

Food habits of Nilgai (*Boselaphus tragocamelus*) in Van Vihar National Park, Bhopal, Madhya Pradesh, India

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(Received: July 25, 2011; Accepted: September 27, 2011)

ABSTRACT

The food plants of nilgai (*Boselaphus tragocamelus*) were studied by direct field observations between July 2010 and June 2011 in Van Vihar National Park, Bhopal with an aim to explore the composition of diet, preferable browse plant species and seasonal variation in diet consumption. The results have shown that food plants of nilgai consists of diverse species of plants (123 plants species). On an average, grass formed major proportion (41.66%), followed by fallen leaves, flowers and fruits (36.00%), browse (16.66%) and herbs, shrubs etc (5.66%). Among the preferred browse species *zizyphus mauritiana* had the highest preference rating (5.5). The diet of the nilgai varied from season to season. Extension of the area of the National Park, creation of more grass plots and plantation of more trees would make more grass and browse species available to nilgai ultimately leading to an increase in its population.

Key words: Ungulate, nilgai, *Boselaphus tragocamelus*, food habits, mixed feeder, preference rating, Van Vihar National Park.

INTRODUCTION

Research on food habits of sympatric ungulates has not progressed in India as it has in Africa (e.g. Talbot and Talbot 1962, Gwyne and Bell 1968, Leuthold 1970, Bell 1971, Jarman and Sinclair 1979). In India, Schaller (1967) has listed the food plants of wild ungulates in Kanha. Berwick (1976) made cafeteria and field feeding trials on wild ungulates and cattle in Gir. Green (1985) has studied ungulate food habits in Kedarnath by faecal analysis. Haque (1990) studied wild ungulate food habits by direct observations on animals feeding and pellet analysis. Johnsingh and Sankar (1991) studied the food plants of wild ungulates and cattle in Mundanthurai based on direct field observations. Sankar (1994) studied the food habits of wild ungulates in Sariska by direct field observations. This paper describes the food habits of nilgai through direct field observations from July 2010 to June 2011 in Van Vihar National Park, Bhopal, Madhya Pradesh, India.

Study area

Van Vihar National Park is (23° 23'N and 77.36° E) situated about 7 km from Bhopal, the capital city of Madhya Pradesh. Declared a National Park in 1983, it covers an area of about 4.45 km². The area is plain and hilly. The park is maintained by the Forest Department of Madhya Pradesh. The park is situated on the fringe of upper lake, which is a Ramsar site and the lifeline of the capital city of Madhya Pradesh. The lake adds immense beauty to the landscape of Van Vihar. It is situated at the foot of the Shymla hill, which is one of the several hills constituting the geography of Bhopal. The climate is sub-tropical. Summers in the region are very hot and dry, and the maximum temperature in the region will range around 47.7° C. The minimum temperature during the summer months will range around 33° C. The winters are cold and dry, and the maximum temperature during this time will range around 25° C. The minimum temperature during the winter is as low as 9.1° C. The average rainfall is around 1146.7 mm.

According to Champion and Seth's classification, this area comes under the southern dry deciduous scrub forest with dry deciduous species. The main species include *Aegle marmelos*, *Acacia nilotica*, *A. leucophloea*, *Zizyphus mauritiana*, *Lagerstomia parviflora*, *Embica officinalis*, *Butea monosperma*, *Phoenix sylvestris* and *Terminalia tomentosa*. The wild ungulate species in Van Vihar National Park comprises of cheetal (*Axis axis*), sambar (*Rusa unicolor niger*), nilgai (*Boselaphus tragocamelus*), Black buck (*Antelope cervicapra*), chowsingha (*Tetracerus quadricornis*), chinkara (*Gazella gazella benneti*) and wild boar (*Sus scrofa*).

METHODS

Food habits of nilgai are often recorded by observing the plants eaten as the animal graze or noting the locations where animals grazed and later inspecting the site to see what plants were eaten (Wallmo et al. 1973). The first of these has been called the "grazing minutes" or "grazing seconds" method (Buechner 1950) and the second the "feeding site method" (Lovaas 1958). Feeding site method was applied to collect information on food plants eaten by the nilgai.

Four areas were selected for this study viz. grassland, savanna, scrubland and woodland. The area searched was same for all the four habitats about (1.5 km²). All the observations were covered on foot. The observer used a binocular Olympus 10X50 DPSI during feeding observations as and when required. When a feeding animal was located, it was observed from a distance of about 10 to 40 meters and recorded the food plants eaten. Then from radius of 5 m around the freshly eaten plant, the number of plant species available and eaten were recorded. Four hours in every day, two hours in morning and two hours in evening were spent on the feeding observations on nilgai. Observations began from July 2010 and end in the June 2011 in Van Vihar National Park, Bhopal, Madhya Pradesh.

Preference ratings for the food plants eaten were calculated by the methods described by the Petrides (1975). According to Petrides (1975), the preference value (P) of a food centers on 1.00 as a

reference point. Species with preference value above 1.00 are those which are sought out as preferred food. Ratings below 1.00 represent forage species which for some reason are neglected and species with a preference rating of exactly 1.00 are being eaten precisely in proportion to its abundance in the field.

RESULTS AND DISCUSSION

The diet of the nilgai consisted of diverse species of food plants. Nilgai in total used 123 plant species that include 37 trees, 34 herbs, 25 grasses, 14 shrubs and 13-creeper/ straggler (Table 1).

Out of total 496 feeding observations obtained on the nilgai between July 2010 to June 2011, it was studied that grass formed 41.66 percent, fallen leaves, flowers and fruits 36.00 percent, browse 16.66 percent and herbs, shrubs etc. 5.66 percent diet of the nilgai (Table 2). The mixed proportion of the diet confirms that nilgai antelopes are mixed feeders.

Studies on feeding habits of nilgai in Asia showed that they are browsers (Berwick 1974, Mirza and Khan 1975, Dinerstein 1979, 1980) or mixed feeders (Haque 1990, Sankar 1994) and in Southern Texas, they are grazers (Sheffield et al. 1983).

Among the preferred browse species of nilgai, *Zizyphus mauritiana* had the highest preference rating (5.5), followed by *Capparis sepiaria*, *Acacia nilotica* and *Z. nummularia* with preference ratings (2.6), (1.7) and (1.4) respectively (Table 3).

Nilgai avoided the vegetative parts of some herbs viz. *Cleome viscosa* and *Cassia tora*, but only their pods were utilized by the nilgai during winter season.

Fallen leaves and fruits of *Zizyphus mauritiana*, fallen flowers and fruits of *Butea monosperma* and fallen leaves of *Anogeissus pendula* and *Dalbergia sissoo* formed an important component in the diet of nilgai in December, January, March and April.

Table 1: Food Plants of Nilgai in Van Vihar National Park, Bhopal, Madhya Pradesh, India (July 2010 – June 2011)

L-leaf, Fl-flower, Fr-fruit.			
Trees		Part used	
<i>Acacia leucophloea</i>	L, Fr		<i>Aegle marmelos</i> L
<i>A. nilotica</i>	L, Fr		<i>Boerhavia diffusa</i> L
<i>A. senegal</i>	L, Fr		<i>Cassia tora</i> L, Fr
<i>A. catechu</i>	L		<i>Cleome viscosa</i> L, Fr
<i>Albizia lebbek</i>	Fr		<i>Corchorus aestuns</i> L
<i>Anogeissus pendula</i>	L		<i>C. olitorius</i> L
<i>Azadirachta indica</i>	L		<i>Carrisa carandus</i> L
<i>Balanites aegyptiaca</i>	L, Fr		<i>Catharine puscillus</i> L
<i>Bouhinia varigeta</i>	L		<i>Cenchrus olitorius</i> L
<i>B. malabarica</i>	L		<i>Cyanotis sp.</i> L
<i>Butea monosperma</i>	L, Fr		<i>C. Cristata</i> L
<i>Dalbergia sissoo</i>	L		<i>Elytrassia acaulis</i> L
<i>Dicrostachys cinerea</i>	L		<i>Euphorbia birta</i> L
<i>Dolichandrona faleala</i>	L		<i>E. Prostrata</i> L
<i>Ehretia leavis</i>	L		<i>Hemidesmus indicus</i> L
<i>Elaeodendron glaucum</i>	L		<i>Ipomea fistulosa</i> L
<i>Ficus sp.</i>	L		<i>Lagascae mollis</i> L
<i>F. glamerata</i>	L		<i>Lindbenbergia urticaefolia</i> L
<i>F. religiosa</i>	L		<i>Melochia corchorifolia</i> L
<i>F. retusa</i>	L		<i>Sida acuta</i> L
<i>F. benghalensis</i>	L		<i>S. veronicaefolia</i> L
<i>Embica officinalis</i>	L		<i>S. rhombifolia</i> L
<i>Lagerstomia parviflora</i>	L		<i>S. rhomboidea</i> L
<i>Lannea coromandelica</i>	L		<i>Solanum sp.</i> L
<i>Mangifera indica</i>	L		<i>S. xanthocarpum</i> L
<i>Mitragyna parvifolia</i>	L		<i>Tephrosia purpurea</i> L
<i>Meliosa tomentosa</i>	L		<i>Tridex procumbens</i> L
<i>Prosopis juliflora</i>	L, Fr, Fl		<i>Tribulus terrestris</i> L
<i>Pterocarpus marsupium</i>	L		<i>Xanthium indicum</i> L
<i>Pongamia pinnata</i>	L		Grasses
<i>Tamarindus indicus</i>	L		<i>Acrocera zizaniodes</i> L
<i>Terminalia bellirica</i>	L		<i>Allotropis cumiciana</i> L
<i>Phoenix sylvestris</i>	L, Fr		<i>Apluda varia</i> L
<i>Syzygium cumini</i>	L		<i>Bothriochloa pertusa</i> L
<i>Zizyphus mauritiana</i>	L, Fr		<i>Brachiaria distachya</i> L
<i>Z. xylopyra</i>	L, Fr		<i>B. refetans</i> L
<i>Z. jujuba</i>	L, Fr		<i>Cenchrus sp.</i> L
Herbs			<i>Cenchrus biflorus</i> L
<i>Ailanthus excelsa</i>	L		<i>Chloris barbata</i> L
<i>Andrographis echioides</i>	L, Fr		<i>Cyanodon dactylon</i> L
<i>Abutilon indicum</i>	L, Fr		<i>Cyprus sp.</i> L
<i>Ageratum conyzoides</i>	L		<i>Cynchrus setigerus</i> L
<i>Amarantus sp.</i>	L		<i>Dendrocalamus strictus</i> L
			<i>Dichanthium annulatum</i> L
			<i>Echinochloa colona</i> L
			<i>Eleusine indica</i> L
			<i>Hemarthria compressa</i> L
			<i>Heteropogon contortus</i> L
			<i>Leersia hexandra</i> L, Fr
			<i>Panium spp</i> L

Table 1: Contd.

<i>Paspalidium germinatum</i>	L	<i>Launaea sp.</i>	L
<i>P. punctatum</i>	L	<i>Rundia dumetorum</i>	L
<i>Paspallum conjugatum</i>	L	<i>Zizyphus nummularia</i>	L, Fr
<i>Seteria verticillata</i>	L	Creepers/Straggler	
<i>Saccharum spontaneum</i>	L	<i>Asparagus recemosus</i>	L
Shrubs		<i>Anagallis arvensis</i>	L
<i>Acacia jacquemontii</i>	L	<i>Alysicarpus monilifer</i>	L
<i>Calotropis gigantea</i>	L	<i>Cocculus hirsutus</i>	L
<i>Capparis decidua</i>	Fl, Fr	<i>Cuscuta hyalina</i>	L
<i>C. sepiaria</i>	L	<i>Ichnocarpus frutescens</i>	L
<i>Clerodendrum phlomidis</i>	L	<i>Ipomoea sp.</i>	L
<i>Flacourtia indica</i>	L	<i>Ipomoea pestigridis</i>	L
<i>Grewia flavescens</i>	L	<i>Luffa acutangula</i>	L
<i>G. Ovalifolia</i>	L	<i>Mucuna pruriens</i>	L
<i>Helicteres isora</i>	L	<i>Pavonia zeylanica</i>	L
<i>Holarrhena antidycentrica</i>	L	<i>Plumbago zeylanica</i>	L
<i>Indigofera tinctoria</i>	L	<i>Zizyphus oenoplia</i>	L

**Table 2: Food habits of Nilgai in Van Vihar National Park,
Bhopal, Madhya Pradesh (July 2010 – June 2011)**

Animal species	Total number of observations	% Grass	% Browse	Fallen leaves, flowers and fruits	% herb, shrub, creeper and straggler
Nilgai	496	41.66	16.66	36.00	5.66

Seasonal diet composition

In monsoon near about 166 observations have been done on the food habits of the nilgai. From these observations, it was observed that diet of the nilgai was dominated by grass species (80%), followed by browse (15%), herbs, shrubs etc. (2%) and fallen leaves, flowers and fruits (3%) as shown in the figure 1. In monsoon nilgai fed mostly on grasses because grasses are green and available in large quantity. Sankar (1994) reported that grass formed an important component of the diet of the nilgai during monsoon (>88.1%) in Sariska.

In winter about 170 feeding observations have been obtained on the nilgai. From these observations, it was observed that fallen leaves, flowers and fruits formed 45 percent; browse 20 percent, herbs, shrubs, creepers and stragglers 10

percent and grass 25 percent of the diet of the nilgai in winter (figure 1).

On the onset of winter grasses began to matured and reduced in growth. Nilgai fed mostly on grasses as long as green grasses are available in large quantity but switch over to browse and fallen leaves, flowers and fruits and grass when grasses become scarce e.g. in winter and summer.

In summer 160 feeding observations were made on the nilgai. It was observed from these observations that the diet of the nilgai did not vary much. Fallen leaves, flowers and fruits comprised 60 percent; browse 15 percent, grass 20 percent and herbs, shrubs, creepers and stragglers 5 percent of the diet of the nilgai during summer (Figure 1).

Table 3: Preference ratings and the dietary importance of browse species of Nilgai in Van Vihar National Park, Bhopal (July 2010-June 2011)

S. No.	Forage species	Quantities (A) Available	(R) Removed	(a) Available	(d) Diet	(P) rating Preference
1	<i>Zizyphus mauritiana</i>	887	60	4.1	22.6	5.5
2	<i>Capparis sepiaria</i>	634	41	5.8	15.4	2.6
3	<i>Acacia nilotica</i>	531	33	6.9	12.4	1.7
4	<i>Zizyphus nummularia</i>	517	28	7.1	10.5	1.4
5	<i>A. Leucophloea</i>	410	26	9.0	9.8	1.0
6	<i>Grewia flavescens</i>	277	25	13.3	9.4	0.7
7	<i>Butea monosperma</i>	198	19	18.7	7.1	0.3
8	<i>Capparis decidua</i>	123	18	30.1	6.7	0.2
9	<i>Prosopis juliflora</i>	88	9	42.1	3.3	0.07
10	<i>Phoenix sylvestris</i>	46	7	80.6	2.6	0.03
	Total	3711SA	265SR			

A= SA/A, d= 100 R/SR, P= d/a

Sankar (1994) reported that browse, fallen leaves, flowers and fruits and grasses are contributed to the diet of the nilgai during summer and winter seasons in Sariska.

The results of the present study are in close agreement with the generalizations made by Sankar (1994).

In May and June months when the grasses are scarce, green fodder produced in the fodder farm like *Chrysopogan fulvus*, *Themeda triandra*, *Heteropogon contortus*, *Dicanthium annulatum*, *Chloris dolichostachia* and wheat husk produced from market is provided as a supplement.

The plant species like *Butea monosperma*, *Zizyphus mauritiana*, *Acacia nilotica*, *A. leucophloea*, *Anogeissus pendula*, *Prosopis Juliflora*, *Terminalia bellirica* etc. are distributed only in some spots in the whole National Park. The estimated population of the nilgai in the National Park is 70-100 animals. Besides, there are 200-230 sambar, 600-700 cheetal, 25-50 black buck and 50-100 wild boar. Extension of the area of the National Park, creation of more grass plots and plantation of the above mentioned trees would make more food and space

available to wild ungulates which ultimately leading to an increase in its population.

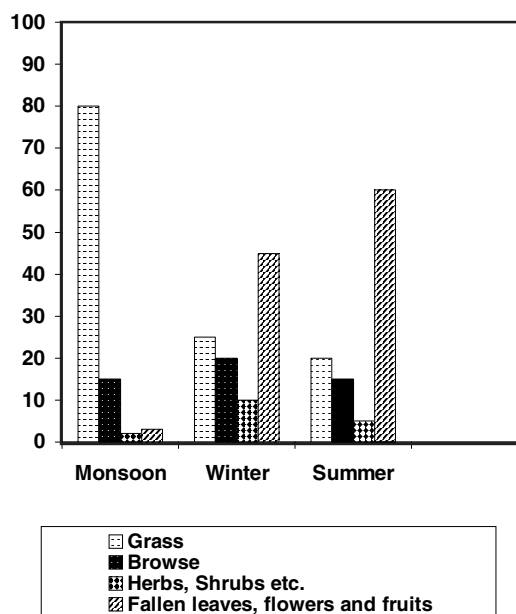


Fig. 1: Seasonal variation in the diet of Nilgai in Van Vihar National Park, Bhopal, Madhya Pradesh (July 2010 – June 2011)

ACKNOWLEDGEMENTS

We would like to thank Principal Chief Conservator of Forests (Wildlife), Madhya Pradesh for having permitted to work in Van Vihar National Park, Bhopal, Director and Assistant Director of Van Vihar Park for their help and guidance in the

research work. We thank to Dr. Showkat Khan, professor, Department of Botany, Safia Science College, Bhopal for plant identification, Dr. Yogash Dubey, professor, IIFM, Bhopal, Dr. K. Sankar and Dr. Bilal Habib, professors, Wildlife Institute of India, Dehradun for guidance in data collection.

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