

## Population development of re-introduced mountain gazelle in the western Empty Quarter (Uruq Bani Ma'arid Protected Area), Saudi Arabia

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### Introduction

Uruq Bani Ma'arid (UBM), Saudi Arabia's largest protected area, is bounded to the west by the southernmost extension of the Tuwaiq Escarpment, a remnant Jurassic limestone massif, and forms part of the extensive sands (mainly longitudinal dunes) of the famous Rub' al-Khali (Empty Quarter), the largest sand sea in the world. The area was protected in 1993 because of its unique landscape, an intact habitat with little or no human disturbance, and its potential as a suitable re-introduction site for the Arabian oryx, sand gazelle and ostrich. For mountain gazelle (*Gazella gazella*) the area was considered rather unsuitable due to its location at the edge of the former geographical range of the species, and was thought to provide only marginal habitat. Historically, mountain gazelle occurred primarily in more rocky habitats across most of the Arabian Peninsula. The current range includes southern Turkey, Jordan, Israel, Oman, United Arab Emirates, Yemen and Saudi Arabia, (though recent genetic evidence suggests



Adult male mountain gazelle in its preferred habitat at UBM Protected Area © T. Wacher

those from the northern countries should now be treated as a completely separate conservation unit or even species). The IUCN Red List currently ranks the species as 'Vulnerable' (A2ad). Mountain gazelle numbers have decreased dramatically throughout their range, particularly in Saudi Arabia. In an effort to establish a population in the southern Tuwaiq Mountains, the Saudi Wildlife Authority (SWA) initiated a re-introduction program in 1996 (Dunham

*et al.*, 1997). Released gazelles originated from King Khalid Wildlife Research Centre (KKWRC), in Saudi Arabia

### Goals

- **Goal 1:** Re-establish a mountain gazelle population in the southern Tuwaiq Mountains, Saudi Arabia, being isolated from the next indigenous population.
- **Goal 2:** Support for the captive population that is still in place and subject to research and planning to improve health and genetic status of gazelles for future re-introductions.
- **Goal 3:** Establish post-release monitoring to provide information on habitat choice, food preferences, dispersal distances and mortality rates in a re-introduction area with marginal habitat and severe environmental conditions (extreme temperature, low precipitation and low food availability).
- **Goal 4:** Compare those data with other re-introduction attempts (e.g. in the Ibx Reserve; see this volume) and with indigenous mountain gazelle populations on Farasan Islands, in the Asir and Hejaz Mountains and on the Tihama coastal plains.

### Success indicators

- **Indicator 1:** A healthy and self-sustaining mountain gazelle population in the southern Tuwaiq Mountains.
- **Indicator 2:** Dispersal and settlement of the progeny of released gazelles into suitable habitat outside the protected area.
- **Indicator 3:** A significant reduction of illegal hunting in Uruq Bani Ma'arid.
- **Indicator 4:** Increased acceptance and public awareness by the local communities around the protected area, and the recognition of the potential of UBM as a destination for national and international tourism.

### Project Summary

**Feasibility:** UBM covers an area of about 12,600 km<sup>2</sup> and is located at the western edge of the Empty Quarter, approximately 200 km north of Najran in southern Saudi Arabia (19.3°N, 45.3°E). The area is located at an altitude between 720 and 940 m a.s.l., with suitable mountain gazelle habitat only along the Tuwaiq Escarpment at the western edge of the Reserve. Mean annual rainfall is low (47 mm), highly variable and unpredictable, making the Empty Quarter one of the driest places on the Arabian Peninsula (Child & Grainger, 1990; Dunham, 1997). Reports of mountain gazelle by local communities indicate that the species previously occurred in UBM. Several subspecies of mountain gazelles are recognized (even within the Arabian populations), but the subspecies status of gazelles historically inhabiting the area is not known. Mountain gazelles released into the Reserve are subspecies hybrids originating from different parts of the Arabian Peninsula. The release site at UBM was chosen to be far from indigenous populations to minimize the risk of re-introduced animals coming into contact with indigenous wild stock in the foreseeable future.

**Implementation:** Re-introduced mountain gazelle were obtained from a captive breeding stock kept at KKWRC. The centre was set up in 1987 by SWA (under

the management of the Zoological Society of London), to develop an existing private collection of the late Saudi King Khalid Ibn Abdul Aziz Al Saud. All gazelles chosen for re-introduction were vaccinated, transported and released as described for mountain gazelle re-introductions into the Ibex Reserve, Saudi Arabia (see this volume). In January and February 1996, a total of 24 mountain gazelles (10 male:14 female) were released at two sites along the escarpment of UBM. Five animals (2 male:3 female) were equipped with radio collars. All others were made individually recognizable by using colored ear tags or collars. Following a successful first year in which territories were established and at least four calves born, a second release of 49 animals (19 males:30 females) was carried out at both sites in January 1997 (Wacher, 1997). Ten animals (5 males:5 females) were fitted with radio collars in this second cohort.

**Post-release monitoring:** Estimates of mortality derived from 15 individuals released with radio-collars revealed that 78% survived by the end of the first year post-release. Of the remainder, five gazelle (35%) had been lost to unknown outcomes within following two months. At least three individuals (20%) of the original radio-collared cohort were still alive in 2002, more than 6 years after release (Wacher, 2006). Monitoring of reproductive success was limited by the small sample size of regularly seen females in the early stages of this re-introduction. The radio-collared females had an initial calving rate of *app.* one calf/female during 1996, dropping to 0.33 calves/female in 1997, before rising to 0.5, then 0.7 calves/female in 1998 and 1999 (Wacher, 1998). Between 2001 and 2006 the proportion of calves/juveniles in the population was 23% - 26% (Wacher, 2006).

Post-release dispersal of re-introduced mountain gazelle observed at UBM has shown two major differences to that observed in the Ibex Reserve (see this volume). Both dispersal distances and home range sizes have been far larger at UBM. At least three individuals dispersed up to 50 km from the release site within 6 months of release, then settled into relatively large home ranges (males (N=3):  $32.0 \pm 13.2$  km<sup>2</sup>, females (N=6):  $63.5 \pm 29.1$  km<sup>2</sup>; Wacher, 1998). Habitat preference has been a key feature of dispersal and range expansion in this re-introduction. Released mountain gazelles have dispersed exclusively along the limestone plateau of the western escarpment, avoiding large sand dunes, and particularly settling around elevated sectors of the escarpment dissected by well vegetated drainage lines (Wacher, 1998). The maximum penetration into the gravel interdunal corridors (shiqqats) recorded until 2002 has been 20 km, following highest densities of *Acacia* trees.

After two years mountain gazelles were dispersed along >120kms of the Tuwaiq Escarpment reaching from Qaryat al Faw in the North to the plains of Ushayran in the South (Wacher, 1997, 1998). Aerial surveys carried out from 1997 to 1999, and ground surveys carried out from 1999 to 2006 revealed a constant population increase (encounter rates: 2002: 0.016/km, 2005: 0.03/km, 2006: 0.07/km; Wacher, 2006). In 2008 the encounter rate had decreased to 0.025/km. Based on a road counts an estimate of 121 - 307 gazelles in an area of 1,350 km<sup>2</sup> of suitable habitat was made in 2008 by Cunningham *et al.* (2008). From 2008

onwards the National Wildlife Research Centre (NWRC) carried out regular ground surveys along eight transects, each about 23 km long (strip width 400 - 700 m) covering only a belt (100 x 10 km) of suitable habitat east of the Tuwaiq Escarpment (Wronski and Islam, unpubl. data). Population estimates are 224 gazelles for 2009, 307 for 2010 and 282 for 2011. These numbers are likely to underestimate the true population size. A new method, estimating gazelle numbers by surveying dung middens provides estimates of more than 700 mountain gazelles (Wronski & Islam, unpubl. data).



Typical *idmi* habitat © Tim Wacher

### Major difficulties faced

- Monitoring has been less intense than that documented for mountain gazelles released at the Ibex Reserve (see this volume), in part because of the smaller number of radio-collars, but mainly because the work was integrated with the monitoring of large numbers of sand gazelle and Arabian oryx re-introduced at the same site.
- Results were only obtained by a combination of incidental encounters, supported by low-intensity conventional radio-tracking and intermittent aerial radio-tracking.
- Due to a lack of resources (finance & labor) no systematic surveys were conducted during the years 2000, 2003, 2004 and 2007.
- Since UBM Protected Area is unfenced and therefore difficult to control, it is open to intrusion by illegal hunters, Bedouins and their camels.

### Major lessons learned

- Observation that reproductive rates are comparatively lower, and range use parameters are relatively higher than in areas with more ecologically favorable conditions, are in keeping with the expectation that marginal areas are less suitable for mountain gazelle re-introduction projects. Although UBM lies at the edge of former range, overall the results show that habitat conditions are probably better than originally assessed.
- Mountain gazelle are tenacious and able to cope with no access to free water, low food diversity, limited food availability and human harassment.
- Environmental education to encourage local and national awareness and support for this and other SWA initiatives remains crucial to the long term success of this project.

## Success of project

Highly Successful	Successful	Partially Successful	Failure
	√		

### Reason(s) for success/failure

- Despite the marginal habitat being at the edge of the species range, experiencing low rainfall and naturally low food availability for extended periods, mountain gazelle survival and reproduction has resulted in net population growth over the first 5 - 6 years.
- We believe use of a comparative large founder group helped mitigate against stochastic risks that might affect a very small initial population.
- Within a short period mountain gazelles dispersed over a comparatively large area along a belt of suitable habitat.
- Long distance dispersal from release sites led to the establishment of mountain gazelle home ranges outside the protected area.
- Mountain gazelle is tenacious ungulate species well adapted to cope with no access to free water, extremely low food availability, and human disturbance.
- Continued breeding of viable and genetically diverse mountain gazelles at King Khalid Wildlife Research Centre.

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