

ECOLOGY OF INDIAN FOX *VULPES BENGALENSIS* (SHAW, 1800) IN AND AROUND TAL CHHAPAR WILDLIFE SANCTUARY, RAJASTHAN, INDIA

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ABSTRACT

The present study deals with ecological observations on Indian fox (*Vulpes bengalensis*) in the Tal Chhapar Wildlife Sanctuary, Rajasthan during monsoon season that coincides with pup rearing period of this animal. Though the sanctuary holds a small population of about three breeding pairs of Indian fox, it serves as a safe breeding ground for source population of the nearby areas. The study showed if the temperature is mild and food is abundant, as on rainy days, the fox may also hunt at mid-day and show bimodal activity in the absence of large predators and any kind of other disturbances. During pup rearing season, most of the time the animal spent in sitting/resting, followed by searching for food and other minor activities. Parental care also found in this animal. Preference for particular den opening by the adults was observed for entry and exist which suggests that adults are well versed of their dens to escape from their predators. Both from food availability sampling and scat analysis, insects were found to be the main food item of this animal during the study period which shows that they are selective in their food habit in the monsoon season, as the availability of insects is all time high in these days. The basic social unit of this animal was found to be restricted to individual family level.

Keywords: Ecology, Indian Fox, Tal Chhapar Wildlife Sanctaury, Rajasthan.

Introduction

The Indian Fox, *Vulpes bengalensis* (Shaw, 1800) is one of three fox species reported from the Indian Subcontinent (Prater, 1971, Namgial *et al.*, 2005) and endemic to this region. It is reported throughout the Indian subcontinent except Afghanistan, Iran and Western Ghats of India. In spite of its wide distribution, its population is decreasing within its range and hence has been enlisted in the endangered list (Schedule-II) of the Wildlife (Protection) Act, 1972 (Amended 2002). It also comes under the category of "Data Deficient" and "Least Concern ver 3.1" and in Appendix III of the CITES (Johnsingh and Jhala, 2004).

This species generally occurs in dry open areas with low tree and shrub cover (Pocock, 1936; Prater, 1971, Johnsingh and Jhala, 2004). Their preferred habitat are short open grassland, scrub or thorn forests, but generally avoids steep terrain, tall grassland, wet forests and extreme arid zones (Johnsingh and Jhala, 2004). It is also tolerant to human presence as they are reported from agricultural fields and vicinity of rural habitations (Vanak, 2005; Johnsingh, 1978; Mankadan and Rahmani, 2000). Sizeable population of this species exists in few protected areas with extensive grasslands or scrub forest established for the protection of other species such as

great Indian bustard, *Ardeotis nigriceps* and Indian blackbuck, *Antelope cervicapra* (Karanth and Singh, 1981; Manakadan and Rahmani, 2000; Vanak, 2005).

Despite being habitat generalists and wide distribution range, studies on behaviour and ecology of this species are only preliminary till date and detailed information on its current distribution and population status in India are still unknown (Johnsingh and Jhala, 2004; Vanak, 2005). Only few studies on some localized populations of this species are so far carried out in India, i.e., at Rollapadu Wildlife Sanctuary, Andhra Pradesh (Manakadan and Rahmani, 2000 and Vanak, 2005), in and around Great Indian Bustard Sanctuary, Kutch, Gujarat (Home, 2005) and at Nannaj, Maharastra (Bhaskaran, 2006). The present work is a short term study to understand the general ecology and behaviour of this species at Tal Chhapar Wildlife Sanctuary, Rajasthan, during monsoon season that coincides with pup rearing time of this species.

Study area

The Talchhapar Wildlife Sanctuary (27° 48' 38" N latitude; 74° 26' 88" E longitudes) is situated in the Churu District of North Western part of Thar Desert of Rajasthan, India. This area, lying in the Biogeographic Zone 3A (Thar Desert) (Rodgers *et al.*, 2002), represents a

Status and ecology of Indian fox including its temperature and humidity requirement and feeding habit are studied in and around Tal Chhapar wildlife sanctuary Rajasthan.

unique ecosystem supporting a rich biodiversity. Though small, the sanctuary is unique in its location being the gateway to the Thar Desert of Rajasthan and thus lies on the way of the migratory passage of many birds. The entire area of the sanctuary is a typical desert ecosystem in which major part of the area is a flat saline depression representing one of the few saline depressions present in the Thar Desert of Rajasthan. 'Tal' means plain and this saline plain land is one of the best savannah habitats in India which changes in to a wetland during monsoon. This Sanctuary is nestled by many villages, and in the middle of human dominated landscape. Initially it was managed as a private hunting reserve of the Maharaja of Bikaner, later declared as a wildlife sanctuary in the year 1962 having an area of 719 ha. Later in 2008-09, an area of about 81 hectares was included in the western side of sanctuary, making up the area now to 800 hectares.

Climate of the Sanctuary and nearby area is very harsh with distinct summer (March to June), monsoon (July to September) and winter (October to February). Being present in the principal arid zone of the country the area has a dry climate with large variation in temperature. Maximum temperature reaches up to 49°C in June and minimum temperature falls up to 2°C or 1°C in months of December – January. During summer very hot wind locally called 'aandhi' blows in south – west direction. Rainfall in this region is highly erratic. Normal mean annual rainfall is about 300 mm, though there is large variation in mean annual rainfall. This year, in a single day total 260 mm rainfall was recorded during cyclone *Phat*, which has lead to many Blackbuck casualties. Being part of Thar Desert, the area faces severe famine at regular intervals. Since the famine of 2003, the Forest Department of Rajasthan has constituted an Eco Development Committee (EDC), with the involvement of local peoples and staffs of State Forest Department which aims to provide supplementary fodder to resident herbivores of this Sanctuary during harsh periods of the year (Choudhary, 2006).

The vegetation of this area has been classified as Northern Tropical Thorn Forest (6B) and sub-classified as Desert Thorn Forest (6B/C1) (Champion and Seth, 1968). The entire area represents typical grassland interspersed with shrubs and trees. The shrubs found in the sanctuary are *Haloxylon salicornicum* (Lana) and *Capparis decidua* (Ker). The trees are *Prosopis juliflora* (Angreji bavanlio), *P. cineraria* (Khejri), *Acacia nilotica* (Desi babul), *Ziziphus nummularia* (Ber), *Salvadora persica* (Mithijal), *Azardirachta indica* (Neem), etc. The herbs and grasses are *Boerhavia diffusa* (Chinawari), *Portulaca quadrifida*

(Ram-jata), *P. oleracea* (Luni), *Cyperus rotundus* (Mothiya), *Suaeda fruticosa* (Lana or Lunaki), etc.

The Sanctuary supports a variety of faunal groups including many unique faunal elements. Black bucks (*Antelope cervicapra*) are the dominant mammalian fauna along with Chinkara (*Gazella bennettii*), Blue bull (*Boselaphus tragocamelus*), Indian fox (*Vulpes bengalensis*), desert fox (*Vulpes v. pusilla*) and Asiatic steppe wildcat or desert cat (*Felis silvestris ornata*). Chief herpetofauna includes spiny-tailed lizard (*Uromastix hardwickii*), common monitor lizard (*Varanus bengalensis*) and desert monitor lizard (*Varanus griseus*). The area is one of the few areas in Rajasthan where both species of foxes and monitor lizards seen together and breed.

The sanctuary also lies on the way of the passage of many migratory birds, important ones are harriers and demoiselle crane, common crane and sociable lapwing. Commonly seen raptors are shikra, red-necked falcon, laggar falcon, eastern imperial eagle, short-toed eagle and tawny eagle. Other birds found in the Sanctuary include house sparrow, green bee-eater, black ibis, skylarks, crested lark, roller, partridges, king vulture, cinereous vulture and white-backed vulture, etc.

Material and Methods

The present field study was undertaken from 1st to 31st July, 2010 involving the ecological observations on the Indian fox (*Vulpes bengalensis*) in the semi-arid landscape of North Western Rajasthan, covering entire sanctuary and vicinity up to 2 km radius, as the Indian Fox uses both the areas during its day to day activities.

(i) Field Sampling Methods

Standard methods of Scan sampling and *Ad-libitum* sampling were followed as per Altman (1974), with few modifications as described below:

(a) Scan Sampling

Scan sampling is a technique of observing and recording animal behavior. Under this method, one records the activity of individuals at pre selected time intervals. In this case, the entire day was divided into time intervals of 20 minutes each, from morning 0530 to 1000 hrs and again in late afternoon from 1500 to 1900. Further, within each time interval every minute was subdivided into two time intervals of 30 seconds. The activity of the fox was noted for every 30 seconds and observation was repeated.

On the basis of the observations taken through scan sampling, a graph of daily activity budget of the animal was obtained. This allows for clearly defined and structured research that gives a good representative

sample of the behavior taking place.

(b) *Ad-libitum* Sampling

Ad-libitum sampling is subjective and it's not focused or controlled in any way or bound by any time constraint. *Ad-libitum* sampling helps in observing a wide range of behaviours and learns what is normal and what is not. It is more useful if one is familiar with the population and notices a change in behaviour. It may be useful to keep tracks of the normal behaviour and simultaneously focus on the new and interesting behaviours.

The normal behaviour of the fox included searching for food, feeding and rearing its young ones. Through *Ad-lib* sampling special behaviours were recorded, e.g. when other animals like monitor lizard or desert cat entered its territory.

(c) Food Availability

The major prey items considered for quantification included mammals particularly rodents and hares, birds, reptiles, arthropods and fruits (Prater, 1971; Johnsingh, 1978; Manakadan and Rahmani, 2000; Home, 2005, Home and Jhala, 2009). For this, stratified random sampling was done during the entire study through five belt transects of 1 km length (fixed width = 2m) in different locations within a radius of 2 kilometers from the dens. The frequency of available food items was determined on the basis of percentage encounter of individual food items in the belt transects. For this all the insects encountered (live or dead) were taken into consideration, while for other food items only number of used materials (e.g. body parts of spiny-tailed lizard or bird or rodent or eaten fruits) were taken into consideration for sampling.

(d) Food habit

Scat analysis is the primary sampling strategy to assess the food resources used by any animal. Since foxes are omnivorous and generalist in food choice, scat collection was done to prove this. Misidentifications of fox scat with cat scat were completely taken care off. All scats were collected within 100 mt. radius of den sites. Both dry and fresh scats were collected for analysis, but fresh scats were sun dried before storing. All scats were stored in paper bag and transferred into polythene zip locks with labeled information about the date of collection and time.

(ii) Analytical Methods

(a) Scat Analysis

Analysis of prey remains in faeces has been widely used to assess carnivore diets. It is a simple nondestructive technique which has wide applicability.

To estimate the diet of the Indian fox, scat analysis was carried out for a total of 28 scats collected during the study period. All the scats were properly washed, dismembered using forceps and needle and the indigestible components such as claws, scales, bones and insect chitin were separated.

(b) Sample Size Estimation

To determine the minimum number of scats that needs to be analyzed to have an accurate estimate of the food habit, the cumulative per cent frequencies of occurrence of different prey species were calculated for each increment of two scats and this was plotted against the total number of scats. As the number of scats increase, the proportion of prey items stabilize at a point which gives an approximate number of scats required to analyze the food habit. This standardization helps to optimize efforts and minimize costs for food habit studies (Home, 2005; Jethva and Jhala, 2003).

Results

Daily activity budget

The present study period was coinciding with the pup rearing time of this species. During the entire study period it was observed that one of the parents always remains in the vicinity of den to keep a tight vigil on the pups as well as den. Generally foxes are considered to be nocturnal as well as crepuscular in habit. During the study period they were found to be bimodal in their diurnal activity i.e. come out of their den in the early morning and remain active maximum up to 1000 hrs and again come out of their den as early as 1350 hrs in the afternoon and remain active till late evening. This prolonged activity during both morning as well as evening shifts may be due to absence of large predators and any kind of other disturbances for this species in this protected area.

This species outside its den perform different activities like resting (sitting), food and feeding, playing, barking, defecating, scratching and stretching of body and running. It was found that this species spends maximum activity in resting (40%) followed by food and feeding (26%) and remaining in other activities. Other activities are worth to be considered minor activities since the species was found not to spend more than 10% in any of these minor activities and these minor activities together accounts for 34% of total activities. On the basis of the daily observations taken through scan sampling, a daily activity budget of the animal was obtained. (Fig.1).

Den preference and use

The dens of the Indian fox could be classified into three categories i.e. simple short dens with small openings, complex cavernous dens with many entrances

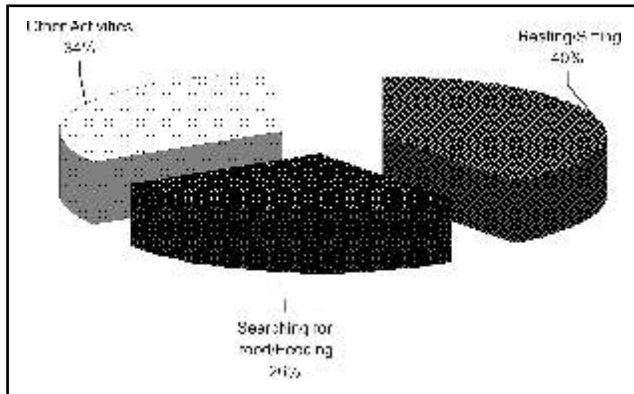


Fig. 1 : Activity Budget with respect to time variable.

and dens under rocks and rock crevices (Johnsingh, 1978). Dens belonging to the second type were seen in the present study area.

During the study period, three families of foxes were noted occupying three mounds inside the Sanctuary though there were four more abandoned moulds in the area. These three active moulds were bigger and placed at slight higher locations. The vegetation in the area of all these dens was slightly dense than that of surrounding area. It was interesting to note here that the adults of each family preferred a particular opening in the den to come out or get inside, whereas, pups had no such preference. They just playfully come out or get into the den through any of the openings. The maximum and minimum numbers of den openings noted in the active moulds were 13 and 8 respectively. Most of the abandoned den openings were clogged by grasses and debris. Many times monitor lizards were found to be chased by the adult foxes if seen roaming on the mounds occupied by them.

Food and Feeding

The frequency of available food items was found to be highest for grasshoppers (20%) followed by rodents (15%) and dragonflies (15%), beetles (14%), spiny-tailed lizards (12%), spiders (9%), fruits (6%), birds (6%) and blackbuck fawns (3%). Insects found to be the major food items (49%) during the study period which was peak

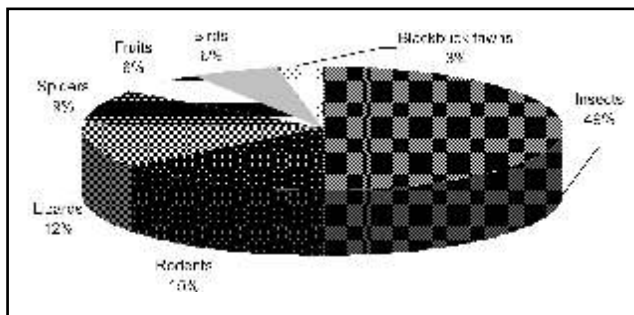


Fig. 2 : Frequency of availability of food items for Indian Fox at Tal Chhapar Sanctuary

of monsoon. (Fig. 2).

Scat analysis revealed that about 86% of its diet comprised of insects, i.e., grasshoppers (Orthoptera), dragonflies (Odonata) and beetles (Coleoptera) followed by 14% of spiny-tailed lizard parts (Fig-3). Insect parts observed in the scat are grasshoppers (Orthoptera), dragonflies (Odonata) and beetles (Coleoptera). The sampling size estimation showed that the cumulative frequencies of prey item stabilized at around 14 scats, in which 50% scats have three food items and 50 % have four food items. This shows that during monsoon season only four food items contributed the entire diet.

During feeding the adults were found to go a distance of more than 3 km from the dens in search of

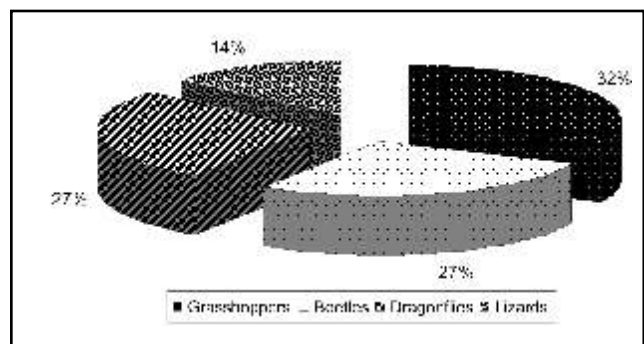


Fig. 3 : Frequency of prey items consumed during monsoon days

food, but juveniles found to feed maximum within a distance of 1km range from their dens always under the vigil of one parent. Mixing of different family members was never observed as different family if found going coincidentally at a time in search of food, always went in different directions.

Discussion

In most parts of its range, Indian foxes are crepuscular and nocturnal (Prater, 1971; Johnsingh, 1978). But the present study shows if the temperature is mild and presence of abundant food, as on rainy days, they may also hunt at mid-day and show bimodal activity in absence of large predators and any kind of other disturbances. During pup rearing season, most of the time foxes spent in sitting/resting, followed by searching for food and other minor activities. Parental care also found in this animal as one parent always vigil the activity of pups outside the dens.

The vegetation in the area of all the dens was slightly dense than that of surrounding area which supports the observation of Johnsingh (1978). All the three families of fox were found to use three dens during the study period which supports Johnsingh (1978) and Manakadan and Rahmani (2000) that den use by this animal is primarily restricted to the pup-rearing period.

Preference for particular den opening by the adults suggests that adults are well versed of their dens to escape from their predators.

Indian foxes are omnivorous, opportunistic feeders and generally consume any food that they can handle. A wide variety of food items had been reported in their diet like insects, ground lizards, rodents, snakes, hedgehogs, hares and fruits (Johnsingh, 1978; Manakadan and Rahmani, 2000). In this study both from food availability sampling and scat analysis insects were found to be the main food item of this animal during the study period. This shows that they are selective in their food habit in the monsoon season, as the availability of insects is all time high in these days.

Since all the three families were found to live in three different nearby dens and each family never found to be mixed with other families, their basic social unit is restricted to individual family level. This supports

Johnsingh (1978) that the basic social unit of Indian fox consists of a breeding pair.

Many times monitor lizards were found to be chased by the foxes when seen on their dens that also support Johnsingh (1978) and Manakadan and Rahmani (2000) that foxes though are not strictly territorial, but exhibit this behavior sometimes.

Threat assessment

Presently foxes are thriving well in this small sanctuary, and using the area of the sanctuary as well as outside agriculture fields. Since the living dens were found to be close to the boundary of sanctuary, and two state high ways touches the boundary of the sanctuary on its two sides, the road traffic is only major threat to this species in the absence of large predators. The declaration of eco-sensitive area with a buffer of 2 km radius could be a positive sign for future wildlife of this small but fully diverse sanctuary.

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ताल छपार वन्य प्राणी अभयारण्य, राजस्थान, भारत में और इसके चारों ओर भारतीय लोमड़ी वूल्वस बेंगालेन्सिस (शॉ, 1800) की पारिस्थितिकी

सुमित डुक्किया, संजय के. दास और राजलक्ष्मी

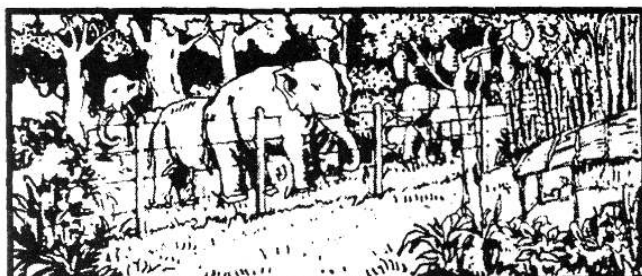
सारांश

वर्तमान अध्ययन में मानसून अवधि के दौरान ताल छपार वन्यप्राणी अभयारण्य, राजस्थान में भारतीय लोमड़ी पर पारिस्थितिकीय प्रेक्षण लिए गए, उक्त अवधि इस पशु की बच्चे पालने की अवधि है। यद्यपि अभयारण्य में भारतीय लोमड़ी के करीब तीन प्रजनन जोड़ों की एक छोटी आबादी है, यह समीपवर्ती क्षेत्रों की स्रोत आबादी के लिए एक सुरक्षित प्रजनन स्थल के रूप में काम करता है। अध्ययन ने दर्शाया कि यदि तापमान हल्का हो और भोजन प्रचुर मात्रा में हो तो जैसा वर्षाती दिवसों में होता है, लोमड़ी मध्य दिवस में शिकार कर सकती है और विशाल परभक्षियों की अनुपस्थिति और किसी भी तरह के अन्य विक्षोभों में द्विबहुलक सक्रियता दर्शाती है। बच्चे पालन मौसम के दौरान पशु अधिकांश समय बैठकर/आराम करके इसके बाद खाद्य की खोज में और अन्य क्रियाकलाप करके गुजारते हैं। इस पशु में पैतृक देखभाल भी पाई गई है। प्रवेश और निकासी के लिए वयस्कों द्वारा विशेष माँद द्वार की पसन्द देखी गई जो संकेत करता है कि वयस्क अपने परभक्षियों से बचने के लिए अपनी माँदों के प्रति दक्ष हैं। खाद्य उपलब्धता सैम्पलिंग और स्केट विश्लेषण दोनों से कीटों को अध्ययन अवधि के दौरान इस पशु का मुख्य खाद्य पाया गया, जो दर्शाता है कि ये मानसून मौसम में अपनी खाद्य आदतों में चयनात्मक हैं क्योंकि कीटों की उपलब्धता इन दिवसों में सबसे अधिक रहती है। इस पशु की आधारभूत सामाजिक इकाई एकल परिवार स्तर तक सीमित पाई गई।

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