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## Home range and habitat selection of Grey francolin (*Francolinus francolinus*) using radiotelemetry.

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### ABSTRACT

*Study was conducted in Haryana to document the habitat selection and home range of Grey francolin October 2007 to September 2009. The grey francolins were fitted with backpack radio-transmitters and released back in their habitat to monitor their home range and habitat selection. For home-range analyses, point locations from radio-tracking data, taken at two-hour intervals during the day time were used. The radio-locations were then plotted on Digitized habitat maps of the study area and home ranges were estimated in hectares (ha). The home-range sizes of the male and female Grey francolins were compared. The habitat data collected at radiolocations were subjected to one-way ANOVA to test for the differences between the mean values of the samples. The mean home range of the male grey francolin was bigger than that of the female. The MCP home ranges of the grey francolins comprised of four habitat types viz. sugarcane, wheat, barley, bare ground and Sorghum. In the grey francolins, home ranges comprised of eight habitat types viz. sugarcane, paddy, wheat, eucalyptus, barley, bare ground, pulses and maize. Male grey francolin prefer microhabitat with more litter cover whereas, female grey francolin prefer more herb cover.*

**Keywords : Grey francolin, Microhabitat, habitat selection , Radiotelemetry, Home range.**

### INTRODUCTION

Grey francolins belong to the order Galliformes having squat and heavy body, short rounded wings, drab colour, tendency of males to call territorially (Ali and Ripley 1983). Grey francolins generally inhabit scrub, swamps forest, grasslands and all kind of crops (Bump & Bump 1964). As the species prefer arable agriculture, which is widely spread over much of its range, they have been able to maintain their number for centuries. However, during the last decade, their distribution ranges and densities have declined drastically (Khan 1998). Grey francolin are considered as threatened species at the national level in Bangladesh (Sarkar 2004). In Sri Lanka, the complete removal of forest and associated scrub along major highways by armed forces has declined the population of Grey francolin (Santiapillai and Wijeyamohan 2004). The main threats to the species along the distribution range are in form of habitat loss, fragmentation (McGowan et al. 1995; Garson 1995). Francolins inhabit arable landscapes, thus the intensification and development of farming systems are considered as major threats (Rands 1992, McGowan et al. 1995, Bo & Dowell 1997). Habitat diversity is being lost due to deforestation, agricultural encroachment, mono-cultivation, expansion in human settlements and other developmental activities (Zahl 1989).

Few studies have been done on habitat selection of Grey francolin (Khan 1989, Sarkar 2004, Santiapillai, C. & Wijeyamohan, S. 2004) but no detailed information is so far available on the home range of Grey francolin. In this study we used radiotelemetry to investigate home range and habitat use, which greatly reduced the disturbance on study species. In this paper, we analyzed habitat use and selection of Grey francolin in order to predict variability in habitat selection and home range of male and female grey francolin. Study also analyzes the influence of different habitat variables on Grey francolin. This work helped us understand habitat selection in our population and identify suitable habitats for conservation planning.

### METHODOLOGY

Field work was carried out from October 2007 to September 2009 in Haryana in India. Study area was divided into num-

ber of survey sites according to variability in vegetation types and cropping patterns. The study area comprised agricultural fields where sugarcane, wheat and rice were the predominant crops. The district has a sub-tropical continental monsoon climate and there is seasonal rhythm of summer, winter, rainfall and great variation in temperature. Temperature ranges from 2-3°C in January to 43°C during May-June.

Trapping of Grey francolins was done during the start of breeding season i.e. the month of March and April (in year 2008 and 2009). Trapping of Grey francolins was done using chain of leg snares fixed on thin rope. Two observers were stationed to monitor the traps from a distance of at least 200 m. Trapped francolins were immediately released from the traps to prevent injury to the francolins. Grey francolins were fitted with Radio-transmitters and were released back into same habitat from where they were caught. Radio-transmitters fitted gives signal of 138 to 174 mhz at regular interval. A MARINER radio-telemetry receiver of 75 - 200 KHz frequency range was used to detect pulses emitted by transmitter. Radio-tracking was done with a three-element handheld YAGI Antenna. A MEGELLAN 12 - Channel GPS (Geographic Positioning System) was used to obtain geographical co-ordinates of radio-tracked Grey francolin and Grey francolin. For home-range analyses, radio locations were taken at two-hour intervals during the daytime. The UTM co-ordinates obtained at radio-locations were then plotted on digital habitat maps of the study area. Habitat sampling was done centered on radio locations of Grey francolins. Habitat parameters like Tree density, canopy cover, shrub cover, herb cover and litter cover were recorded at the radio-locations.

### Data Analysis

Home ranges were estimated in hectares (ha) using the Minimum Convex Polygon (MCP) method calculated using ArcView 3.1 extension package Animal Movement Analysis (Hooge and Eichenlaub 1997). Descriptive statistics for various habitat variables were calculated using SPSS (Version 11.5) for Windows. The habitat data collected at radiolocations were subjected to one-way ANOVA to test for the differences between the mean values of the samples. Because of the errors always related with tracking Volant species we

felt this habitat analysis method was most appropriate for this study.

**RESULTS**

**Home Range**

Total four francolins were trapped. Total 480 radiolocations were obtained ranging 100-150 for each bird. The mean home ranges of the male Grey francolins averaged 14.38 ha, whereas that of female was 9.11 ha (Table 1). The mean home range of the male grey francolins was bigger than those of the female Grey francolins and the differences were significant.

**Table 1. Mean home range estimates of radio-tracked Grey francolins**

Species	No. of observations (N)	Sex	Radiolocations (n)	Mean Home Range (Hec.)
Grey francolin	174	Male	160	14.38±0.88
Grey francolin	182	Female	178	9.11±2.45

**Table 2. Percent Usage of habitat types by male and female Grey Francolin.**

	Sugarcane (%)	Paddy (%)	Wheat (%)	Eucalyptus (%)	Barley (%)	Pulse (%)	Maize (%)	Bare Ground (%)
Male	38.5		26.1		21.06			14.2
Female	35.6		14.1		0.24	13.3	17.4	19.2

The MCP home ranges of the male Grey francolins comprised of 35.68 % sugarcane, 19.24 % bare ground, 17.43 % maize, 14.15 % wheat, 13.31 % pulses and 0.24 % barley (Table 2). The MCP home ranges of the female Grey francolins comprised of 38.52 % sugarcane, 26.19 % wheat, 21.06 % barley and 14.23 % bare ground. The home ranges of the male Grey francolins comprised of four habitat types viz. sugarcane, wheat, barley, bare ground and Sorghum. In the female Grey francolins, the home ranges comprised of eight habitat types viz. sugarcane, paddy, wheat, eucalyptus, barley, bare ground, pulses and maize (Fig.1).

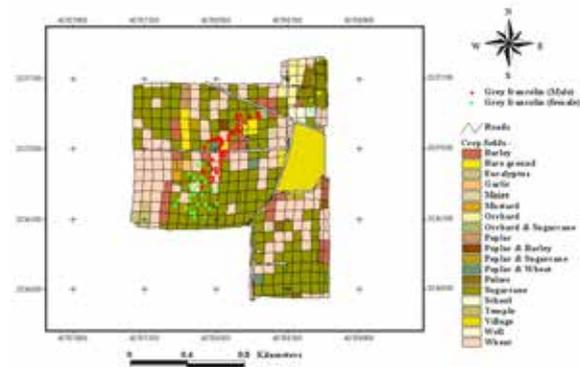


Fig. 1. Habitat map of Study area of District Yamuna Nagar showing home ranges and habitat selection by male and female Grey francolins using radiolocations.

**DISCUSSION**

The mean home range of the male grey francolins was bigger than those of the female Grey francolins. The mean home ranges of the male Grey francolins comprised of sugarcane, bare ground, maize, wheat, pulses and barley. The mean home ranges of the female Grey francolins comprised of sugarcane, wheat, barley and bare ground.

Khan (1998) recorded that home ranges of female black

francolin is relatively smaller as compared to males, this was because females wandered near to nest before egg laying and this results in decreased home range size during incubation. Aebischer and Robertson (1993) used MCP home range for analyzing habitat utilization by Ring-necked pheasants and used to describe outer limits of each animal movement (McGowan, P. J. K. & Garson, P.J. 1995). Iqbal et al. (1996) on basis of radiotracking recorded that male Swamp francolin had larger home ranges than those of the females.

The present study predicts that the home ranges of the male Grey francolins were bigger than that of the females. Similar results were obtained by Iqbal (1992) on Swamp francolin using technique of radiotelemetry in UP, India and analyzed that male have greater home range as compared to female Swamp Francolin *Francolinus gularis*. Also it was concluded that the home ranges of female Grey francolin during breeding season was smaller than that of the male, as male did not take part in incubation duties (Rana and Kalsi 2004). As the chicks of francolin are precocious but they are accompanied by the female for many days until they learn to fly and feed themselves. This parental care leads to shrinkage in the home range of Female Grey francolin (Iqbal 1992). Home ranges of Grey partridge *Perdix perdix* were variable throughout the year and did not differ by season (Church and Porter 1990). Similarly, Birkan (1992) measured home ranges of Grey partridge using Kernel analysis and analyzed that mean home ranges of female are smaller than males. Birkan (1992) also recorded that the home ranges of birds in pairs with unsuccessful breeding were smaller than those of birds in a covey with young. Such incubation duties which are performed by female leads to the shrinkage in home range of Female Grey francolin whereas no such influence in home range of male Grey francolin is observed, this is because when female starts incubating, male pairs with another female (Johnsgard 1988; Roberts 1991). Male grey francolin does not pair throughout the breeding season unlike that of male Grey francolin (Ali & Ripley 1983). When female Grey francolin incubates male pairs with another female, this leads to increased home range of Grey francolin and also more habitat types.

Suitable habitats for Grey francolin have been described as cultivated areas close to human habitations and light scrub jungle (Whistler 1941, Bump and Bump 1964). Grey francolins prefer scrub cover in vicinity of crops such as Wheat *Triticum aestivum*, Sugarcane *Saccharum officinarum*, Sorghum *Sorghum vulgare*, Mustard *Brassica campestris* and pulses. These crops provided suitable food and cover to the Grey francolins (Bump and Bump 1964). In this study using digitized habitat maps it was concluded that both Grey and Black francolin prefers sugarcane more as compared to other crops as it provides suitable cover. The home ranges of the male Grey francolins comprised of four habitat types viz. sugarcane, wheat, barley, bare ground and Sorghum. In the female Grey francolins, the home ranges comprised of eight habitat types viz. sugarcane, paddy, wheat, eucalyptus, barley, bare ground, pulses and maize. Kalsi et al. (2002) assessed that both Grey francolin and Black francolin show preference to agriculture areas dominated by sugarcane and wheat. In Pakistan Grey francolin prefer woody vegetation such as woodland and woody ravine and Grey francolin is mostly found in shrub land and woody ravines (Shah 2004). Kalsi and Rana (2004) recorded the significant difference in habitat of two sexes of Grey francolin in India. The female Grey francolin preferred sugarcane and eucalyptus whereas male preferred sugarcane and sorghum. Grey francolin was mostly recorded in open tall grasslands followed by bushlands in India (Abbasi and Khan 2004).

Grey francolins generally inhabit scrub, swamps forest, grasslands and all kind of crops (Bump & Bump 1964). Birds prefer those kinds of crops which provide them sufficient cover and food. It was analysed that Grey francolin prefers sugarcane, wheat, maize and barley. Widely preferred crops by Grey francolin are wheat, rice, mustard, sorghum, maize and sugarcane (Bump & Bump 1964, Johnsgard 1988). Widely preferred crop cover of Grey francolin is *dhub\_sirkanda\_mes-*

quite *Prosopis juliflora* (Khan 1989). In the study it was shown that male grey francolin prefer sugarcane most because of cover. Males are found calling in plain areas with denser plant growth (Khan 1989). Grey francolin prefer scrub and cultivation more than expected while woodlands and grasslands were preferred less than expected in Majathal Harsang Wildlife Sanctuary, India (Shah et al. 2002). Grey francolin in Bangladesh uses Sugarcane as a new macrohabitat for cover, and sheltering whereas wild grasses inside the sugarcane are used macrohabitat for cover, and sheltering whereas wild grasses inside the sugarcane are used as a microhabitat for resting, feeding and breeding (Sarkar 2004). Grey francolin in Sri Lanka roost in family groups in thorny trees to escape from snakes (Santiapillai, C. & Wijeyamohan, S. 2004).

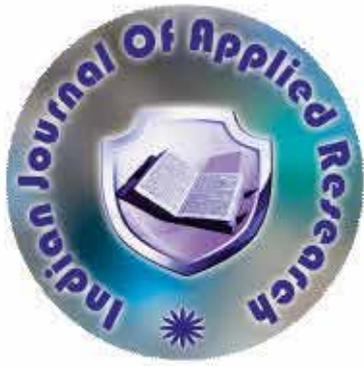
Certain factors like litter cover, scrub etc also influences the home range and habitat selection of species (Abbasi & Khan 2004). Cultivated fields comprising of sugarcane, wheat, maize and barley constituting dense herb cover comprises an important habitat for Grey francolin whereas, microhabitat with dense litter cover is suitable habitat for Grey francolin.

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