VERTEBRATE ZOOLOGY

63 (2): 241 – 245
11.9.2013

SENCKENBERG

Population density of the Blanford's fox *Vulpes cana* in Jordan

Ehab Eid [1], Natalia Boulad [1], Thabit Al Share [1], Omar Abed [1] & Yasmin Hageer [2]

[1] Research and Survey Section, The Royal Society for the Conservation of Nature, P. O. Box 1215, Abdallah Louzi St, Jubaiha 11941, Amman, Jordan — [2] Biological sciences department, Macquarie University, North Rayde, NSW; yasmine.hageer(at)gmail.com

Corresponding author: Ehab EID, E-Mail: eha_jo(at)yahoo.com or ehab(at)rscn.org.jo

Accepted 02.v.2013.
Published online at www.senckenberg.de/vertebrate-zoology on 29.viii.2013.

Abstract

A survey of the Blanford's fox was established in Jabal Masuda (Southern Jordan), to increase the knowledge of its density. Live-trapping method was used and capture mark-recapture technique was applied. We captured a total of 27 specimens including nine re-captured specimens. Density was determined using two methods: the Bondrup-Nielsen formula which identified 8.5 individuals per km², and the ArcGIS tools which showed values, between 0.177 to 9 individuals per km². This paper is the first to give measured information on the Blanford's fox density in Jordan. As well, it showed that ArcGIS 9.3 Spatial Analyst Extension is an effective tool in establishing information on density in large spatial areas. The information provided could serve as a base for future monitoring of the Blanford's fox's range of occurrence.

Key words

Blanford's fox, Jabal Masuda, Jordan, Population Density, *Vulpes cana*, ArcGIS.

Introduction

The Blanford's fox, *Vulpes cana,* is a small rare, canid species (Fig. 1) with a scattered distribution and restricted range of occurrence. The Blanford's fox is considered a vulnerable species according to the latest Red Lists assessment performed by the International Union for the Conservation of Nature "IUCN" established for the Mediterranean mammalian and the mammals of the Arabian Peninsula area (Mallon & Budd, 2011; Temple & Cuttelod, 2009). The Blanford's Fox is associated with mountainous habitats (Smith *et al*., 2003) and was first recorded in Jordan in the Dana Biosphere Reserve, near At Tafilah (Amr *et al*., 1996). Our knowledge of the species distribution has since increased, having been recorded in the Petra Mountains (Disi & Hatough-Bouran, 1999), Mujib Biosphere reserve and Wadi Rum Protected Area (Abu Baker *et al*., 2004) and Jabal Masuda Protected Area, (Eid, 2008, pers. observation). Despite the recent discoveries that have increased our knowledge of the species distribution, very little is known about the densities of Blanford's fox.

The only published population density estimates were provided by Geffen *et al* (2004) with values of 2.0 km² in Ein Gedi and 0.5 km² in Eilat. Surveys in other regions, such as the Arabian Peninsula, indicate that Blanford's fox is locally abundant researchers captured foxes in the north-eastern mountains of the country frequently (Smith *et al.,* 2003). In Jordan, there are no measured values of the Blanford's fox density (Abu Baker *et al*., 2004).

Fig. 1. Blanford's Fox in Jabal Masuda, Jordan.

The objective of this study was to estimate the population density of Blanford's fox at Jabal Masuda Protected Area, Jordan.

The Jabal Masuda Protected Area is located along the southern highlands of Jordan and it reaches down to Wadi Araba, covering an area of 294.6 km² (Center Coordinates; East 35º 20.267' and North 30º 9.06') (Map 1). The elevation ranges from 318 m a.s.l at the southwestern part near Wadi Araba up to 1600 m a.s.l at the northeastern mountains near Al Rajif village. The site shows a mixture of different landscapes and comprises three major habitats; limestone mountains, sandstone escarpments, and scattered sandy areas representing 77%, 22% and 1% of the total area of Jabal Masuda, respectively. The survey targeted the sandstone area at the north- eastern part of Jabal Masuda PA with the following coordinates (North West corner 35° 22.5' E; 30° 15.8' N and South-east 35° 27.8' E 30° 7.8' N) since the Blanford's fox distribution was confined to this area.

Materials and Methods

We used live-trapping to estimate the density of the Blanford's fox. A total of 278 trapping nights were performed between December 2009 and January 2010 within the targeted area using ten medium sized traps (100 x 40 x 40 cm). Traps were distributed in wadis, open areas and rocky slopes depending mainly on the accessibility of the site. Traps were left in situ for four successive nights hidden as much as possible to provide shelter for the captured animals as well as to protect the traps from being observed and probably taken.

Traps were checked every morning and reset in the late afternoon using sardines as bait. When a specimen was captured, it was identified and marked for the purpose of capture mark-recapture technique by means of cutting hairs from different locations of the animal body. The specimen was released at the capturing site. If the specimen was re-captured, the site of capturing was recorded and after that, it was immediately released.

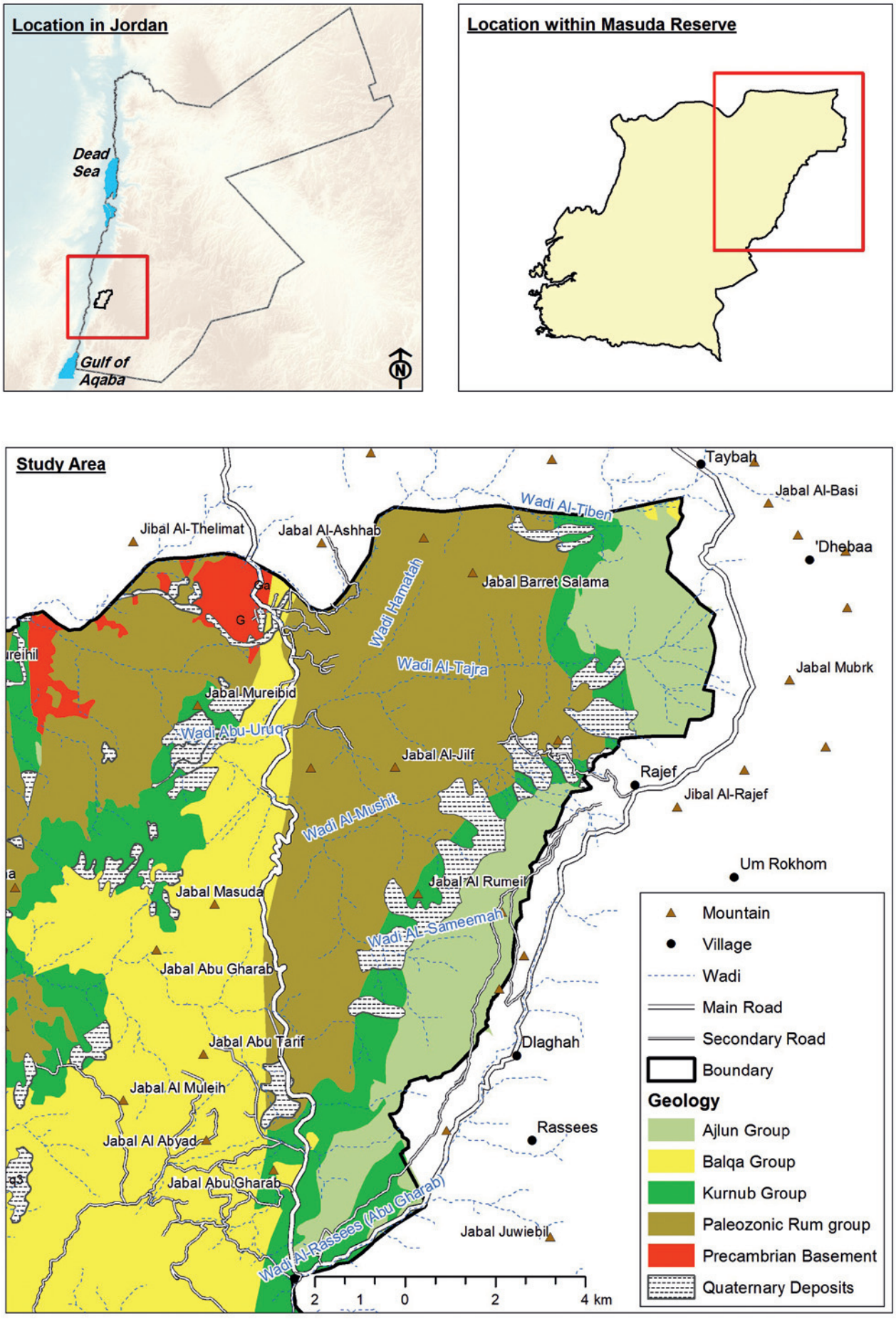
The density of the Blanford's fox was calculated using two methods. The first density estimation using the formula:

Estimated density / true density = $(\sqrt{A}+1)^2$ / A where A = Area studied / Average home range size (Bondrup-Nielsen, 1983).

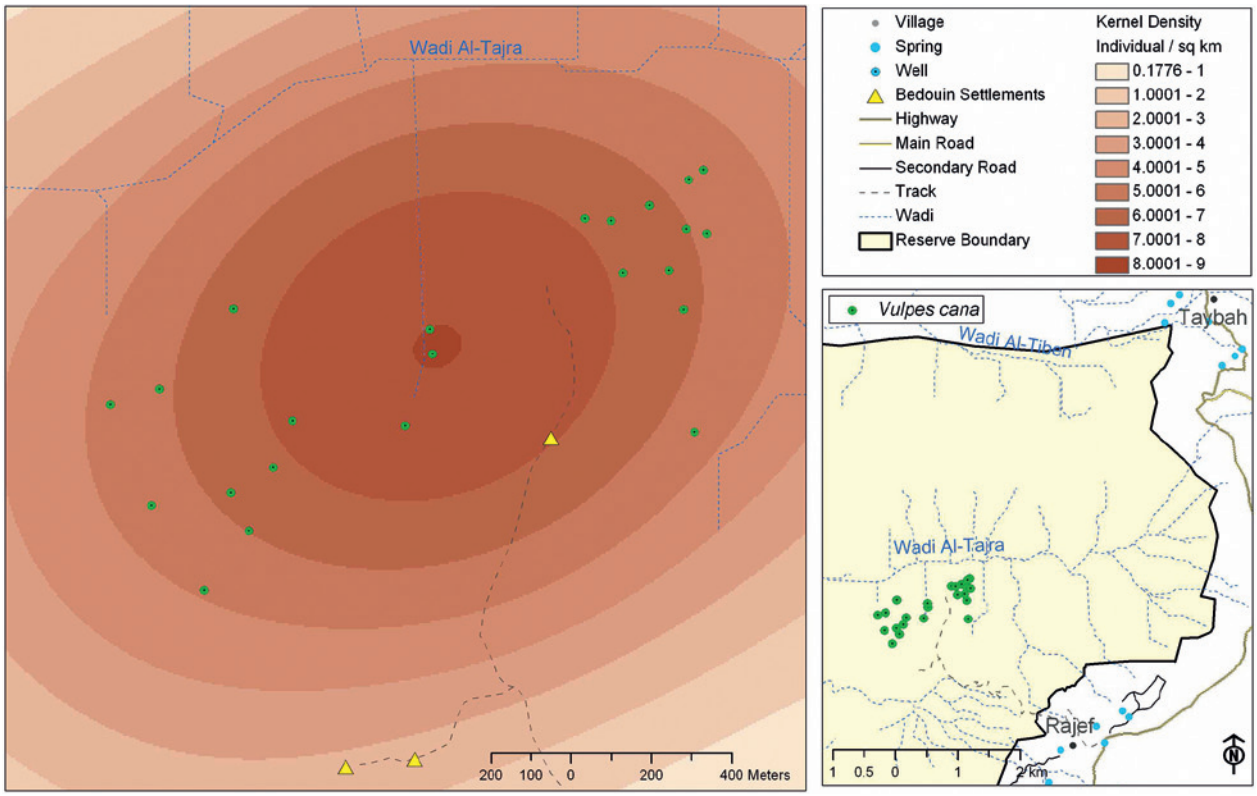
We also used the Kernel density tool available in ArcGIS 9.3 Spatial Analyst Extension to estimate density. This tool calculates the density based on the quadratic Kernel function described in Silverman (1986 p. 76, equation 4.5). The population field was considered 1.0, as each point represented one individual, and the input search radius was considered 1500 m based on the proximity of the individuals to each others.

Results

A total of 27 Blanford's fox were captured including nine re-captured specimens. The average body mass was



Map 1. Jabal Masuda Location in Jordan.



Map 2. Kernel density estimates of the Blanford's Fox.

1.35 kg (1.35±0.21) (α=1.86). Density estimated by the Bondrup- Nielsen formula was 8.5 Blanford's foxes per km², while the Kernel density method estimated values between 0.177 to 9 individuals per km² (Map 2).

Discussion

Our results suggest that Jabal Masuda has a high density of Blanford's foxes (8.5 foxes per km²) which were much higher than reported from other studies whose densities ranged from two individuals per km² and 0.5 per km² in Eilat (Geffen *et al.*, 2004). In addition, our results also confirm that Jabul Masuda has the highest density of Blanford's foxes in Jordan comparing to the preliminary assessment made by Abu Baker *et al.*, (2004). The high density values in Jabal Masuda area could be the result of low predation from potential predators including red foxes, caracal and the extinction of the Arabian leopard *Panthera pardus*, (Smith *et al.*, 2003). In addition, Jabal Masuda experiences little human-associated habitat degradation and is characterized as a difficult to navigate terrain with steeps and deep valleys, which may favor Blanford's foxes escape from other carnivore species. This is supported by our observation that released Blanford's foxes headed directly and climbed the steep wadi walls to escape. In addition, the relatively high number of goat carcasses present at the time of the study may have contributed to an increase of food availability as Blanford's foxes tend to eat insects that appear on the carcasses (Stuart & Stuart, 2003)

This survey results showed that the Kernel density tool produces comparable results to other non-GIS based methods such as Bondrup- Nielsen formula. In addition, it could be a useful tool for the spatial interpretation of the change in the species densities and distribution patterns when calculated for the same species over different time stamps. It is recommended to repeat the calculations using the same search radius (neighborhood size) for the same species during future surveys and monitoring programs to produce highly comparable results.

Acknowledgment

The team is grateful to the Embassy of the Kingdoms of the Netherlands and Amman- Jordan for their extremely generous fund to make this project achievable. In addition, the help of the Royal Society for the Conservation of Nature is highly appreciated. Special appreciation is extended to Mr. Malik Al Owaji, Mr. Yasine Ananbeh and Mr. Akram Ma'akbeh for their participation during the field work. Thanks are also extended to Professor Omar Attum, Prof. Boris Krystufek and Professor Zuhair Amr for reviewing the draft paper and providing their comments.

References

Abu Baker, M., Al-Omari, K., Qarqaz, M., Khaled, Y., Yousef, M. & Amr, Z. (2004): On the Current Status and Distribution of the Blanford's fox, *Vulpes cana* Blanford, 1877, in Jordan (Mammalia: Carnivora: Canidae). – Turk. J. Zool., **28**: 1–6.

Amr, Z.S., Kalishaw, G., Yousef, M., Chilcot, B.J. & Al Budari, A. (1996): Carnivores of Dana Nature Reserve (Carnivora: Canidae, Hyaenidae and Felidae), Jordan. – Zool. Middle East, **13**: 5–16.

Bondrup-Nielsen, S. (1983): Density estimation as a function of live-trapping grid and home range size. – Can. J. Zool., **61**: 2361–2365.

Disi A.M. & Hatough-Bouran, A. (1999): Biodiversity of the terrestrial vertebrate fauna of Petra (Jordan). – Časopis Národního Muzea, Řada Přírodovědecká, **168**: 83–98.

Geffen, E., Hefner, R. & Wright, P. (2004): Blanford's Fox *Vulpes cana* Blanford, 1877. In: Sillero-Zubiri, C., Hoffman, M. & Mac-Donald, D.W. 2004 (eds.) Canids: Foxes, Wolves, Jackals and Dogs – 2004 Status Survey and Conservation Action Plan. IUCN/SSC Canid Specialist Group.

Mallon, D. & Budd, K. (eds.) (2011): Regional Red List Status of Carnivores in the Arabian Peninsula. – Cambridge, UK and Gland Switzerland: IUCN, and Sharjah, UAE: Environment and Protected Areas. vi+49pp.

Silverman, B.W. (1986): Density Estimation for Statistics and Data Analysis. – New York: Chapman and Hall.

Smith, M., Budd, K.J. & Gross, C. (2003): The Distribution of Blanford's fox (*Vulpes cana*: Blanford, 1877) in the United Arab Emirates. – J. Arid Environ., **54**: 55–60.

Stuart, C. & Stuart, T. (1995): First Record of Blanford's Fox; *Vulpes cana* from south-eastern Arabian Peninsula with notes on the Canids of the Mountains of the United Arab Emirates. – Unpublished Internal Report, Arabian leopard Trust, Dubai.

Temple, H. & Cuttelod, A. (2009). The Status and Distribution of Mediterranean Mammals. – IUCN, Gland, Switzerland and Cambridge, UK: IUCN. Vii+32pp.