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STATUS AND CONSERVATION OF HANGUL (*CERVUS ELAPHUS* HANGLU) IN ITS RELIC RANGE AREAS OUTSIDE DACHIGAM NATIONAL PARK, KASHMIR

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ABSTRACT

The present paper reports population of Kashmir red deer or hangul (*Cervus elaphus* hanglu) outside Dachigam National Park accentuated by habitat suitability assessment. Study results indicate that hangul is restricted to an effective area of 351.15 Km.^{2} outside Dachigam National Park. The overall mean hangul encounter rate outside Dachigam was 0.043 hangul/kilometer walk. The overall hangul sex ratio outside Dachigam was 11.81 males/100 females and the fawn to female ratio was 5.93 fawn/100 females. The overall hangul density outside Dachigam turned out to be 0.49 hangul/Km^2. The isolated hangul population outside Dachigam NP and the fragile habitats therein need immediate attention for their effective management and long term conservation. Overa Wildlife Sanctuary and Shikargah Conservation Reserve are considered the alternate potential reintroduction sites for establishing a second viable hangul population outside Dachigam National Park. There is an urgent need for early initiation of the hangul conservation breeding programme for reintroduction/ repopulating existing good habitats in the hangul relic areas, beginning with the Shikargah-Overa ranges in Lidder Valley. Development of a scientific based programme for regulated monitoring of these relic hangul populations and to identify ideal corridors to help dispersion of Hangul.

Key words: Hangul, *Cervus elaphus hanglu*, Encounter rate, Sex ration, Population size, Density, Dachigam National Park

Introduction

The Kashmir red deer or hangul (*Cervus elaphus hanglu*), a critically endangered deer is one of the four eastern most subspecies of red deer (*Cervus elaphus*) found in Asia. The subspecies is endemic to Kashmir mountains in the north-western himalayas of India. As per shikar map of Kashmir prepared by Late Mr. Hari Singh - the then Maharaja of Jammu and Kashmir, the hangul was once distributed widely in the mountains of Kashmir along the Zanskar mountain ranges in an arc of an area of c. 65 km (40 mile) width in north and east of Jhelum and lower Chenab rivers, extending from Karen in Kishenganga. catchment over to Dorus in Lolab valley and Erin catchments in Bandipora in the north to the lower Chenab river basins in the south through the present day Baltal-Thajwas Wildlife Sanctuary (WS), Tral Conservation Reserves (Shikargah/Panner, Khiram), Overa-Aru WS, Desu WS, Rajpariyan (Daksum) WS and Marwah/Wadwan in Kishtwar High Altitude NP. Gamagul Siya- Behi Sanctuary in Himachal Pradesh also had few hangul outside Jammu and Kashmir in the past (Holloway, 1971).

However, the distribution range as well as populations of hangul drastically declined from 3000-5000 individuals in 1900 and *c.* 2,000 in 1947 to not more than 180 individuals in 1969 (Schaller, 1969) and 140-170 in 1970 (Holloway, 1971). During the recent years, there has been a marginal decline in the hangul population in Dachigam N.P and adjoining areas from 146 and 249 individuals in 2004 to 117 and 190 animals in 2006 and between 170 and 190 animals in 2008. The decline in hangul population is presumed to be possibly a reflection of the continued degradation of Hangul's summer habitat in upper Dachigam and irregular biotic interference in its winter habitats in lower Dachigam (Holloway, 1971; Kurt, 1978), besides low breeding and poor young survival rate accentuated by poaching from the adjoining areas and possibly predation by leopard (Ahmad, 2006; Qureshi *et al.,* 2009; Ahmad *et al.,* 2009).

Many scholars in the past (Schaller, 1969; Holloway, 1971; Holloway and Wani, 1971; Holloway *et al.,* 1970; Kurt, 1976; Kurt, 1978; Kurt, 1979; Anon., 1985; Inayatullah, 1987; Ahmad *et al.,* 2003; Qureshi and Shah, 2004; Ahmad *et al.,* 2005; Iqbal *et al.,* 2005; Ahmad, 2006; Ahmad *et al.,* 2009; Qureshi *et al.,* 2009) have estimated hangul populations. However, past efforts have been restricted to Dachigam National Park and populations surviving outside Dachigam National

Overa Wildlife sanctuary and Shikargarh conservation reserve were found suitable for reintroduction of hangul outside Dachigam National Park.

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Park remained unknown. We, therefore, conducted surveys to generate baseline data on hangul population status and current distribution for long term survival of isolated hangul populations occurring outside Dachigam National Park.

Methods

The surveys were conducted in 35 survey units in the Hangul's past distribution range (Pre, 1947) outside Dachigam National Park on regular basis 3-4 times a month in different day hours on rotational basis. The areas covered include Surfraw and Akhal forest blocks under Sindh Forest Division, Baltal-Thajwas Wildlife Sanctuary and Wangath Conservation Reserve, Brein, Nishat and Cheshmashahi Conservation Reserve, Khrew and Khonmoh Conservation Reserves, Hajan and Satura Blocks under Tral Wildlife Range, Shikargah/Panner /Khiram Conservation Reserves and Overa – Aru Wildlife Sanctuary (Fig. 1).

In each area, the survey sites were selected based on the discussions about hangul presence held with the forest and wildlife staff and local people specifically glaziers, hunters and forest produce gatherers. A forest and wildlife beat was considered as a unit for hangul counting and habitat assessment following Jhala *et al.* (2005). Within each survey unit, previously market transects/prominent trails of known length and *Nullahas* (streams) were identified and scanned twice in different seasons and different time periods of the day following Rutledge (1982) for monitoring hangul population and habitat use. The transects/trails. Both direct and indirect evidences of hangul in a survey block were collected. While information on group composition (age and sex) was collated during direct sighting, data on indirect evidences (pellets) was collected in (2×20 m) belt transects randomly laid in the survey blocks.

Analyses

Hangul relative abundance was estimated by no of hangul seen per kilometer transect walk. The denisity was estimated by no. of hangul seen/km.^{2} was estimated following Burnham *et al.* (1981), The One way analysis of variance (ANOVA) and Chi-square goodness-of-fit test (Zar, 1996) were used for analysis of population data. All statistical analyses were performed by using SPSS-8 (SPSS Inc. USA) Norris (1990).

Results

During intensive range wise surveys (2000-2009) hangul was found restricted to an effective area of 351.15 Km^2 outside Dachigam National Park out of the approximately 884.41 Km^2 of its distributional range outside Dachigam National Park. The survey efforts involved were almost distributed equally amongst the 35 survey blocks/units (Table 1) in different seasons and the time effort (in hours) and distance effort (in kilometers) involved during the surveys did not show any significant difference (F = 0.624 P = 0.600) and (F = 0.029; P = 0.993) between the seasons. The total time spent was 1040 hours and the total distance covered during the surveys was 3367 kilometers. During the study period a total of 19 hangul group sightings comprising of a total of 153 hangul individuals were recorded across the 35 survey units outside Dachigam National Park The overall mean hangul encounter rate outside Dachigam was 0.043 hangul/kilometer walk. The overall hangul sex ratio outside Dachigam was 11.81 males/100 females and the fawn to female ratio was 5.93 fawn/100 females. The overall hangul density outside Dachigam turned out to be 0.49 hangul/Km^2.

The few isolated hangul populations observed during the surveys in these relic range areas included a population of around 11 hangul sighted in the adjoining conservation reserve areas of Bren-Nishat including Cheshmashahi Forest Reserve; Khrew (2-6 hangul); Khanagund (1-2 hangul); Shikargah (7-12 hangul) and Overa WS (6-10 hangul). Besides, 6 hangul (1 male, 3 female and 2 young) have been sighted on the trail between Surfrao and Akhal Blocks of Sindh Forest Division and a group of about 12 hangul sighted north of Holy Amarnath Cave.

Discussion

During the study period (2000-2009) a total of 19 hangul group sightings comprising of a total of 153 hangul individuals were recorded in the 35 surveyed units along the relic hangul range areas outside Dachigam National Park. Hangul publication was restricted to an effective area of 351.15 Km^2 outside Dachigam National Park out of approximately 884.41 Km^2 of its distributional range outside Dachigam National Park. The results clearly indicate that apart from number of other threats to its long term survival in the relic areas, one of the major issues concerning the long term conservation and survival of hangul has been the declining population trend due to low sex ratio and fawn to female ratio. The overall hangul sex ratio outside Dachigam observed was 11.81 males/100 females and the fawn to female ratio was 5.93 fawn/100 females. Though the sex ratio observed in this study is comparable to the reported values in the past (Qureshi *et al.,* 2009; Ahmad *et al.,* 2009), the fawn to female ration recorded during the study is nuch below the reported figures for the same recorded by the previous workers (Qureshi *et al.,* 2009; Ahmad *et al.,* 2009) which is of great concern and need immediate attention.

The overall hangul density outside Dachigam turned out to be 0.49 hangul/Km^2 which is much below that observed for hangul inside Dachigam National Park (Ahmad, 2006; Ahmad *et al.,* 2009) and much lower than the lowest density of red deer of around 1-0 stag/km^2 and

1-2 hinds/km^2 reported in most of the areas in Scotland (Clutton-Brock and Albon, 1989). However, the overall mean hangul encounter rate outside Dachigam of 0.043 hangul/kilometer walk recorded during the study is somehow comparable to the recorded values from Dachigam National Park (Ahmad, 2006) and other adjoining areas by other workers (Ahmad *et al.,* 2009; Qureshi *et al.,* 2009).

The study results and field observations are indicative of the fact that the hangul which once used to range its movements to the alpine meadows of upper Dachigam, due to possibly heavy disturbance and over grazing in these areas, has shown displacement and dispersion from the disturbed and livestock affected areas and seems to have expanded its movements and distributional range to its relic areas outside Dachigam National Park. This phenomenon of animal displacement and dispersion away from livestock affected areas has also been reported in red deer and Elk (Clutton-Brock and Albon, 1989; Franklin and Lieb, 1979). According to a number of reports hangul used to range in summers up to altitudes of some 3000 m in Dagwan, Nagberan and Marsar of Upper Dachigam. However, in due course of time these areas have been occupied by livestock, nomads and grazeirs resulting in disappearance of hangul from there with the exception of few strays. During our surveys we did not see any hangul nor find any indirect evidence of hangul presence in the alpine meadows of upper Dachigam.

It is as such important to expand the range and habitat of hangul in Dachigam National Park, to its sub alpine and alpine meadows in upper Dachigam and also to its former distributional range by making these areas free from livestock and other anthropogenic pressures, by control poaching and disturbances to hangul and by restocking hangul in some of its past ranges of occurrence for which a conservation breeding plan is important to breed a stock for repopulating existing good habitats in hangul erstwhile range.

Overa Wildlife Sanctuary and Shikargah Conservation Reserve, almost free from human interferences, are as such recommended to be ideal to initiate the reintroduction. These areas used to hold the largest population of hangul outside Dachigam in the past (Inayatullah, 1987) and during the present study as well, a largest stray hangul population (37 estimated in 2000 and an estimated 6-12 individuals in 2004) outside Dachigam National Park has been recorded in these areas only. Secondly, these areas possess all the diverse and ideal habitats similar to that of Dachigam National Park and have a close corridor links with Dachigam National Park. These areas can as such prove to be a suitable habitat for a second viable population of the Hangul, outside Dachigam National Park and presents other excellent opportunity for a comparative study of its

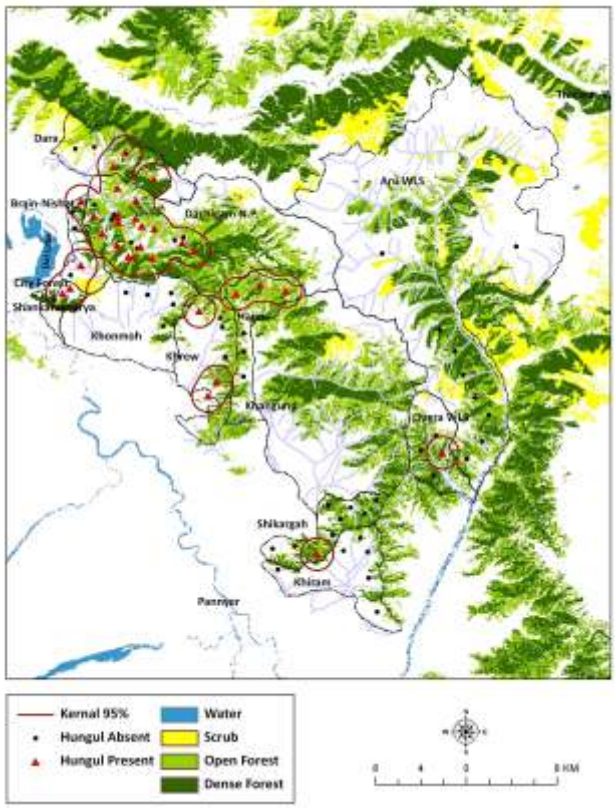

Fig. 1 : Areas Intensively Surveyed and the Hangul Distribution recorded in and Outside Dachigam National Park (2000-2009)

hangul population with that of the Dachigam National Park and possible interaction between the two populations.

The other areas of Hangul's past distribution such as Erin catchments of Bandipora, Baltal-Thajwas Wildlife Sanctuary, Surfrao-Akhal blocks of Sindh Forest Division, Tral Reserves, Desu *rakh*, Rajparyan (Daksum) Wildlife Sanctuary and Kishtwar High altitude National Park requires immediate management and conservation efforts on scientific lines. Both direct and indirect evidences during the surveys suggest that the Surfrao, Akhal and Kangan blocks of Sindh Forest Division, attract large populations of hangul particularly in summer and beginning of autumn. The largest group of 6 hangul individuals was sighted in Surfrao/Akhal block and the overall mean hangul size recorded in this study block was 1.72 ± 0.87 (c.l.) individuals (Table 1). This might possibly be because the upper sub alpine reaches of Dachigam NP, during this season are under heavy pressure of biotic interferences in the form of excessive livestock grazing by local people, Gujjar and Bakerwal, and sheep and Goat of the Government sheep breeding farm. This area sharing its boundaries to the north and north-east of Dachigam NP, needs to be given a priority conservation inputs and is required to be notified as a sanctuary in order to serve as a summer home for Hangul.

Table 1: Status of hangul observed in the Relic range areas in Kashmir outside Dachigam National Park (February 2000-March 2009)

Survey Block	Survey Units	Year	Total Surveys	Total Area Km^2	Area Surveyed Km^2	Hangul Seen	Male	Female	Young	Total Effort (Hrs.)	Distance Covered (Kms)	Hangul Mean Group Size	Conf. Limit	Enc. Rate/Km Walk	Sex Ratio	Fawn Female Ratio	Density/ Km^2	Pellet Groups	Hoof Marks
Shikargah	3	1	15	15.25	12.25	14	3	10	1	45	150	0.93	1.01	0.093	30	10	1.14	25	4
Panner	2	1	10	10.00	03.50	0	0	0	0	32	104	0.00	0	0	0	0	0	0	0
Hajan/Satura	2	1	10	05.00	03.00	0	0	0	0	36	115	0	0	0	0	0	0	0	0
Khanagund	2	1	10	10.00	07.50	0	0	0	0	30	100	0	0	0	0	0	0	3	0
Khrew	2	1	15	07.90	05.50	8	0	8	0	45	150	0.53	0.51	0.053	0	0	1.45	29	16
Khonmoh	1	1	10	04.00	02.50	3	0	2	1	30	96	0.3	0.68	0.031	0	50	1.21	2	0
Nishat/Brein	2	1	15	08.00	06.50	18	3	14	1	47	148	1.2	0.82	0.122	21.43	7.14	2.77	34	11
Khiram	2	1	10	05.07	04.00	6	1	7	2	36	104	0.6	0.69	0.058	14.29	28.57	1.5	9	0
Overa	6	1	18	60.00	40.50	37	12	20	5	46	154	1.33	0.77	0.240	60	25	0.91	33	4
Aru	2	1	10	366.0	75.50	0	0	0	0	30	100	0	0	0	0	0	0	0	0
Surfrao/Akhal	3	1	15	45.06	18.25	20	5	12	3	47	150	1.73	1.01	0.133	41.67	25	1.09	26	16
Kangan	1	1	5	09.00	04.50	2	2	0	0	15	50	0.4	1.11	0.040	0	0	0.44	4	0
Baltal/Thajwas	3	1	6	210.0	95.40	0	0	0	0	20	70	0	0	0	0	0	0	0	0
Wangath	2	1	4	58.50	35.50	0	0	0	0	3	10	0	0	0	0	0	0	0	0
Gurez	2	1	3	-	36.25	6	1	4	1	9	30	2	4.97	0.2	25	25	0 .2	12	6
Shikargah	3	2	18	15.25	12.25	6	1	4	1	55	180	1.11	1.04	0.033	25	25	0.49	7	2
Panner	2	2	12	10.00	03.50	0	0	0	0	38	124	0	0	0	0	0	0	0	0
Hajan/Satura	2	2	12	05.00	03.00	0	0	0	0	43	140	0	0	0	0	0	0	0	0
Khanagund	2	2	12	10.00	07.50	0	0	0	0	36	120	0	0	0	0	0	0	6	0
Khrew	2	2	18	07.09	05.50	3	1	2	0	54	180	0.67	0.48	0.016	50	0	0.55	8	6
Khonmoh	1	2	12	04.00	02.50	2	0	2	0	36	116	0.25	0.55	0.017	0	0	0.8	2	0
Nishat/Brein	2	2	18	08.00	06.50	4	1	3	0	56	178	1.11	0.7	0.022	33.33	0	0.62	8	3
Khiram	2	2	12	05.07	04.00	2	1	0	0	42	124	0.5	0.57	0.016	0	0	0.5	4	0
Overa	6	2	18	60.00	40.50	12	2	7	2	61	184	1.5	0.69	0.065	28.57	28.57	0.30	6	3
Aru	2	2	12	366.0	75.50	0	0	0	0	36	120	0	0	0	0	0	0	0	0
Surfrao/Akhal	3	2	18	45.06	18.25	6	1	4	1	56	180	1.72	0.87	0.033	25	25	0.33	7	6
Kangan	1	2	6	09.00	04.50	2	0	2	0	18	60	0.67	1.08	0.033	0	0	0.44	2	1
Baltal/Thajwas	3	2	6	210.0	95.40	0	0	0	0	20	70	0	0	0	0	0	0	0	0
Wangath	2	2	6	58.50	35.50	2	0	2	0	9	30	0	0	0.066	0	0	0.05	7	0
Gurez	2	2	3	-	36.25	0	0	0	0	9	30	0	0	0	0	0	0	0	0
				884.4	351.05	153	34	103	18	1040	3367			0.0425	11.81	5.926	0.486	234	78

Further intensive survey efforts are required to be carried out in these areas for collecting of baseline information on the habitat conditions and biotic interferences of these areas *vis-à-vis* present status and distribution of hangul. These data need to be then interpolated to assess the reestablishment of these areas as well as corridors for hangul and for hangul reintroduction. The survey and interviews suggest that a few hangul do continue to remain outside Dachigam all year round in areas of Gurez, Ajas, Bunakot, Bandipora, Kangan, Surpharo Baltal, Harmukh and Wangath which need to be further investigated. Reconnaissance surveys and interviews conducted in Upper Dachigam (Leech top to Gunus nar) and Sindh forests suggest the presence of hangul during summer months. In the North Division, Changdaji has a good habitat with reports of hangul presence. These reports however, also need to be further confirmed through systematic intensive surveys. Continued examination of the perceptions and the opinions of the local people living near Dachigam National Park and adjoining protected areas and reserves and their involvement in the management practices are necessary for perpetuating an effective long term strategy and a conservation and management recovery plan for hangul and its habitats that would include among others an ex-situ conservation breeding programme.

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डाकीगाम राष्ट्रीय पार्क, कश्मीर के पुराने वाह्य क्षेत्रों में हंगल (*सर्वस एलीफस* हंगलू) की स्थिति और संरक्षण

खुर्शीद अहमद, कमर कुरेशी, पराग निगम तथा इन्तीसार सुहेल

सारांश

प्रस्तुत प्रलेख में, कश्मीर के लाल हिरन या हंगल (*सर्वस एलीफस* हंगलू) की डाकीगाम राष्ट्रीय पार्क के बाह्य क्षेत्रों में वृद्धि के लिए वासस्थल उपयुक्तता का आकलन किया गया है। अध्ययन के परिणामों से पता चलता है कि डाकीगाम राष्ट्रीय पार्क के बाह्य क्षेत्रों में हंगल 351.15

वर्ग कि0मी0 तक सीमित है। डाकीगाम के बाहर हंगल के प्रत्यक्ष दर्शन की दर 0.043 हंगल/कि0मी0 पद यात्रा पर थी। डाकीगाम के बाहर हंगल का समग्र लिंगानुपात 11.81 नर/100 मादा और मृग छौनों से मादा का अनुपात 5.93 मृगछौना/100 मादायें था। डाकीगाम के बाहर हंगल का सम्पूर्ण घनत्व 0.49 हंगल/वर्ग कि0मी0 था। डाकीगाम राष्ट्रीय पार्क के बाहर उसके नाजुक वासस्थलों में हंगल की पृथक्कृत आबादी के प्रबंधन और दीर्घकालिक संरक्षण पर तुरन्त ध्यान देने की आवश्यकता है। डाकीगाम के बाहर ओबेरा वन्यजीव अभ्यारण तथा शिखागढ़ संरक्षण रिजर्व को हंगल की आबादी को संरक्षित करने हेतु उपयुक्त विकल्प स्थल माना गया है। लिड्डर घाटी में शिखागढ़–ओबेरा रेंजों से शुरू होने वाले हंगल के पुराने क्षेत्रों में हंगल के संरक्षित प्रजनन कार्यक्रम की शुरूआत यथाशीघ्र करने की आवश्यकता है ताकि अच्छे वासस्थलों में हंगल की आबादी को पुनर्स्थापित किया जा सके। हंगले की आबादी के पुराने क्षेत्रों में नियमित मॉनीटरिंग के लिये विज्ञान पर आधारित कार्यक्रम तैयार करना होगा और हंगल के वितरण के लिए उपयुक्त कारीडोर्स की व्यवस्था करनी होगी।

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