

On the Current Status and Distribution of Blanford's Fox, *Vulpes cana* Blanford, 1877, in Jordan (Mammalia: Carnivora: Canidae)

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Abstract: The current status and distribution of Blanford's Fox, *Vulpes cana*, in Jordan is reviewed based on recent field observations and specimen collections. New distribution records along with morphometric data are given.

Key Words: *Vulpes cana*, Jordan, Carnivora, Conservation, Distribution.

Blanford Tilkininin (*Vulpes cana* Blanford) Ürdün'deki Son Durumu

Özet: Blanford tilkininin (*Vulpes cana* Blanford) Ürdün'deki son durumu ve dağılımı arazide yapılan gözlemlere ve toplanılan örneklerle dayandırılarak incelenmiştir.

Yeni dağılım bilgileri morfometrik verilerle birlikte verilmiştir.

Anahtar Sözcükler: *Vulpes cana*, Ürdün, etobur, korumacılık, dağılım

Introduction

Blanford's fox, *Vulpes cana*, is one of the rarest foxes in southwest Asia. Its known distribution includes northern Iran, Afghanistan, northwest Pakistan, the former Soviet Union, Palestine, Sinai, Oman and Saudi Arabia (Lay, 1967; Ilani, 1983; Harrison and Bates, 1989; Harrison and Bates, 1991; Al-Khalili, 1993; Geffen et al., 1993; Geffen, 1994; Al-Jumaily, 1998), with a recent record from Egypt (Peters and Rödel, 1994).

Geffen et al. (1992a; 1992b; 1992c; 1993) and Geffen and Macdonald (1993) reported on its diet, foraging behavior, habitat selection and seasonal changes in body weight. Other reports described the physical characteristics and coloration patterns of Blanford's fox specimens collected from Iran, Afghanistan, Pakistan and Russia (Novikov, 1962; Roberts, 1977).

Although the large mammals (Carnivora and Artiodactyla) of Jordan had been extensively studied (Amr et al., 1987; Amr and Disi, 1988; Qumsiyeh et al., 1993; Qumsiyeh, 1996), the first record of Blanford's fox was that from Dana Nature Reserve (Amr et al., 1996). The animal was recently observed on a rocky slope of the Petra mountains (Disi and Hatough-Bouran, 1999). The former record initiated extensive field surveys by the Royal Society for the Conservation of Nature (RSCN) to study wild carnivores in 3 nature reserves (Dana, Mujib and Rum nature reserves) in 1994, 1995 and 1998 respectively (RSCN, 1995; 1996; 1999).

In this paper, the current distribution of *V. cana* in Jordan is reviewed, and additional morphometric data are presented. Threats affecting Blanford's fox as well as conservation strategies are also addressed.

Materials and methods

Field observations and collection

Field observations and collections made by the RSCN during field surveys in the Dana, Mujib and Rum nature reserves were undertaken. Locally built cage traps of 2 sizes (100 x 40 x 40 cm and 100 x 30 x 30 cm) were used in this study. Trapping sites were selected after recording recent tracts. Some traps were placed in paths located between wadis or under shrubs. Sardines or chicken bones and eggs were used as bait. The traps were checked and baited daily. A total of 1934 trap/nights in the 3 nature reserves were undertaken. Captured animals were anesthetized when necessary to be weighed and body measurements were taken. Animals were subsequently marked and released within 30 min of their examination.

Other methods, including surveys of animal signs, spotlight transects using a 1,000,000 candles spotlight, and baiting stations, were employed to assess the presence of *V. cana* (Table 1).

Study Sites

The fauna and flora of the 3 major nature reserves occupying a total of 1080 km² were studied. Following is a brief description of these reserves.

Dana Nature Reserve (DNR)

The DNR features a system of wadis and mountains cliffs, crevices and caves that are scattered throughout the area. Rocks are predominantly of limestone and sandstone extending from the Sharrah mountains in the east to the desert lands of Wadi Araba in the west.

The reserve includes 4 different types of ecosystems (according to vegetation types): sand dune desert with xerophytic shrubs (*Haloxylon persicum*, *Hammada*

scopyra); Acacia sub-tropical vegetation dominated by *Acacia raddiana*, *Acacia tortilis* and *Ziziphus spina-christi*; Irano-Turanian mid-altitude steppe characterized by *Artemesia herba-alba*, *Retama raetum*, *Anabasis articulata* and other low shrubs; and a Mediterranean semi-arid zone dominated by *Juniperus phoenicia* and, at higher altitudes, *Pistacia atlantica* and *Quercus coccifera*.

Mujib Nature Reserve (MNR)

The MNR occupies the eastern side of the Rift Valley along the Dead Sea. Sharp edges and cliffs of different altitudes of Paleozoic sandstone mountains at lower altitudes and of Mesozoic limestone at higher altitudes dominate the area. The reserve is influenced by 3 biogeographic regions: the Irano-Turanian, Saharo-Arabian (the dominant type) and the Sudanian penetration region. *Retama raetam* and *Rhus tripartita* are the most dominant plants in the reserve.

Rum Nature Reserve (RNR)

The Wadi Rum area is characterized by the dominance of very steep-sided, high mountain ridges with flat or rounded tops of the Rum sandstone group, separated by wide, flat-bottomed sandy wadis and sand plains. The area is under the influence of the Sudanian biogeographical region (Sudanian penetration). The Rum area has a dry desert type of climate with very hot summers and relatively mild, warm winters. The sand dune vegetation (mainly *Haloxylon persicum*) dominates the area. The northern part of the reserve comprises a 5-wadi system running north to south, parallel to each other. These are Wadi el-Marsad, Wadi Rumman, Wadi Rum, Wadi Um Ishrin and Wadi Um Harraq. The western, central and southern parts of the area are dominated by crystalline rocks of the retded basement and typified by rugged mountain ranges and undulating hills and ridges separated by wide, generally flat-bottomed wadis.

Table 1. Survey methods employed during the field surveys.

Survey method	Dana Nature Reserve	Mujib Nature Reserve	Wadi Rum Protected Area
Cage trapping	953 trapping nights	461 trapping nights	520 trapping nights
Survey for animal signs (spoor transects)	12 transect	Several transects over a distance of 7 km (duration not recorded)	28.4 h transects over a distance of 17.4 km
Spotlight transects	14 nights	13.5 h transects over a distance of 79.3 km	24.5 h transects over a distance of 257 km
Baiting stations	24 nights	Several nights (duration not recorded)	3.5 nights

Results

Field observations and survey results

Field surveys conducted by the RSCN in the DNR (Tafila Governorate) in 1995, MNR (Karak Governorate) in 1996 and RNR (Aqaba Governorate) in 1999 resulted in the collection of 3 (all males), 8 (6 males and 2 females) and 6 (4 females and 2 males) specimens respectively.

The current distribution of Blanford's fox in Jordan is presented in the Figure. The distribution of *V. cana* is confined to the southwestern arid and semi-arid mountains. The mountain slopes in the south represent the northern-most limit for the distribution of Blanford's fox.

The body measurements of the 15 captured animals are shown in Table 2.

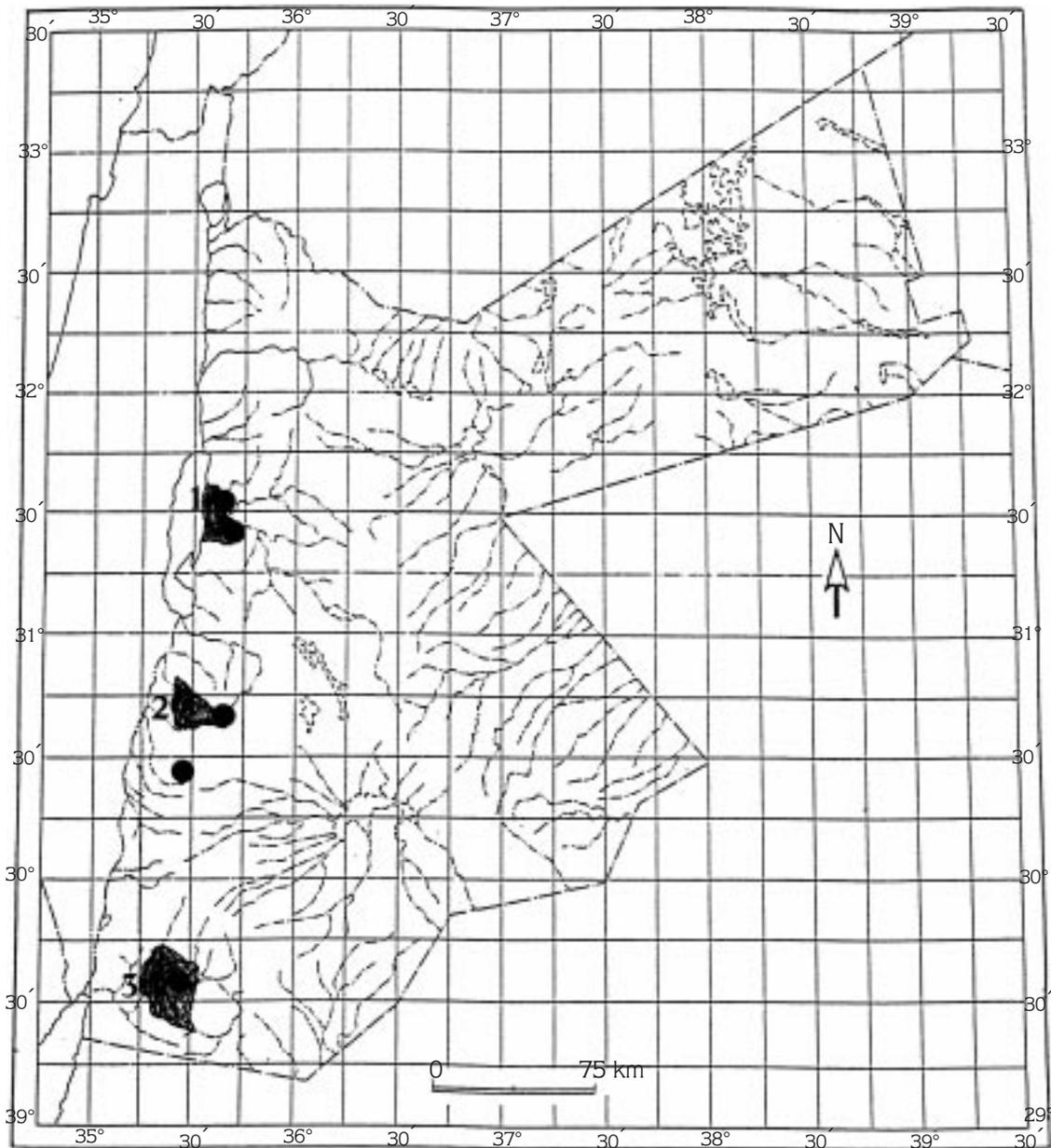


Figure. Map of Jordan showing distribution (solid circles) and study sites of *Vulpes cana*.
 1. Mujib Nature Reserve (MNR). 2. Dana Nature Reserve (DNR). 3. Rum Nature Reserve (RNR).

Table 2. External measurements (in cm) of *Vulpes cana* collected at DNR, MNR and RNR Jordan.

Measurements	Mean	Range	Number of specimens
Head and body length	38.3	35.6-46	15
Tail length	31.35	30-38	15
Forearm length	14.3	13.1-16	15
Hind foot length	9.1	8.6-11	15
Ear length	8.5	6.8-8.9	15
Hind footpad diameter	1.345	1-1.39	15
Fore footpad diameter	1.365	1.2-1.64	15
Weight (kg)	1.025	0.4-1.5	15

Ecological observations

Blanford's fox prefers rocky habitats. All trapping sites were located in the rocky terrain of the Mediterranean area and xeric parts of the Dana, Mujib and Rum areas. The locations were invariably mountainous with cliffs, crevices and caves scattered throughout the area.

The red fox, *V. vulpes*, was recorded from the same ground in all 3 reserves; other carnivores included the Egyptian mongoose, (*Herpestes ichneumon*) and the Eurasian badger (*Meles meles*) in the MNR, the wildcat (*Felis silvestris*), the Caracal, (*Caracal caracal*) and the Eurasian badger in the DNR and the wildcat in the RNR.

In the MNR Blanford's fox was trapped and seen during spotlighting. Six males and 2 females (5 adults and 3 sub-adults) were collected. The sub-adults were trapped in December and January. The trapping rate was higher than that for the red fox, while the sighting rate at night was lower. Its tracks were quite recognizable (having small naked pads, the two mid digits much larger than the lateral ones with no space in between the 4 digits) in the Raddas area and in lower parts of Wadi al-Mawjib. Five of the captured animals were recaptured, with an average inter-trap period of 4.6 nights (1-6) and an average inter-trap distance 437 m (100-1000 m). According to capture-recapture results, 2 family groups could be mapped with associated sub-adults.

Six individuals were trapped within a 560 km² in the Wadi Rum protected area. Between December, 1998 and February 1999, 4 females and 2 males (all adults) were captured. Blanford's fox was not observed during

spotlight transects. However, its footprints were very distinctive inside and around traps. Depending on the Herestad and Bunnell's equation for estimating the home range size of carnivores, which states home range size (km²) = 0.011 x weight of the animal^{1.36} (Geffen et al., 1992c), the estimated home range of Blanford's fox in Rum is 1.59 km² based on a mean weight of 1 kg (n = 6). However, an independent radio-telemetry study in the Rum area is needed to verify these findings.

In the DNR, the population density seemed lower than that of the MNR and RNR as only 3 adult males were captured during the survey. One individual was captured twice (11.11.1994 and 31.12.1994).

In general, the animals were calm and were handled with a minimum of effort. Some individuals uttered a vocalization that sounded like a cross between a dog barking and sawing. These sounds were recorded on videotape.

Collected specimens were recaptured within a range between 437 m in the MNR and 800 m in the DNR. This observation could be attributed to the limited home range (0.5-2 km²) reported by Geffen et al. (1992c).

Threats affecting Blanford's fox in Jordan

Because local people do not differentiate between the different species of foxes, the 3 species, including Blanford's fox, are treated as pests. Foxes are hunted and poisoned by farmers for attacking poultry and damaging grapes and other fruit crops. Many red foxes were found poisoned by villagers targeting carnivores attacking their livestock and fruit trees. Blanford's fox may be indirectly killed through the carcass poisoning of other target species such as hyenas and wolves. However, the meat consumption of Blanford's fox was never recorded in the areas where it was recorded. No verbal records exist for the medicinal usage of Blanford's fox's meat in Jordan.

Understanding the unique habitat selection of Blanford's fox is essential to implement protection strategies for this rare and beautiful fox. Construction of the Mujib Dam, the pressure of ecotourism in Wadi Rum through traffic using vehicles to transport tourists in the reserve and hiking are among the possible causes for its population decline. The destruction and alteration of suitable habitats for expanded agriculture and quarrying activities are being practiced in Wadi Rum. These activities could also adversely affect the natural food sources of this species.

According to the IUCN, the status of Blanford's fox is reported as insufficiently known, and it is listed in CITES Appendix II. Locally, the status of *V. cana* is considered vulnerable.

Nature reserves managed by the RSCN such as the DNR, MNR and RNR represent key areas for protecting this carnivore in Jordan. Fortunately, the surviving populations of this rare species are mostly within the borders of these managed nature reserves. However, more effort should be directed to establish base-line data on the current population in these reserves by studying the population structure and related ecological parameters.

Other similar habitats in the mountain ranges from Mujib to Aqaba, such as the Dead Sea mountains and the mountains overlooking Wadi Araba, are also suitable for the existence of this fox and more protection should be directed to these areas.

Discussion

The status of Blanford's fox in Jordan is reported here in detail for the first time. Aside from Blanford's fox, 2 other species of foxes are now known to exist in Jordan: the red fox, *V. vulpes*, with a wide range of distribution, inhabiting all known terrains; and the sand fox, *V. ruppelli*, with a confined distribution to extreme desert conditions (Amr and Disi, 1988; Qumsiyeh et al., 1993; Amr, 2000; Bunaian et al., 2001). Several specimens of the red fox were trapped within the same study areas (sand dunes and Mediterranean areas). Foxes in general are locally called "Tha'lab" or "Husieni". It seems the *V. cana* is associated with rocky areas, thus avoiding limited distributional inter-specific competition with *V. vulpes*.

Blanford's fox was reported from Arabia in Oman (Harrison and Bates, 1989; Nader, 1990), as well as Palestine (Ilani, 1983), Sinai (Mendelssohn et al., 1987) and Iran (Lay, 1967). Blanford's fox was first recorded from the northern parts of Yemen by Al-Safadi (1990) in a similar habitat to that of the red fox. It was found in low numbers, especially in the eastern parts of the republic. It is believed that the surviving populations in Oman, Rift Valley and the Negev desert are relicts (Mendelssohn et al., 1987), and the desert extending across Iraq, Arabia and Jordan forms a barrier. The records at MNR probably represent the northern-most limit for the species in Jordan (Figure).

Blanford's fox is an agile climber. Individuals released from traps were extremely agile and had the ability to climb sharp vertical cliffs with the help of large jumps. Similar descriptions were reported by Geffen et al. (1992a, 1992c).

Radio tracking studies in Palestine (Geffen and Macdonald, 1992; Geffen et al., 1992c; Geffen et al., 1993) for Blanford's fox estimated a mean home range size of 1.6 km² (range was 0.5 to 2.75 km²). Such home ranges were mostly occupied by pairs with the occasional presence of a sub-adult female, or by a single pair. Four individuals trapped as juveniles or sub-adults shared the home range of an adult pair for 6 to 12 months. Geffen et al. (1993), reported that a pair (adult male and female) could occupy the same home range for 3 months or more. According to trapping results in the Rum survey, 4 adults were shared the same home range of about 1.5 km² in the al-Qattar area.

Geffen et al. (1992c) reported on the morphological adaptations and seasonal weight changes of Blanford's fox. It was noted that the mean weight and body length of this animal increased towards the northern edge of its range from Eilat to Ein Gidi near the Dead Sea. In addition, adult body weight increased during the winter and decreased in the summer.

The morphological characters of Blanford's fox such as naked footpads, sharp and curved claws as well as its short hind legs are attributed to its adaptation to rocky, steep mountains (Geffen et al., 1992a). *V. cana* has an enormous jumping ability; captured specimens were seen to jump up a cliff 20 m above the release area. Mendelssohn et al. (1987) reported similar observations.

The diet of this fox is mainly insectivorous as well as frugivorous (Geffen et al., 1992b). The insects favored are mainly coleopterans, orthopterans, ants, wasps and isopteranans.

The current population size of this rare species is still unknown. Habitat destruction and human persecution of foxes are the major possible threats affecting the population densities of Blanford's fox in Jordan. The practice of shooting and carcass poisoning for the mass killing of carnivores was reported from the northeastern Badia region of Jordan for hyenas, wolves and foxes (Bunaian et al., 2001).

Further studies to determine the population size in nature reserves and address the main threats affecting its

populations in Jordan should be conducted. Fecal analysis studies to reveal the dietary habits of this rare fox are also recommended.

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