

Hangul (*Cervus elaphus hanglu*) depletion in Dachigam National Park and its adjoining mountainous ranges in Kashmir valley: A Review

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Abstract: The Kashmir Red Deer or Hangul (*Cervus elaphus hanglu*) a member of family cervidae being the state animal is presently surviving only under the moist temperate forests of Kashmir region. Most of its population is concentrated in the world famous Dachigam National Park which covers an area of 141 square kilometers and is located on foothills of Zabarwan range among the high mountains of the mighty western Himalayas. In the past Kashmir had a large and vibrant population of Hangul. Now at present the Hangul has been declared critically endangered species by Red Data Book of the International Union for Conservation of Nature and Natural Resources (IUCN). The declining population of Hangul in Kashmir is because of the shrinkage of forests due to deforestation, fragmentation of natural habitat due to closure of corridor links between Overa Wildlife Sanctuary and Shikargah Conservation Reserve as well as other potential habitats, contamination of high altitude water bodies due to dam projects and climatic changes due to tourism and recreation and also high population pressure has significantly curbed the wild population of Hangul. There is an urgent requirement to initiate a conservation breeding programme to augment Hangul population in the wild.

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1. Introduction

Red deer of Kashmir commonly known as Hangul (*Cervus elaphus hanglu*), the state animal of Jammu and Kashmir is critically endangered by the IUCN. Conservation of this species assumes significance as this is the only survivor of Red Deer Group in the Indian sub-continent as the Shou (*Cervus elaphus Wallichii*) of Bhutan is now considered extinct by experts. Prior to 1950, the deer was quite abundant and distributed widely in mountains of Kashmir (Schaller, 1969b). However, after 1950, depletion in numbers of Hangul was attributed to mass poaching and loss of its habitat to agriculture and stock-grazing. At present, the only harboring habitat of deer is Dachigam National Park and its adjoining areas (Khursheed, 2007). The decline occurred there also as from an estimated 2000 Hangul in 1947 (Gee, 1965), only 140 to 170 survived in 1970 (Holloway, 1970). Grazing, poaching and disturbance due to human activities were identified as major factors affecting recovery of Hangul in Dachigam (Kurt, 1978, 1979). Due to declaration of Dachigam as a National Park in 1981 and measures taken for its rehabilitation, the deer numbers started increasing to appreciable extent. But outbreak of militancy in 1989 and political unrest in the state thereafter, once again put the deer in great trouble. The latest census exercises conducted by Wildlife Department of J & K from 2004 to 2009 have put the numbers in between 150 to 200. In 2006,

Hangul sex ratio was 21 males per 100 females however, fawn- female ratio seems to be an important concern as it shows significant decline from 23 to 9 fawns per 100 females between 2004 and 2006 (DWP, 2006). Thereafter, due to efforts of department of wildlife protection, the population showed encouraged trends as indicated by 2009 census report (27 males/100 females and 28 fawns/100 females). The present information therefore attempts to highlight possible causes of decline and to recommend management strategies for conservation of Hangul deer.

1.1 Dachigam National Park

Dachigam National Park, the only abode of critically endangered Hangul is situated at 21 km northeast of Srinagar in Jammu and Kashmir state of India approximately between latitudes 34° 05' and 34° 12' North and longitudes 74° 54' and 75° 09' East. Roughly rectangular, the Park is 141 km² in area. It is approximately 24 km in length and 6 km in breadth ranging in altitude from 1700 to 4000 m. A more or less continuous range of mountains except in the west where it has been artificially fenced, borders the Park. The Park has two ranges: lower Dachigam (26 km²) and upper Dachigam (115 km²) roughly divided on the basis of forest types, altitudinal range and movements of deer. The Park exhibits a variety of vegetation types

(Singh and Kachroo, 1976) and experiences sub-Mediterranean type of climate.

1.2 Habits and Habitat

Hangul, Kashmir Red Deer being the state animal is a subspecies of European Red Deer. Although more than 150 species of deer are recognized globally, Hangul is the only surviving race of the Red Deer family of Europe in the subcontinent. Hangul was once distributed relatively widely in the mountains of Kashmir. However, the only viable population today is in Dachigam National Park where it is distributed between an elevation of 1,700 m to 3,500 m. This area harbours broad leaved mesophyll forest of Maple (*Acer* spp.), Mulberry (*Morus alba*), *Ulmus* spp., *Rubus* spp., *Salix* spp., Walnut (*Juglans regia*), Hatab (*Parrotia jacquemontiana*), a variety of conifers such as Deodar (*Cedrus deodara*), Blue pine (*Pinus wallichiana*), Spruce (*Picea smithiana*) and Fir (*Abies pindrow*). Hanguls are found in single or small groups of 2 to 25 members. With the onset of spring, groups separate and during summer mixed groups are hardly seen. The social organisation of deer shows it is matriarchal, mature stags live apart from the hinds except during the rut, the care of the young is left entirely on the hinds. In summer female forms groups in small units or mother fawn which may associate for shorter periods forming groups of 12-16 members and males are found in single or in small stag units of 2-9 members. Various climatic factors and requirements of food, protection from predators etc. may bring these groups together in a single unit. Each unit with its component groups has its grazing territory, a low level winter territory which gives more or less direct access to high level summer territory. The wintering territory that is Lower Dachigam is really "the home ground". The oak patches offer good cover during winters and are very much preferred for resting. Since the oak patch is very near the main road therefore due to heavy vehicular traffic deer avoids these patches during day time while as sighting is very frequent afterwards.

2. CAUSES OF DEPLETION

2.1 Physical factors

2.1.1 Habitat Fragmentation

The habitat of Hangul has been disturbed by many factors and the prominent ones being metallic road from Lower Dachigam to Upper Dachigam, fragmentation by fish farm, sheep farm, water supply from Marsar Lake to Dachigam village and adjacent areas, transmission lines and also encroachment by agricultural activities which limit the movement of the herbivores in the park.

2.1.2 Grazing

Grazing continues to be a limiting factor preventing hangul from full exploitation of its habitat. The alpine meadows during summer months are occupied by large herds of herbivores of nomads and sheep breeding farm, Dachigam (Bhat, 2008). The alpine meadows are rich in broad leaved herbs which formed the main diet of deer during summer (Kurt, 1977; Oza, 1977). Because of this enormous disturbance in upper reaches, the deer no longer migrates to these areas for feeding and are forced to sub-optimal foraging habitats (Bhat, 2008; Khursheed, 2007; Kurt, 1978, 1979). Some areas in upper Dachigam were heavily grazed and prone to erosion (Bhat, 2008). There is always great danger that parasites and diseases of sheep may spread to deer (Longhurst et al., 1954).

2.1.3 Fuel wood and timber extraction

This activity which is still prevalent in park always disturbs Hangul and exposes them to predators. Men in groups of 20 to 30 extracting fuel wood and timber have been recorded from the park (Bhat, 2008).

2.1.4 Grass cutting

Nomads in addition to stock grazing harvest grass and dry it for feeding their cattle during winter. A large number of women of nearby villages enter the park through different entry routes for grass extraction. These activities not only led to dispersal of Hangul groups but also to depletion of food spectrum (Bhat, 2008).

2.1.5 Charcoal making

This activity has been recorded in lower Dachigam during autumn months (Bhat, 2008).

2.1.6 Fishing

Illegal fishing of Dagwan stream which flows through heart of park causes disturbance to Hangul in deciduous forests on either side of stream. This disturbance causes Hangul in general and pregnant females in particular to expend more energy and are forced to move out of such habitats making them prone to predation (Bhat, 2008).

2.1.7 Other anthropogenic disturbances

Several Govt. departments in addition to wildlife staff presently exist in premises of Dachigam National Park. These departments include: a) Govt. sheep breeding farm. b) Fisheries department. c) Hospitality and protocol. d) Gardens and parks. e) Water works and irrigation. f) Security forces. Most disturbances to Hangul come from staff and vehicles of these departments (Bhat, 2008). On the onset of rut deer come down to lower altitudes where daily and

regular movements of VIP's greatly affect their breeding behavior (Bhat et al., 2009). The declining population of Hangul is because of the shrinkage of forests, fragmentation of natural habitat due to closure of corridor links between Overa Wildlife Sanctuary and Shikargah Conservation Reserve as well as other potential habitats, contamination of high altitude water bodies and climatic changes due to tourism and recreation and high population pressure. Mushroom growth of cement factories has in the recent past cropped up in adjoining areas of the park on southern side. The impact of these factories on quality of park is multi-faceted. The emissions of smoke, particulate matter and noise are again a great threat to deer and its habitat. The particulate matter like dust is existing as a permanent cover on surrounding vegetation. Noise of unbearable limits produced by these factories and vehicles concerned with them disturb faunal elements (Bhat, 2008).

2.2 Biological factors

2.2.1 Poaching

Poaching has been identified as main cause of decline of Hangul in the past (Gee, 1965; Holloway, 1970) and comprised both civilian and military personnel (Kurt, 1978). Poaching by nomads who take their livestock to upper reaches of the park during summer is still a major cause of Hangul decline (Stockley, 1936; Gee, 1965). Full-fledged settlements of nomads in upper Dachigam have been encountered during summer (Bhat, 2008). Poaching is evident from the fact that some of them possessed herd protection guns that could also be used for poaching (Bhat, 2008). There are recent reports of Hangul poaching in the park (DWP, 2011).

2.2.2 Predation

Four large Predators could be considered to influence the Hangul population, i.e. brown bear, snow leopard, leopard and Himalayan black bear. But leopard had been seen the main predator which has caused maximum decline in its population. Deer are more prone to predation by leopard during winter when movements of Hangul get restricted to few deciduous habitats of lower Dachigam (Shah et al., 2009). There is a direct relationship between habitat shrinkage and probability of prey locations by predator. This is a usual phenomenon of park that occurs during winter when snow covers the ground. Some prey species tend to congregate in small areas in deeper snow as forage becomes unavailable elsewhere (Fuller, 1991) and encounter rate may increase (Huggard, 1993). So Hangul predation by leopard is more during winter and it has been reported that more than 60% of leopard diet is constituted by Hangul (Khursheed, 2007). When deer come down to lower

reaches during winter and remain concentrated in a small belt of lower Dachigam, they become easy targets of leopard (Bhat, 2008; Shah et al., 2009). The fawns are more vulnerable to bear predation during summer due to excessive movements of bears in lower Dachigam owing to availability of fruit and other food items (Bhat, 2008). Schaller (1969a) has also reported that black bear is one of the main predators killing young ones of Hangul deer. Bhat (2008) has recorded bear predation risks associated with Hangul deer in park and reported that on the onset of winter bear and Hangul deer share same habitats in lower belts of Dachigam which are devoid of food for black bear making Hangul more vulnerable to bear predation (Bhat, 2008).

3. Conservation Measures

The prevailing scenario in the National Park is almost satisfactory at present. There are many issues to be resolved by the Wildlife Department for ensuring proper conservation of Hangul and its habitat.

- Livestock grazing in the core habitat of Hangul Deer and Musk Deer at upper Dachigam should be completely banned.
- Habitat areas of Hangul Deer and Musk Deer, especially the preferred plant species for forage in these areas should be protected. Efforts should also be made for the plantation of these plant species in the degraded habitats.
- For successful management of the National Park sheep breeding farm and other interferences like VIP lodge and trout hatchery should be removed and relocated in some other part of the valley with better grazing.
- Scientific community should conduct research on priority management issues. It is often argued that the ecologists fail in communicating their knowledge to decision makers and, therefore, have limited influence. It is, therefore necessary to link science to management in order to have effective management. The advice provided by the researchers need to be fed into the developmental exercises.
- Awareness of public about importance of biodiversity in general and endangered/threatened species in particular should be raised to win their support and cooperation in conservation efforts.

4. Discussion

Hangul was once distributed widely in the mountains and valleys of Kashmir (Schaller, 1969b). The only Hangul report outside Jammu and Kashmir was from Gamagul Siya-Behi Sanctuary in Himachal Pradesh (Kurt, 1978). Holloway (1970)

mentions its distribution to be confined to an area of 65 km in width to the North and East of Jhelum and lower Chenab rivers from Shalurah in North to Ramnagar in South. Unconfirmed reports of isolated small populations do occur within the aforesaid range, particularly in the North (Kurt, 1978). Hangul were also known to be present in the upper Bringi valley (Holloway, 1971) in Bandipora, Gurez, Sindh valley, Drass valley, Lidder valley and Desu, South-East of Srinagar (Kurt, 1978). Iqbal et al., (2005) reported 25 percent Hangul occurrence in Leopard scats, which has contributed 61 percent of prey biomass consumed by Leopard. This indicates substantial Leopard dependence on Hangul. There is a possibility of predation by other carnivores too like shepherds dogs, jackals, black bear and other carnivores. Stockley (1936) has described black bears as destroyer of new born calves/fawns though Kurt (1978) has not seen predation of Hangul fawns by black bear. There are many missing ecological linkages in the understanding of the Hangul population which need to be addressed.

The population and distribution range of Hangul is getting impacted by change in habitat quality, predation pressure and anthropogenic pressure. It is important to monitor and evaluate factors responsible for decline in Hangul population. The adjoining mountainous areas of Dachigam National Park are facing heavy biotic pressure due to developmental activities. There is an urgent need to establish captive breeding facility for long term conservation similar to the process done in Kanha for the Barasingha (Pawar, 1978).

5. Recommendations

The current trends indicate that Hangul deer could go extinct if necessary interventions are not made immediately. Due consideration should be given to the following points for the protection and management of wildlife in general and Hangul in particular in Dachigam National Park:

- There is an urgency to develop a comprehensive management plan for Dachigam National Park. Despite some conservation steps taken in the past, still the park has been degraded for its resources. So a fresh comprehensive management plan can be worked out to protect the Hangul habitats in the park.
- Scientific community should conduct research on priority management issues. It is often argued that the ecologists/researchers fail in communicating their knowledge to decision makers and, therefore, have limited influence. It is, therefore, necessary to link science to management in order to have effective management. The advice provided by the

researchers need to be fed into the development exercise.

- The population structure of Hangul deer (abundance age structure, sex ratio and increase rate) should be analyzed and maintained; fawning grounds need to be monitored and safe guarded as fawn- female ratio is alarming.
- Improvement of the vegetation in lower Dachigam by a regulated fire regime and by removal of senescent vegetation on grassy slopes.
- Appropriate legal measures should be enforced in order to protect the park areas against illegal exploitation and the government of Jammu and Kashmir should develop and implement strategies for controlling grazing in upper Dachigam so as to prevent the summer habitats of deer from destruction. In addition, regular monitoring of all the entry routes should be undertaken to prevent local encroachment. For this purpose, the strength of field staff should be increased. Once encroachment is stopped and grazing is banned, poaching will automatically stop. Unless this is done, Hangul is certain to become extinct in the wild.
- The presence of several government departments was recognized as the main and long outstanding problem which can be solved only by their removal. The restriction of access to lower Dachigam during rutting season should be enforced and fully implemented.
- The Wildlife Department of Jammu and Kashmir should practice captive breeding of rare and endangered Hangul deer.
- Awareness programs should be launched to educate the local people about the values and importance of wildlife and exchange of information between the public, forest managers and wildlife biologists should be given due emphasis for ensuring long term success of wildlife management.
- There should be annual census of the predators like black bear and leopard to know their exact status and thorough study of predator-prey interactions be undertaken to know the impact of predation on critically endangered Hangul deer.
- Tourism should be controlled and its negative consequences reduced. A centre should be established in the National Park to educate visitors about environmental protection and management.
- Special conservation schemes should be launched by government of Jammu and Kashmir in collaboration with government of

India with the aim of protecting the critically endangered Hangul deer.

- A socio-economic survey in the adjoining villages of the park can be undertaken to know the dependence of people on park resources and the development of viable alternatives should be given emphasis. Eco-development should be launched as necessary measures for rural development.

6. Conclusion

The foregoing discussions present review information on the endangered red deer of Kashmir commonly known as Hangul (*Cervus elaphus hanglu*). It is quite evident from the discussion that overall conservation scenario continues to be dismal. A lot of management and research input is required to retain the population of Hangul deer. Restoration of important conservation measures is needed which include enforcement of legislation, evaluation of habitat, regular monitoring of the species status, factors responsible for its degradation and use of latest technology like cloning using potential surrogates like goat for Hangul. Care takers of Hangul, animal scientists and veterinarians can play a significant role in improving its population status in the park.

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