A COMPARATIVE STUDY ON THE POPULATION AND HABITATS OF THE GREY FRANCOLIN *FRANCOLINUS PONDICERIANUS* AND BLACK FRANCOLIN *FRANCOLINUS FRANCOLINUS* IN MANG GAME RESERVE, HARIPUR, PAKISTAN

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ABSTRACT

Grey and black francolins are the prime game birds of Pakistan. According to Red Data Book both species are declared as threatened worldwide. However in Pakistan the status of both species is not assessed. Therefore to study population and habitat of both the species is of critical importance. The current study was conducted in Mang game reserve, Haripur in order to explore the comparative population and habitat structure of both the species. For population dynamics, the data were collected fortnightly and calculated month wise for a year in the three sub habitats of the game reserve. Our study reveals that in grassland the population density of grey francolin ranged from $0.63\pm0.00/Km^2$ in January to $4.69\pm2.2/Km^2$ in the month of October. In hilly land the population of grey francolin ranged from $1.9\pm0.00/Km^2$ in January to $6.3\pm0.00/Km^2$ in October and in wetland land the population of grey francolin ranged from $1.75\pm1.06/Km^2$ in January to $4.93\pm2.72/Km^2$ in October. The population of black francolin in grassland ranged from $0.63\pm0.00/Km^2$ in July to $2.19\pm1.32/Km^2$ and $2.19\pm0.45/Km^2$ in October and November respectively. In hilly land the population of black francolin ranged from $1.6\pm0.42/Km^2$ in March and June to $4.40\pm0.85/Km^2$ in October. The same way in wetland the black francolin's population ranged from $0.98\pm0.46/Km^2$ in February to $3.75\pm0.92/Km^2$ in October and November. The dominant plants in all the three habitats were *Acacia Modesta* and *Cyndondactylon*. The major threats to the francolins included illegal hunting, overgrazing and use of pesticides in the crop fields. Mang game reserve can prove to be suitable place for conservation of both the francolins.

Keywords: Grey francolin, Black francolin, Population, Density, Habitat, Pakistan.

INTRODUCTION

Francolinus makes the largest genus of the family, Pheasinidae, of the order Galliformes (Morony *et al,* 1975). The grey francolin (*F. pondicerianus)* is the indigenous pheasant of Pakistan (Roberts 1991; Islam 1999). It may show limited seasonal movements up to 81 km beneath physico-biotic variation (Del Hoyo *et al*, 1994).

The grey francolin (*F. pondicerianus)* is commonly spread in the drier parts of the country and extended to India, Sri Lanka and Bangladesh (Ali and Ripley 1983). The species is commonly found in dehydrated open grassland and spine rub state, most commonly in rural areas with cultivated fields (Ali and Ripley 1983). The *F. pondicerianus* is most commonly found along stable stream sources during summer and fall (Roberts 1991). In the Indian subcontinent, it is limited to well water scrub forest, tamarisk and high grass forest and enters crops to nourish in dawn and dusk (Ali 2002).

The *F. francolinus* feeds normally on insects and is remembered as "a farmer's friend". It commonly feeds on insects, caterpillars, seeds, shoots, beetles, bugs, aphids and ants (Ali and Ripley 1969). The species consumes insect pests, their eggs and larvae and affect human cultural and social life of the region (Lum 1986; Javed 1999). The severe cold and drought are the limiting factors for *F. francolinus* population (Liao *et al,* 2007). Its distribution is reported in the Indus plains, tropical thorn forests and all over inferior hills of Lasbela and Makran in Balochistan. It is also found in deserts of Cholistan in southern Punjab, Salt Range and Potohar Plateau. In Khyber Pakhtunkhwa (KP) province, the francolin species are present in inferior hills in the areas of Cherat and in a few regions of Kohat (Roberts 1991). The *F. francolinus* is most commonly present in different biological zones of Pakistan (Ali and Ripley 1961). It is well adopted in irrigated, vegetated, plantations, grassy, cultivated fields, in rub and juniper forests (Charalambides 1994).

In Asia, populations of both these francolin species are on the verge of decline. Various factors have been speculated to play important role in this decline including illegal hunting as well as too much use of guns for hunting, excessive predation, loss of food, over grazing, habitat destruction, decrease in plants canopy, drought, extreme cold and agricultural pesticides (Roberts 1991; Ghaemi 1998; Heidari *et al,* 2009). Unfortunately, very few studies address the various aspects of francolins found in different parts of the

country. In view of their declining trend in Pakistan, the current study was designed to estimate the population size of these two Francolin species in Mang Game reserve, KP, Pakistan.

MATERIALS AND METHODS

Study Area: District Haripur borders Abbottabad district in the north east, Mansehra district in the north, Attock district in the south east, Buner district in the north west and Swabi district in the west. The Federal Capital of Islamabad is also adjacent to the district in the south. Haripur is the main city of the Haripur district in the Hazara Division, KP, Pakistan, some 65 km north of Islamabad and 35 km (22 mi) south of Abbottabad. It is located in a hilly plain area at an average altitude of 610 m. The city lies on the Karakoram Highway. Haripur is located between latitude 34´08´´ N and 33´15´´ N and longitude 72´45´´E and 73´15´´E. The climate of Haripur is continental in character i.e. very hot in summer and bitterly cold in winter. June is the hottest month of the summer. The rain fall varies in different areas depending upon the topography. It is less in the plains of Haripur but more in hilly areas of North and North East. Annual rainfall is about 800 mm in which 2/3 is received in summer and 1/3 in winter (Khair-un-Nisa *et al*, 2007).

The Mang game reserve covers 4350 hectares and is situated in district Haripur, KP, Pakistan. The Mang game reserve was established in public sector in 1986 under the N.W.F.P wildlife ACT 1975. The game reserve has two small lakes for water storage and fish culturing.

The dominant flora includes trees like *Dilbergia sissoo, Zizyphus spina christi, Acacia modesta, Broussonetia papyrifera, Ficus palmata.* The shrubs include *Adhatoda vasica, Dodoaeaa viscosa, Zizyphus jujuba* and the herbs include *Cynodon dactylon, Cenchrus ciliaris, Desmostachya bipinnata, Cannabis sativa.*

Study Design: The population density of francolins was estimated using "line transect" method explained by Burnham *et al,* (1980). In order to find out the potential habitats of the two concerned species, a few preliminary surveys were conducted, which provided base to divide the game reserve into three sub habitats namely grassland, hilly land and wetland. To estimate the population density of *F. pondicerianus* and *F. francolinus*, three lines transects (each 2 km long) were used in each sub-habitat i.e. Transect –I was drawn in grassland, Transect –II in the hilly land and transect –III in the grassland along the wetland. The data were collected fortnightly at morning and evening from July 2011- June 2012. The observations were recorded on both sides of each transect with approximate width of 60 m, and observed the vertical finding distance on flushing the francolins.

Calculation of Density: Birds counts were recorded on each side of the transect while walking through each transect. On flushing the birds, the measurements were recorded according to Burnham *et al,* (1980). The population density of each francolin species was calculated using the formula,

$$D = N/2LW$$

Where,
D = estimated density of animals
N = number of animals observed
L = length of transect line
W = mean perpendicular distance of animals

Habitat Analysis: The habitat preferences of the two species in game reserve were investigated by identification of major plants species. Quadrate method (Gleason 1920) was used for vegetation sampling. Quadrates were laid out randomly in the different habitats. The sizes of the quadrates were 1 m × 1 m for herbs, 5 m × 5 m for shrubs and 10 m ×10 m for trees. A measuring tape was used for establishing the design of quadrates. Species in each selected habitat were identified and noted for the meaningful understanding of the habitat.

The phytosociological characteristics were calculated in each site and their relative values were measured to assess status of vegetation.

Density is defined as sum of all individuals of each type of species per unit area and was calculated using the formula: Density = Sum of all individuals of species / Total number of quadrates.

Relative density for species was calculated as percentage of the total density of all species in quadrate using the formula: Relative Density = Density of single species / Density of all species.

Frequency is the level of homogeny of the happening of the individuals of species within the area and was calculated using the formula: Frequency = (No. of the quadrates in which a species occur x 100) / Total number of quadrate

Relative frequency was derived from the percentage ratio of the total frequency of all species in the study area and was calculated using the formula: Relative frequency = (Frequency value of one species x 100) / Total frequency of all species

The relative canopy cover was determined from the total cover values of a single species as a ratio of the total cover values for all the species and was calculated using the formula: Relative canopy cover = (Canopy cover of a species x 100) / Total canopy cover of all the species.

In heterogeneous plants community, density, cover and frequency of a species do not give a clear picture about the dominant species. It can be gained by adding the values of the relative cover, relative density and relative frequency and dividing the sum by three.

This is called importance value index (IVI) of the species.
Impotence Value Index = (Relative density + Relative frequency +Relative Dominance)/3

Statistical analysis: The data recorded from the three sub-habitats were used to calculate population densities of the two francolin species and were compared using student t-test.

RESULTS AND DISCUSSION

Month wise population of grey and black francolins
At grassland: The population density is presented as mean±SD/Km^2. In grassland the maximum population (4.69±2.21) of grey francolin was found in the month of October whereas the minimum population was recorded in the month of January (0.63±0.00). The extreme weathers of summer comprising of June (1.88±1.75) and July (1.88±1.76) and winter comprising of December (1.9±0.91), January (0.63±0.00) and February (1.26±0.87) proved to harbor low population of the grey francolin. August, September and October proved to be favorable months where population of grey francolin flourished (Table 1).

The same way black francolin flourished well in the months of September, October and November with maximum population density of 2.19±1.32 and 2.19±0.45 in October and November respectively. In the months of June (0.64±0.01) and July (0.63±0.00) the population of black francolin reduced to minimum. Like grey francolin extreme weather proved to cause decline in the population of the black francolin (Table 1).

At hilly land: At hilly land the population of grey francolin ranged from 1.9±0.00 in January to 6.3±0.00 in October. In this sub-habitat seasonal variations in the population of grey francolin are evident. The extreme hot (June) or cold (December, January and February) weather hindered population of the grey francolin whereas mild temperature of March, April and May (spring) and September, October and November (fall) proved to favor the population of the grey francolin in the game reserve.

The population of the black francolin in the hilly land ranged from 1.6±0.42 (March and June) to 4.40±0.85 (October). Like grey, the black francolin also flourished well in the months (September, October and March, April) with mild temperature. All these finding show that season play important role in the population dynamics of both the francolins (Table 2).

At wetland: At wetland land the population of grey francolin ranged from 1.75±1.06 in January to 4.93±2.72 in October. In this sub-habitat September and October are the months with maximum population density whereas extreme cold weather in January and February caused reduced population. If compared to grassland and hilly land, the extreme hot months of June and July didn't

cause significant reduction in the population density in this sub-habitat. This may also be due to the presence of water in extreme hot weather and movement of the birds from grassland and hilly land to the wetland in the extreme hot season.

The population of the black francolin in wetland ranged from 0.98±0.46 (February) to 3.75±0.92 (October and November). Like grey, the black francolin also flourished well in the months of October and November with mild temperature. The hot weather of June and July did not show evident effects on the population of black francolin in the wetland. The potential reasons of water presence and movement of birds towards water bodies might have played the role for the same (Table 3).

Mahmood *et al.* (2010) mentioned the maximum density for both grey and black francolins in the month of October which is also true for the current study where maximum population is found in September, October and November in all the 3 sub-habitats of the game reserve. The possible reason for higher densities of both francolins in October seems to be the optimum temperature and maturation of new brooders. However Khan (2010) described the maximum population to be in August, whereas lowest in February for grey francolins. The low population of francolins in June seems to be due to the extreme temperature in the game reserve and surroundings, but the same is not true for the wetland where reasonable population of both francolins is found. Furthermore the reason for low population in winter may be due to extreme cold; however the hunting season prevails throughout the winter causing decline in francolin's population. Cramp and Simmons (1980) also mentioned the severe cold, drought and hot conditions (weather) to be the limiting factors for the population of black francolin. Overall the population of grey francolin was found to be higher compared to black francolin. The population of grey francolin in the current study is found to be higher in morning compared to evening (data not shown), also supported by (Rotella and Ratti 1988).

In Pakistan few studies have been conducted, mentioning the population densities of francolins in different regions. The population density of black francolin ranges from 0.12 birds/km^2 in Shorkot plantation, 0.06 birds/ km^2 in Changa Manga plantation to 5.81 birds/km^2 in Lal Suhanra National Park. The grey partridge population was also recorded to be 4 birds/ km^2 in Lal Suhanra National Park (Maan and Chuadhry 2000). The black francolin populations are also reported to be 1.8, 0.7, 4.6 and 5.6 birds/ha in cropland, dry land, wetland and cropland along wetland respectively at Sandal Bar District Faisalabad (Khan *et al,* 1991). The population of grey francolin ranged from 0.03 to 2.35 birds/ha in Lal Suhanra National Park and Lehri National Park, Punjab, Pakistan throughout the year (Mian 1985; Mahmood *et al,* 2010). However, Khan (2010) reported the population density of grey and black francolins to be

8.40 birds/km^2 and 6.20 birds/km^2, respectively in Lal Suhanra National park. Temperature is considered to be the major factor in deciding the populations of francolins however in summer new brooders are also matured and ready for calls which causes increase in the population density. Besides these factor sufficient amount of food also play critical role. For decrease in population of francolins, the possible reason seems to be illegal hunting, netting, grazing, urbanization and industrialization.

Seasonal fluctuations also affect the population of both the francolin species. Overall both the species maintain low population during winter. But the population density of both francolin species starts rising gradually in summer to monsoon and post monsoon. Afterward the population declines due to severe winter.

Shooting from December to February also play important role in population decline of the francolins. The population density of both francolins species rise with the advent of the suitable environmental condition, sufficient food and newly mature chick in monsoon and post monsoon. Several factors affect the population of black francolins population in Mang game reserve. The most common factors include illegal hunting, unregulated netting, overgrazing, agricultural pesticides, natural predator and habitat destruction. These factors reduce the population density of grey and black francolins severely in Mang game reserve. Other studies also described illegal hunting, use of pesticides and overgrazing to be the prominent declining factors in the francolins population (Anonymous 2007).

Habitat Description

Grassland: In Grassland, *Ziziphus spina-christi* (IVI= 25.6), *Dilbergia sissoo* (IVI=24.1), *Acacia modesta* (IVI=21.5) and *Broussonetia papyrifera* (IVI=20.1) were the major tree species. For shrubs in grassland the Mean Density, Mean Relative Density, Mean Frequency and Mean Relative frequency, were 2.1, 33.3, 60 and 33.3 respectively. Furthermore, the Mean Density, Mean Relative Density, Mean Frequency and Mean Relative frequency of herbs in Grassland were 2.24, 20, 58.7 and 20.7 respectively (Table 5).

Hilly land: In Hilly land, *Acacia modesta* (IVI=20.9), *Dilbergia sissoo* (IVI=15.75), *Broussonetia papyrifera* (IVI=13.6), *Ficus palmta* (IVI=12.3) and *Ziziphus spina-christi* (IVI=9.45) were the major tree species. For shrubs in hilly land, the Mean Density, Mean Relative Density, Mean Frequency and Mean Relative Frequency were 2.6, 33.3, 60 and 33.3 respectively. Furthermore, the Mean Density, Mean Relative Density, Mean Frequency and

Mean Relative frequency of herbs in Grassland were 0.8, 20, 36 and 20 respectively (Table 6).

Wetland: In Wetland, *Ficus palmta* (IVI=25.5), *Dilbergia sissoo* (IVI=22.2), *Acacia modesta* (IVI=19.9), *Ziziphus spina-christi* (IVI=16.7) and *Broussonetia papyrifera* (IVI=15.7) were the major tree species. For shrubs in wetland, the Mean Density, Mean Relative Density, Mean Frequency and Mean Relative Frequency were 13, 1.3, 33.3 and 40 respectively. Furthermore, the Mean Density, Mean Relative Density, Mean Frequency and Mean Relative frequency of herbs in wetland were 17.7, 1.2, 16.4 and 55.6 respectively (Table 7).

Table 1. Month wise population density (mean±SD/km²) of grey and black francolins in Grassland at Mang Game Reserve Haripur, from July 2011 to June 2012.

Month	Grey Francolin	Black Francolin
July (2011)	1.88±1.76	0.63±0.00
August (2011)	3.40±2.26	1.25±0.88
September (2011)	3.40±2.26	1.81±0.79
October (2011)	4.69±2.21	2.19±1.32
November (2011)	2.81±2.21	2.19±0.45
December (2011)	1.90±0.91	0.94±0.44
January (2012)	0.63±0.00	0.94±0.44
Feburary (2012)	1.26±0.87	0.75±0.71
March (2012)	2.50±0.88	1.26±0.88
April (2012)	2.81±1.33	1.25±0.00
May (2012)	3.12±1.77	1.56±0.44
June (2012)	1.88±1.75	0.64±0.01

Table 2. Month wise population density (mean±SD/km²) of grey and black francolins in Hillyland at Mang Game Reserve Haripur, from July 2011 to June 2012.

Month	Grey Francolin	Black Francolin
July (2011)	2.50±0.85	2.55±0.92
August (2011)	4.10±0.42	2.55±1.77
September (2011)	3.80±0.85	3.15±1.77
October (2011)	6.30±0.00	4.40±0.85
November (2011)	4.10±0.42	2.85±1.34
December (2011)	2.85±1.34	2.25±1.34
January (2012)	1.90±0.00	1.90±0.85
Feburary (2012)	2.25±0.49	1.90±0.85
March (2012)	3.15±0.92	1.60±0.42
April (2012)	3.15±1.77	2.25±0.49
May (2012)	3.15±1.77	2.25±1.34
June (2012)	4.20±1.41	1.60±0.42

Table 3. Month wise population density (mean±SD/km²) of grey and black francolins in Wetland at Mang Game Reserve Haripur, from July 2011 to June 2012.

Month	Grey Francolin	Black Francolin
July (2011)	2.93±2.02	1.60±0.42
August (2011)	2.90±1.98	1.60±0.42
September (2011)	4.05±2.19	3.10±0.85
October (2011)	4.93±2.72	3.75±0.92
November (2011)	3.80±2.55	3.75±0.92
December (2011)	2.93±2.02	1.90±0.00
January (2012)	1.75±1.06	1.90±0.85
Feburary (2012)	1.95±0.07	0.98±0.46
March (2012)	2.60±1.56	2.20±0.42
April (2012)	2.90±1.98	1.60±0.42
May (2012)	2.55±1.48	1.85±0.07
June (2012)	2.05±1.48	2.20±1.27

Table 4. Month wise population density (mean±SD/km²) of grey and black francolins in all the three sub-habitats of Mang Game Reserve Haripur, from July 2011 to June 2012.

Month	Grey Francolin	Black Francolin	p-value
July	2.7±0.62	1.93±0.64	0.3462
August	3.03±0.33	2.95±1.18	0.9348
September	3.33±0.77	3.12±0.57	0.785
October	4.42±0.92	3.64±0.16	0.3589
November	3.32±1.10	3.45±1.03	0.9141
December	2.59±1.46	2.24±0.20	0.7689
January	1.88±0.01	2.08±1.12	0.8242
Feburary	2.40±0.01	1.48±0.01	0.2131
March	2.69±0.63	1.72±0.64	0.2662
April	2.83±1.11	2.29±0.55	0.6004
May	2.62±0.82	2.24±0.79	0.6834
June	2.49±1.27	1.83±0.77	0.593

Table 5. Vegetation of Grassland habitat in Mang Game Reserve, Haripur from July 2011 to June 2012.

Trees	D/10m²	RD	F	RF	RDo	IVI
Dalbergiasisso	4	22.7	100	27.8	3.5	24.1
Zizyphusspina-christi	6	34.1	100	27.8	2.6	25.6
Acacia modesta	3.2	18.2	80	22.2	4.2	21.5
Broussonetiapapyrifera	2	11.4	40	11.1	1.1	20.1
Ficuspamta	2.4	13.6	40	11.1	4.7	7.1
Mean	**3.5**	**20**	**72**	**20**	**3.2**	**19.7**
Shrubs	**D/5m²**	**RD**	**F**	**RF**		
Adhatodavasica	1.8	28.1	80	44.4		
Dodoniaviscosa	2.4	37.5	60	33.3		
Zizyphus jujube	2.2	34.4	40	22.2		
Mean	**2.1**	**33.3**	**60**	**33.3**		
Herbs	**D/1m²**	**RD**	**F**	**RF**		
Cynodondactylon	2.7	24.1	80	27.3		
Cinchrusciliarus	1.7	15.2	66.6	22.5		
Desmotachyabipinata	2.3	20.5	40	16.7		
Partheniumhysterophorus	3.2	28.6	73.3	25.0		
Cannabis sativa	1.3	11.6	33.3	11.4		
Mean	**2.24**	**20**	**58.7**	**20.7**		

D = Density, RD = Relative Density, F = Frequency, RF = Relative Frequency, RDo = Relative Dominance, IVI = Importance Value Index (IVI = RD + RF + RDo).

Table 6. Vegetation of Hillyland habitat in Mang Game Reserve, Haripur from July 2011 to June 2012.

Trees	D/10 m²	RD	F	RF	RDo	I.V.I
Dalbergiasisso	3.2	15	60	20	3.8	15.75
Zizyphusspina Christi	6	28	40	13.3	2.1	9.45
Acacia modesta	5.6	26.2	100	33.3	4.1	20.9
Broussonetiapapyrifera	3	14	60	20	2.9	13.6
Ficuspamta	3.6	16.8	40	13.3	3.3	12.3
Mean	**4.3**	**20**	**60**	**20**	**3.2**	**14.4**
Shrubs	**D/5 m²**	**RD**	**F**	**RF**		
Adhatodavasica	2	25.6	60	33.3		
Dodoniaviscosa	3.5	44.9	70	38.9		

Herbs	D/1 m²	RD	F	RF
Zizyphus jujube	2.3	29.5	50	27.7
Mean	**2.6**	**33.3**	**60**	**33.3**
Herbs	**D/1 m²**	**RD**	**F**	**RF**
Cynodondactylon	1	23.8	60	33.3
Cinchrusciliarus	1.2	28.6	30	16.6
Desmotachyabipinata	0.8	19	40	22.2
Partheniumhysterophorus	0.7	16.7	30	16.6
Cannabis sativa	0.5	11.9	20	11.1
Mean	**0.8**	**20**	**36**	**20**

D = Density, RD = Relative Density, F = Frequency, RF = Relative Frequency, RDo = Relative Dominance, IVI = Importance Value Index (IVI = RD + RF + RDo).

Table 7: Vegetation of Wetland habitat in Mang Game Reserve, Haripur from July 2011 to June 2012.

Trees	D/10 m²	RD	F	RF	RDo	I.V.I
Dalbergiasisso	16	3.2	28.6	40	13.3	22.2
Zizyphusspina Christi	12	2.4	21.4	40	13.3	16.7
Acacia modesta	10	2	17.9	100	33.3	19.9
Broussonetiapapyrifera	10	2	17.9	60	20	15.7
Ficuspamta	8	1.6	14.3	60	20	25.5
Mean	**11.2**	**2.2**	**20.0**	**60**	**20.0**	**20.0**
Shrubs	**D/5 m²**	**RD**	**F**	**RF**		
Adhatodavasica	10	1	25.6	30		
Dodoniaviscosa	7	0.7	17.9	50		
Rubes fruiticosis	22	2.2	56.4	40		
Mean	**13**	**1.3**	**33.3**	**40**		
Herbs	**D/1 m²**	**RD**	**F**	**RF**		
Zizyphus jujube	8	0.5	7	53.3		
Cynodondactylon	26	1.7	23.9	80		
Cinchrusciliarus	12	0.8	11.3	60		
Desmotachyabipinata	34	2.3	32.4	66.7		
Partheniumhysterophorus	14	0.9	12.6	40		
Cannabis sativa	12	0.8	11.3	33.3		
Mean	**17.7**	**1.2**	**16.4**	**55.6**		

D = Density, RD = Relative Density, F = Frequency, RF = Relative Frequency, RDo = Relative Dominance, IVI = Importance Value Index (IVI = RD + RF + RDo).

Habitat influences the presence, abundance, distribution, movement and behavior of game animals (Musila*et al*, 2001). However, food and cover play important role in habitat selection (Jansen *et al*, 2001). Therefore, in nature wild animals are not evenly distributed and distribution of animals varies with time or seasons (Dunn 1993). Our data show that sufficient trees, shrubs and herbs are present in the study area which provide overall suitable habitats for survival of the mentioned francolins. This vegetation is enough to provide all sort of requirements like food, cover, roosting sites, day time protection from predators as well as nesting place to the francolins. Our recorded data reveals a maximum mean population of grey francolin to be found in hilly land, whereas low population density was recorded in wetland. Roberts (1991) stated that grey francolin roost in shrubs and low trees and most commonly in lateral branches away from trunk, normally roosting on the ground in areas with little vegetation or no tall vegetation. Vegetation of hilly land in our data is of the similar type therefore proved most suitable for grey francolin.

Black francolin mainly feeds on seeds, shoots, insects especially caterpillar, ants, bugs and aphids (Ali and Ripley 1969) which are commonly found in crops or grassland. Therefore black francolin is found mainly on ground in grasses or crop fields (Heidari *et al*, 2009). Such types of habitat also provide protection to Black Francolin from different types of predators. Our data also show that black francolin preferred either grassland or wetland where grasses were found in majority.

Conclusions: Mang game reserve, Haripur provides a suitable habitat for both grey and black francolin. In case illegal hunting, overgrazing, use of pesticides in the crop fields and destruction of vegetation are reduced, the

Mang game reserve can prove to be a suitable place for the conservation of both the species.

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