DETERMINING ANIMAL NUMBERS AN INTRICATE TASK

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Introduction

Quoting the late Professor Rudi Bigalke, my tutor at the University of Stellenbosch in South Africa, determining animal numbers is like "opening a can of worms". The complexities of determining free ranging animal numbers are unlimited and often not understood or appreciated. This does not deny the fact that there is a real need to determine animal numbers from a management point of view. As manager, the carrying capacity of an area and stocking rate of animals is required and without any idea of animal numbers on the ground this becomes nigh impossible. However, population trends over time are more important than accurate numbers at any one time and should form the basis of the management of free ranging animal populations.

We use recent ungulate surveys employing different techniques and analyses thereof in the Uruq bani M'arid Protected Area, as a case study.

Study Area

The Uruq bani M'arid Protected Area is located approximately 750 km southwest of Riyadh and 250 km north of Najran bordered on its west by the southernmost extension of the Tuwaiq Escarpment, a remnant Jurassic limestone massif, and to the east by the extensive sands (mainly longitudinal dunes) of the notorious Rub' al-Khali (Empty Quarter) – the largest sand sea in the world. The overall size of the Protected Area is 12 500 km² with a Core Area of 2400 km². It is sparsely vegetated, with *Acacia tortilis* trees being the dominant bigger trees mainly in the western wadis. The rainfall is highly variable and low, (an annual mean of less than 47 mm) resulting in the lowest plant growth after the Empty Quarter within Saudi Arabia (Dunham 1997).

Methods

Four techniques for estimating ungulate numbers from sample counts (i.e. the analysis differed although the same procedure was followed – e.g. Strip Count) were used for comparative purposes. The counts were vehicle and aerial based. The vehicle surveys were conducted using three vehicles with one driver and two observers each. Each group had to complete two transects of approximately 200 km each covering the Core Protected Area (2400 km²) and the Controlled Grazing Area (5200 km²) in the Uruq bani M'arid Protected Area. All animals were counted although a strip width was determined for each transect depending on the general visibility along the various transects and varied between 400 m to 800 m (i.e. 200 to 400 m on either side of the vehicle). The counts were conducted over two days – 17 & 18 March 2008. Furthermore, an aerial survey (flying height - 150 m & speed - 100 knots) using a predetermined strip width of 300 m on the port and starboard side respectively, (the Strip count equation was used to analyse findings – See Bothma 1989) was conducted on 6th & 7th May 2008 for comparative purposes. The techniques used to analyse the data were:

1). Road Strip Count [N = nH÷h; n = number of animals actually seen during count; H = size of reserve (i.e. core & controlled hunting area); h = size of surface area covered during count]
2). Strip Count using correction factors (area & species) [(S x A) x B = P; S – Actual number of game seen; A – Area correction factor; B – Species correction factor; P – Population estimate]
3). Drive Count (adapted for vehicles) [Surface area of core area & controlled grazing area ÷ surface area sampled = fixed factor x game numbers seen]
4). Aerial Survey using Strip Count [N = nH÷h; n = number of animals actually seen during count; H = size of reserve (i.e. core & controlled hunting area); h = size of surface area covered during count]

The Road Strip Count (Technique 1), Drive Count (Technique 3) and Aerial Survey (Technique 4) are described by Bothma (1989) while the Strip Count using correction factors (Technique 2) is described by Stuart-Hill (2001). The aerial survey is also described in detail by Bothma (1989).

Counts were done for Reem (Sand Gazelle – *Gazella subgutturosa marica*), Idmi (Mountain Gazelle – *Gazella gazella*) and Oryx (*Oryx leucoryx*).

Results

During the vehicle survey a total of 1166 km were driven along six predetermined transects covering large sections of the Core and the Controlled Grazing Areas with the total area sampled being 719 km². The total time spent by the three groups for the six transects was approximately 24 hours (i.e. 4 hours/transect). The aerial survey covered 749 km along 15 fixed transects covering large sections of the southern and central Core Protected Area with the total area sampled being 449 km². The total flight time was 4 hours and 41 minutes.
The various techniques used resulted in the following extrapolated ungulate numbers:

1). Road Strip Count

Table 1. Road Strip Count Results.

Species	Total number seen	Calculation	Estimated number
Reem (*Gazella subgutturosa marica*)	36	36 x 7600 km² ÷ 719 km²	380
Oryx (*Oryx leucoryx*)	19	19 x 7600km² ÷ 719 km²	200
Idmi (*Gazella gazella*)	29	29 x 1200km² ÷ 144 km²	242 or 121 [50% of habitat]*

* If 50% of the habitat (conservative estimate) is deemed suitable for Idmi then this would result in 121 animals.

2). Strip Count using correction factors (area & species)

Table 2. Strip Count Results using Correction Factors.

Species	Total number seen	Total under <500 m	Area corr. Factor	Species corr. factor	Calculation	Estimated number
Reem	36	33	11.8	1.9	33 x 11.8 x 1.9	740
Oryx	19	7	11.8	2.9	7 x 11.8 x 2.9	240
Idmi	29	22	10	1.1	22 x 10 x 1.1	242

(See Stuart-Hill 2001 for area & species correction factors).

3). Drive Count (adapted for vehicles)

Table 3. Drive Count Results.

Species	Total number seen	Fixed factor	Estimated number
Reem	36	10.6	382
Oryx	19	10.6	201
Idmi	29	10.6	307

(See Stuart-Hill 2001 for fixed factor calculations).

4). Aerial Survey using Strip Count

Table 4. Strip Count Results – Aerial Survey.

Species	Total number seen	Calculation	Estimated number
Reem	5	5	n/a
Oryx	23	23 x 2400 km² ÷ 449 km²	123
Idmi	3	3	n/a

Due to few sightings, no extrapolation was done for Reem & Idmi.

Table 5 is a summary of the results for the vehicle and aerial surveys as conducted during March and May 2008.

Table 5. Summary of the census results conducted in March (vehicle) and May (aerial) 2008 in the Uruq bani M'arid Protected Area.

	Reem		Idmi		Oryx	
	Ground	Air	Ground	Air	Ground	Air
Total groups seen	19	3	19	3	8	12
Total individuals seen	36	5	29	3	19	23
Average group size	1.89	1.67	1.53	1	2.38	1.92
Range in group size	1-7	1-2	1-5	1	1-9	1-9
% Calves & sub adults	6	20	3	-	15.8	8
Estimated numbers	380	n/a	121	n/a	200	123
Sightings/100km	3.1	0.67	2.5	0.4	1.6	3.07

Discussion

Depending on the technique and consequent calculations used to determine the ungulate numbers, extrapolations vary between 380-382-740 for Reem, 121-242-307 for Idmi and 123-200-201-240 for Oryx for the Uruq bani M'arid Protected Area during early 2008. These numbers are estimates based on extrapolations only with the value of this lying in regular – i.e. biannual – follow-up surveys to determine population trends over time. From a management point of view such trends are more important for the active sustainable management of ungulate populations than mere "numbers" only.

The advantages of such surveys are legion with numerous other data able to be collected at the same time – e.g. animal distribution & movement, animal and vegetation condition assessment, population structure, calving/lambing percentage, mortalities, etc. (these data are not reported here).

Aerial surveys are quicker – i.e. cover more ground, but have other problems, the biggest being the flying height (300 ft is recommended for smaller ungulates) and observer experience.

Although time consuming and often fraught with environmental problems, such monitoring is imperative for the efficient management of Protected Areas as ungulate stocking rates and determining a sustainable carrying capacity are based on such numbers and population trends. This underscores the importance of regular monitoring for effective management.

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