

Winter diets of Hangul-deer (*Cervus elaphus hanglu* Wagner) at Dachigam National Park, Kashmir

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Abstract

Pellet and rumen of hangul-deer in the Dachigam National Park were analysed to determine their food habits. Seventeen plant taxa were identified in the diet. Buds, dry leaves and soft shoots of *Parrotiopsis jacquemontiana*, *Jasminum humile* and *Arthraxon lanceolata* were found to be the most important items in the food of the deer.

Key words: Hangul, Dachigam, winter diet, pellet, rumen, browse.

1. Introduction

Cervus elaphus hanglu Wagner, popularly known as 'hangul', is the only close relative of the European red deer (*Cervus elaphus elaphus* Linnaeus) in the Himalayas. Up to the middle of the present century the deer was quite abundant and distributed widely in the mountains of Kashmir. However, due to excessive hunting and habitat destruction its population decreased continuously and the animal came to the verge of extinction in late 60's, when Schaller¹ and Holloway² gave figures between 140 and 180 animals. At present, the hangul is a threatened species and has been brought on the Red Data Book of the International Union for Conservation of Nature and Natural Resources and the Government of Jammu and Kashmir has taken several steps to save this beautiful animal from total extinction. These measures have resulted, to some extent, in an increase in the deer population and the latest census carried out by the Directorate of Wildlife Preservation, Jammu and Kashmir, has put the number of

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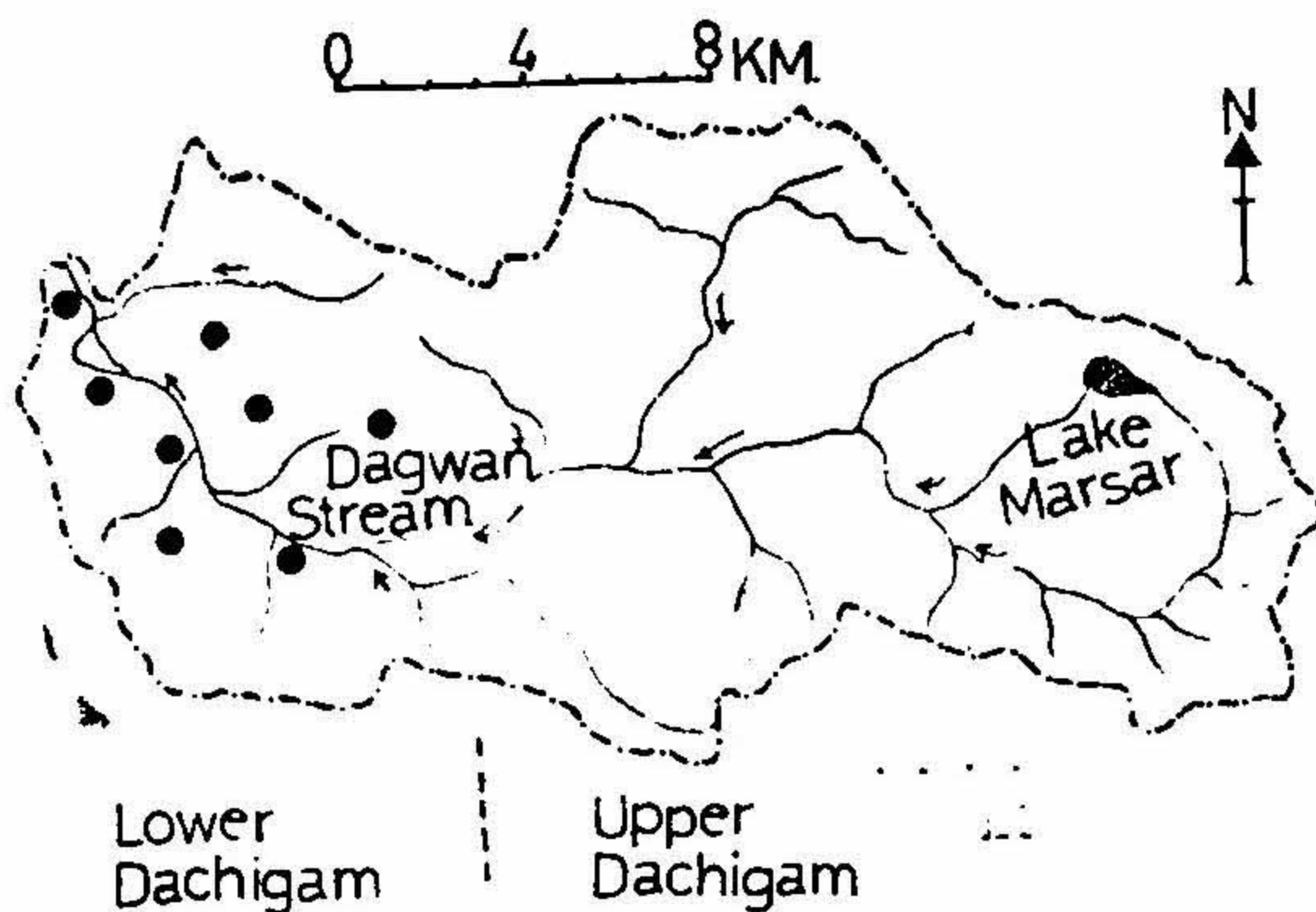


FIG. 1. Outline map of Dachigam National Park.
●● = Sampling sites.

deer in Dachigam at 430 heads. In addition, some 30 animals have been reported from Sindh Valley, Tral, Shikargah, Overa, Lidder Valley, Drass Valley, Bandipur, Kishwar and Desu Valley³.

The mere ban on the killing of the hangul will not, however, save this animal from extinction. The environment should be conducive for its survival and different life activities. In this connection, studies pertaining to its biology, like feeding and breeding biology, and ecology are of prime importance. Whereas a lot of work has been done on the various aspects of *Cervus e. elaphus*^{4,5}, very little is known about its cousin, the hangul (*Cervus e. hanglu*). The present contribution enumerates food and feeding behaviour of hangul and is based on data collected from the pellet and rumen analyses of deer for December, 1981 and January and February, 1982.

2. Study area

The Dachigam National Park lies about 20 km to the north of Srinagar and has almost a rectangular shape, being 22 km long and 8 km wide (fig. 1). It is approximately located between 34° 8' and 34° 14' N and 74° 57' and 75° 04' E and occupies an area of about 141 sq. km, its altitude varying from 1,700 to 3,000 m A.M.S.L. The park is roughly divisible into two parts, lower Dachigam (Dagwan Valley) in the west, which comprises approximately one-third of the area and the upper Dachigam in the higher reaches in the east. The mountain ranges enclosing Dachigam are a part of Zaskar range. Two steep ridges, one rising from near Harwan reservoir and another east of New Thid, form the natural boundaries of the park⁶. Dagwan stream, having its origin in Marsar Lake, continues through the park into the

Harwan reservoir and is fed along its course by a network of mountain drains running through the gulleys.

Dachigam experiences a sub-mediterranean type of climate with large inter-yearly variations in the amount of precipitation and exhibits a variety of vegetational types⁷. The mountain slopes and the catchment area of the stream support mostly natural vegetation, whereas parts of ravine support a mixture of planted and the natural elements.

During colder months (November–March) the hangul remains mainly concentrated in the lower Dachigam area but as soon as the vegetation starts to grow in spring it migrates to the upper Dachigam area. Besides the hangul, several other wild mammals and birds are reported to live in the park, important ones being, Brown bear (*Ursus arctos isabellinus*), Himalayan black bear (*Selenarctos thibetanus*), Musk deer (*Moschus moschiferus*), Leopard (*Panthera pardus*) and Serow (*Capricornis sumatraensis*) and Monal pheasant (*Lophophorus impaganus*) and Ram Chakor (*Tetragallus himalayensis*).

3. Material and methods

Pellets, used to determine different food items of the hangul, were collected on a weekly basis during the winter months of December, 1981 and January–February, 1982, from different sites in lower Dachigam area (fig. 1). Analysis was carried out according to the method of Satakopan⁸. A fixed number of pellets were thoroughly mixed and ground loosely to separate the agglomerates into single particles. The material was then sieved through a series of sieves of different mesh size. Bits of leaves, etc., obtained from screening were boiled in a chloral hydrate solution for a few minutes till they became transparent. The material was then washed repeatedly in distilled water till chloral hydrate was completely removed. After dehydrating through grades of alcohol and xylol, the material was mounted in canada balsam.

Reference slides were prepared for the identification of unknown dietary elements in the pellets. For this purpose, bits of leaves, soft shoots, buds, etc., from plants collected from the same area were processed just like unknown samples through chloral hydrate and other steps.

Feeding behaviour of the hangul was observed in the feeding grounds with the help of 8 × 30 field binoculars and the plants fed by the animal were identified on the spot with the help of available literature⁷.

In addition to the pellet analysis, rumen contents of four hangul-deer which died as a result of leopard attacks on 19th December 1981, 6th, 18th and 25th January, 1982, were also examined for the food items according to the method of Korschgen⁹.

4. Results

During the course of present studies, 106 pellet groups and four rumena of the hangul were analysed. Number and percentage of pellet groups and rumena containing each particular food item are given in Tables I and II.

Table 1

Percentage frequency of pellet groups of hangul having different food items

Type of food	Months			Part consumed
	December 1981	January 1982	February 1982	
No. of pellet groups	30	48	28	
<i>Parrotiopsis jacquemontiana</i>	97	95	100	Soft stem, bud
<i>Jasminum humile</i>	82	83	85	Stem, leaf
<i>Arthraxon lanceolata</i>	85	80	12	Whole plant
<i>Berberis lycium</i>	45	47	75	Leaf
<i>Anthriscus</i> sp.	73	43	45	Shoots
<i>Rosa webbiana</i>	72	41	19	Leaf
<i>Rosa mac ophylla</i>	70	39	13	Leaf
<i>Artemisia</i> sp.	30	35	46	Shoots
<i>Rubus ulmifolius</i>	40	36	20	Leaf
<i>Prunus tomentosa</i>	29	33	35	Stem, dry leaf
<i>Salix</i> sp.	32	35	9	Dry leaf
<i>Clematis</i> sp.	37	38	19	Stem
<i>Morus alba</i>	45	40	0	Dry leaf
<i>Hedera nepalensis</i>	41	19	17	Leaf
<i>Jasminum</i> sp.	24	7	2	Stem, dry leaf
<i>Quercus rober</i>	21	6	0	Dry leaf
<i>Celtis australis</i>	25	8	0	Dry leaf
Miscellaneous	20	15	5	

Table II
Number and percentage of hangul rumen having different food items

Type of food	Frequency of occurrence		% composition of the diet
	No. of deer	%	
<i>Parrotiopsis j. cquemontiana</i>	4	100	13.3
<i>Loranthum humile</i>	4	100	12.2
<i>Arctoxon lanceolata</i>	3	75	8.6
<i>Berberis lycium</i>	4	100	8.2
<i>Achrisca</i> sp.	3	75	8.0
<i>Lana webbiana</i>	4	100	6.7
<i>Lana macrophylla</i>	4	100	6.1
<i>Artemisia</i> sp.	3	75	5.4
<i>Salix umifolius</i>	2	50	4.9
<i>Prunus tomentosa</i>	2	50	5.2
<i>Salix</i> sp.	2	50	3.7
<i>Oenanthi</i> sp.	3	75	4.6
<i>Urtica alba</i>	2	50	4.4
<i>Edera nepalensis</i>	2	50	3.8
<i>Laminum</i> sp.	1	25	1.6
<i>Quercus rober</i>	1	25	0.7
<i>Celastris australis</i>	1	25	1.6
Miscellaneous	4	100	1.0

A perusal of the data reveals that *Parrotiopsis jacquemontiana* was the most important browse species both in the proportion of frequency of occurrence (95–100%) and in overall composition of the diet in the rumen (13.3%). The second most heavily preferred species was *Jasminum humile* with an average composition of 12.2% and a frequency occurrence of over 80%. *Arthraxon lanceolata* was eaten throughout winter, especially in December and January when it was present in over 80% of the pellet samples. Its overall contribution to the diet (as per rumen analysis) was 8.6%. *Berberis lycium* occurred in 45–75% of the samples in three months and composed about 8.2% of the rumen contents.

Anthriscus sp., *Rosa webbiana* and *Rosa macrophylla* were common food items in December, when they were recorded in 70% or more of pellet samples but in the next two months their frequency of occurrence in the pellet samples decreased to 13–45%. They accounted for 8.0, 6.7 and 6.1% of the food intake respectively. Other species having a frequency of 15–50% in the pellets were *Artemisia* sp., *Rubus ulmifolius*, *Prunus tomentosa*, *Clematis* sp. and *Hedera nepalensis*. Dry leaves of *Salix* sp. and *Jasminum* sp. were also recorded in about one-third of the pellet samples but in February, when there was a considerable cover of snow, the frequency occurrence of these species decreased greatly. Similarly frequency occurrence of leaves of *Morus alba*, *Quercus rober* and *Celtis australis*, which were recorded in 21–45% of the samples in December, decreased in the following month and were totally absent in February.

In addition to the above plant species, some unidentifiable food items and sand particles were also recorded in the pellets. Comparatively lesser number of plant species were encountered in the pellets in late January and February than the rest of the collection period.

The hangul feeds in small groups of both sexes during night, early morning hours and late afternoon and very few animals were seen moving or feeding between 0900 h and 1530 h. High feeding activities were observed before 0830 h and after 1600 h.

5. Discussion

In spite of the fact that the present data do not give any indication of the seasonal variation of the diet of the hangul, they do throw some light on the winter food of this animal. Kurt¹⁰ lists ten plants, viz., *Jasminum*, *Desmodium*, *Prunus*, *Indigofera*, *Viburnum*, *Rubus*, *Rosa*, *Parrotiopsis*, *Fraxinus* and *Robinia* which were used by the hangul as its food in the Dachigam National Park. His study revealed *Fraxinus hookeri* and *Jasminum humile* to be the most preferred food items during February and March. Our investigations indicate that the winter diet of hangul consists of seventeen identifiable plant species of herb, shrub and tree categories. Most preferred food items of the deer during the present study were *Parrotiopsis Jacquemontiana*, *Jasminum humile* and *Arthraxon lanceolata* which were recorded in 80–100% of the pellet samples.

Fraxinus hookeri, reported by Kurt¹⁰, is very rare in the lower Dachigam area and was not recorded from any rumen or pellet sample.

During winter months, variations in the frequency occurrence of different dietary elements of the hangul in the park seem to be greatly influenced by the extent of the snow cover. Such a supposition is confirmed by the fact that *Salix* sp., *Morus alba*, *Jasminum* sp., *Quercus rober* and *Celtis australis* were very rare or totally absent in the pellet samples in late February as the fallen leaves of these plants which are used as food by the hangul were covered by the snow. At this time the main items of the diet were buds and shoots of plants which remained erect in the snow, viz., *Parrotiopsis jacquemontiana*, *Jasminum humile* and *Berberis lycium* which were recorded in more than 50% of the pellet samples. Besides the plant matter, sand particles formed an appreciable part of the pellets, which seems due mainly to drinking of fast flowing water from Dagwan stream and its tributaries.

On account of differential digestibility of soft and hard foods, a number of problems are inherent in studying the diet of large herbivores. As Jackson¹¹ has stated the results on the dietary items of the mammals based on pellet and rumen analysis might be biased in favour of coarser material. However, as the present data pertain to winter only when the ratio of the soft material, such as green leaves, in the food is very low, chances of bias are less. Further, as our results from the pellet and rumen analysis have been confirmed by the direct observations on the feeding behaviour of the animal, these can fairly be taken as indicative of the relative importance of different dietary items. On this basis, it may be concluded that the hangul browses on the dry leaves, buds and soft shoots of plants during winter and the grasses are of low importance. Hunt¹² has also found the browse to be main dietary item of elk (*C. elaphus*).

Impact of wood cutting and other disturbances on the deer population in the Dachigam is well known^{7,10}. Several plant species, like *Parrotiopsis jacquemontiana*, etc., besides providing food for the hangul during winter, form not only palatable foliage for the cattle but also good fuel. Whereas the grazing in the park has been almost completely checked, removal of the bushes and felling of trees for the firewood and construction purposes goes on unnoticed. In order to maintain suitable food available for the hangul in winter, the destruction of their habitat, must be completely stopped.

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