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Food habits of dhole *Cuon alpinus* in tropical forests of southern India

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The food habits of dhole were evaluated in the tropical forests of Silent Valley National Park (SVNP) from December 2011 to May 2012 by analysing their scats. Eleven prey species were identified. Sambar was found to be the principal prey species for dhole as inferred from the relative biomass consumption of prey remains in dhole scats. Regarding prey biomass contribution, sambar was highest (66.74%) while grey jungle fowl was the lowest (0.32%). The aim of this study was to assess the food habits of dhole co-existing with large predators, tiger and leopard in the tropical forests of SVNP.

Keywords: Dhole, food habit, prey species, scat analysis, SVNP.

DHOLE is a terrestrial, ‘pack-living’ cursorial hunter, known as a voracious feeder which disembowels the prey¹. Its distribution ranged from Siberia in the north,

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India in the west, Java in the south and China in the east²⁻⁴. Historically dhole dominated large parts of alpine, temperate, tropical and subtropical forests of Asia. Due to habitat fragmentation and several other anthropogenic pressures, its distribution range has been limited to a fraction^{5,6}. Several studies in India suggested that dholes primarily feed on medium to large ungulates and hunt smaller prey as well^{4,7-10}. Although studies on the food habits of dhole have been documented in many protected areas of India, most of these studies are from those areas which support higher densities of large and medium-sized prey species, while little information exists on the diet of dhole typically in evergreen forests having low densities of terrestrial herbivores. Nilgiri langur was found to be the most abundant prey species with a density of 9.91 ± 1.44 animals/km² followed by lion tailed macaque 9.76 ± 0.99 , bonnet macaque 8.32 ± 2.13 , sambar 5.51 ± 1.63 , gaur 3.97 ± 1.79 , muntjac 3.64 ± 0.2 and grey jungle fowl 3.56 ± 0.28 . The least abundant prey species was malabar giant squirrel 1.97 ± 0.19 animals/sq. km¹¹. Due to several compelling factors such as challenging undulating terrain, low permeability due to the dense vegetation and the time constraints to ensure uniform coverage of the entire study area, an intensive area of 48 sq. km of the park was selected for the study. This area was selected such that it represents all major habitat types of the park. The vegetation of the entire area is shielded from extremes of the climate due to the presence of high mountains of Western Ghats on all sides. The landscape of the park is highly undulating with high and continuous ridges along its north-eastern boundary. Most of the area of the national park is covered with dense tropical wet evergreen forests. Grasslands are confined to limited areas, Kunthipuzha in the west and on higher slopes in the east. Therefore, the study was intended to determine the baseline information on feeding habits of dhole inhabiting the dense tropical forests of Silent Valley National Park (SVNP), where it co-exists with two large carnivores, tiger (*Panthera tigris*) and leopard (*Panthera pardus*). Multiple predator species not only compete for shared prey but also pose direct threats to each other in most of the ecosystems. These intraguild interactions play a key role in structuring carnivore community. Although some studies suggest that ecological factors are the primary factors in structuring the predator communities in tropical forests¹², the role of behavioural factors cannot be ruled out as they are poorly understood. Although the feeding habits of tiger and leopard were not studied, understanding these is critical to the development of conservation and management plans for the lesser predator, dhole in comparison to large predators such as tiger and leopard in the tropical forests of India where they co-exist.

The present study was conducted in an intensive area of 48 sq. km that represented all the major habitat types of the Silent Valley National Park (92 sq. km), (11°00' to 11°15'N and 76°15' to 76°35'E), Kerala between Decem-

ber 2011 and May 2012 (Figure 1). The vegetation of this region comprises tropical evergreen forests, tropical semi-evergreen forests, moist deciduous forests, sub-tropical temperate forest (Sholas) and grasslands¹³. SVNP, due to its typical geographic setting, receives plenty of rainfall during both the south-west and north-east monsoons, with a recorded mean annual rainfall of 4400 mm. The park experiences a mean annual temperature of 20.2°C. The potential ungulate prey species found in the study area are sambar (*Rusa unicolor*), muntjac (*Muntiacus muntjak*), wild pig (*Sus scrofa*), mouse deer (*Moschiola indica*), Nilgiri tahr (*Nilgiritragus hylocrius*) and gaur (*Bos gaurus*). Apart from dhole, tiger, leopard, jungle cat (*Felis chaus*), brown palm civet (*Paradoxurus jerdoni*) and small Indian civet (*Viverricula indica*) are the other carnivores present in the study area. Asian elephants (*Elephas maximus*) are distributed throughout the park. Bonnet macaque (*Macaca radiata*), Nilgiri langur (*Trachypithecus johni*) and lion-tailed macaque (*Macaca silenus*) are the primate species found in the study area. The other prey species are Indian porcupine (*Hystrix indica*), malabar giant squirrel (*Ratufa indica*), black naped hare (*Lepus nigricollis*) and grey jungle fowl (*Gallus sonneratii*).

Scat analysis was used to determine the food habits of dhole^{10,14-16}. Scats of dhole were collected according to requirements whenever encountered in an intensive study area during the study period. On the basis of size and other secondary characteristics such as pug marks and scrapes, dhole scats were differentiated from other carnivore species. Dhole scats differ from collective defecation 'dung pile'⁶. This is not reported in domestic dog and jackal and could be distinguished readily from the scats of the two felids, which were larger, stickier and deposited on grass¹⁷. Since there were no other canid species in the study area, dhole scats were easily identified. To ensure that scats were from independent feeding events, only one scat was collected from a latrine site. A total of 70 scats samples were collected and analysed. After drying, the scats were preserved in a tagged polythene bag and later washed thoroughly using a 1 mm sieve. The undigested prey remains such as hairs, bones, hooves, feathers, quills, claws, etc. were separated and used to identify the prey species^{18,19}.

The biomass consumed and the number of individual prey species consumed by dhole were estimated using the regression equation: $Y = 0.035 + 0.02X$ (ref. 20), where Y is the prey consumed per field collectible scat and X is the average weight of an individual of a particular prey type. The average body weight of each prey species was taken from the available literature^{8,21}.

The remains of 9 prey species were identified in 70 scats of dhole, of which 59% had single prey item, 30% had two prey items and 11% had three prey items. Frequency of occurrence and percentage frequency of occurrence of prey remains in dhole scats were calculated

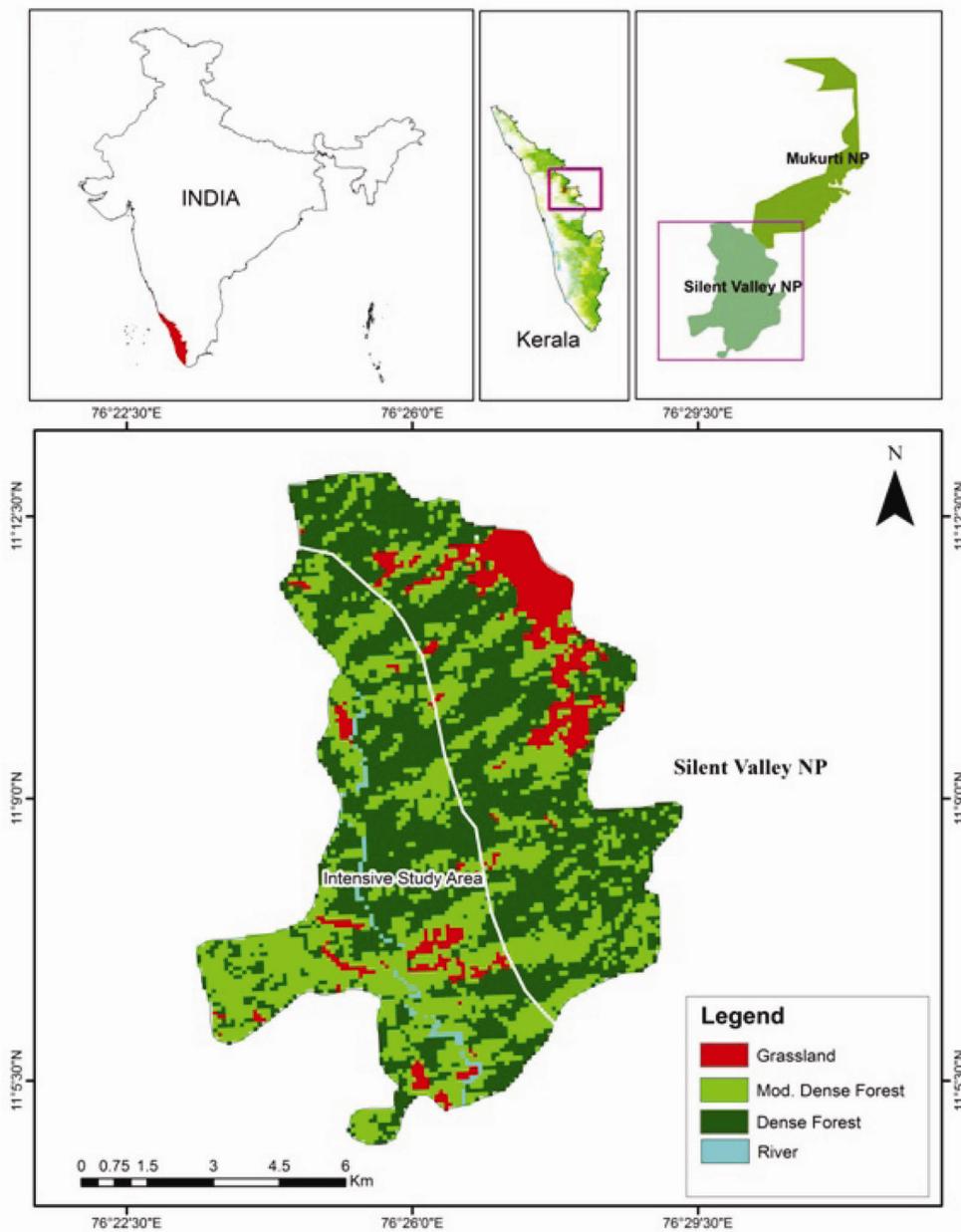


Figure 1. Location of intensive study area in Silent Valley National Park.

Table 1. Frequency of occurrence (*A*), relative biomass consumed (*D*) and relative number of prey individuals consumed (*E*) by dhole, based on 70 scats. The correction factors (*Y*) were derived using regressions of Floyd *et al.*²⁰ ($Y = 0.35 + 0.020X$). Average unit weight of prey species (*X*) were taken from Karanth and Sunquist⁸

Prey species	<i>X</i> (kg)	<i>A</i> (%)	<i>Y</i> (kg/scat)	<i>D</i> (%)	<i>E</i> (%)
Sambar	70	55.71	1.43	66.72	31.47
Mouse deer	5	25.71	0.13	2.89	19.13
Nilgiri langur	8	14.29	0.19	2.32	9.59
Wild boar	31	10.00	0.65	5.46	5.82
Hare	3	24.28	0.09	1.92	21.18
Nilgiri tahr	90	7.14	1.83	10.94	4.01
Gaur	75	5.71	1.53	7.32	3.22
Barking deer	20	5.71	0.43	2.07	3.42
Birds	1	2.85	0.05	0.13	4.33

Table 2. Frequency (%) of prey species in dhole scat in Indian subcontinent

Species	Present study	KMTR	Pakke TR	MTR	BTR	Pench	NGRTR	STR
Sambar	55.71	30.77	17.79	16.85	8.8	40.6	11.1	46.97
Cattle	–	10.26	3.06	0.34	–	1.7	–	–
Wild pig	10.0	23.08	52.14	0.42	6.6	0.1	8.6	0.06
Gaur	5.71	2.56	4.2	1.01	0.5	0.1	2.2	–
Nilgiri tahr	7.14	2.56	–	–	–	–	–	–
Langur	14.29	7.69	–	1.6	0.45	2.6	0.4	4.55
Chital	NP	2.56	–	70.85	66.8	50.5	54.1	30.3
Barking deer	5.71	3.85	17.79	0	2.2	–	24	1.52
Mouse deer	25.71	6.41	NP	3.2	0.5	–	4.7	–
Rodents (hare)	24.28	6.41	1.22	2.95	–	1.9	–	40.97
Jungle fowl	2.86	3.85	2.1	0.42	–	–	–	1.52

Present study, KMTR, Kalakad Mundanthurai²⁴, Pakke²²; MTR, Mudumalai Tiger Reserve¹⁰; BTR, Bandipur Tiger Reserve²⁵; Pench Tiger Reserve⁴; NGR, Nagerahole²⁶ and Satpura TR⁹.

(Table 1). Sambar remains were found to be 36.79% in dhole diet followed by mouse deer (16.98%), hare (16.03%), nilgiri langur (9.43%), wild boar (6.60%), Nilgiri tahr (4.71%), gaur (3.77%), muntjac (3.77%) and grey jungle fowl (1.88%). Sambar, mouse deer and hare contributed maximum (67.92%) to the diet of dhole (Table 1). In terms of biomass consumed by dhole, sambar contributed the most (66.74%), followed by nilgiri tahr (10.94%), gaur (7.32%), wild boar (5.46%), mouse deer (2.89%), nilgiri langur (2.32%), muntjac (2.07%), hare (1.92%) and grey jungle fowl (0.32%) (Table 1).

Sambar was found to be the principal prey species for dhole in tropical forest of SVNP as inferred from the relative frequency of occurrence (36.79%) and relative biomass consumed (66.74%) (Table 1), which is similar to the findings reported from Kalakad-Mundanthurai Tiger Reserve²² and Satpura TR⁹. Similar studies in Mudumalai Tiger Reserve^{8,10,17,23} in south India have indicated chital as the preferable prey for dhole whereas, this is not the case in our study as chital is not present in SVNP (Table 2). Considering the relative biomass consumed, Nilgiri tahr was found to be the second principal prey species followed by gaur, wild boar, mouse deer, nilgiri langur, muntjac, hare and grey jungle fowl. Nilgiri tahr is the second most preferred prey species for dholes in SVNP which contradicts all the previous studies conducted in India which might be due to the absence of medium sized prey (chital) in the study area. When compared with other studies, common hare was consumed in significant amount in Mudumalai Tiger Reserve⁶ and Satpura Tiger Reserve⁹, whereas in the present study, its contribution to the dholes diet was low. Mouse deer was consumed in higher amount in Mudumalai Tiger Reserve¹⁰ contrary to its negligible consumption in the present case. Wild pig and langur were the other prey species found in dhole scats in SVNP. The rugged terrain and thick cover of the study area might be the reasons which rendered these agile and fast-moving species less available for dholes. The presence of gaur remains in dhole scats could not be

confirmed weather it was due to predation or scavenging behaviour of dholes⁴. This study provided baseline information on the food habits of dhole in this particular landscape. There is need for detailed study on the feeding ecology of other two sympatric carnivores of the study area to get a better understanding of the functioning of this ecosystem. We also need more studies to understand the foraging ecology of dhole in SVNP, southern India.

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