
STATUS OF DORCAS GAZELLE (*GAZELLA DORCAS*) IN THE AREA SOUTH OF GREEN MOUNTAIN, LIBYA IN 2007: CHALLENGES AND OPPORTUNITIES FOR THE FUTURE

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ABSTRACT

Threats to Dorcas gazelle were examined and the rate of decrease in population was estimated in the area south of the Green Mountain in North-East Libya. The results were collected from questionnaires and focal interviews. All previous studies had reported significant decreased in Dorcas gazelle population throughout Libya during the last years of the twentieth century. The results showed that Dorcas gazelle continues to exist but in very low numbers. The number of groups of gazelle has decreased and the estimated rate of decline has increased to between 60 and 90 % in 2007. The decline has been noticeable with typical herd sizes of approximately 50 – 100 gazelle being reported before 1970, 10 – 15 gazelle seen in the 1970s, 5 – 10 gazelle in the 1980s and from the 1990s onwards, group sizes of only 3 or fewer gazelles. Shared use of habitat with domestic sheep and predators does not appear to be detrimental to Dorcas gazelle, but the main threat for this animal is humans, who lack awareness of its natural value. Some respondents believed that Dorcas gazelle had left their habitat and migrated to other safe areas, but this study showed that the number of Dorcas gazelle was decreasing rapidly, mainly because of overhunting. Further research is needed into the current distribution and numbers of surviving Dorcas gazelle. Aerial and ground surveys of areas of potential habitat should be carried out to establish the current status and distribution. There is an urgent need for the implementation of management programme to conserve the gazelle involving the participation of local people.

Keywords: *Gazella dorcas*, Green Mountain, North-East Libya, Questionnaire survey, Conservation, Hunting

INTRODUCTION

The Dorcas gazelle (*Gazella dorcas*) is the smallest gazelle species that belongs to the Bovine family and the Antelope subfamily (Groves, 1988; Corbet and Hill, 1991) and is one of the national symbols of

Libya. It is considered to be an extreme habitat generalist among gazelle species as it inhabits a great variety of dry habitats especially flat gravel-plains or mixed gravel and dune areas although it seems to avoid very sandy areas (Mallon and Kingswood, 2001), dry wadis and plateaux (Baharav

and Mendelssohn, 1976), open dry areas and uninhabited oasis-type depressions (Osborn and Helmy, 1980). Previously, it was the most widespread and common ungulate species throughout most of North Africa countries (Mallon and Kingswood, 2001; El Alqamy and El Din, 2006; Lafontaine *et al.*, 2006; Chammem *et al.*, 2008; Abaigar *et al.*, 2013; Attum *et al.*, 2014). Historically Dorcas gazelle was the most common gazelle in Libya and was seen in herds of up to 100. Despite legal protection in Libya, the wild population of Dorcas gazelle is experiencing a drastic reduction across its range largely due to illegal hunting. Additionally, other human activities, such as livestock grazing, agriculture and growth of settlements (especially around new wells) reduced the space available for this species. The potential for natural recovery of populations is further compromised by disturbance from motorized vehicles and the effects of ongoing social conflicts and political instability in some areas of its range (Mallon and Kingswood, 2001; Chammem *et al.*, 2008). These issues are not unique to Dorcas gazelle and many of these are problems faced by gazelle populations in arid environments worldwide (Newby, 1990; Attum *et al.*, 2014). As a result of these pressures, the Dorcas gazelle is globally classified as vulnerable by the IUCN (2016) reflecting its severe global decline and in Libya, the Dorcas gazelle is classified as endangered under IUCN criteria (Mallon and Kingswood, 2001; Frost, 2014). Nonetheless, the relative importance of the various factors which determine the distribution and abundance of Dorcas gazelle, including the availability of habitat and a range of human factors, is not clear (Chammem *et al.*, 2008) and in some areas these factors are completely unknown (Montfort, 2003). The aim of this study was to assess the status of the Dorcas gazelle in one part of its range in North-East Libya in the period running up to the current political instability in 2007.

MATERIALS AND METHODS

Study Area: The study area is located in North-East Libya, south of Green Mountain, also called Aljabal al Akhdar. Geographically the study area included Kwlan, Wadi El Mahaga, Ceede Muhame Hamri, Suluntah, Candula and Mrawah in the North, and includes Al Kharoba, Am Algazallan, Al kwemat, Bulat Mhraz, Bulat Alraml and Bulat Borkaes in the south. The study area is bordered to the east by the El Mekhili area, and on the west by Taknis village and the Gardas Al Abed area. The area lies between latitudes 32°33' and 31°45' N, and longitudes 22°21' and 21°04' E (Figures 1 a, b).

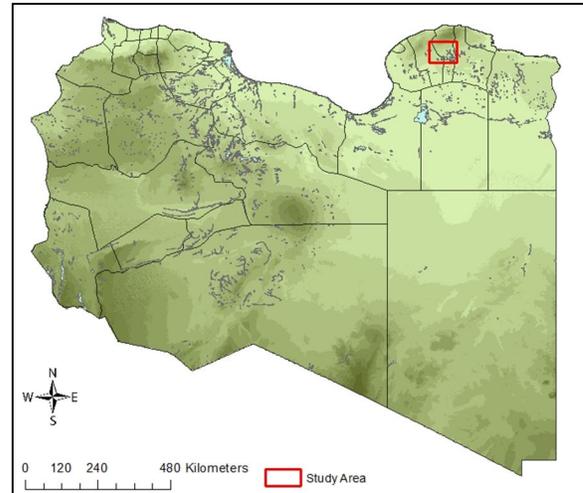


Figure 1(a): General location of the study area in Libya

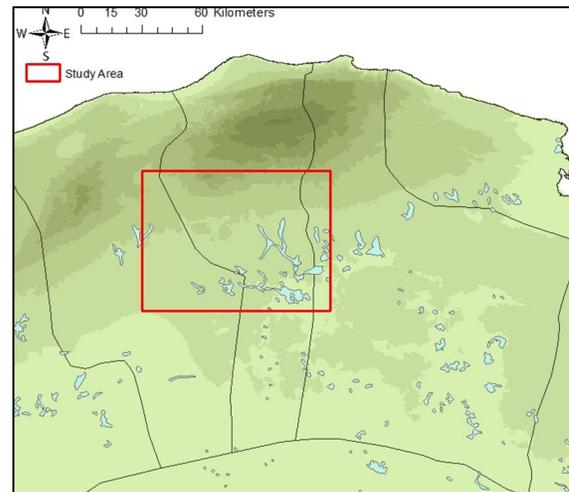


Figure 1(b): Location of the study area south of Green Mountain

The estimated size of the study area is almost 16,716 km² and the human population is estimated to be 600,000. The habitats in the study area are varied, semi-arid steppe grasslands with an annual rainfall of 219 mm in the north and arid dry desert with an annual rainfall of 30 mm in the south. Around 75 % of the rainfall falls during the winter season (EL-Barasi *et al.*, 2013). The study area is one of the most important pastoral areas in the north eastern part of Libya. It is a part of a zone with intensive human activities mainly in the form of agriculture (so locally leading to overgrazing), mechanization and mining. Domestic animals constitute approximately 1,228,255 head (livestock and camels) with a long history of such land uses (EL-Barasi *et al.*, 2013) in the area.

The vegetation is generally dominated by patches of short perennial grasses, such as *Sarcopoterium spinosum*, *Stipa capensis*, *Pituranthos tortuosus*, *Peganum harmala*, *Periploca angustifolia* and *Thymelaea hirsuta*. There are some widely-scattered herbaceous plant species such as *Rhamnus oleoides*, *Ziziphus lotus*, *Thymus capitatus*, *Artemisia herba-alba*, *Juniperus phoenicea*, *Rhamnus tripartita*, *Retama raetam*, *Suaeda mollis*, *Urginea maritima*, *Capparis spinosa* and *Matricaria chamomilla* (SWECO, 1986).

As for wild animals in the region, there are many mammals, birds and reptiles. In addition to *Gazella dorcas*, notable among the mammals are *Canis aureus*, *Hyaena hyaena*, *Lepus capensis arabicus*, *Hystrix cristata*, *Hemiechinus auritus* and *Jaculus jaculus*. Similarly, there is a highly specialized bird fauna including species such as *Alectoris barbara* and *Chlamydotis undulata*.

Reptiles such as *Cerastes vipera*, *Testudo ibera*, *Varanus griseus*, *Lecerta muralis* and *Mabuya vittata* are also present. In addition, this region is increasingly used as permanent pasture for camels, as well as for ruminants, including cattle, goats, and sheep (Awami, 1997).

Survey of Dorcas gazelle: The main method used was questionnaire survey with focal interviews completed using the same questions. A total of 150 questionnaires were completed during the first phase of fieldwork. Focal interviews were done with respondents who were not able to read and write,

the questionnaire was read and their responses were written down by one of the authors. Prior to the full survey a pilot survey was undertaken to test the validity of the questionnaire.

Given the lack of detailed Dorcas gazelle records in this region, the main target of the study was local people who reside in areas within the gazelle's known range. The respondents belonged to these categories: hunters or other individuals interested in hunting, interested individuals who live near to where Dorcas gazelle are found and conservation organisations or other individuals interested in wildlife conservation. These people were given the questionnaire to complete, or else interviewed, in order to establish the current status of gazelle and identify the locations and numbers of gazelle sighted. The questionnaire also explored the perceived factor responsible for the decline in gazelle numbers, the economic value of the gazelle to the respondents. In addition to the questionnaire, secondary data was gathered from literature searches of existing written records and data sets.

Data Analysis: Data collected from the questionnaire and interviews were converted where possible to percentages for ease of use and comparison. The data was analysed using the SPSS software package to test the reliability of the combined data base for the core (relevant) questions and to see the extent of the effect of the influencing factors (independent variables) on the rate of decrease of the gazelle (y) (dependent variable). The factors examined were: overhunting (X₁), a lack of natural habitat (lack of food and water) (X₂), urbanization (X₃), hunting at inappropriate times (X₄), acquisition of hunting tools and of modern means of transportation (X₅) and a lack of awareness of the environmental value of the gazelle (X₆).

RESULTS

A total of 150 questionnaires were completed with the age of respondents ranging from 25 to 70 years. Within this cohort, there was a diversity of education levels, ranging from uneducated to postgraduate (Table 1) but with a majority qualified to at least high school level, especially in the youngest age groups.

Table 1: Respondents by age group and level of education in the study on the status of Dorcas gazelle in the area south of Green Mountain, Libya

Age groups/years	Uneducated	Primary	Preparatory	High school	University	Total	Percentage (%)
25 - 40	0	5	13	33	36	87	58
41 - 55	2	4	23	7	12	48	32
56 - 70	3	3	4	2	3	15	10
Total	5	12	40	42	51	150	100
Percentage (%)	3.3	8	26.7	28	34		100

The result indicated that the Dorcas gazelle continues to exist but the numbers are very low. The number of gazelle decreased in the study area, with the majority of respondents estimating a decline of between 60 and 90 % during the last years of the 20th century and the early 21st century (Figure 2).

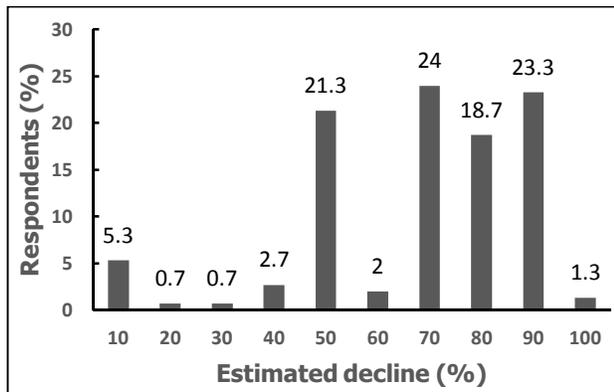


Figure 2: The percentage decline of the Dorcas gazelle between the 1960s and 2007 as estimated by the respondents in the area south of Green Mountain, Libya

The majority of respondents (84.7 %) confirmed that the gazelle was present in group sizes of more than 3 in the 1960s (Table 2).

Table 2: Respondents percentage estimate of gazelle group size in the area south of green mountain, Libya, for 1960s and 2007

Years	Gazelle group size estimates				
	0	1	2	3	>3
1960s	0	0	0	15.3	84.7
2007	24.7	10.7	9.3	49.3	6

Several commented that herd sizes at that time were in the region of 50 – 100 individuals, declining to approximately 10 – 15 gazelles in the 1970s and 5 – 10 gazelles in the 1980s. Estimates of group size at the time of the study in 2007 were of three, or fewer, individuals, with almost 25 % of respondents reporting seeing no gazelles in that year. They also identified humans as the main cause of this decline (Figure 3) due to combinations of the influencing factors $X_1 - X_6$ but with varying levels of impact (Table 3).



Figure 3: Evidence of the hunting of Dorcas gazelle using shotguns and vehicles (Algadafi, 2007)

Table 3: Respondents ranking of factors responsible for the decrease in the number of sighted Dorcas gazelle in the area south of Green Mountain, Libya

Factors	Most important		2 nd most important		3 rd most important		4 th most important		5 th most important		6 th most important		Total	
	No	%	No	%	No	%	No	%	No	%	No	%	No	%
X ₁	85	56.7	16	10.7	0	0	18	12	3	2	28	18.6	150	100
X ₂	47	31.3	22	14.7	4	2.6	54	36	13	8.7	10	6.7	150	100
X ₃	12	8	42	28	13	8.7	22	14.7	48	32	13	8.7	150	100
X ₄	5	3.3	27	18	13	8.7	25	16.7	55	36.6	25	16.7	150	100
X ₅	1	0.7	20	13.3	69	46	3	2	18	12	39	26	150	100
X ₆	0	0	23	15.3	51	34	28	18.6	13	8.7	35	23.3	150	100
Total	150	100	150	100	150	100	150	100	150	100	150	100		

X₁ = overhunting, X₂ = lack of natural habitat (including lack of food and water), X₃ = urbanization, X₄ = hunting at an inappropriate time of year, X₅ = acquisition of hunting tools and of modern means of transportation, X₆ = lack of awareness of the environmental value of gazelle

The study also examined the estimated economic benefit to local people of the gazelle and found that on average the respondents estimated the value per Dorcas gazelle at \$750. Although this is a crude estimate (and not explored in more depth here), this gives some indication as to the importance of the Dorcas gazelle as a game animal as well as other factors such as intrinsic value, cost of buying individuals from existing captive stocks and tourism.

DISCUSSION

At the Sahelo-Saharan Interest Group meeting (SSIG) in 2003, there was formal confirmation of the recent presence of Dorcas gazelle in Libya in the preceding 5 years (Montfort, 2003).

Later studies have shown that scattered herds of Dorcas gazelle persisted only in the most remote areas, as in the case of a group of approximately 10 individuals seen on 2nd November 2005 in south-western Libya (Masseti, 2010). Our results indicated that in 2007, whilst still present, Dorcas gazelle sightings had decreased considerably (60 – 90 %), compared to historical estimates, in the study area south of Green Mountain and neighbouring Libyan Desert.

Whilst there are several contributory factors to the decline, the major impact is the lack of awareness of the overall environmental value of the gazelle leading to overhunting.

Respondents believed that the decline in numbers were due to Dorcas gazelle leaving their habitat (semi-desert) and migrating to safer areas. However, it seems that the number of Dorcas gazelle is decreasing because of illegal hunting and overhunting in all parts of its range (Newby, 1990; East, 1992; Attum *et al.*, 2014; IUCN, 2016). Respondents believed that Dorcas gazelle was not threatened by a lack of natural habitat (i.e. lack of food and water), urbanization, shared use with domestic sheep or the presence of predators.

Despite the problems that it faces, the gazelle is financially valued by the communities studied here at a current estimate of \$750 per gazelle. This contrasts with the earlier situation in which gazelle were exploited. Respondents stated that, in the 1970s and 1980s, Dorcas gazelle were often given as a gift with no money changing hands.

As the hunting of game (including gazelle) is ingrained in Libyan culture, it is unlikely to be totally eliminated. Therefore, the findings indicate that in order to improve the future management of this species, there is a need to regulate and limit hunting trips and sell licences that allow hunting at appropriate times of the year. Such activities should be calibrated by scientific evidence and set at a value commensurate with the conservation management of other gazelle populations. Such initiatives should be linked to other conservation methods such as captive breeding.

Currently in Libya, there is a captive breeding programme of Dorcas gazelle (Hufnagl, 1972; Essghaier, 1980; Yom-Tov *et al.*, 1995; Masseti, 2010) but this is rather *ad hoc*, the species origins are uncertain and it is organised individually by people with an interest in the species rather than a systematic, measured strategy of reintroduction.

There are many challenges for the gazelle in post-conflict Libya, so there is an urgent need to clarify the situation. Upcoming field and survey work will aim to establish where the Dorcas gazelle currently exists in this part of its range. Understanding its current status will allow the formulation of an appropriate in-country management strategy to help re-establish the Dorcas gazelle across its traditional range in Libya.

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