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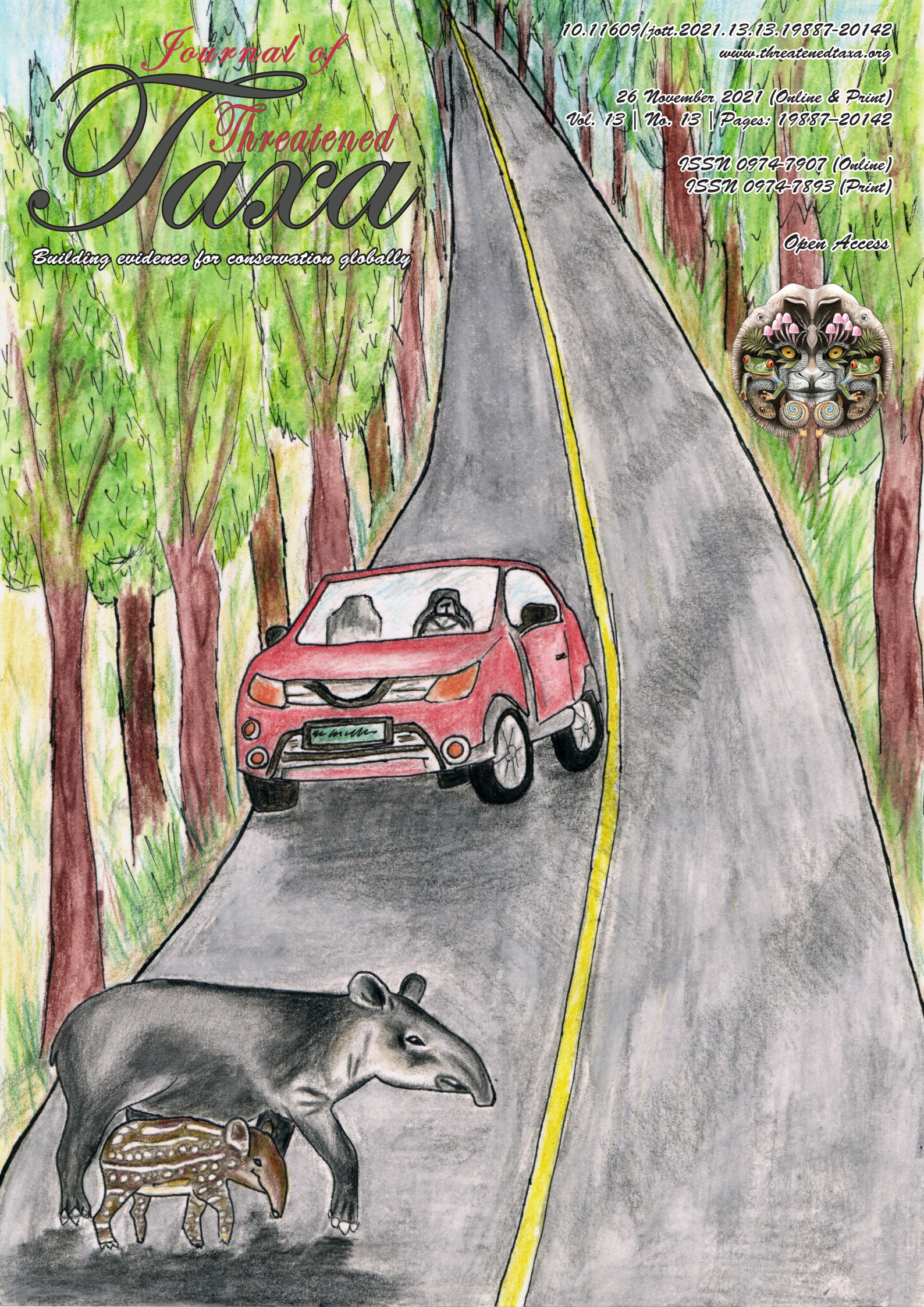

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Caption: Lowland Tapir *Tapirus terrestris* (Medium—watercolours on watercolour paper) © Aakanksha Komanduri.

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COMMUNICATION

Seasonal food preferences and group activity pattern of Blackbuck *Antilope cervicapra* (L., 1758) (Mammalia: Cetartiodactyla: Bovidae) in a semi-arid region of western Haryana, India

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Abstract: To evaluate food preferences and group activity patterns, a fragmented population of Blackbuck *Antilope cervicapra* was selected for observation in a semi-arid ecosystem of western Haryana. A field survey was conducted fortnightly, from dawn to dusk, between September 2019 and August 2020, covering every season. Scan sampling and quadrat methods were used to record data on group size and vegetation. Group sizes ranged from 3 to 72 individuals. Based on visual observation, blackbuck seasonally consumed 26 species belonging to 25 families with varied preferences, out of a total of 53 plant species documented from the study site. Some plant species with high medicinal and therapeutic values were preferred, including *Artemisia scoparia, Cucumis callous, Ziziphus jujuba*, and *Ziziphus nummularia*. Unlike most herbivores, Blackbuck also consumed the toxic and medicinally rich *Calotropis procera*. We suggest that zoos which house blackbuck include these preferred wild plant species in their diet. Observations on group activity were analyzed on hourly, monthly and seasonal bases, and converted into time percentages. Group foraging activity was at a maximum in the monsoon (62%) and minimum in winter (50%), followed by resting: maximum in winter (21%) and minimum (12%) in monsoon, largely influenced by food availability. Foraging/walking ratio was at a maximum (5.2) in monsoon and minimum (3.1) in winter, and was correlated with the number of group sightings (maximum in winter and minimum in monsoon) in nearby farmland, when the animals faced food scarcity in their natural habitat and fed on crops.

Keywords: Farmland, foraging activity, herbivores, medicinal, monsoon, natural habitat, observation, population, scarcity, vegetation.

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INTRODUCTION

The Blackbuck *Antilope cervicapra* (Linnaeus, 1758) is endemic to the Indian subcontinent. The adult male (subspecies *rajputanae*) weighs 34 to 45 kg, while females weigh 31 to 39 kg (Ranjitsinh 1989). This antelope shows sexual dimorphism even at the age of 4–6 months when horns start growing in males; at maturity males become conspicuously colored and have long horns (Shrestha 2003). The coats of adult males are striking black or dark brown with white underparts, while the coat of females and immature males varies from tan to darker brown. Blackbucks live in open habitats such as grasslands, bush, and dry thorn scrub (Schaller 1967). The species was once distributed throughout western Pakistan from the foothills of the Himalaya from Punjab through Uttar Pradesh in India to the Terai zone of Nepal, West Bengal (India) to Bangladesh (Lydekker 1924). It is currently listed as Least Concern (LC) on the IUCN Red List (IUCN SSC Antelope Specialist Group 2017), but earlier it was categorized as Near Threatened (NT) (Mallon 2008). It is listed in Appendix III in CITES (Convention on International Trade in Endangered Species of Wild Fauna and Flora), and as a Schedule I species with highest protection level in India under the Indian Wildlife (Protection) Act, 1972. The recent improvement in the conservation status of Blackbuck is probably due to unintentional creation of more suitable open habitat by converting dense scrub land and woodland to agricultural areas (IUCN SSC Antelope Specialist Group 2017).

Various ecological and behavioural aspects of Blackbuck have been studied in India (Gupta & Bhardwaj 1990; Gehlot & Jakher 2007, 2011; Kumar & Rahmani 2008; Dookia et al. 2011; Gangotri & Gangotri 2014; Baskaran et al. 2016; Prashanth et al. 2016; Debata 2017; Sagar & Antony 2017) and also in Khairapur, Bardia District, Nepal (Pradhan et al. 1999; DNPWC 2012). In Haryana, Ranjitsinh (1989) reported 2,410 Blackbuck from Hisar district alone, from a total of 4,852 Blackbuck in the state, making Hisar a high-density blackbuck area. So far, no detailed account of its foraging behavior has been documented in western Haryana.

The human population explosion, large-scale poaching, destruction of natural habitats for commercial cultivation, grazing activities and human habitation have caused Blackbuck to disappear from many areas. The total population is estimated at 35,000 mature individuals by IUCN (2017). Our primary census survey revealed that the isolated Blackbuck populations in Fatehabad, Hisar are in close proximity to villages dominated by the Bishnoi community, and in some parts of southern Haryana Blackbuck share their habitat with Nilgai *Boselaphus tragocamelus.* The main threats are habitat destruction, barbed wire fencing, feral dogs, and illegal hunting.

Blackbucks are mainly diurnal, but sometimes also active at night (Long 2003). They are gregarious (Schaller 1967) and mostly live in groups of single or mixed sexes numbering from 15 to several thousand animals. Densities are 0.5–3 per ha (Long 2003). Their diet includes grass, cereal crops and forbs, and they also browse on bushes (Long 2003). Blackbuck is reported as a crop pest in many habitats, where it eats mainly the young shoots of cereal and pulses, in particular sorghum and millet (Chauhan & Singh 1990).

Seasonal or interannual variation in availability of resources suggests the presence of behavioral, physiological and morphological adaptations in consumers (Van Schaik et al. 1993) and may influence the composition of vertebrate faunal communities (Fleming et al. 1987). Furthermore, certain species of plants provide alternative food sources during times of food scarcity, and thus may be vital for population survival (Terborgh 1983). Group sizes increase with habitat openness and resource availability. This information can be helpful to assess the habitat requirements of animals, predict their presence or abundance in other areas and the potential effects of habitat transformation (Arthur et al. 1996; Rı´os-Uzeda et al. 2006), and to support wildlife management plans (Morrison et al. 2006).

The present study was carried out to characterize blackbuck habitats, activity patterns and resource usage in a patch of natural vegetation in a human-dominated landscape outside the protected area network in the semi-arid region of western Haryana. This information will guide long-term conservation of the state animal of Haryana.

Description of Study Area

The study site is situated in Badopal village of Fatehabad district, commonly called 'Blackbuck habitat Badopal' in the Western part of the state Haryana of India (29.418N, 75.576'E). The surrounding villages including Badopal are dominated by the Bishnoi community which has high reverence and tolerance towards blackbuck. Total area of study site is approximately 2.41 km^2 including the area acquired by government to build a residential colony. The rest of the land is owned by local farmers. The study also extended further into the surrounding area of habitat under cultivation of different seasonal crops.

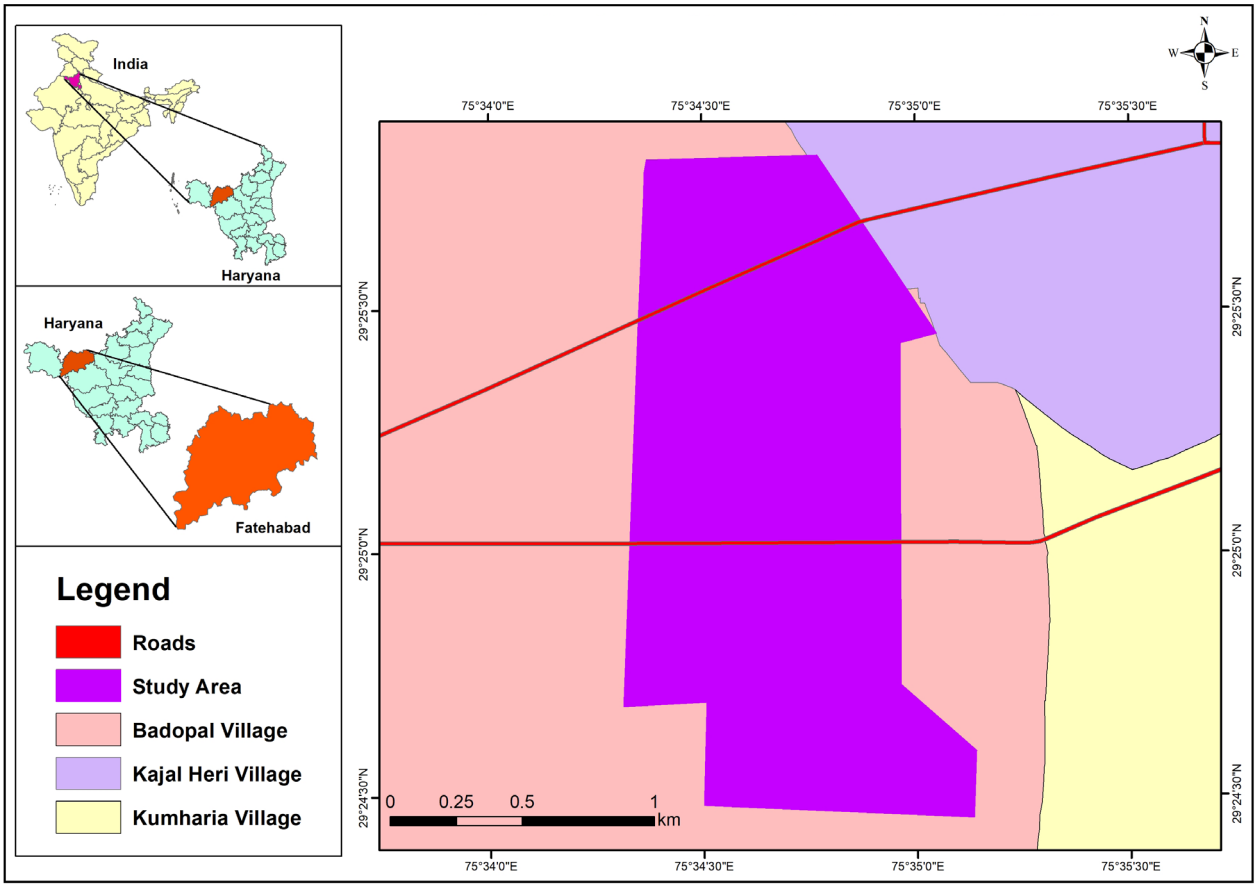

Figure 1. Study site map in Badopal village of Fatehabad district, Haryana, India.

Historical Background (Blackbuck Habitat Badopal)

The study site was selected in 2012 by Nuclear Power Corporation Limited (NPCIL) for construction of a residential colony on 183 acres (0.76 km^2) of private and Panchyat land near Badopal village of District Fatehabad. The site was enclosed with blade wire fencing, resulting in the death of several blackbuck. This situation met strong resistance and criticism by locals from Bishnoi communities along with other wildlife organizations, and a case was filed with the National Green Tribunal (NGT) which resulted in no further infrastructure being built by NPCIL. The site is now governed and managed by the district administration, and the blackbuck habitat is still in need of the development of a conservation plan by the state government. Wildlife Institute of India (2015) did a reconnaissance and recommended this area, including adjoining private land, as a community reserve for conservation of blackbuck.

The study area lies in biogeographic province 4-A, Semi-arid, Punjab Plains (Rodgers et al. 2000), and the 'Trans-Gangetic Plains Regions' agroclimatic zone under the 'Arid to Semi-arid' climatic region, which is characterized by scanty rainfall, aridity and extremes of temperature. The vegetation comprises predominantly xerophytes and is characterized as 'tropical desert thorn'. This site is a natural patch surrounded by a semi-arid agro-ecosystem. Adjoining fields are used for growing crops such as wheat, maize, other cereals, cotton, and pulses. Apart from Blackbuck, the habitat also supports Nilgai, Desert Fox *Vulpes vulpes pusilla,* Asian Palm Civet *Paradoxurus hermaphrodites,* Indian Hedgehog *Paraechinus micropus*. Important reptiles include Monitor Lizard *Varanu* ssp., Indian Cobra *Naja naja.*

METHODOLOGY AND MATERIALS

Blackbuck group activity patterns

There are four seasons: monsoon (June to August), autumn (September to November), winter (December to February), and summer (March to May). Field observations were made from dawn to dusk from September 2019 to August 2020. Field visits were

conducted fortnightly during each season to record the behavior and feeding preferences of Blackbuck. Except winter, the observations were taken during three diurnal phases: morning (0630–1000 h), noon (1200–1400 h), and evening (1600–1900 h). There was a slight change in timing during winter to 0800–1100 h, 1300–1500 h, and 1600–1830 h in morning, afternoon, and evening, respectively. Group activity patterns were recorded using the scan sampling method (Altman 1974). The sampling time was 15 minutes continuously with a sampling interval of 10 minutes. The observations recorded for the group activity were analyzed on hourly, monthly, and seasonal basis.

$$\% \text{ Activity of group} = \frac{\text{Number of animals engaged in a particular activity in a sample}}{\text{Total number of animal engaged in all activities in a sample}} \times 100$$

The group activities were categorized as foraging, walking, resting, scanning/standing, social activities (playing, fight display, sexual activities, and grooming) and other activities (urination, defecation, marking, ear threat, and object aggression).

We calculated annual error mean squares (percentage time) and error degree of freedom applying Duncan Multiple Range Test **(**DMRT) using SPSS version 21.0 considering season(s) as replication and group activities as treatments.

Vegetation sampling and food preferences

Vegetation composition was recorded by randomly sampling 10 quadrats of 20×20m. The tree composition of each quadrat was counted whereas shrubs and herbs were counted within sub-quadrates of 5×5m and 1x1m respectively. The density (D) of the flora was analyzed following Phillips (1959) and Mishra (1968).

Foraging activity was observed using binoculars. After each feeding bout and once the animals moved, the plant species eaten by the group were recorded. Diet preferences were also recorded by calculating the number of attempts by the animals to consume a particular plant species in a particular season. For this purpose we used quadrat sampling for the area left and right of a line transect.

Note: Guidelines issued by the Ministry of Health and Family Welfare, Government of India to combat COVID-19 were strictly followed during field visits during the lockdown period.

Optical equipment

A Nikon COOLPIX P900 digital camera and Nikon ACULON binoculars (8×42, 8°) were used for photography and taking observations from long distances so as not to disturb the normal activity of the animals.

RESULTS

Floral Composition

Plant species documented from the study site included 14 trees, five shrubs, 31 herbs, and three climbers. Among the trees, maximum density was demonstrated by *Acacia senegal* (200 individuals/ha) followed by *Melia azedarach* (27.5 individuals/ha). Density of dominant shrubs, herbs and climbers were: *Parthenium hysterophorus* (6170 individuals/ha), *Artemisia scoparia* (13,200 individuals/ha), and *Citrullus colocynthis* (702.5 individuals/ha).

Frequency class distribution

Frequency class distribution of different plant species is shown in Figure 2.

Out of 53 plant species identified in the habitat, it was observed that blackbuck largely prefer 26, as shown in Table 1.

Blackbuck browsing on trees varies according to season, with a maximum in summer and winter. The preference for trees depends mainly on the availability and height of the tree. Data suggests that the preferred parts of *Acacia senegal* and *Prosopis cineraria* were leaves, whereas in case of *Prosopis juliflora* and *Ziziphus jujuba,* leaves, pods and fruits were preferred. *Prosopis juliflora was* ignored during the monsoon season due to availability of preferred food in ample quantity.

Only three species of shrub were eaten by Blackbuck: *Calotropis procera, Maytenuse marginata, Ziziphus nummularia.* The literature available so far on blackbuck has not reported *Calotropis procera* as a forage species, but our field investigation revealed that in summer and winter preferences for *Calotropis* were medium and high respectively, and low in monsoon and autumn. Blackbuck mainly feeds on the leaves of this species during scarcity of other food.

A total of 18 species of herb were mainly foraged on by the blackbucks especially in the monsoon and autumn season (Table 1), Grasses like *Cynodon dactylon*, *Eragrostis* spp., *Dactylocteniuma egyptium*, *Digera muricata, Digitaria* spp., *Cyperus rotundus* were preferred in every season. *Aerva javanica* and *Artemisia scoparia* are dominant herbs but consumed only when the preferred grasses are not available especially in autumn and to some extent in winter.

Most herbs were dominant in monsoon and autumn season but either become dry or unfavorable for

Table 1. Food preferences of Blackbuck during different season: M—Monsoon | S—Summer, Au—Autumn | W—Winter | LP—Low Preference | MP—Medium Preference | HP—High Preference | NR—Not reported in that season | L—Leaves | SM—Stem | F—Fruits | P—Pods | WP—Whole Plant | *—Non native.

	Name of the plant	Family	Majoring in the season (mainly vegetative phase)	Seasonal food preference				Parts eaten
				M	Au	W	S	
A.	**Trees**							
1	*Acacia senegal*	Mimosaceae	All	LP	LP	HP	HP	L
2	*Prosopis cineraria*	Mimosaceae	All	LP	LP	MP	MP	L
3	*Prosopis juliflora* *	Fabaceae	All	NR	LP	MP	HP	L & P
4	*Ziziphus jujuba*	Rhamnaceae	All	LP	NR	NR	MP	F
B.	**Shrubs**							
5	*Calotropis procera*	Asclepiadaceae	All	LP	LP	HP	MP	L
6	*Maytenuse emarginata*	Celastraceae	All	NR	LP	LP	MP	L
7	*Ziziphus nummularia*	Rhamnaceae	All	MP	MP	HP	HP	L & F
C.	**Herbs**							
8	*Aerva javanica*	Amaranthaceae	Au	NR	LP	NR	NR	L
9	*Artemisia scoparia* *	Asteraceae	M & Au	MP	MP	LP	NR	L & S
10	*Boerhavia diffusa*	Nyctaginaceae	M	LP	LP	NR	NR	L
11	*Cynodon dactylon*	Poaceae	S, M, Au	HP	HP	NR	HP	WP
12	*Cyperus rotundus*	Cyperaceae	M & Au	HP	HP	NR	NR	WP
13	*Dactyloctenium aegyptium* *	Poaceae	Au	LP	MP	NR	NR	WP
14	*Digera muricata*	Amaranthaceae	M	LP	LP	NR	NR	WP
15	*Digitaria* spp.	Poaceae	M	MP	LP	NR	NR	WP
16	*Eragrostis* spp.	Poaceae	Au	LP	MP	NR	NR	WP
17	*Euphorbia prostrata* *	Euphorbiaceae	M	LP	MP	NR	NR	WP
18	*Indigofera linnaei*	Fabaceae	M	LP	NR	NR	NR	WP
19	*Heliotropium europaeum*	Boraginaceae	Au	NR	LP	NR	NR	WP
20	*Chenopodium album*	Chenopodiaceae	M and Au	LP	LP	NR	NR	WP
21	*Pupalia lappacea*	Amaranthaceae	Au	LP	LP	NR	NR	SM & L
22	*Setaria virdis*	Poaceae	M & S	MP	MP	NR	NR	WP
23	*Tephrosia purpurea*	Fabaceae	M & Au	LP	MP	NR	NR	L & P
24	*Trianthema portulacastrum*	Aizoaceae	M	MP	LP	NR	NR	WP
25	*Xanthium strumarium* *	Asteraceae	M & Au	LP	LP	NR	NR	WP
D.	**Climbers**							
26	*Cucumis callosus*	Cucurbitaceae	S & M	LP	LP	NR	MP	F

feeding during winter and summer (Table 2). Many plant species listed in Table 1 are also consumed by nilgai, so interspecific competition between Blackbuck and Nilgai may result in resource partitioning. Crop raiding increases during winter and summer seasons (Table 3).

Group activity pattern

Seasonal variations in group activity of the blackbuck were recorded (Figs. 3 and 4)

The annual data suggests that maximum time (62%)

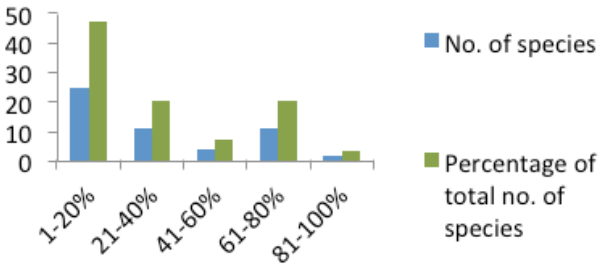

Figure 2. Frequency class distribution of plant species showing the number of species and percentage of the total number of the species.

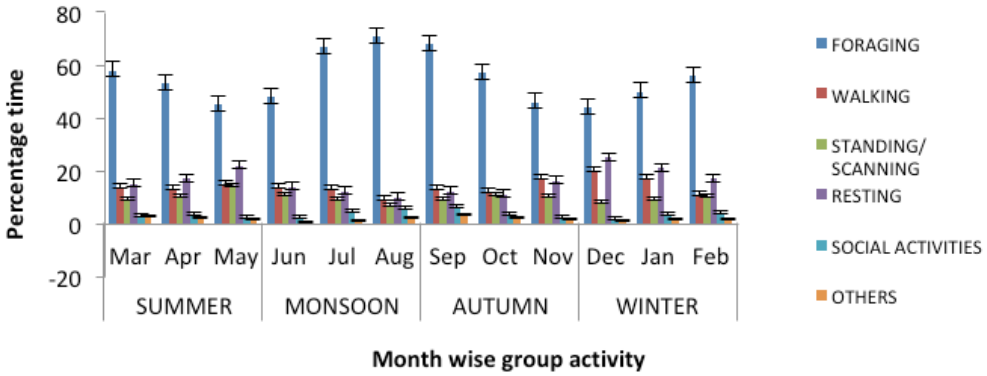

Figure 3. Percentage time versus monthly group activity by Blackbuck (Error bars with standard error).

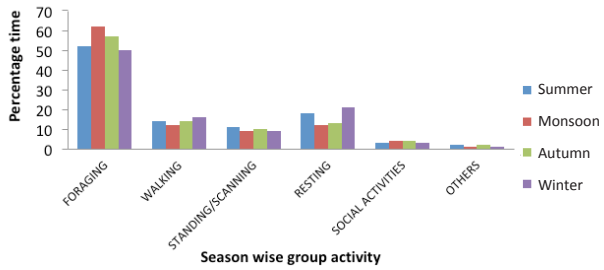

Figure 4. Percentage time spent on a particular group activity by season.

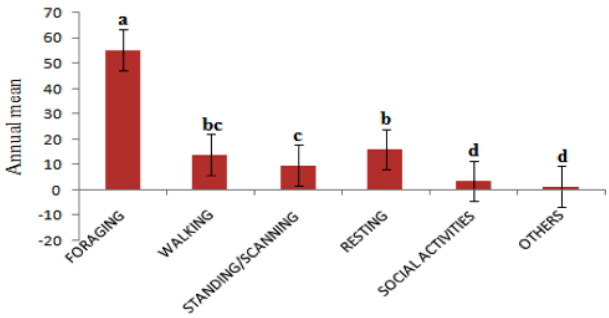

Figure 5. Annual mean of group activity (treatment bars with different letters differ significantly at $P \leq 0.05$ based on Duncan Multiple Range Test.

Table 2. Most dominant vegetation during all seasons, except trees, in descending order, and their interactions with Blackbuck. Some plant species were dominant in two seasons with varying densities.

Dominant flora covering the habitat in particular season			
A. Monsoon			
Scientific name	**Category**	**Food preference**	**Remarks**
Artemisia scoparia	Herb	Yes	Low preference for food in monsoon
Verbesina encelioides	Herb	No	Full bloom make the landscape helpful during parturition of females but inhibits communication and restrict establishment of territory by adult males and makes them vulnerable to feral dogs attacks.
Cyperus rotundus	Herb	Yes	One of the favorite diet items
B. Autumn			
Artemisia scoparia	Herb	Yes	Medium food preference in late autumn
Verbesina encelioides	Herb	No	Drier in late autumn, no direct use; hindrance for territory establishment.
Pupalia lappacea	Herb	Yes	Low preference, drier during late autumn, no use when completely dry.
C. Winter			
Pupalia lappacea	Herb	Yes	The habitat was mostly covered with this herb in dry condition during extreme winter. Low food preference in autumn and monsoon season.
Verbesina encelioides	Herb	No	2nd most dominant in habitat, mostly dry and used for preorbital marking.
Artemisia scoparia	Herb	Yes	Dried, preferred as a secondary food
D. Summer			
Verbesina encelioides	Herb	No	High density during late summer, no direct use except to hide the infant by females during initial days of nurturing
Parthenium hysterophorus	Shrub	No	No direct use but advantageous for feral dogs for attacking blackbucks.

was spent for foraging activity during monsoon followed by autumn (57%), summer (52%), and winter (50%) (Figure 4). Foraging activities were directly related to availability of food. Blackbuck spent more time resting in winter than in other seasons.

Diurnally, maximum number of crop raids (28 raids/sighting) were observed in winter followed by summer (22 raids/sighting) and minimum (11 raids/sighting) in monsoon (Table 4). Public opinion around the study site revealed that the crop raids were more prominent at night than in daytime.

The foraging to walking ratio

The foraging to walking ratio is a very important factor to evaluate the foraging success and assessment of habitat in terms of food availability. The animals spent more time walking in winter and summer season during less availability of food. The foraging to walking ratios for monsoon and autumn were 5.16 and 4.07 respectively, higher than summer and winter ratios of 3.71 and 3.12, respectively.

It was observed that blackbuck group composition and population fluctuation are also affected by crop patterns in the region due to high nutritional value of agricultural crops. The recorded data indicates a strong relationship between the foraging walking ratio and crop raiding during different season (Table 3).

All the annual group activities were statistically significant ($p < 0.05$) except social and other activity. Foraging activity was maximum followed by resting, walking, standing/scanning (Figure 5). As per the recorded data, animal spent >3.0 times on foraging, fulfilling their food requirement to performing all other such activities.

Conservation implications

Based on our primary census survey, and the reconnaissance study of Wildlife Institute of India (2015) the Blackbuck populations in the districts of western Haryana are fragmented and distributed in small isolated patches surrounded by high human habitation and intensive agricultural practices. All these small size populations in villages like Mangali- Rawat Khera, Balsamand, (Hisar) Dhangar (Community Reserve for Blackbuck, 25 acres (2019)), Badopal (Current study site) (Fathehabad) harboring in same climatic semi-arid conditions and plant communities. Due to agricultural revolution and better irrigation system in Haryana, currently these sites have no true grasslands as preferred by the blackbucks, so the species have only options to feed on available plant species and consumed on crops to fulfill its nutritional demands. Therefore, the feeding pattern of the species has adapted according to the changing climatic and floral compositions during time and space.

Table 3. Diurnal seasonal data of foraging walking ratio and group sighting in nearby agricultural lands.

Season	Foraging walking ratio(within habitat) (A)	No. of group sighted ranging from (3-38) in adjoining agricultural field in a radius of 0.05 km to 4 km (B)
Summer	3.71	22
Monsoon	5.16	11
Autumn	4.07	15
Winter	3.12	28
Pearson Correlation between (A) and (B)	-0.947^{NS}	

DISCUSSION

Meeting nutritional demands is the most essential task for any animal (Parker et al. 2009). Challenges faced by ruminant herbivores are mainly linked to forage quality (Drent & Prins 1987; Illius & Gordon 1992), because green plants provide a relatively small yield of nutrients and require complicated mechanisms of fiber digestion based on microbial fermentation (Van Soest 1994). Selecting forage with high protein and low fiber content optimizes nutrient and energy intake and also reduces retention time, thus increasing intake capacity (Van Soest 1994; Mysterud et al. 2001). Additional selection criteria include the dietary need for essential minerals and secondary metabolites (Cassini 1994). Habitat use results from multiscale and multifactorial processes (Senft et al. 1987; Bailey et al. 1996; Van Beest et al. 2010) and its outcome in terms of individual movement and distribution depends on habitat use by multifactorial processes the outcome of which depended on the variations of landscapes of food in space and time (Mueller & Fagan 2008).

Foraging patterns and food preferences of blackbuck have been studied in Rajasthan and southern India, but without relating feeding data to group activity patterns. Unlike chinkara *Gazella bennettii*, Blackbucks are not found in true deserts, but attain their highest densities in semi-arid grassland-scrub systems where they prefer short grasslands (<50 cm) and avoid wooded habitats and grasslands above shoulder height (Jhala

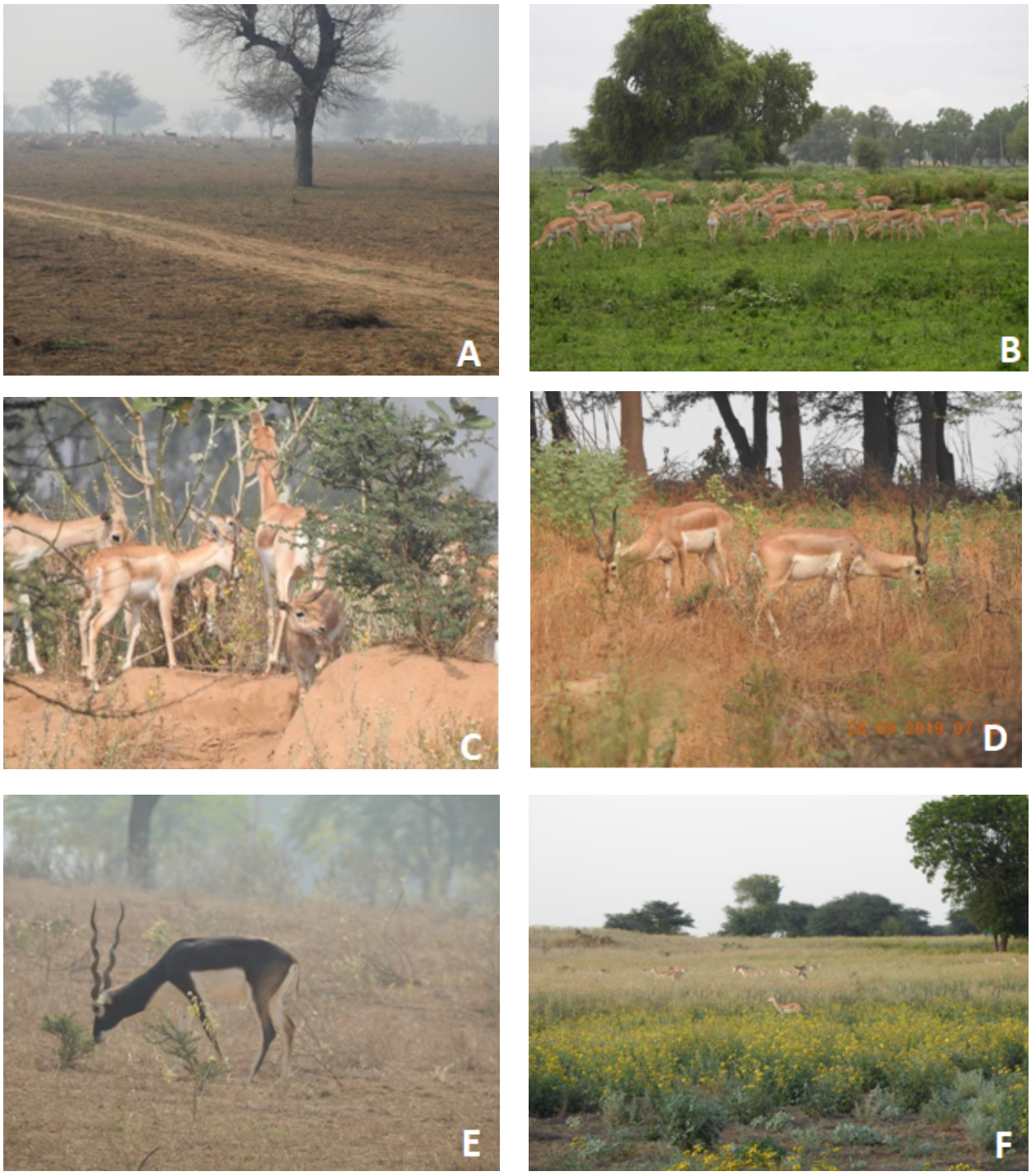

Image 1. A—Habitat view in February 2020 | B—Harem/family/mixed herd during monsoon season (July 2020) | C—Females foraging on *Calotropis procera* (late November 2019) | D—Two male blackbuck (age 2–3 years) nibbling on *Artemisia scoparia* (Autumn) | E—Adult male blackbuck browsing on *Acacia senegal* (late Autumn) | F—Habitat dominated with *Verbesina encelioides* in April 2020. © Vikram Delu.

1991). Their diet primarily consists of grasses so there is profound seasonality in their nutritional ecology. Pods and fallen leaves of trees such as *Acacia* species and *Prosopis juliflora* are favored in summer, and *Dichanthium annulatum* during monsoon season (Jadeja et al. 2013). Berseem *Trifolium alexandrinum* and oats *Avena sativa* are provided as food sources for blackbuck in captivity (Pathak et al. 1992). Foraging activity is at a minimum during summer, a little higher during winter and at a maximum during the monsoon season (Nair

1975; Chattopadhyay & Bhattacharya 1986; Kumar 1993). However, in this study foraging activity was slightly higher in summer than winter. Blackbucks have access to high quantity and quality forage during the monsoon (June–August) and early autumn (September) and in summer (March–April) coinciding with periods of maximum grass growth, the other months remain more or less dry to varying degrees.

Blackbucks are adapted to grassland ecosystems, and have evolved to conserve water by increasing the urea concentration in their urine and water reabsorption from their feces (Jhala et al. 1992). The protein content of the blackbuck diet drops significantly (<4%) in summer, well below the maintenance requirement for ruminants which is 5.5–9 % (Robbins 1983). During this period, protein digestibility is negative, i.e., Blackbuck loses more protein via feces than they can obtain from the forage. The digestibility of dry matter declines from a high of 76.5 % during the monsoon to a low of 32 % during summer. Blackbuck adapt to this low-quality diet by reducing intake from over 130g/kg 0.75 during the monsoon to less than 20g/kg 0.75 during summer (Jhala 1997).

During the present investigation the animals showed selectivity in food choices from available food in the habitat. It was also noted that blackbuck feed on *Calotropis procera* which is generally not eaten by herbivores due to the high concentration of alkaloids.

The present study suggests that the level of selectivity of food is not fully related to the dominance of plant species in a particular season. For example, *Verbesina encelioides, Parthenium hysterophorus* dominated in summer and *Verbesina encelioides* was the second most dominant in the monsoon but these plants were not the preferred food items of blackbuck. Similar variations in the diet of the Blackbuck have been reported in northwestern, central, and southern India and in parts of Nepal (Jhala 1997; Mahato et al. 2010; Jhala & Isvaran 2016).

Like most tropical ungulates, the body condition of Blackbuck cycles from good (during monsoon and autumn) to poor (during late summers and winter) due to the utilization of body fat and muscle proteins. To compensate their food requirements the animal shows physiological and behavioral adaptations by shifting to browsing instead of grazing and more crop raiding was reported during summer and winter. The feeding to walking ratio observed in the present study was higher in monsoon and autumn than in summer and winter and the number of crop raids were lower in monsoon and autumn than summer and winter. Our findings are supported by the observations of Hofmann (1989) that Blackbuck face a more prolonged period of low nutrition during hot summer and dry winter in comparison to other tropical ungulates studied in Africa as the dry spell in India lasts for over nine months as compared to 4–6 months in Africa. Blackbucks are unusual as they are relatively small (with correspondingly higher energy requirements) and have specialized on a low-quality forage source, i.e., grasses. A data set of the dietary preferences of mammalian species can be useful in elucidating a wide range of ecological processes, such as predator-prey interactions (Sinclair 2003; Jones & Safi 2011) and eco-morphological diversification (Davies et al. 2007).

CONCLUSION

The food preferences and behavior of a species are determined by the biogeographic region, climatic factors, food availability, prey-predator base and interspecific competition. Blackbuck diets are influenced by all these parameters. The present study is first of its kind in western Haryana on dietary choice, seasonality of available food items and behavioral shift from grazing to browsing by Blackbucks and will assist development of a scientific conservation plan for the many fragmented population of this species in and around Haryana. We would like to suggest that zoos of India which hold Blackbuck should include these preferred wild plant species in Blackbuck diet. The present study also emphasizes to the district and state authorities to notify and conserve this habitat as a community reserve and to include participation by local people to strengthen community-based wildlife conservation in the area.

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Hindi: कृष्ण मृग (*एंटीलोप सर्विकाप्रा*) की खाद्य वरीयताओं और समूह गतिविधि प्रतिरूप का मूल्यांकन करने के लिए, पश्चिमी हरियाणा के अर्ध-शुष्क पारिस्थितिकी तंत्र की एक खंडित आबादी का क्षेत्रीय सर्वेक्षण सितंबर 2019 से अगस्त 2020 के बीच, सुबह से शाम, वर्षभर हर ऋतु में पाक्षिक रूप से किया। समूह के आकार (3 से 72) और वनस्पति पर आंकड़े एकत्रित करने के लिए स्कैन सैंपलिंग और क्वाड्रैट विधियों का उपयोग किया गया तथा दृश्य अवलोकन के आधार पर यह पाया कि कृष्ण मृग अध्ययन स्थल से प्रलेखित कुल 53 पौधों की प्रजातियों में से 25 परिवारों की 26 प्रजातियों को विभिन्न प्राथमिकताओं के साथ खाते हैं। जिनमें उच्च औषधीय और चिकित्सीय मूल्यों वाली कुछ पौधों की प्रजातियों को प्राथमिकता दी गई जैसे *आर्टेमिसिया स्कोपरिया, कुकुमिस कॉलस, ज़िज़िफस जुजुबी* और *ज़िज़ीफस न्यूमुलेरिया*। अधिकांश शाकाहारी जीवों के विपरीत, कृष्ण मृग ने विषाक्त और औषधीय रूप से समृद्ध आक (*कैलोट्रोपिस प्रोसेरा*) का भी सेवन किया। हमारा सुझाव है कि जिन चिड़ियाघरों में काले हिरण है, वे इनके आहार में इन पसंदीदा जंगली पौधों की प्रजातियों को शामिल कर सकते हैं। समूह गतिविधि प्रतिरूप का विश्लेषण प्रति घंटा, मासिक तथा ऋतु आधार और समय प्रतिशत में परिवर्तित कर किया गया। भोजन की उपलब्धता बड़े पैमाने पर प्रभावित करते हुए देखा गया, मॉनसून में समूह भोजन गतिविधि अधिकतम (62%) और सर्दियों में न्यूनतम (50%) इसके बाद विश्राम सर्दियों में अधिकतम (21%) और मानसून में न्यूनतम (12%), था। भोजन /चलने का अनुपात मानसून में अधिकतम (5.2) और सर्दियों में न्यूनतम (3.1) था, जो आसपास के खेत में समूह देखे जाने की संख्या (सर्दियों में अधिकतम और मानसून में न्यूनतम) के साथ सहसंबद्ध था। जब जानवरों को प्राकृतिक आवास में भोजन की कमी का सामना करना पड़ता है तब वे फसलों को खाते हैं।

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Author contributions: VD & DS designed the research plan, DS guided the research. VD collected the field data and wrote draft of the manuscript. DS & SD analyzed the data and finalize draft of the manuscript. SD added scientific inputs and also advised during research and writing period. Priya and Kiran helped in data collection and manuscript writing.

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