HANGUL

(*Cervus hanglu hanglu*), Population Monitoring Exercise, 2023.

DEPARTMENT OF WILDLIFE PROTECTION,
GOVERNMENT OF JAMMU & KASHMIR

Hangul is a critically endangered Species as per IUCN, Red List Data, a Schedule I Species in Indian Wildlife Protection Act 1972. The species is under threat based on the vulnerability of population w.r.t population viability, population structure, dwindling population, habitat vulnerability and possibility of inbreeding. The species needs a considerable immediate global attention. It is a long ranging species but due to habitat fragmentation is now restricted to a small area at Dachigam National Park and some scattered population in some pockets. The policy decision with regard to this species must be landscape level planning to cover as much area as possible based on the past distribution, to help it revive on its own.

SUMMARY

Hangul (Cervus hanglu hanglu), the state animal of the of UT Jammu and Kashmir is one of the eastern most distributed species of red deer inhabiting the temperate coniferous forests in western Himalayas of Jammu and Kashmir. Hangul is Critically endangered as per IUCN RED LIST DATA and listed under Schedule I of the Indian Wildlife (Protection) Act, 1972. It was once widely distributed in the mountains of Kashmir and parts of Chamba District of Himachal Pradesh in an arc 65km in width to the north and east of Jhelum and lower Chenab rivers. During the recent past, the distribution range of Hangul appears to have been drastically reduced possibly due to habitat fragmentation and associated factors. Some small or relic populations are also reported to be present in some areas in Kupwara, Bandipora, Ganderbal, Pulwama and Anantnag Districts.

Of the present distribution range in Dachigam Landscape (ca. 1,000 km2) only viable population of Hangul occurs in Dachigam National Park and only some small groups are present in its adjoining protected areas which includes 10 Conservation Reserves (CR), Tral WS and the Overa-Aru Wildlife Sanctuary (WS). Within the Dachigam National Park of 141 km2also, the animals are restricting their movements mostly to lower and middle part because of various disturbances in the upper i.e., summer range of this animal. The hangul movement and presence has been recorded in the Tral WS and Wangat CR during recent winter season.

The Department of Wildlife Protection, Jammu & Kashmir (DWLP) in collaboration with the Wildlife Institute of India (WII) and local research institutions, has been regularly monitoring the Hangul Population in the Dachigam landscape since 2004 through scientific methods that involves participation of researchers, field staff, university students, NGOs and NGIs. Till date nine such annual exercises have been carried out during March of 2004, 2006, 2008, 2009, 2011, 2015, 2017, 2019 and 2021 (Qureshi & Shah, 2004, Qureshi et al. 2009, Charoo et al., 2011, 2015, 2017 and 2019). The Hangul population estimates in the past were 197 (2004), 153 (2006), 127 (2008), 175 (2009), 218 (2011), 183(2015), 214(2017), 237 (2019), 261(2021). In the present population monitoring exercise, 55 Transects (each of average 3km) were traversed and three such repeats were done. Out of the three attempted repeats, only two repeats were considered for data analysis. Based on the direct animal sightings, a mean population number of hangul was estimated to be 275 individuals at Dachigam National Park. Also, at Shikargarh, in Tral wildlife sanctuary, which is known to be second home for hangul, 14 individuals were recorded based on the camera trapping exercise being carried out at Conservation Breeding Centre.

HANGUL POPULATION IS STABLE BUT THERE IS NO CONSIDERABLE IMPROVEMENT IN POPULATION BECAUSE OF THE VARIOUS CONCERNS THAT INCLUDE:

Habitat fragmentation and poaching: Degradation owing to the large scale biotic interferences in Hangul's habitat, in the form of excessive livestock grazing in its erstwhile summer habitats, grass cutting, fuel and firewood collection, human trampling owing to men and vehicles of paramilitary (CRPF) forces camped inside Park and employees of more than six other Government departments in lower Dachigam and poaching have contributed largely to the Hangul habitat degradation and hence decline of the Hangul during the recent past.

Livestock Grazing: Livestock grazing in Upper Dachigam has been considered to prove harmful to Hangul in the long run. Apart from competition for food resources, chances of transmission of disease also exist as there has been confirmed evidence of transmission of John's Disease to Hangul in Dachigam in 1978.The higher parasitic prevalence rate (32.26%) during summer has been attributed possibly to be influenced by cross-species parasitic infection from the livestock when the Hangul shares its habitats with livestock in both lower and upper Dachigam.

Ecological Threats The recent scientific studies on current Hangul population trend have indicated that the species could go extinct if serious management and Conservation interventions are not made immediately. The studies indicate that besides biotic interferences, some of the major ecological issues, concerning the decline in the population and long-term conservation and survival of the Hangul are Low breeding and disturbed viability. The ideal ratios of 40-50 Male/100 female & above 60 fawn/100 female reported in Red deer populations, however in case of hangul it is significantly skewed

Predation: The low fawn to female ratio and fawn survival is presumed to be attributed to stress owing to the biotic disturbance in upper Dachigam compounded with nutritional stress and fawn predation by common leopard, Asiatic black bear, jackal , red fox and stray dogs of shepherds and army installations. The predation by leopard and black bear, both of which prey principally on the young deer seems to be the worst threat for. Studies indicate that the predation on Hangul by leopard comprises 60% of biomass of leopard diet which is very high in winter and summer when the Hangul has a limited distributional range to move in Dachigam National Park. The predation, if it continues, will add to the demographic stochasticity and may produce a further future decline in the Hangul population in the future. The information on this aspect is however is inadequate and this is an important grey area of research that will be addressed in the action plan.

Disturbed Corridors and Landscapes The corridors Surfrao/Akhal and Kangan blocks of Sindh Reserve forest north and north east of Dachigam Dachigam-Tral and Shikargah-Overa south and south east of Dachigam where significant movement of Hangul is being recorded and validated scientifically by Satellite Telemetry studies and camera trapping by SKUAST-Kashmir and the Department, require a special attention and immediate management and conservation efforts on scientific lines. The continued monitoring and surveys for collecting further baseline information on the habitat conditions and biotic interference in these corridor areas is imperative for enabling re-establishment of these areas as ecologically viable corridors for Hangul movement and reintroduction and to maintain required genetic heterozygosity for population viability.

Decreased Genetic Heterozygosity The Scientific studies conducted by by WII and SKUAST-Kashmir have indicated a decrease in genetic heterozygosity in Hangul population over a period of time and resultant susceptibility to inbreeding depression resulting from low population size. The sensitivity analysis indicated that there is a 25% chance of extinction in 100 years. Increasing the chance of poaching to 39% with additional winter mortality with a 5% chance of occurrence will substantially increase the extinction risk to 90%. There is as such a dire need for urgent measures to arrest the loss in heterozygosis and declining trend of the Hangul population.

A Conservation Action Plan (CAP) for Hangul has been formulated and needs to be approved and implemented immediately without any further delay. Landscape level planning needs to be strengthened further to connect the erstwhile habitats of hangul on the northern side i.e., Gurez, Tulel. The aim of the CAP is to stop the disturbed trends of population of the species and build better information base for future conservation actions needed for long term survival of the species. Another aspect of the action plan is to identify the historical available habitats of species for possible actions of wider dispersal and generating mass support for the conservation of Hangul.

The present population monitoring exercise was carried out in the last week of March 2023. Prior to the monitoring exercise, orientation/training program about the technique and hands on training the staff, students and other voluntary members was organized at Dachigam National Park. Detailed presentations were given on the techniques of population estimation, health monitoring, use of GPS and other equipment. All the participants were also given instructions how to fill up the format while sighting the animals. The participants were given demonstration of distinguishing stags from hinds and followers with the herd composition.

FIELD METHOD

The Dept. of wildlife protection has been carrying Hangul population estimation exercises since a long time. Several methods have been tried to monitor the population of Hangul e.g., Holloway (1971) conducted a systematic count in November 1969 and February 1970. He divided the area into six blocks, each block was scanned by a group of individuals so as to maximize the detection. Gee (1965) guesstimated population size in 1957 and 1965. Schaller (1969) estimated population during the rut and concluded that rutting period is not good for population estimation.

Holloway's method was adopted largely by the DWLP for Hangul counts. The population monitoring method of DWLP was more or less consistent and enumeration was done largely in mornings excepting in few cases when it was conducted both in morning and evening (DWLP, 1996, 1997, 2000, 2001, 2002, 2003).

However in 2004 the trail/ transect method was standardized by the Department of wildlife Protection with technical support from Wildlife Institute of India to carry out population monitoring of Hangul in and around Dachigam National Park. The area has been surveyed and transects have been established in standard method on the basis of stratified random sampling.

In the present exercise same method was employed for the population monitoring of Hangul.

In the present exercise 55 such line transects were walked for the population monitoring exercise and repeated on three days i.e., 16.04.2023, 18.04.2023 and 20.04.2023. However, for estimating mean population size only two counts were taken into account for data analysis.

The camera trap results from Conservation Breeding Centre Shikargarh were also included in the total overall estimate of population of hangul.

Apart from population estimate exercise, an effort was made to collect the biological samples of hangul to understand the genetic diversity/population demography/health monitoring. All the samples have been stored and will be analysed accordingly.

Field officials/ students/ volunteers recording field observation, collecting biological samples

ANALYSIS

Estimation based on multiple counts

N (mean population) = sum of each count/number of counts=∑Pni/n

RESULTS

1. First count 018.03.2023= 211
2. 2nd count 06.04.2021= 338

Mean = 1stday count + 2nd day count /no. of counts

= 211+338/2

=274.5

- In addition to the above, 14 (4 males, 9 females, 2 fawn/UI) individuals of hangul have been camera trapped at Shikargah near Conservation Breeding centre in Tral Wildlife Sanctuary.

So the total number of hangul sighted during the monitoring exercise is 289.

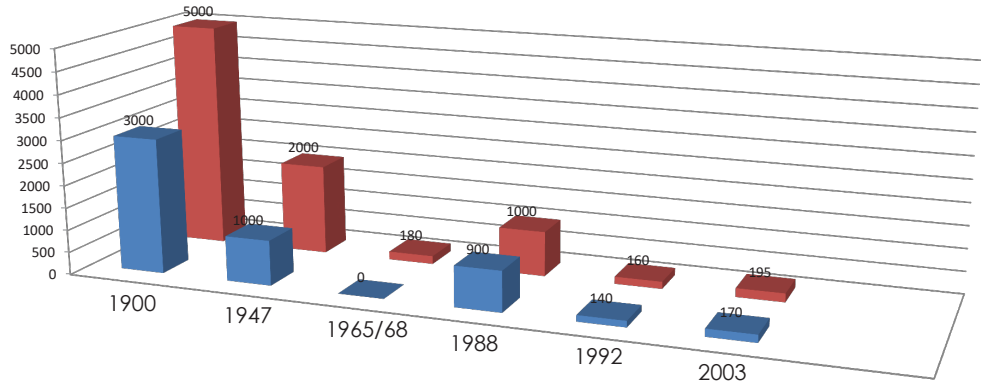


Fig 1. Hangul population range trends, 1900 to 2003.

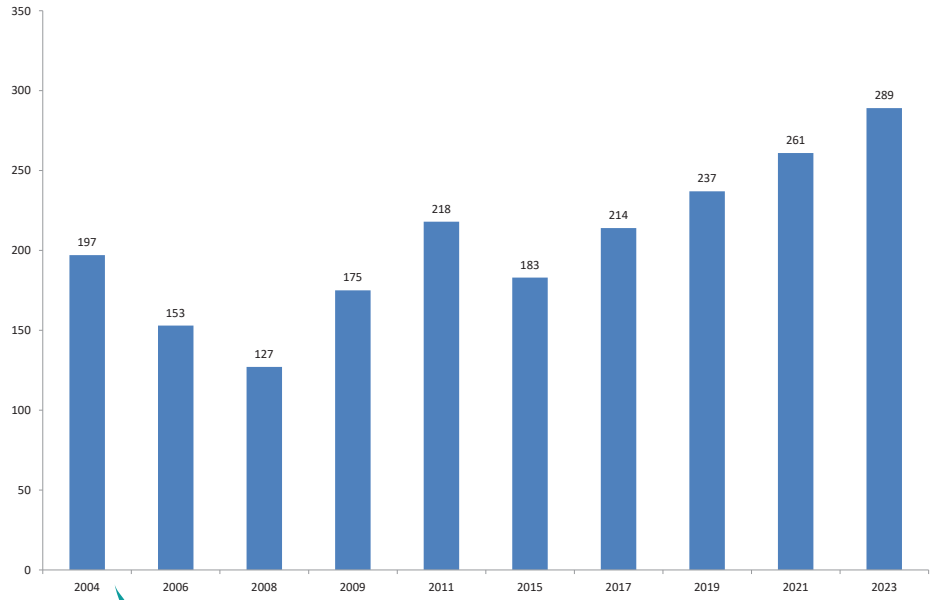


Fig. 2 Hangul population trend 2004 to 2023.

TABLE 1: DETAILS OF HANGUL SIGHTINGS, APRIL 2023

Day	Total	Male	Female	Young	Unidentified
18.04.2023	211	18	153	31	9
20.04.2023	338	22	289	25	2

TABLE 2: MALE: FEMALE AND FAWN: FEMALE RATIO OF HANGUL, APRIL 2023

Day	Males: 100 Females	Young :100 Females
18.04.2023	11.7	20.2
20.04.2023	7.6	8.6

TABLE 3: MALE: FEMALE AND FAWN:FEMALE RATIOS OF HANGUL ACROSS THE YEARS (2004 TO 2023)

Year	Sex Ratio (Males:100 Females)	Fawn-Female Ratio (Fawns : 100 Females)
2004	19	23
2006	21	9
2009	26.52	27.82
2011	29.52	25.80
2015	22.33	14.33
2017	15.8	19.1
2019	15.3	9
2021	12.6	13.4
2023	9.6	14.4

CONCLUSION

The present population monitoring exercise results show a marginal increase in population from the past estimates (2019: 237; 2021: 261; 2023: 289) however, there is no considerable increase in population numbers. The basic demographic ratio's of male: female and female: fawn ratios's are skewed. The number of hangul which were not distinctly identified by the participants may have also account to the more skewed ratios.

The recent sightings of hangul based on camera trap evidences in Tral Wildlife Sanctuary is encouraging, 14 individuals were camera trapped recently. Likewise, the photographic evidences captured by the of officials of Dept. of Wildlife Protection in Wangat Conservation Reserve also shows that the habitats outside Dachigam National Park can be promising to hold a contiguous population of hangul at Landscape level. The upper reaches of this landscape if properly managed and made available for hangul can have an immense positive impact on hangul in terms of increasing the number and sustaining a genetically viable population.

The habitat improvement measures and Landscape level planning approach taken up by the Department in the recent past (shifting of sheep breeding farm, notification of Tral WLS) will have long term conservation benefits for hangul and for other wildlife as well. However, these measures need to be augmented by the ex-situ conservation efforts of successful captive breeding. There is still a dearth of vital information on basic ecological knowledge on this important species. Research is needed to understand the skewed demographic ratio's and the reasons associated.

ACKNOWLEDGEMENTS

The present population monitoring exercise is a team effort of the volunteers from different academic and other institutions, frontline staff, officials and the officers of the Wildlife Department.

The Department of Wildlife Protection will like to acknowledge the researchers/volunteers of University of Kashmir, SKUAST-K, Wildlife Trust of India, Wildlife SOS, and Wildlife Research & Conservation Fund for active participation in the present exercise. Thanks are due to the Forest Protection Force officials for being part of this initiative. All the field staff of the DWLP at Central Division, south Division and Shopian Division and associated areas is acknowledged for cooperation during the field exercise.

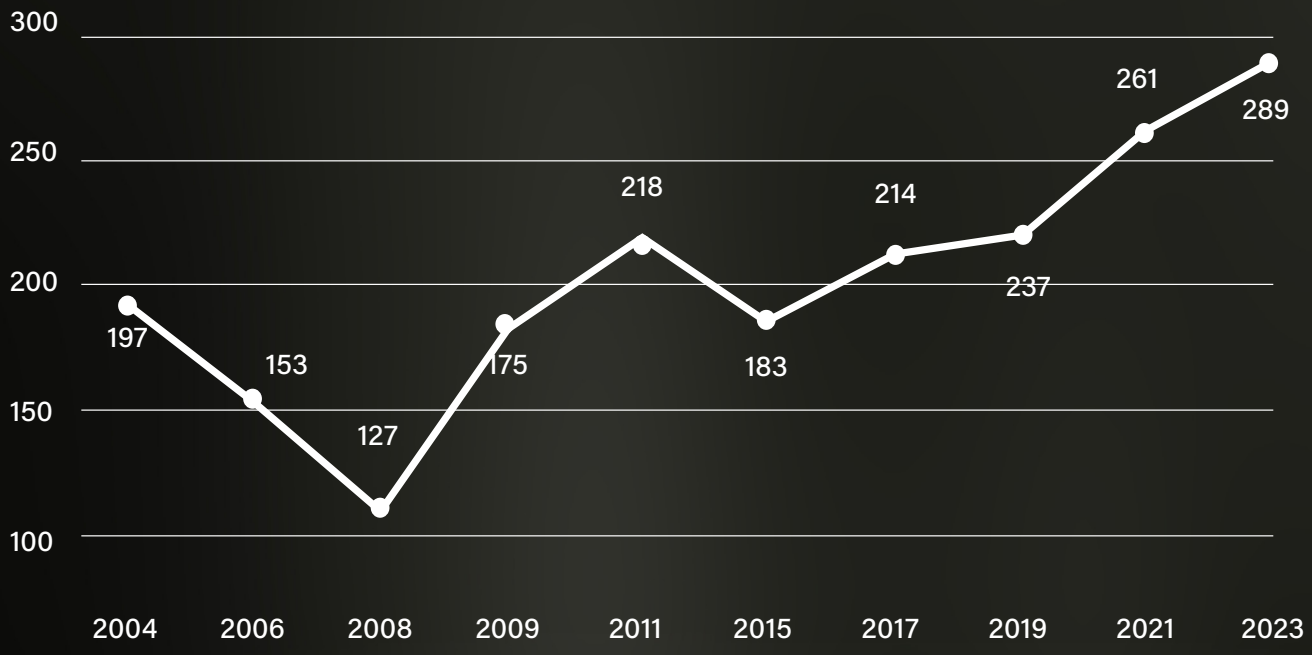
RELATED LITERATURE :

- Ahmad, K. 2005. Aspects of Ecology of Hangul (Cervus elaphus hanglu) in Dachigam National Park, Kashmir India. Thesis submitted to Forest Research Institute, Dehradun.
- Ahmad, K., S. Sathyakumar and Q. Qureshi. 2009. Conservation status of the last surviving wild population of Hangul or Kashmir Red Deer Cervus elaphus hanglu in Kashmir, India. Journal of Bombay Natural History Society. 106(3): 245-255.
- Brook, S.M., Thakur, M., Ranjitsinh, M.K., Donnithorne-Tait, D. & Ahmad, K. 2017. Cervus hanglu ssp. hanglu. The IUCN Red List of Threatened Species 2017: e.T113259123A113281791.
- Burnham, K. P., D. R. Anderson and J.L Laake. I980. Estimation of density from line transect sampling of biological populations; Wildlife Monographs. 72 1-202
- Charoo, S.A., L.K. Sharma and S. Sathyakumar. 2009. Asiatic Black Bear – Human conflicts around DachigamNational Park, Kashmir. Technical Report. Wildlife Institute of India, Dehradun. 51 pp.
- Charoo, S.A., L.K. Sharma and S. Sathyakumar. 2010.Distribution and Relative Abundance of Kashmir Red Deer OR HANGUL (Cervus Elaphus Hanglu) at Dachigam National Park, Kashmir, India.Galemys 22 (n° especial): 171-184
- Charoo, S.A., Naqash, R.Y and S. Sathyakumar. 2011. Monitoring of Hangul population in Dachigam Landscape March 2011. Technical report submitted to Dept. of Wildlife Protection Govt. of J&K and Wildlife Institute of India, Dehradun.
- Darling, F. 1937. A Herd of Red Deer. Oxford University Press, London.
- Department of Wildlife Protection. 1996. Hangul an overview (Census report for Feb.1996) Dachigam National Park. Department of Wildlife Protection, J&K Government.
- Department of Wildlife Protection. 1997. The call of Red deer (Hangul Census 1997) Dachigam National Park. Department of Wildlife Protection, J&K Government.
- Department of Wildlife Protection. 2000. Dachigam National Park: Annual Hangul Census Report. Department of Wildlife Protection, J&K Government.
- Department of Wildlife Protection. 2001. Annual Animal census report – Dachigam National Park & adjoining areas. Department of Wildlife Protection, J&K Government.
- Department of Wildlife Protection. 2002. A report on Annual animal census (Phase-I). Department of Wildlife Protection, J&K Government.
- Department of Wildlife Protection. 2003. Hangul Census Report 2002-2003, Vol-4 (41). Information and publicity wing of the Department of Wildlife Protection, J&K Government.
- Gee, E. P. 1965. Report on the status of the Kashmir stag. Bomay Natural History Society. 62(3) 87-109.
- Grzimek, B.1990. Encyclopedia of Mammals. Vol. 5 (Artiodactyla). McGraw Hill Publishing Company.
- Holloway, C. 1971. Dachigam Wildlife Sanctuary Kashmir with special reference to the status and

management of Hangul. Proc. IUCN 11th Technical Meeting IUCN Publ. 19-109-112

- Inayat Ullah, M. 1985. Ecological cum Management Plan for Dachigam National Park (1985 – 1990) Department of Wildlife Protection, Jammu & Kashmir.
- Iqbal, S. 2005. Predator-prey relationship with special reference to Hangul (Cervus elaphus hanglu) in Dachigam National Park, Kashmir – India. Unpublished Interim report. Department of Wildlife Protection, J & K Government.
- Kurt F. 1978. Threatened Deer proceedings of A. IUCN threatened Deer programme Kashmir Deer (Cervus elaphus Hanglu) in Dachigam.
- Lydekker, R. 1924. The Game animals of India, Burma, Malaya and Tibet, Rowland Ward, London.
- Quenouille, M.H. (1956), "Notes on bias in estimation," Biometrika, 43, 353–360.
- Regier, H.A. & Robson, D.S., 1967, Estimating population number and mortality rates. In The biological basis of freshwater fish production. A symposium sponsored by Sectional Committee on Productivity of Freshwater Communities of the International Biological Programme, ed. by S.D. Gerking. Oxford, Blackwell Scientific Publications, p. 31-66.
- Schaller, G.B. 1969. Observation on Hangul or Kashmir stag (Cervus elaphus hanglu). Journal of Bombay Natural History Society. 66 (1): 1-7.
- Shah, G.M., A.R. Yousuf and M.Y. Qadri. 1984. Winter Diets of Hangul (Cervus elaphus hanglu) in Dachigam National Park.
- Sharma, L.K., S.A. Charoo and S. Sathyakumar.2010. Habitat use and food habits of Hangul Cervus elaphus hanglu) at Dachigam National Park. Spanish Journal of wildlife Galemys 22 (nº especial): 309-329.
- Sofi, M.N. and R. Ahmad. 2009. 'Hunt for Hangul' Establishing the presence of Hangul outside Dachigam National Park, Jammu and Kashmir, Wildlife Trust of India, New Delhi.

Hangul Population Trend 2004-2023



DEPARTMENT OF WILDLIFE PROTECTION,
GOVERNMENT OF JAMMU & KASHMIR