

## Animal Diversity in the Southern Desert-Environment of Tunisia and Latest Knowledge of Most Important Species

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**Abstract:** Surveys in the southern desert-environment of Tunisia, particularly in the Jbil National Park and its neighbouring areas showed important animal diversity despite the drought and harsh conditions characterizing those regions. Investigation during recent years has concerned three main groups widely known, namely mammals, birds and reptiles, totalling at least 15, 60 and 10 species in the region respectively. In this paper we are principally interested in the Slender-horned gazelle, Dorcas gazelle, and Houbara bustard considered emblematic species of the desert zone which have potential to contribute to interest in ecotourism. The distribution, habitat requirements and the main threats of these species were given special attention in this paper in order to contribute in the biodiversity conservation.

**Keywords:** Animal diversity, Desert, Dorcas gazelle, Houbara bustard, Slender-horned gazelle

### 1. Introduction

The southern desert environment of Tunisia contains several animal species and constitutes a potential habitat for populations of the most important component of animal diversity namely, Slender-horned gazelle (*Gazella leptoceros loderi*), Dorcas gazelles (*Gazella dorcas*) and Houbara bustard (*Chlamydotis undulata undulata*). These species are rare and under threat due mainly to over hunting poaching and severe habitat degradation (Lavauden, 1926; Heim de Balzac, 1936; Kacem *et al.*, 1994; Chammem *et al.*, 2003). The exact status and the tendency of their populations are poorly known in Tunisia. Investigations during the last three years in desert zones, notably in the Jbil National Park (called hereafter PNJ) and its surrounding regions (encompasses approximately 15,000 km<sup>2</sup>) which is fairly typical for desert habitat, constitute an important steps to give greater attention to those species for future conservation management planning in Tunisia. However, to be effective, conservation program efforts require fundamental information on the actual situation of the population of these species for which there is paucity of published data. Thus, the major aim of this paper was to provide fundamental information about distribution, habitat requirements, relative abundance and the main threats. Indeed, such information concerning these species of high conservation concern should be considered for elaborating long term conservation programmes in the desert zone which have potential to contribute to interest in ecotourism.

### 2. Materials and Methods

#### 2.1. Study area

The study was carried out in the (PNJ) and its surrounding areas which were not covered in previous studies. This zone is characterized by precarious soils and climatic conditions. The climate is very irregular between seasons and even in the same season, except for the summer (Floret and Pontanier, 1982). The rains are irregular and scarce with an annual average not exceeding 80 mm. The temperature is contrasted between hot summer and fresh winter. The average of annual temperature exceeds 20 °C. The average of the maximum of the hottest month is close to 38 °C whereas the average of the minimums of the coldest month is close to 3 °C (MEAT, 1995). Moreover, study area is characterized by violent winds and a strong evapotranspiration (Ozenda, 1977; Floret and Pontanier, 1982). The vegetation covering this area are desert type and are characterized by sparse shrubby vegetable (Schoenenberger, 1992; Karem, 2003). On the other hand, it is important to notice that the surrounding zones of the enclosed part of the

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Jbil National Park are extensively exploited as pasture for camel, sheep and goats grazing. These regions are characterized also by tourist activity which spread over long period, from September to May.

## 2.2. Animals surveys

Investigations have been realized during spring 2006 (23 April to 6 Mai) and autumn 2007 (18 October to 2 November). General surveys on routes of 350 km were travelled by foot (**Fig. 1**) on morning and evening when wind speeds were generally moderate and visibility was fine. Moreover, 83 transects notably on vegetated cuvettes between the main dunes were covered for gazelles survey in order to sample density of gazelles signs. Those transect were set at 340 m long by 10 m wide, using combination of GPS and a 10 m length of cord stretched between observers. All signs or sightings of gazelles, and reliably interpreted signs (tracks, midden and dung pellets, sketeral remains) or observations of other wild species or human activities were recorded throughout the survey.

Regarding Houbara bustard, point count survey on an area of 363 km<sup>2</sup> (Fig. 1) which represent it's potential habitats has been surveyed during breeding seasons 2007 and 2008. Bustard's distribution sites were gathered from point count surveys at distance to each other of 2 km from those fixed point counts. We observed for 15 min per point using binoculars and telescopes. Counting took place early in the morning or later in the afternoon when the Houbara activity is maximal and to avoid hot times when heat mirages could bias the census by hindering detectability (Combreau and Launay, 1996; Launay and Bailey 1999). In addition, other locations of Houbaras sighted occasionally or nests or tracks detected during other periods of surveys on vehicle and on foot were all systematically recorded.

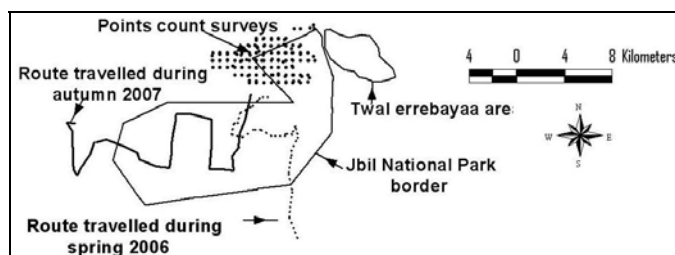


Fig. 1. Study area: routes patrolled and point counting survey.

## 3. Results and Discussion

### 3.1. Slender-horned gazelle

The investigations realized during the two periods (spring 2006 and autumn 2007) showed that the Slender-horned gazelle is not widespread in the study area. The total number of the Slender-horned gazelles observed did not exceed 11 individuals between the two periods (3 gazelles in 2006 and 8 gazelles in 2007) and largely dispersed small flocks. However, presence of gazelles recorded through observations of dung piles and tracks revealed that this species is particularly found in the inter-dunal valleys. In total, 95% of the inter-dunal valleys travelled were occupied. Moreover, according to the inter-dunal valleys surveyed using transect method, we detected signs on 33 and 20 transects among 42 and 41 transects surveyed, respectively in 2006 and 2007, corresponding then to occupancy rates of about 78.6% and 48.8%, respectively. Surveys carried out in 2006 showed an average density of 7.37 dung pellets/ha with 5.3 fresh heap/ha. Those dung pellets have been estimated only at 0.53 heap/km with 0.37 fresh heap/km. Regarding midden, it was evaluated at 0.7 and 0.12 midden/km travelled. On the other hand, the number of tracks was estimated at more than 1 track/ha in the inter-dunal valleys vs 0.17 tracks/km on route. Results showed that the western zones of the (PNJ), surveyed during autumn 2007, seem to be more suitable for Slender-horned gazelle. Indeed, despite the lower occupation (78.6% in 2006 vs 48.8% in 2007) and the similar density of pellet dung (7.7 in 2007 vs 7.34 in 2006) found, all others indices recorded in spring 2006 are lower than those recorded in autumn 2007 (**Table 1**). The difference can go from simple to triple or even more in the case of the tracks index in inter-dunal valleys which was around 3.9 tracks/ha in 2007 vs 1.05 traces/ha in 2006 or also on route patrolled where we found 0.924 track/km in 2007 vs 0.17 track/km in 2006. This difference between the western and eastern zones

could be due to several factors such as the climatic conditions which were more suitable during the autumnal season. Furthermore, the western sector seems to be less disturbed by the nomads and tourists. Indeed, the observations carried out in spring 2006 and autumn 2007 revealed that the presence indices of nomads and the traces of vehicles were respectively about 26.2 % in 2006 vs 7.3 % 2007 and of 42.9% in 2006 vs 14.7% in 2007. Furthermore, it should be noted that the observations carried out in autumn 2007 revealed that the populations of gazelles occupied especially the small inter-dunal valley basins. Nevertheless, the rather large valleys or those containing water points frequented by nomads as well as their herds are avoided by the Slender-horned gazelles.

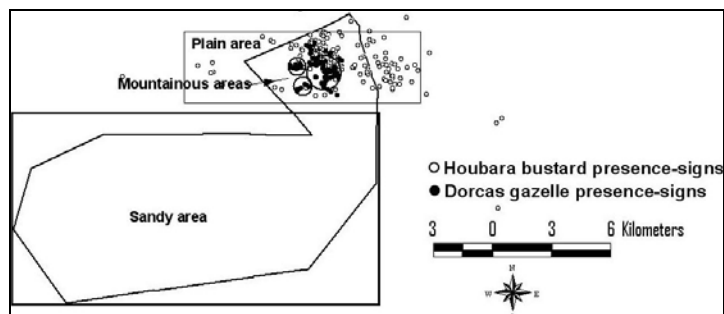
**Table1. Results of the Slender-horned gazelle surveys.**

		Gazelles Sign on Transects (Density/ha)	Gazelles Sign on routes (Index/km)
Observed gazelles		0	0.017
Dung pellets	2006	7.37	0.53
Midden		0.7	0.12
Track		1.05	0.17
Observed gazelles		0	0.046
Dung pellets	2007	7.7	1.442
Midden		1.9	0.395
Track		3.90	0.924

### 3.2. Houbara bustard

The investigations revealed that the Houbara bustard occupies only one small area which did not exceed 363 km<sup>2</sup> (Fig. 2). In fact, no Houbara bustard signs have been found during the Slender-horned gazelle in 2006 and 2007. This result suggested that this bird inhabit open plains with scattered vegetations (Brosset, 1961; Gaucher, 1995; Goriup, 1997; Chammem *et al.*, 2003) and avoid difficult habitats like sandy area (Dementiev, 1968). Indeed, this kind of habitat allows good visibility over long distances to prevent predator approaches and also good area for breeding biology (Collar, 1980; Johnsgard, 1991; Launay *et al.*, 1997; Osborne *et al.*, 1997; Yang and Al, 2003).

During surveys realized on the breeding season 2007 and 2008 on the breeding area of 363 km<sup>2</sup>, 3 nests have been found. Moreover, chick traces were also observed between March and April which correspond with laying period. Concerning display sites, 24 different sites were observed in the most important area since the first surveys carried out in 2004. During 2007 and 2008, 16 different display sites have been detected (9 in 2007 and 13 in 2008). Point count survey in 2007 on an area of 255 km<sup>2</sup>, revealed 7 sites, representing a density of 0,027 mâles/km<sup>2</sup>, vs 10 sites in 2008, representing 0,04 mâles/km<sup>2</sup>.



**Fig. 2. Areas distribution of Houbara bustard and Dorcas gazelle (b).**

### 3.3. Dorcas gazelle

The surveys of the Dorcas gazelle showed its low density in the (PNJ). Direct observations were carried out in few occasions during the four last years, particularly on the plain and the mountainous areas (Fig. 2), where we found only one gazelle or small flocks (less than 3 gazelles). The greatest flock counting

6 individuals was observed in autumn 2007. This species seems to avoid the sandy area. Indeed, during the two surveys period carried out in 2006 and 2007, no gazelle was observed on dunes nor in inter-dunal valley. Moreover no signs were detected in the habitat occupied by the Slender-horned gazelle. Therefore, if we consider that Dorcas gazelle inhabit only the plain and particularly the mountainous area of the (PNJ), the density of the Dorcas gazelle can be estimated to 0.16 gazelles/km<sup>2</sup>. Regarding indices, we found an average of 1.87 midden/ha in the occupied area of which 85% were found in mountainous areas. However, only rate of 12% and 3% were respectively found in depressions, and in plains or in ravines and wadis. This result indicated that mountainous habitats were suitable for this generalist species in this desert environment (Dupuy, 1967; Osborn and Helmy, 1980; Kacem *et al.*, 1994; Mallon and Kingswood, 2001) and which could be dictated by food availability or security factors (Grettenberger, 1987).

#### 4. Conclusion

The desert environment of southern Tunisia constitutes an important habitat for gazelles and Houbara bustard. Surveys showed that Slender-horned gazelle inhabits dune regions particularly inter-dunal valleys of the (PNJ) and its surrounding areas. This species was more detected in the central and the western part of the park. However the two other emblematic species namely Houbara bustard and gazelle Dorcas they are scarcely detected in the dune. Their habitats were limited to north eastern part of the (PNJ), and they were particularly detected on plain and mountainous areas. This study showed that those species are in decline notably if we look to their limited number observed and their low estimated density of signs. Human disturbance in particular pastoral land activities and over hunting seem to be the most important causes of this situation. Thus, greater efforts were needed in order to conserve them. In this regard, the creation of Jbil National Park will contribute to conserve not only these endangered species, but also the whole associated fauna.

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