सर्वेक्षणका बेला यो प्रजाति सजिलै देखियोस भन्ने हेतुले लुकेका ठाउँबाट बाहिर निकाल्न लामो लठ्ठीको टुप्पामा प्रणयका बेला नाच्ने खरमुजुरको भान हुने कालोसेतो ध्वजाको मद्दत लिइयो। कुल संख्या घटेता पनि यो सर्वेक्षणमा पनि पहिलेको सर्वेक्षणमा जतिनै वयस्क भाले खरमुजुरहरू देखिए। कोशी टप्पु क्षेत्रमा भेटिएको वयस्क भाले खरमुजुरको घनत्व भारतीय उपमहाद्वीपकै उच्च मध्येको हो। वासस्थानका रूपमा रहेका घाँसेमैदानहरू विनाश हुदै जानु र बाँकी रहेका घाँसेमैदानहरूमा पनि व्यवस्थापनका अनुपयुक्त तरिका अपनाइनुका कारण वासस्थानको गुणस्तरमा यस हुनु खरमुजुरका लागि प्रमुख चुनौतीका रूपमा रहेका छन्। खरमुजुरको विगो संरक्षणका लागि संरक्षित क्षेत्रहरूमा यस प्रजातिलाई उपयुक्त घाँसेमैदान व्यवस्थापन गर्नुका साथसाथै संरक्षित क्षेत्र आसपासका स्थानीय समुदाय र कृषकहरूसँग सहकार्य गरी यस प्रजातिको वासस्थानको उचित संरक्षण, विशेषत बच्चाकोरलने समयमा, गर्नु पर्ने कुरा यस वैज्ञानिक पत्रमा उल्लेख गरिएको छ।

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INTRODUCTION

Bengal Florican *Houbaropsis bengalensis* (Gmelin, 1789) is the only member of its genus, and is the rarest member of the bustard order, Otidiformes. The species is classified as Critically Endangered on the IUCN Red List due to the widespread and on-going modification of its grassland habitat (BirdLife International 2018). It is also included on Appendix I of CITES (BirdLife International 2018).

Resident populations of Bengal Florican (Image 1) occur in the floodplain grasslands in Cambodia, India, and Nepal (BirdLife International 2018). The Cambodia population is estimated to be 432 individuals (Packman et al. 2014). The overall population estimate for India is not available, but it is certain to hold a significant population considering the large areas of suitable habitat especially within its northern protected areas. Recent surveys have recorded 72 adult males in Manas Tiger Reserve, Kaziranga and Orang National Parks in Assam and 60–70 territorial male Bengal Floricans are estimated to be present in D'Ering Wildlife Sanctuary in Arunachal Pradesh (BirdLife International 2018).

In Nepal, the species occurs in Shuklaphanta National Park, Bardia National Park, Chitwan National Park, Koshi Tappu Wildlife Reserve, and Koshi Barrage area with a combined population of less than 100 individuals (DNPWC 2016, Figure 1). In Koshi Tappu Wildlife Reserve, the species was occasionally seen in the 1970s (Dahmer 1976) and there were several records from the Koshi Barrage in the early 1980s (Baker 1981; Turton & Speight 1982), but none were sighted after 1986 (Inskipp & Inskipp 1991).

However, in 2011 the Bengal Florican made a comeback to the wildlife reserve. A 2011 survey estimated as many as 12 pairs in Koshi area at nine sites along a 39km north-south stretch of the Koshi River. Out of the total of 17 birds recorded during the survey only five birds were recorded outside the Koshi Tappu Wildlife Reserve. A comprehensive follow-up survey in April and May 2012 counted 47 birds. This represented the largest known population in Nepal, with perhaps the highest density in the Indian subcontinent (Baral et al. 2013).

The main threat to the Bengal Florican in the protected areas in Nepal is improper habitat management by ploughing, intensive burning and grass harvesting leading to a loss of suitable habitat (Poudyal et al. 2008; Baral et al. 2013; DNPWC 2016). The Bengal Florican is a 'flagship' species in the Terai grasslands. There is a need to develop a sustainable recovery strategy for the critically threatened Bengal Florican that



Image 1. Bengal Florican *Houbaropsis bengalensis*

provides long-term biodiversity benefits not only for the florican but also for other species that rely on the fragile and threatened grassland habitats. An effective strategy needs to establish an improved scientific evidence-base on the dynamics of Bengal Florican population decline, increase regional conservation capacity-building and cooperation, raise awareness, and build legislation for habitat protection, and appropriate management aiming to support optimum population size. Despite years of conservation focus on this species, the population continues to decline elevating the species' status recently to Critically Endangered from Endangered. A global scenario for the Bengal Florican and other bustard species is adequately presented in a recent publication (Collar et al. 2017).

Following recommendations by Baral et al. (2013), the objective of this study was to assess the change in status of the population of the Bengal Florican in Koshi Tappu Wildlife Reserve and its adjacent areas after a period of five years.

METHODS

Study area

Koshi Tappu Wildlife Reserve (26.65°N & 87.00°E) lies in the floodplain of the Sapta Koshi River in southeastern lowland Nepal (Figure 2). The reserve was officially established in 1976 and extended in 1980 covering an area of 175km². The habitat within Koshi Tappu Wildlife Reserve and its adjacent areas, referred henceforth as Koshi Tappu, is broadly classified as mixed deciduous riverine forest (5.4%), grassland (17.1%), swamp (18.1%),

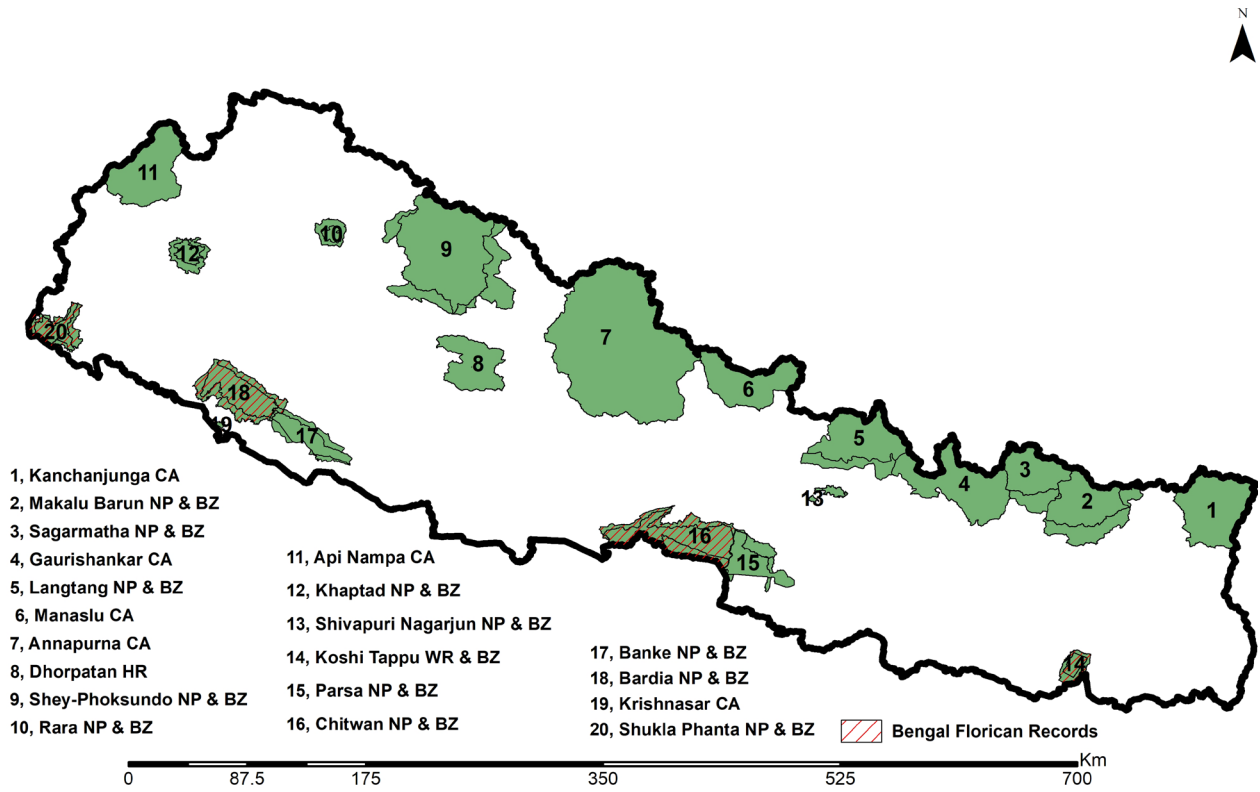


Figure 1. Distribution of Bengal Florican in Nepal.

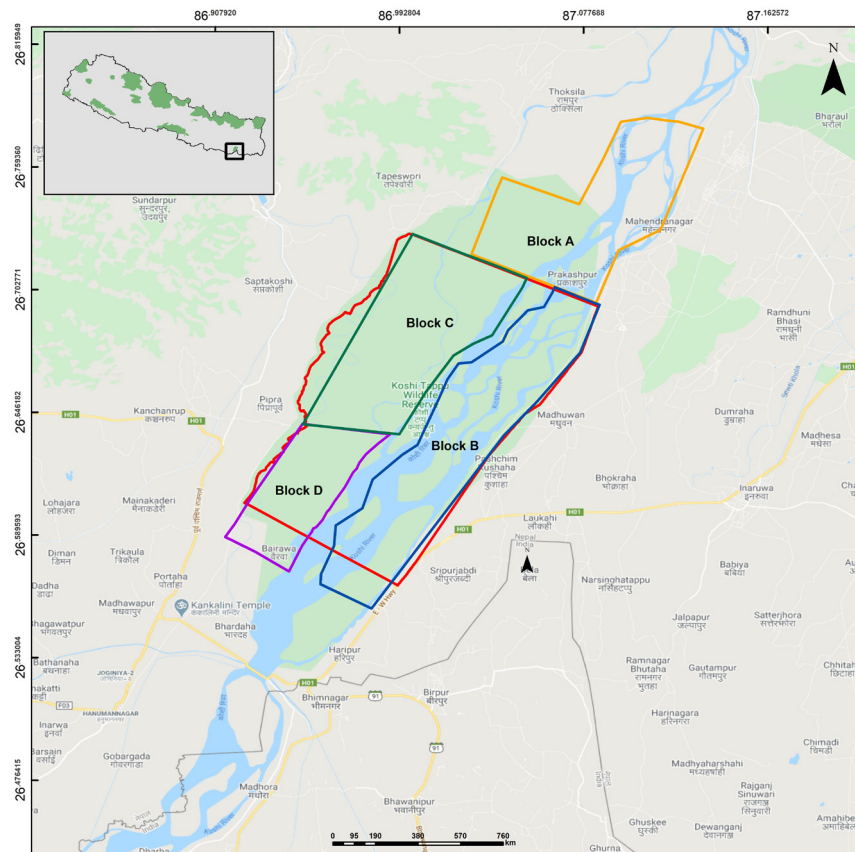


Figure 2 . Koshi Tappu showing the survey area with four blocks.

Table 1. Description of survey blocks in Koshi Tappu Wildlife Reserve and its adjacent areas.

Block	Sites	Location	Area (km ²)	Habitat characteristics	Disturbance level
A	Site 1	26.77N 87.10E	4	<i>Saccharum spontaneum</i> with smaller patches of <i>Imperata</i> grasses; within Koshi Tappu Wildlife Reserve and buffer zone	High
	Site 2	26.74N 87.12E	14	<i>S. spontaneum</i> with fewer patches of <i>Imperata</i> grasses than site 1; outside Koshi Tappu Wildlife Reserve and buffer zone	High
	Site 3	26.77N 87.07E	30.2	Cultivation land with some thatched houses. Few patches of <i>Typha elephantina</i> and short grasses mainly <i>Imperata</i> .	High
B	Site 1	26.69N 87.09E	30.5	<i>S. spontaneum</i> with a sward height of about 50cm; within Koshi Tappu Wildlife Reserve and buffer zone	Medium
	Site 2	26.66N 87.09E	6	<i>S. spontaneum</i> with a sward height of about 50cm; within Koshi Tappu Wildlife Reserve and buffer zone	Medium
	Site 3	26.56N 87.01E	9	<i>S. spontaneum</i> with a sward height of about 50cm; within Koshi Tappu Wildlife Reserve and buffer zone	Medium
C	Site 1	26.66N 87.04E	12.9	<i>Saccharum</i> and <i>Imperata</i> grasslands with patches of young <i>Dalbergia sissoo</i> and <i>Acacia catechu</i> ; within Koshi Tappu Wildlife Reserve and buffer zone	Medium
	Site 2	26.66N 87.04E	37.3		Medium
D	Site 1	26.63N 87.02E	25	<i>Saccharum</i> and <i>Imperata</i> species; within Koshi Tappu Wildlife- Reserve and buffer zone	High

Disturbance was measured in three categorical levels—low, medium, and high.

river (52.4%), and agricultural land (7.0%) (Dahal et al. 2009). The southern part of the reserve is a large expanse of open water, marshes and reed-beds created by the construction of Koshi barrage between 1958 and 1964 (Limbu & Subba 2011). The reserve is bounded by two parallel embankments, a shorter one to the west and longer one to the east of the Sapta Koshi River and is subject to annual flooding (Baral et al. 2012). Koshi Tappu Wildlife Reserve was Nepal's first Ramsar site in 1987 (Sah 1997) and is an Important Bird Area (Baral & Inskipp 2005). A total of 526 bird species has been recorded in the area (Baral 2016; Koshi Tappu Wildlife Reserve 2018).

Field method

Prior to the field survey, we identified suitable Bengal Florican habitats in and around Koshi Tappu Wildlife Reserve using Google Earth Image (2016) and reconnaissance survey. We followed the previous 2012 survey design and established four survey blocks (Table 1, Figure 2). Survey blocks A and B were considerably larger, by 30.2km² and 30.4km², respectively, compared to 2012 survey due to the dynamic nature of the floodplain.

The survey was conducted between 23–29 April 2017. The survey blocks were reached either by boat or by a four-wheel vehicle and the surveys were conducted on foot between 05.00–10.00 hr and 15.00–18.00 hr. Bengal Floricans are most active during the early morning and late afternoon and human disturbance is

also minimal during these times.

In total 12 experienced surveyors took part in the survey. Each surveyor had a pair of binoculars and forms to record data on sighted birds along with location and habitat information. Additionally, each survey team carried a mobile phone, digital camera and a GPS receiver. Watches were synchronised among team members to record accurate time of Bengal Florican sightings. Each survey team also carried a long pole with black and white clothing to mimic male Bengal Florican display flight. The aim of this was to stimulate male Bengal Floricans to display thus increasing detectability. Sightings of flying birds were communicated to other teams via mobile phones to minimize double counts. The survey covered 168.9km² of the 193km² identified as suitable Bengal Florican habitat in Koshi Tappu.

Enumerating number of Bengal Floricans

Bengal Florican sighting records were checked for double counts using sex, location and time. The species nesting season is from May to August (Oates 1898). We, therefore, assumed that the adult birds had already established territories during the survey and were faithful to their sites. The total number of birds was obtained by adding the total number of birds recorded in each survey block.

Several factors were recognized to be potential biases in counting the Bengal Florican population. Since only adult males displayed, counts were likely to be biased towards males. Grass height varied considerably

across the survey area, and we did not correct for detection bias due to variation in visibility. Bias due to different observers, timing of count, and varying levels of human disturbance were also recognized. Potential variability introduced using Bengal Florican dummies was not estimated. The number of Bengal Floricans that had not yet established territories during the survey was unknown. The possibility of birds moving between blocks during the survey period was recognized.

RESULTS

Bengal Florican was recorded in all four surveyed blocks. In total, 41 adult birds were recorded of which 29 birds were male and 12 birds were female. Five birds were recorded outside the Koshi Tappu Wildlife Reserve and its buffer zone, four birds in the buffer zone, and 32 birds in the reserve (Table 2).

The highest number (15 birds) and density (0.33 birds/km²) of Bengal Floricans were recorded in Block B. Only four Bengal Floricans at a density of 0.16 birds/km² were counted in Block D. In Block A nine adult Bengal Floricans at a density of 0.19/km² were counted. The survey blocks A and D were the most grazed and disturbed areas, evident by the large number of cattle present and on average, the shortest grass sward height. All the blocks except Block A were within the reserve and buffer zone. Seventy percent of Block A was outside the reserve and buffer zone.

The overall density of the species in the surveyed area was 0.24 birds/km². Assuming that the un-surveyed area had a density of Bengal Floricans similar to the area covered, we estimated a total population of 46 Bengal Floricans within suitable habitat in Koshi Tappu. Bengal Floricans were only recorded in grasslands predominantly consisting of *Imperata cylindrica* and *Saccharum spontaneum* with a sward height greater than 50cm.

Correction of the Bengal Florican 2012 survey estimate (Baral et al. 2013)

We found that the area of Block C reported by Baral et al. (2013) was much larger than its actual size. Based on area calculated using QGIS 2.18 (QGIS Development Team 2004), we revised this to 50km² (105km² was reported in Baral et al. 2013). The revised estimated density of Bengal Floricans in Koshi Tappu for 2012 was 0.43 bird/km² (Table 3).

DISCUSSION

We counted fewer adult Bengal Floricans (41 birds) in Koshi Tappu over a larger area (168.9km²) compared to the previous survey in 2012 (Baral et al. 2013, 47 birds in 108.1km²). This indicates a 13% decline over five years.

The survey found a 2.42 male to female sex ratio. It is not unusual to find a higher number of males compared to females in populations of globally threatened bird

Table 2. The number of adult Bengal Floricans counted within the surveyed blocks in Koshi Tappu Wildlife Reserve and its adjacent areas.

Sampling block	Area (km ²)	Number of adult male Bengal Floricans counted	Number of adult female Bengal Floricans counted	Total number of adult Bengal Floricans counted	Estimated adult density (birds / km ²)
Block A	48.2	6	3	9	0.19
Block B	45.5	10	5	15	0.33
Block C	50.2	10	3	13	0.26
Block D	25	3	1	4	0.16
Total	168.9	29	12	41	0.24

Table 3. Revised 2012 survey density estimate of Bengal Florican in Koshi Tappu Wildlife Reserve and its adjacent areas (data source Baral et al. 2013).

Sampling block	Area (km ²)	Number of male Bengal Floricans counted	Number of female Bengal Floricans counted	Total number of Bengal Floricans counted	Estimated density (birds / km ²)
Block A	18	9	5	14	0.78
Block B	15.1	5	3	8	0.53
Block C	50	14	9	23	0.46
Block D	25	1	1	2	0.08
Total	108.1	29	18	47	Average total density 0.43

Table 4. Density of adult male Bengal Florican populations in southern and southeastern Asia.

Site	Number of adult male Bengal Floricans	Area (km ²)	Density (individuals /km ²)	Data source
Manas Tiger Reserve, India	33	319	0.1	BirdLife International (2017)
Kaziranga National Park, India	32	378	0.08	BirdLife International (2017)
D'Ering Wildlife Sanctuary, India	60–70 (mean 65)	190	0.34	BirdLife International (2017)
All Bengal Florican habitat, Cambodia	216	307	0.7	Packman et al. (2014)
Koshi Tappu, Nepal	29	163.65	0.18	Bengal Florican Survey (2017)

species (Donald 2007). Further studies are required to understand reasons for the higher percentage of male Bengal Florican sightings. Comparing the density of adult male Bengal Floricans as a proxy of Bengal Florican population density across the various sites in southern and southeastern Asia, Koshi Tappu continues to remain one of the strongholds for the species (Table 4).

Previous studies have reported species dependence on *Saccharum-Imperata* assemblage during the breeding season (Inskipp & Inskipp 1983; Baral 2001; Poudyal et al. 2008). This study also found higher density of Bengal Floricans in *Saccharum-Imperata* grassland assemblage with sward height of about 50cm. Detailed studies on grassland ecology combined with studies on the ecology of the Bengal Florican are necessary to understand their habitat preferences which can guide management intervention to maintain viable populations (Baral et al. 2013).

The species faces a number of threats in Nepal. Very small areas of suitable habitat remain, and these are mainly within protected areas. At present, the grasslands of Koshi Tappu Wildlife Reserve and Shuklaphanta National Park provide the best habitats for this species. In Chitwan and Bardia National Parks, single habitat patches suitable for Bengal Florican have been reduced to less than 50ha. Even in protected areas, the species is threatened by improper habitat management by ploughing, grass harvesting and intensive burning, leading to a loss of suitable habitat (Poudyal et al. 2008). Other significant threats are disturbance (overgrazing), susceptibility to predation and hunting (Poudyal et al. 2008). In addition, the invasive alien plant species *Mikania micrantha* which can smother grasslands, has had serious impact on Chitwan National Park and Koshi Tappu Wildlife Reserve habitats (Siwakoti 2007; Baral & Adhikari 2017). At Koshi, feral dogs, fern and wood collectors and an unnatural increase in native predators, Asiatic Golden Jackal *Canis aureus* and Indian Grey Mongoose *Herpestes edwardsi*, are additional threats (Baral et al. 2013). Both native predators have increased

and are possibly still increasing in Koshi as they are more adaptable to the widespread disturbance that Koshi faces and are known to flourish in such conditions. Pressure on lowland grasslands is increasing. Bengal Floricans are especially at risk during the monsoon when some move outside the protected areas where they might breed into unprotected riverine areas with adjacent agricultural fields.

Based on our studies and experience, we recommend that the local communities should be trained and supported in managing grasslands that fulfil their needs for cattle fodder and thatch grasses and provide suitable habitat for Bengal Floricans and other grassland species. Farmers should be encouraged to leave some of the grassland habitats within farmlands especially during Bengal Florican's breeding season. This is already happening in Chitwan National Park buffer zone in East Nawalparasi District, where a community-managed grassland is working along similar lines to that of community forestry (Chitwan National Park 2016). Relevant national and local NGOs should buy and manage fallow-land and grassland areas along the Koshi River (and other major river courses in Nepal). Similar initiatives should be promoted in adjoining parts of India and establish transboundary cooperation to restore river habitat corridors facilitating bird movements. The Nepal Government should create and expand protected zones along river corridors.

The feral cattle and to some extent Wild Water Buffalo *Bubalus arnee* in Koshi Tappu have helped to keep the *Saccharum* and *Imperata* grasses short and suitable for Bengal Florican. This grazing needs to be monitored and regulated especially during the breeding season of birds, viz., April to August. Use of heavy machinery by Koshi Project, Government of Bihar, India should be avoided in Koshi Tappu especially during breeding season of April–August. Similarly, urgent action is needed to control the spread of invasive alien plant species, especially *Mikania micrantha* and *Parthenium hysterophorus*. Management with the aim to restore and/ or maintain

areas of intact grasslands should be implemented, based on improved understanding of floodplain grassland dynamics in Koshi Tappu Wildlife Reserve. Nationwide awareness programme should be conducted through audio-visual media such as documentaries on Bengal Florican as public support is crucial for the conservation of threatened species at the grass-root level.

REFERENCES

- Baker, T. (1981). Birds seen in Nepal, Feb–Mar 1981. Unpublished report.
- Baral, H.S. (2001). Community Structure and Habitat Associations of Lowland Grassland Birds in Nepal. University of Amsterdam and Cardiff University. Amsterdam and Cardiff, 235pp.
- Baral, H.S. (2016). *Birds of Saptakoshi Floodplains*. Himalayan Nature, Kathmandu, Nepal, 44pp.
- Baral, H.S., A.K. Ram, B. Chaudhary, S. Basnet, H. Chaudhary, T. Giri & D. Chaudhary (2012). Conservation status of Bengal Florican *Houbaropsis bengalensis bengalensis* (Gmelin, 1789) (Gruiformes: Otidae) in Koshi Tappu Wildlife Reserve and adjoining areas, eastern Nepal. *Journal of Threatened Taxa* 4(3): 2464–2469. <https://doi.org/10.11609/JOTT.o2948.2464-9>
- Baral, H.S., A.K. Ram, B. Chaudhary, D. Chaudhary, A. Timilsina, S. Acharya, K. Bindari, S. Acharya, B. Acharya, P. Thulung, A. Karki & K.P. Acharya (2013). Survey of Bengal florican *Houbaropsis bengalensis* (Gmelin, 1789) (Gruiformes: Otidae) in Koshi Tappu Wildlife Reserve and adjoining areas, Nepal. *Journal of Threatened taxa* 5(7): 4076–4083. <https://doi.org/10.11609/JOTT.o3240.4076-83>
- Baral, H.S. & B. Adhikari (2017). *Mikania micrantha*: its status and impact on people and wildlife in Nepal, pp. 59–72. In: Ellison, C.A., K.V. Sankaran & S.T. Murphy (eds). *Invasive Alien Plants: Impacts on Development and Options for Management*. CAB International, UK, xii +232pp.
- Baral, H.S. & C. Inskipp (2005). *Important bird areas in Nepal*. Bird Conservation Nepal, Kathmandu and BirdLife International, Cambridge. Electronic version accessed on 06 December 2018.
- BirdLife International (2017). Species fact sheet: *Houbaropsis bengalensis*. <http://www.birdlife.org>. Electronic version accessed 4 December 2017.
- BirdLife International (2018). Species factsheet: *Houbaropsis bengalensis*. <http://www.birdlife.org>. Electronic version accessed 15 November 2018.
- Chitwan National Park (2016). Grassland Habitat Mapping in Chitwan National Park. Chitwan National Park, Chitwan, Nepal, 64pp.
- Collar, N.J., H.S. Baral, N. Batbayar, G.S. Bhardwaj, N. Brahma, R. Burnside, A.U. Choudhury, O. Combreau, P.M. Dolman, P.F. Donald, S. Dutta, D. Gadham, K. Gore, O.A. Goroshko, C. Hong, G.A. Jathar, R.R.S. Jha, Y.V. Jhala, M.A. Koshkin, B.P. Lahkar, G. Liu, S.P. Mahood, M.B. Morales, S.S. Narwade, T. Natsagdorj, A.A. Nefedov, J.P. Silva, J.J. Thakuri, M. Wang, Y. Zhang & A.E. Kessler (2017). Averting the extinction of bustards in Asia. *Forktail* 33: 1–26.
- Dahal, B.R., P.J. McGowan & S.J. Browne (2009). An assessment of census techniques, habitat use and threats to Swamp Francolin *Francolinus gularis* in Koshi Tappu Wildlife Reserve, Nepal. *Bird Conservation International* 19(2): 137–147. <https://doi.org/10.1017/S0959270908008083>
- Dahmer, T.D. (1976). *Birds of Kosi Tappu Wildlife Reserve*. Unpublished report.
- DNPWC (2016). *Bengal florican Conservation Action Plan*. Department of National Parks and Wildlife Conservation, Kathmandu, 32pp.
- Donald, P.F. (2007). Adult sex ratios in wild bird populations. *Ibis* 149(4): 671–692. <https://doi.org/10.1111/j.1474-919X.2007.00724.x>
- Inskipp, C. & T. Inskipp (1983). *Report on a Survey of Bengal Floricans (Houbaropsis bengalensis) in Nepal and India, 1982*. International Council for Bird Preservation (Study Report 2), Cambridge, UK, 54pp.
- Inskipp, C. & T. Inskipp (1991). *A Guide to the Birds of Nepal*, 2nd edition. Christopher Helm, London, 400pp.
- Koshi Tappu Wildlife Reserve (2018). Koshi Tappu Wildlife Reserve and Its Buffer Zone Management Plan (2017/75– 2078/79). Koshi Tappu Wildlife Reserve, Sunsari, Nepal, 214pp.
- Limbu, K.P. & B.R. Subba (2011). Status of key faunal species in Koshi Tappu Wildlife Reserve after Koshi flood disaster 2008. *Nepalese Journal of Biosciences* 1: 41–54.
- Oates, E.W. (1898). *A Manual of The Game Birds of India*. A J Combridge and Company, Bombay, ix+431pp.
- Packman, C.E., D.A. Showler, N.J. Collar, S. Virak, S.P. Mahood, M. Handschuh, T.D. Evans, H. Chamnan & P.M. Dolman (2014). Rapid decline of the largest remaining population of Bengal Florican *Houbaropsis bengalensis* and recommendations for its conservation. *Bird conservation international* 24(4): 429–437. <https://doi.org/10.1017/S0959270913000567>
- Poudyal, L.P., P.B. Singh & S. Maharajan (2008). Bengal Florican *Houbaropsis bengalensis* in Nepal: an update. *Birding Asia* 10: 43–47.
- Sah, J.P. (1997). *Koshi Tappu Wetlands: Nepal's Ramsar site*. IUCN Nepal, Kathmandu, 273pp.
- Siwakoti, M. (2007). Mikania Weed: A Challenge for Conservationist. *Our Nature* 5(1): 70–74. <https://doi.org/10.3126/on.v5i1.801>
- Turton, J.M. & G.J. Speight (1982). A report on birds seen in Nepal, 1982. (Unpublished).

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