African Journal of Biotechnology Vol. 9 (25), pp. 3847-3851, 21 June, 2010
Available online at http://www.academicjournals.org/AJB
ISSN 1684–5315 © 2010 Academic Journals

Full Length Research Paper

Effect of plant cover on presence of Black Francolin (*Francolinus francolinus*) in Khouzestan Province, Southwestern Iran

R. Behbash[1]*, M. Karami[2], A. Mahiny[3], M. Nabavi[4] and N. Khorasani[5]

[1]Department of Environmental Science, Faculty of the Environment & Energy, Science & Research Branch, Islamic Azad University, Tehran, Iran.
[2]University of Teheran, College of Natural Ressources, Karadj, Iran.
[3]Gorgan University of Agricultural Sciences & Natural Resources, Gorgan, Iran.
[4]University of Marine Science & Technology, Khoramshahr, Iran.
[5]University of Teheran, College of Natural Ressources, Karadj, Iran.

Accepted 15 December, 2009

Three of 6 subspecies of black francolins *(Francolinus francolinus)*, are found throughout Iran. Habitat destruction and indiscriminate hunting as well as agricultural pesticides are among the most crucial factors threatening the populations of these birds in Khouzestan Province, southwestern Iran. Using plot sampling, this study aims to investigate different vegetative factors including plant species, percentage of species presence and dominant plant cover height on francolin presence. Sampling was carried out throughout 5 presence areas of black francolin and 2 areas lacking francolins (control areas). Results showed that frequency of Camels thorn (*Alhagi cameloram),* Cashew *(Prosopis farcta)* and African Salsola *(Suaeda fruticosa*) were higher in presence areas compared with other plant species. Using One Way ANOVA, it was determined that there was no significant difference between plant cover percent (P = 0.279) and dominant plant cover height (P = 0.316). However, difference of these two mentioned factors were significant in 4 seasons (P = 000 for cover height and P = 0.001 for cover percent). In fact, the highest black francolin presence was recorded at 15 – 67 and 4 – 48 for cover percent and cover height classes respectively.

Key words: Black francolin, *Francolinus francolinus*, plant cover, habitat, Iran.

INTRODUCTION

There are 3 subspecies of black francolin that are widely distributed throughout Southeastern, Southern, Southwestern and Northern Iran (Mansoori, 2008; Dayani, 1997; Porter et al., 2005). Habitat destruction and indiscriminate hunting and agricultural pesticides are among the most crucial factors threatening these species in Khuzestan Province. This study aims to investigate different factors related to plant coverage including type of plants, dominant plant coverage height and species content level. Ghaemi (1998) studied the ecology of black francolin as well as carried out the evaluation of the habitat in Golestan province. He then considered agricultural pesticides as the most crucial threatening factor for the species. Moreover, Zarei (2005, 2007) investigated the impact of plant coverage on black francolin distribution in Sardarabad-Shoushtar region of the studied province. In addition to the study of threatening factors, he also demonstrated the effect of intentional fire of sugarcane fields as one of the threatening factors. Nabavi et al. (2005) Nabavi *et al.* (2005) also studied the distribution of black francolin in Khouzestan. Islam (1999) and Knorr (2002) pointed that typical habitat of the bird in the region was composed of forests along river banks, grasslands, banana gardens and wheat fields, barley, maize, sugarcane and tobacco as well as shrub lands. Bump & Bump (1964) and Johnsgard (1988) pointed out that the bird is non-migratory and travels short distances to get food. IUCN (2009) and Birdlife (2009) classified

*Corresponding author. E-mail: rbehbash@yahoo.com.

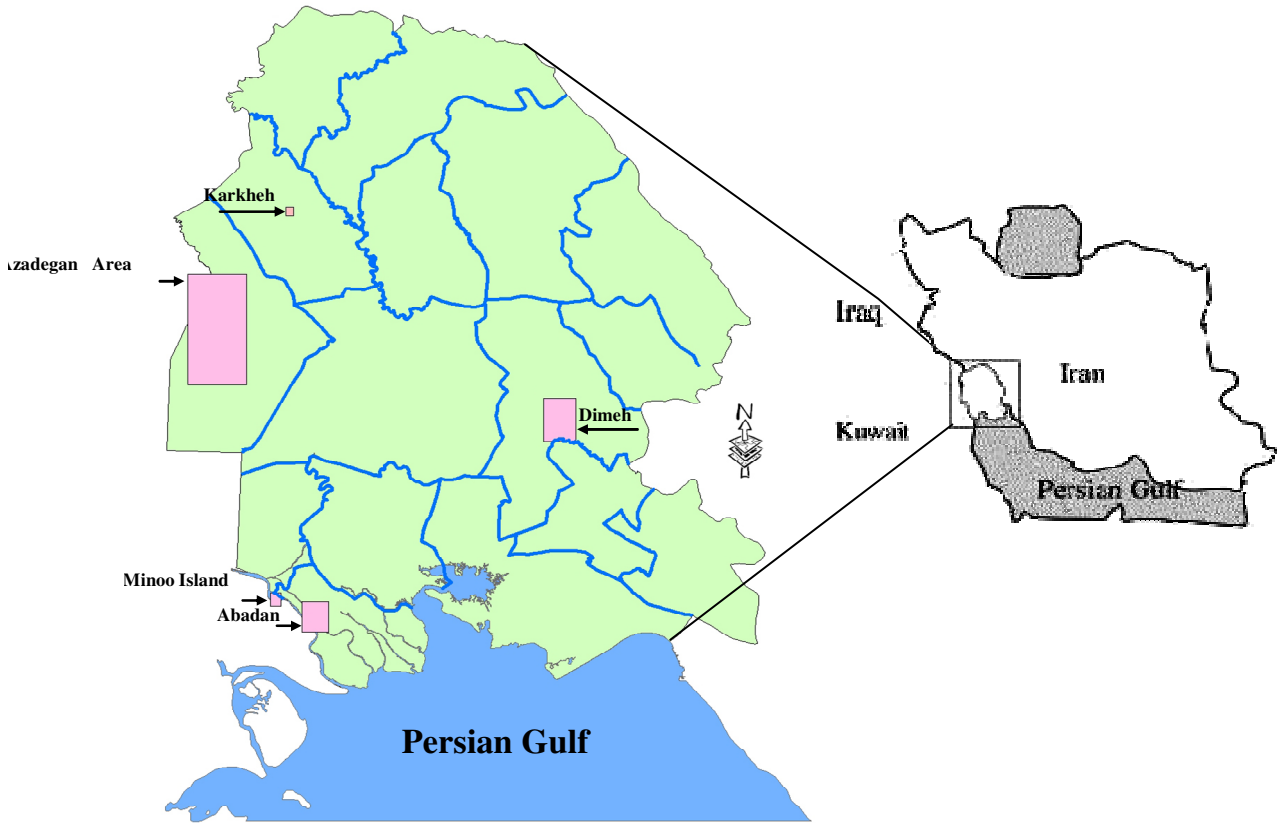

Figure 1. Map of study area.

black francolin in "Least Concern" category. The bird is considered “protected” by Iran Department of Environment; which means its populations are declining in the country.

MATERIALS AND METHODS

Study areas

Five study areas were selected in Khouzestan Province (Figure 1). These areas were: 1) three palm grove areas (10.4179 km^2, located in 48 20.7- 48 28 E and 30 19.91-30 11.81 N), 2) Minoo Island (an area about 6.8276 km^2, located in 4814.4-4811.4 E and 30 18.5-30 22 N), 3) Dimmeh (29.02 12 km^2 located in 39.29-49 38.1 E and 31 4.3-31 15.7 N), 4) two areas in Karkheh Wildlife Refuge (2.0012 km^2 area, located in 48 12.92-48 14.9 E and 32 3.5-32 5.9 N) and 5) Azadegan Plain (with an area of 6.1911 km^2 located in 47 45.7-48 2 E and 31 18-31 48 N). Areas of 1, 2 and 4 are close to river system, area number 3 is composed mainly of irrigated agricultural fields and area number 5 is near Horoolazim Wetland.

Study design

After selecting the study sites, visits were made to the study plots during winter 2007 and autumn 2008. Where birds or their signs were observed, a plot of 1 square meter was laid and exact location of the plot was recorded by GPS.

In four directions and 6 meters from the center of the main plot, 4 other plots were laid. Percent of plant cover, height of dominant plant cover, plant species, percentage of each species and distance to river and fields were recorded in all plots.

Two regions lacking black francolin were considered as the control areas. Prior to parametric statistical tests, data were tested for normality by Kolmogrov-Smirnov test. Variables that did not follow normal distribution were transformed following Box-Cox method (Krebs, 2001). Arc-Sine transformation was carried out for percentage data. Collected data were analyzed using one way ANOVA, t-test and cross-tab analysis. SPSS (ver.11) software was used to carry out the statistical tests.

RESULTS

156 birds and 7 nests were located during 128 observations made to the study areas. Mean group size was 5.7 with 95% confidence levels of 3.9 to 7.6.

In total, 651 plots were laid and data on vegetation recorded. Table 1 gives number of plant species recorded in different seasons in five study areas. Also, frequencies of plant species in five study areas are given in Figure 2.

Number of birds observed and their percentages in different plant cover and height classes are given in Tables 2 and 3, respectively. The highest number of male and female francolin was observed in 15-44% plant

Table 1. Number of plants species in 5 present locations.

Region	Number of plants species				Total year
	Winter	Spring	Summer	Autumn	
Karkheh	19	22	11	7	33
Minoo island	6	8	4	6	16
Azadegan area	12	-	9	8	19
Dimeh	17	14	9	11	37
Abadan	10	12	-	3	17

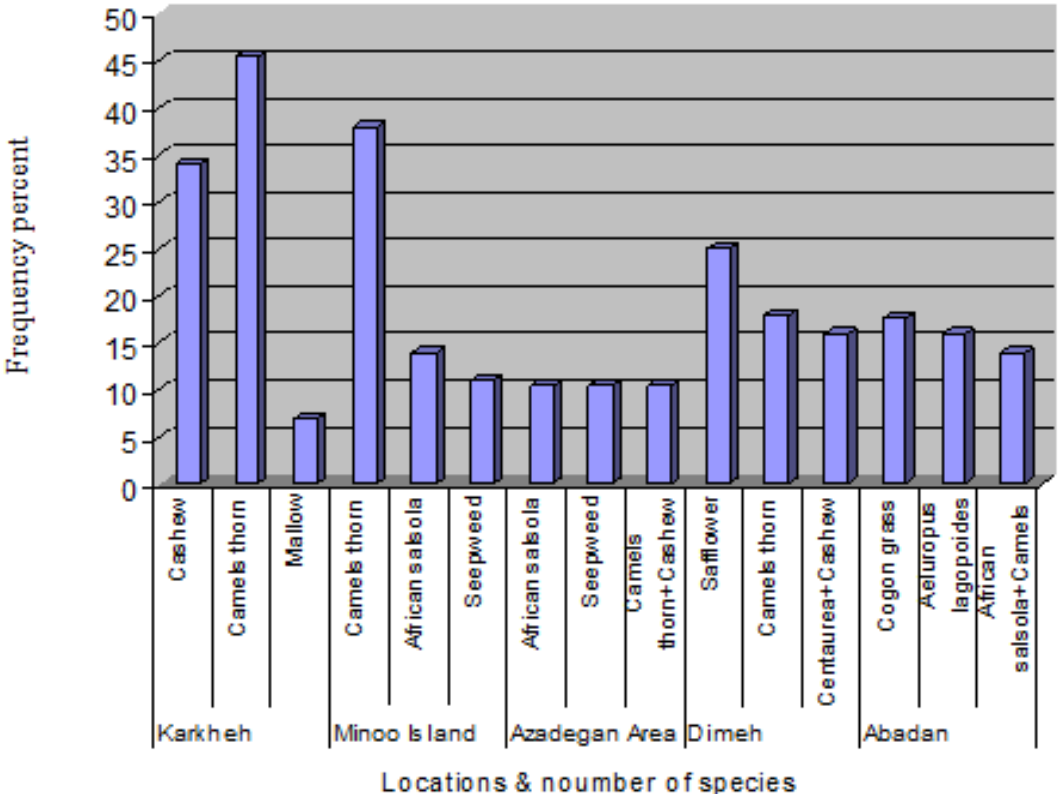

Figure 2. Chart showing frequency percent of plants in each region according to results collected from sampled plates.

Table 2. Summary of plant cover percentage and number of detected Black Francolins.

NO.	Observation frequency	Observation percent	Plant cover percent level
1	27	19.6	0-14
2	45	32.6	15-44
3	31	22.5	45-67
4	16	11.6	68-85
5	19	13.8	86-100

cover class. Also, the highest number of birds was observed in 30-48 cm vegetation height class (Table 3).

One way ANOVA showed observation sites of black francolins in different seasons were statistically different with respect to plant cover ($P<0.001$) and height ($P<0.000$). However, observation sites of male and females were not different with respect to cover ($P=0.300$) and height ($P=0.438$).

Table 3. Summary of plant cover height level and number of detected Black Francolins.

NO.	Observation frequency	Observation percent	Plant cover height level
1	39	32	4 -29
2	56	45.9	30-48
3	23	18.9	49-76
4	3	2.5	77-111
5	1	0.8	112-166

DISCUSSION

In most of the sampling plots, where black francolins were present plants included Camels'thorn, Cashew and African Isola. Zarei (2007) pointed out that Cashew, Saltbush (*Atriplex leucocratic*), Saltwort *(Salsola sp.)* Safflower (*Carthamus oxyacantha*) were the most frequent in the studied plots associated with the francolins presence. Zarei (2007) studied plants species in 17 plots each 1 square meter during 9 months in sugar cane field margins in Khouzestan.

The highest plant diversity throughout the grazed region with access to water supply was seen in Dimeh (37 species) and Karkheh (33 species), respectively (Table 1). Table 2 clearly shows that in general, black francolin is present in 0-100 plant cover, although 55% of the observations were related to plant cover percent 15 - 67. Meanwhile, 45 observations (32.6%) were referred to the plant cover percent 15 - 44 (Table 2). In a similar experiment, the highest presence of black francolin (54% of the total observations) was identified in plant cover percent 65-89 (Zarei, 2007) and 77.9% of the observations were made in plant cover height level 4 - 48 cm. It is evident that 45.9% of the total observations were reported in plant cover height 30 - 48 (Table 3). Zarei showed that approximately 64% of the observations belonged to the areas with 1-79 cm plant cover height. Similar results showed that most observations appeared in spring when presence of male birds was dominant over females (19 males and 9 females). Thus, the males prefer low plant cover in order to attract attentions. However, most observations of black francolin were recorded in 15-44 plant cover during summer. In addition, both sexes presented the highest presence within plant cover 15 - 44% with no significant differences ($p > 0.05$ and Chi-square = 0.527). Investigation of sex distribution amongst the height levels demonstrated that females were more attracted to the upper stratum due to availability of better habitats. On the contrary, the males showed a greater tendency towards the height level 4-48. However, there was no significant differences between the sexes ($P > 0.050$ and Chi-square = 0.317).

There existed a significant relationship between plant cover percentage and plant cover height and variations of the two attributes were seen in different seasons. We observed that black francolin showed a high tendency to a special plant cover height percentage. However, the two studied parameters did not show any significant differences due to the equal preferences of black francolin to the studied parameters throughout the Khouzestan Province. Also, between the two sexes, the two plant parameters did not show any significant differences. This showed that probably there was a little difference between the two sexes. Moreover, comparison of the presence locations and the control areas appeared to be highly significantly different between the two parameters. Black Francolin as a land bird is not strong in flight and needs a specified limit of plant cover height and percent for shelter, food and nest building.

This study provided information useful in restoring francolins destructed habitats, and helped in prediction of the negative effects of the projects on the habitat of the bird and in prescribing measures to reduce the negative effects. Finally, it is suggested that studies be carried out in other habitats of Black Francolin (throughout south, Southeast and north of Iran) using similar methods and results be compared.

Conclusion

We studied francolins distribution in selected sites in Khouzestan Province of Iran. We determined plant coverage and other plant attributes and carried out statistical analyses to show the effects of plant cover attributes on the bird. Both sexes were considered and a yearly sampling was conducted. We were able to establish relationships between the bird's distribution and plant height and plant cover percentage. Spotting of sexes in different plant heights also indicated minor habitat preferences of the male and female birds. We also used information gleaned from other similar studies in the area and compared them with ours, leading to general conclusions as to the management actions that can eventually prevent or abate negative effects of human use on the bird's habitat.

ACKNOWLEDGEMENT

Review of the anonymous reviewers greatly improved the manuscript. Wildlife guards in Khouzestan Province

helped very much in gathering information during field work.

REFERENCES

Birdlife (2009). Black francolin-BirdLife Species Factsheet. http://www.birdlife.org/datazone/species/index.html?action=SpcHTMDetails.asp&sid=146.

Bump G, Bump JW (1964). A Study and Review of the Black Francolin and the Gray Francolin. Spec. Sci. Rep. Wildl. No. 81. Bur. Sport Fish. Wildl., Washington, D.C.

Dayani A (1997). The Birds of Middle East & Near East. Tehran Univ. Publication. pp. 98-100.

Ghaemi R (1998). Ecological Survey of Black Francolin in Golestan Province. J. Environ. 10(2): 35-39.

Islam K (1999). Eerckel's Francolin, Black francolin, Gray francolin. The Birds of north America, No. 394-396. p. 5.

Johnsgard PA (1999). The Pheasants Of The World Biology and Natural History, Smithsonian Institution Press, Washington.

Knorr O (2002). Black Francolin. www.willamette.edu/cla/classics/Aristophanes/BlackFrancolin.html

Krebs CJ (2001). Ecological Methodology. Addison-welsey educational publishers, Inc. p. 551.

Mansoori J (2008). A Guide to the Birds of Iran. Farzaneh Press, Iran. p. 160.

Nabavi SB, Amini A (2005). Survey of Distribution of Mammals and Birds in Khouzesta. Iran D.O.E.

Porter RF, Christensen S, Schiermacker-Hansen P (2005). Birds of the Middle East. Christopher Helm. p. 58.

SSC & IUCN (2004). Partridges, Quails, Francolins, Snowcocks, Guineafowl and Turkeys: Status Survey and Conservation Action Plan. The IUCN Red List of Threatened Species. (2009). Version 2009.1. www.iucnredlist.org.

Zareie H (2005). Ecological survey of *Francolinus francolinus* on Sugarcane farmlands. B.Sc. thesis of Environmental Science, Islamic Azad University, Branch- ahvaz (Iran).

Zarei H (2007). Survey Effect of Vegetation on *Francolinus francolinus* distribution and Determination of Its Diet in Sardar-abad (shushtar). M.Sc. thesis of Environmental Science, Islamic Azad University, Science & Research Branch-ahvaz (Iran). pp. 41-53.