

Status, habitat use and threats of cheer pheasant *Catreus wallichii* in and around Dhorpatan Hunting Reserve, Nepal

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Paper submitted January 2010, returned, November 2010, accepted January 2011

Abstract We assessed the density, population size, habitat use and threats to the cheer pheasant *Catreus wallichii* in Dhorpatan Valley, Nepal, within Dhorpatan Hunting Reserve (DHR) and in the proposed buffer zone in 2003 and 2005. Cheer were found in the Surtibhag, Phagune, Bobang and Muri areas where densities of cheer pheasant recorded were 5 (± 1.2), 12.4 (± 1.2), 8 (± 0.88) and 7.5 (± 0.8) pairs per km², and the areas of suitable habitat for cheer pheasant estimated were 7.5, 13.5, 11 and 13.5 km² respectively. Based on density and suitable habitat, populations of cheer in Surtibhag, Phagune, Bobang and Muri areas were estimated to be 37 (± 9), 167 (± 16), 67 (± 10) and 101 (± 10) pairs of cheer pheasant respectively. The densities of cheer pheasant were the highest recorded from Nepal, and population levels in the Dhorpatan Valley had not changed since it was surveyed in 1981. The species preferred open forests and shrubs with grassy undergrowth on rugged, rocky slopes. Densities of cheer pheasant were negatively correlated with tree crown cover. There was no significant correlation with grass cover or measures of grazing pressure, suggesting that current levels of grazing, timber collection and grass burning were not hindering the species' existence. Hunting and snaring may be major continuing threats to cheer pheasant despite legal protection. Future conservation and research activities are proposed to help support this population.

Keywords Cheer pheasant, habitat, abundance, hunting, Dhorpatan Hunting Reserve

Introduction

The cheer pheasant *Catreus wallichii* is a relict, monotypic galliform species (Del Hoyo et al., 1994). Cheer pheasant (hereafter cheer) is endemic to the Indian subcontinent where it is restricted to a narrow belt of the Himalayas from northern Pakistan, through India, to Nepal (Grimmett et al., 1998). In Nepal, it is comparatively densely distributed in western Nepal and its range extends west to the Kali-Gandaki River Watershed (Inskipp & Inskipp, 1991). The bird has been recorded from Dhorpatan Hunting Reserve (DHR), Banglung, Myagdi, Mustang, Rukum, Jumla, Mugu, Baitadi districts and Rara National Park. The international conservation status of cheer is Globally Threatened, being listed as Vulnerable (Birdlife International, 2001; IUCN, 2009). The species is further legally protected in Nepal (HMGN, 1973) and is recognised as Vulnerable at a national level (Baral & Inskipp, 2004).

Cheer generally frequent the outer hill ranges of the Himalayas, typically avoiding dense forest and favouring very precipitous terrain with scrub, tall grasses and stunted trees, particularly where interspersed with rocky crags (Marshall, 1884; Ali & Ripley, 1998; Roberts, 1991–1992; Gaston et al., 1981b; Garson et al., 1992; Baral et al., 1996). In the Kaligandaki Valley of western Nepal, cheer are found utilising steep slopes with dense ground cover and very open crown cover (Acharya, 2004). In 1981, Lelliott reported that the cheer occurred in burnt, felled and cut areas with secondary growth in forest containing pine, juniper and rhododendron. The bird prefers open forest type comprising grass coverage and rocky crags underneath. The bird needs sufficient grass coverage and rocky crags to protect it and its nest from predators. Loss and degradation of the cheer's specialised habitat, hunting and human disturbance in the Himalayan foothills, are causing the decline of this species (Garson et al., 1992; Kasli, 1998).

The threats to habitats of cheer identified by these studies included over-grazing, deforestation and the uncontrolled use of fire to promote grazing.

The important cheer population at Dhorpatan has been known since the 1970s (Fleming et al., 1976) and Sherpas from Mountain Travel Ltd. subsequently reported cheer from the valley east of Dhorpatan in 1976/1977. The first formal survey of the cheer population in Dhorpatan Valley of Dhorpatan Hunting Reserve was carried out by Lelliott in 1981. The population was not surveyed for a further 22 years, until this study was conducted in the Dhorpatan Valley in 2003 and Bobang–Muri areas in the proposed buffer zone of DHR in 2005. Elsewhere in Nepal, recent surveys of cheer have been conducted in Rara National Park in 2005 (Budhathapa, 2006) and 2008 (Singh, 2009) and the Lower Kali Gandaki Valley, Mustang in 2004, 2006 and 2009 (Acharya et al., 2006; Subedi, 2009).

The objectives of this study were to determine the population status and habitat utilisation, and to identify threats to cheer conservation in Dhorpatan Valley, Bobang and Muri.

Methods

Study area

Dhorpatan Hunting Reserve, located at a longitude of 82° 15' E to 83° 15' E and latitude of 28° 27' 30" N to 28° 50' N, was established in 1983 and gazetted in 1987 for sport hunting of large ungulates, primarily blue sheep *Pseudovis naysaur* (DNPWC, 2006). It is the only hunting reserve in Nepal. It covers an area of 132,500 ha in the south of Dhaulagiri Himalayas. The largest part (59%) of the reserve lies in Rukum District of the Mid-Western Development Region of Nepal and the remaining parts 26% and 14% lie in Baglung and Myagdi Districts of the Western Development Region of Nepal respectively. The altitude of DHR ranges approximately between 2000 and 7246 m above sea level (a.s.l). The climate is dry and cold in winter (November to February) and rainy in the summer from mid May to August. Most of the reserve is covered by snow during winter (December to February). This reserve is characterised by alpine, sub-alpine and high temperate vegetation. The

common tree species of the reserve are oaks *Quercus spp.*, east Himalayan fir *Abies pindrow*, birch *Betula utilis*, spruce *Picea smithiana*, juniper *Juniperus recurva*, Himalayan blue pine, *Pinus wallichiana*, hemlock *Tsuga dumosa*, rhododendrons *Rhododendron spp.* and other alpine shrubs. This reserve has one of the highest numbers of endemic plants (36 species) indicating its biological significance (Kandel, 2000). There are flat meadows above the tree line that are used for grazing livestock, locally known as Kharka or Buki.

Phagune and Surtibang broadly consist of pine-juniper forest with *Abies spectabilis* and *Rhododendron spp.* on the upper slopes. Progressing westwards down the valley, other coniferous species such as cedar *Toona sp.*, spruce *Picea sp.* and Himalayan cypress, *Cupressus sp.* are evident. On the lower slopes broadleaved species such as *Quercus spp.*, maple *Acer sp.* and *Rhododendron spp.* dominate (Lelliott, 1981). Other species include birch *Betula sp.*, *Arundianaria sp.* and *Berberis sp.* The other two study areas, Bobang and Muri, are located in the proposed buffer zone around DHR. Both areas are different from Phagune and Surtibang. In the Bobang area, the forest is dominated by *Quercus spp.*, *Rhododendron spp.* and chir pine *Pinus roxburghii*, along with occasional *Schima wallichii* and *Myrica esculenta*. The major species in the Muri area are *Abies spectabilis*, *Rhododendron spp.*, *Rubus ellipticus* and *Berberis aristata*. The study areas Phagune, Surtibang, Bobang and Muri cover 45.5 km².

Informal discussions with local people, reserve staff, birdwatchers and herders were used to identify areas of potential cheer habitat. A preliminary visit was made to promising areas to map the area of potentially suitable cheer habitat. Four study areas were selected for intensive study: Phagune (28° 29' 46" N and 83° 04' 45" E) and Surtibang (28° 30' 6" N and 83° 01' 18" E) were located in the Dhorpatan Valley, inside DHR. These areas constitute most part of Dhorpatan Valley; Bobang (28° 21' 30" N and 83° 07' 3" E) and Muri (28° 30' 0" and 83° 20' 00" E) were located to the south and east, in the proposed buffer zone of DHR. The Bobang study area included Bobang and Adhikari Chaur.

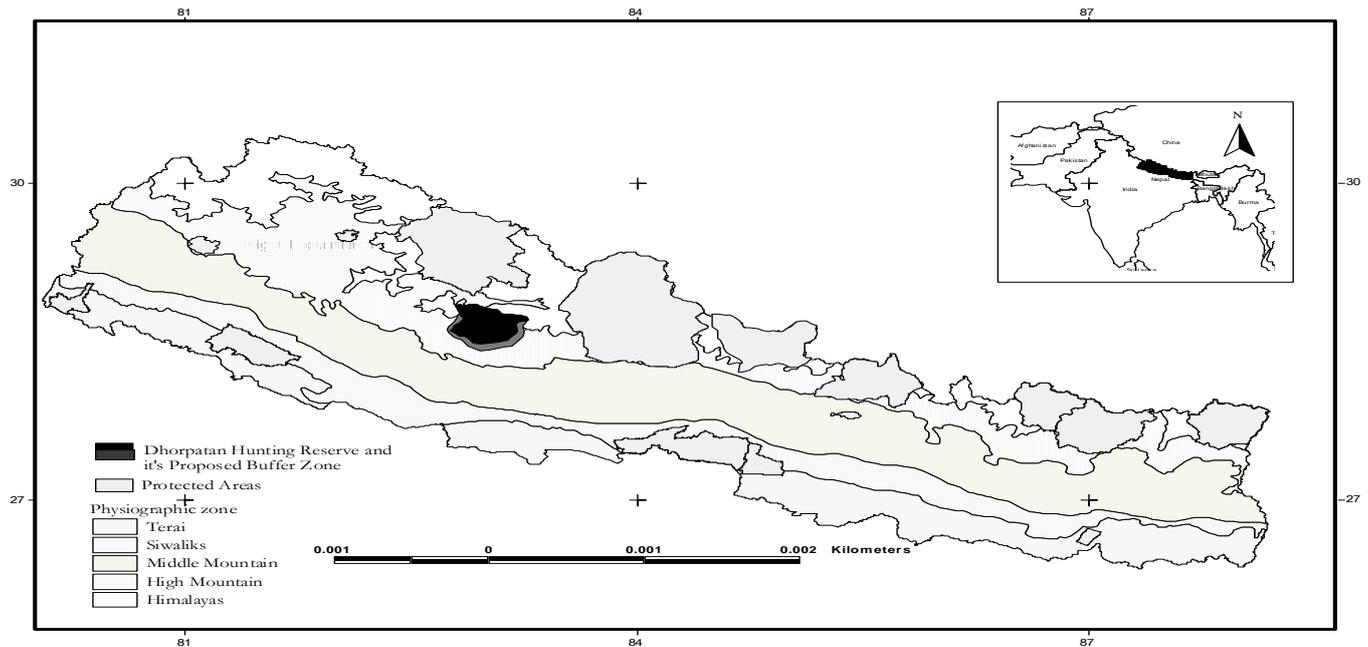


FIG. 1 Map of Nepal showing the location of Dhorpatan Hunting Reserve, its buffer zone and other protected areas of Nepal.

Population estimation

Both male and female cheer are vocal, giving loud calls in the morning and evening (Young et al., 1987). They are very vocal during the breeding season (April - June) and in autumn (October - November) (Ali & Ripley, 1998). Based on their vocalisation, calling birds were counted from survey points i.e. Point Count Method (Bibby, et al., 2000). Survey points (hereafter points) were established at vantage points separated by minimum distances of at least 600 m, so calls of cheer could be heard from long distances. Seventeen points including the eight points surveyed by Lelliott (1981) were selected inside DHR (ten at Phagune and seven at Surtibhag). All selected points were surveyed from May 15 to June 6, 2003. An additional 17 points were surveyed in the proposed buffer zone of DHR from May 17 to May 29, 2005 (eight at Muri and nine at Bobang).

Survey points were manned for 15 minutes from the time of first call. The time, approximate distance and compass direction of all calling birds were noted from each survey point to avoid duplication by observers at nearby points. The calling birds were recorded within a 300 m radius around each point on three consecutive mornings. Thus, each point was surveyed three times. Data from all survey points within a site were collected to find the total number of cheer for each morning, and the average numbers of cheer per morning were used to compute an approximate density

of calling cheer. The density was estimated based on the circular sampling area of radius 300 m (0.28 km²) around each point and number of birds heard. Then the population was estimated based on the assumption that cheer are paired during their breeding season.

Habitat variables

The geographical location of each survey point and its altitude were recorded using a hand-held GPS. The approximate distance from each point to the nearest human settlements and water sources were measured on a map (1:150000) and transferred to ground distance in metres. The slope at each point was measured using Abney's Level (Pitty, 1968).

Four plots of size 10 x 10 m were laid in different corners of each circular plot established for the survey of cheer (i.e. plot with 300 m radius) and all trees were identified and counted. Nested plots of sizes 5 m x 5 m and 1 m x 1 m were laid within each 10 x 10 m plot to record shrub and grass species numbers and abundance. The presence of boulders was also recorded within each circular plot. Vegetation cover was measured within a 300 m radius, in percentage bands (0 - 25%, 25 - 50%, 50 - 75%) separately for the ground layer and the tree canopy layer (crown cover). A topographic map (1:150000) was used during vegetation cover estimation.

Threats

To assess threats, we relied on secondary information. A meeting was organised to

determine the views of local people on hunting and snaring activities, frequency of forest fires per year and to determine the number of livestock per household. Some questions regarding forest fire and hunting and snaring were asked individually. The grazing intensity was measured in different classes: high, medium and low based on number of livestock grazed per unit area, regeneration, extent of soil erosion and unpalatable species.

Data analysis

Mean calling cheer densities (with 95% confidence limits) were estimated using the pooled data. Cheer densities in the four study areas were compared in an ANOVA, using post hoc tests (Tukey's) to test for differences between the study areas. Pearson's correlation coefficients were used to test for correlations between numbers of calling cheer and the observed habitat variables (tree canopy cover, ground layer cover, distance to human settlement and distance to water sources). Bird data recorded from Lelliott's eight original survey points were used to test for population changes between 1981 and 2003, using a Wilcoxon signed rank test.

Results

Population estimates

Estimated densities and populations of cheer in the four study areas are presented in Table 1. Densities of cheer differed significantly between Phagune and Surtibang ($P < 0.05$) whereas the densities between each other study area did not differ significantly ($P > 0.05$). Cheer counts at Lelliott's eight survey points in Dhorpatan Valley did not differ significantly between 1981 and 2003 ($Z = -1.521$, $P > 0.05$). Lelliott (1981) estimated 32 calling birds whereas in 2003 we estimated 26 calling birds from the same eight survey points.

A total area of 21 (7.5 and 13.5) km² of DHR was considered suitable habitat for cheer in Dhorpatan Valley. Hence, Dhorpatan Valley (Surtibang and Phagune) alone supports an

estimated population of cheer of between 179 and 229 pairs. Similarly, a total 24.5 (11 and 13.5) km² in Bobang and Muri (around DHR) was considered suitable for cheer. Hence, these areas support a population of cheer ranging from 148 to 188 pairs. These figures have been estimated based on the density of birds per km² and suitable habitat. In total, the Dhorpatan Valley (Surtibang and Phagune), Bobang and Muri comprise 45.5 km² of habitat suitable for cheer. In total, the area has an estimated population of cheer ranging from 327 to 417 pairs.

Habitat use

In the Dhorpatan Valley (Phangune and Surtibhag) cheer were found in high temperate and sub-alpine forests dominated by *Pinus wallichiana* where *Juniperus spp.*, *Abies spectabilis* and *Rhododendron spp.* were also present (PLATE 1). The sites were near human settlements on north and east-facing slopes, within the altitude range 2844 m a.s.l to 3005 m a.s.l. The dominant grasses in Dhorpatan Valley were *Chrysopogon spp.*, *Eragrostis spp.* and *Eulaliopsis spp.* In the Bobang area, cheer were found in open forests dominated by *Quercus spp.*, *Rhododendron spp.* and *Pinus ruxburghii* along with occasional *Schima wallichii* and *Myrica esculenta*. The sites were between 1700 m a.s.l and 3200 m a.s.l on slopes of 200 to 350 with rocky crags and boulders. The main grass species were *Imperata cylindrica*, *Eragrostis spp.* and *Chrysopogon spp.*

In the Muri Area, the cheer were found among scattered trees and bushes on rugged slopes of 250 to 450 between 1900 m a.s.l and 3200 m a.s.l (PLATE 2). The vegetation was more mixed and included *Pinus wallichiana*, *Quercus spp.*, *Abies spectabilis*, *Garuga pinnata*, *Rhododendron spp.*, *Schima wallichii*, *Myrica esculenta*, *Prunus nepalensis*, *Rubus ellipticus*, *Berberis aristata*, *Lyonia ovalifolia* and *Lyonia spp.* along with the grasses *Eulaliopsis spp.*, *Eragrostis spp.* and *Chrysopogon spp.*

TABLE 1 Cheer densities, areas of potential habitat and population estimates for the four study sites.

Study area	Survey points	Density (km ⁻² ± 95% CI)	Potential habitat area (km ²)	Population estimate in pairs (± 95% CI)
Surtibang	7	5.0 (± 1.2)	7.5	37 (± 9)
Phagune	10	12.4 (± 1.2)	13.5	167 (± 16)
Bobang	9	8.0 (± 0.8)	11.0	67 (± 10)
Muri	8	7.5 (± 0.8)	13.5	101 (± 10)



PLATE 1 Cheer pheasant habitat in Dhorpatan Valley

a)



b)



PLATE 2 Cheer habitat at Bobang (a) and Muri (b).

There was a strong negative correlation between cheer density and crown cover at each survey point ($r_p = -0.58$, $P = 0.01$; FIG. 2). The differences between cheer densities in the four study areas were largely explained by crown cover, with the highest cheer densities occurring in areas with low crown cover. Cheer densities at the survey points were not correlated with the cover of ground layer vegetation ($r_p = 0.325$) or grazing intensity ($r_p = 0.221$). In each study area, the cheer habitat was located near human settlements. The average distance to settlements was 453 m. The mean distance from the survey points to water was 143 m. However, this study did not reveal a correlation between the presence of cheer and human settlement ($r_p = 0.09$). There was also no correlation between the presence of cheer and distance to water ($r_p = -0.12$).

Threats

Overgrazing, hunting and snaring and uncontrolled forest fire might affect cheer and its habitat. Livestock (cattle, sheep and goats) were kept in villages over winter and they were then moved up to Dhorpatan Valley for summer and autumn grazing (May to September). Tracks and signs of livestock were found throughout the Dhorpatan Valley, indicating that the valley was used for summer grazing. Migrant grazers also used Dhorpatan Valley annually to reach the high-altitude buki (pasture lands), between May and September each year. About 68 households from Morang village, 110 from Bobang village and 65 from

Adhikari Chaur were dependent on the forests in Bobang area, which was quantified by counting households within each village. An average of five livestock per household were kept over winter, between September and May.

As cheer is protected by the National Park and Wildlife Conservation Act 1973, data on hunting and snaring could not be collected directly. Shikaris (poachers), gothalos (herders) and medicinal plant collectors were reported to use numerous hidden traps to capture cheer and other pheasants (Bir Bahadur pers. comm.). In June 2002, one local gothalo collected and incubated nine cheer eggs from the bhujji of Khinidula area. In the Bobang area, two cheer were shot by local boys in 2004 by using bows (Anil Adai pers. comm.). Villagers from Gadi village said that cheer used to be found in the eastern part of the Bobang area, but that they had since been killed off by hunting, snaring and egg collection.

No evidence of recent fires was found in the study areas. No forest fires had been recorded for at least 2 years in the Bobang area. In the Muri area, people build shelters for their animals on their bari-land, adjacent to the forests. They used to burn away the vegetation surrounding the shelters to protect them from forest fires. Villagers have occasionally lost control of these fires, causing forest fires. Bari-land is agricultural land without ditches and irrigation facilities. Hence bari-land is not suitable for rice production.

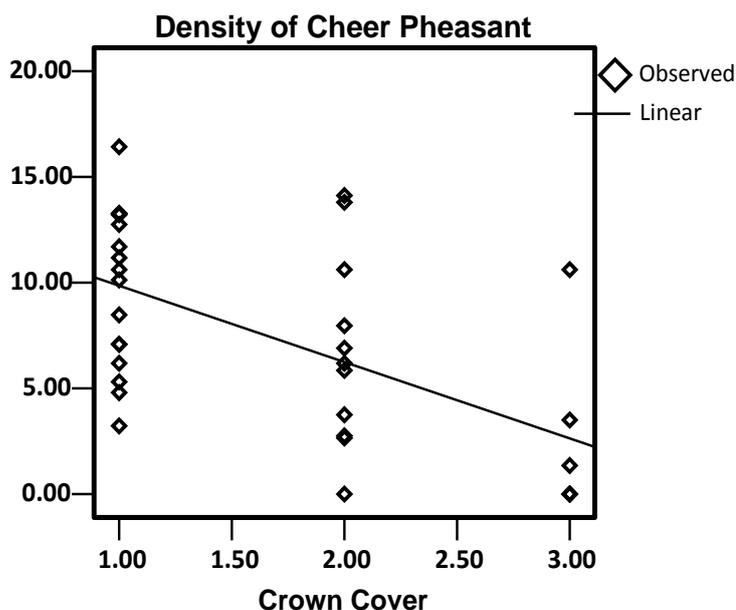


FIG. 2 Correlation between crown cover and cheer pheasant density.

Discussion

Population estimation and habitat use

The cheer densities recorded in Dhorpatan Valley (9 pairs per km²), Bobang (8 pairs per km²) and Muri (7.5 pairs per km²) are the highest known from Nepal. Cheer density was estimated to be 2 pairs per km² in Rara National Park (Singh, 2009) and 1 per km² in Kaligandaki Valley of Annapurna Conservation Area (Subedi, 2009).

Cheer densities were strongly related to tree crown cover, with the highest densities in open forests with relatively low crown cover. In contrast, the same analysis failed to find a relationship between cheer densities and either the cover of ground vegetation or other indirect measures of grazing pressure. This suggests that the current level of grazing pressure is not a threat to the species in and around DHR. Indeed, the current levels of livestock grazing pressure at Dhorpatan Valley and Bobang may actually help to maintain suitable habitat for cheer, a role that was presumably fulfilled by wild herbivores in the past. In DHR, the grazing pattern is seasonal, only from May to September. Dhorpatan Valley is used as a corridor to reach alpine meadows. Livestock graze within the range of cheer habitat for one month (May) when they are being moved to alpine meadows from the villages and one month (September) while returning. The habitat in DHR is almost free from disturbance during rearing season whereas the habitat of cheer in Bobang is totally free from livestock from May to September when egg laying, incubation and rearing of offspring take place. This type of naturally-scheduled, traditional grazing system is ecologically very helpful to maintain open forest. Wright et al., (2009) recently identified another apparent case of traditional livestock management replacing the role of lost wild herbivores in maintaining the habitat of a threatened open-forest bird. In this case, the forest wetlands of relict populations of white-shouldered ibis *Pseudibis davisoni* in dry dipterocarp forests are now maintained by domestic cattle and buffalo, which have apparently replaced gaur *Bos gaurus*, banteng *B. javanicus* and Asian elephant *Elephas maximus*.

This survey showed that the habitat of cheer can be characterised as grasslands intermingled with trees and rocky crags between the altitude of 1700 m a.s.l and 3200 m a.s.l. In Rara National Park, cheer has been recorded up to 3350 m a.s.l (Singh, 2009). These findings are in agreement with previous work, which found

that cheer generally frequented the outer hill ranges of the Himalayas, avoiding dense forest and favouring very precipitous, rocky terrain with scrub, tall grasses and stunted trees (Ali & Ripley, 1998; Gaston et al., 1981; Garson et al., 1992).

Threats

Snaring, hunting, overgrazing, deforestation and forest fire have been identified as the main threats to cheer in Nepal (Subedi, 2003; Singh, 2006). However, this study could not collect sufficient evidence of snaring and hunting due to the short duration of study and cheer's legal status. Cheer is legally protected in Nepal and therefore hunting or snaring or any kinds of hindrance to the bird are strictly prohibited outside protected areas whereas killing or hindering any kind of flora and fauna are strictly prohibited inside protected areas. Local people suggest that snaring and hunting of cheer does occur. Snaring of cheer pheasant in Nepal was common over a century ago (Baker, 1930). Nowadays, hunters catch cheer in a variety of ways, using captive cheer as lures, trapping or shooting with guns (Singh, 2006; Subedi, 2003; Acharya, 2006). According to local informants, cheer are still hunted, despite legal protection by the Nepal Government. All Himalayan pheasants are hunted indiscriminately, but the cheer seems to suffer disproportionately, perhaps because it roosts communally at lower elevations and closer to inhabited areas than do most other Himalayan Galliformes (Kalsi, 1999). Cheer are sedentary, easily detected by their calls and they occupy open habitats, with the result that they are extremely vulnerable to hunting and susceptible to local eradication (Ali & Ripley, 1998; Young et al., 1987; Kalsi, 1999).

Livestock grazing, harvesting of timber and lighting fires to maintain grasslands take place in the area, but appear to be at levels beneficial to cheer. In the Bobang area, even though the intensity of grazing was apparently quite high during winter, the area also held a dense population of cheer. Also, the cheer population appeared to have remained stable in Dhorpatan Valley since the last survey, 22 years ago. Overgrazing is likely to be deleterious to the habitat of cheer as it causes the loss of grassland, promotes unpalatable species and finally changes the habitat structure. In Rara National Park, cheer are in peril because of snaring (by using captive cheer as lures) and overgrazing (Singh, 2009). Light grazing may be beneficial to the habitat of cheer as it helps to maintain grassland and open forest type. The

intensity of grazing should be taken into account when focusing on the conservation of cheer pheasant.

Recommendations

Dhorpatan Hunting Reserve is the only region in Nepal supporting an apparently stable, viable population of cheer pheasant. Therefore, it is crucial to monitor the population regularly and existing conservation measures should continue, as they are beneficial to the bird.

There is an ongoing need for further research on various aspects of the ecology of cheer and factors limiting its numbers, particularly the degree of tolerance to grazing, deforestation and grass burning. Protection from hunting and overgrazing, reinstatement of guard posts, cheer conservation awareness programmes and income-generating programmes (to motivate local people) should be implemented for the long-term conservation of the species.

Acknowledgements

We are thankful to the World Pheasant Association, Pheasant Specialist Group and Oriental Bird Club, UK for the grants that supported this work. We are indebted to Mrs Carol Inskipp, Dr Hem Sagar Baral and Dr David Buckingham for their kind cooperation during the research period and preparation of report. We are thankful for the help we received from Dr David Buckingham and Dr Phillip McGowan for their valuable suggestions to improve this manuscript. We would like to extend our thanks to the Department of National Parks and Wildlife Conservation (DNPWC) for granting permission to carry out research in and around Dhorpatan Hunting Reserve. We are thankful to Suman Sharma and Prabhat Pal for their tireless support during the field study.

References

- ACHARYA SHARMA, R., THAPA, S. & GHIMERE, Y. (2006) *Monitoring of cheer pheasant* *Catreus wallichii* *in Lower Kaligandaki Valley, Mustang, Nepal*. Unpublished Report submitted to Annapurna Conservation Area Project, Pokhara, Nepal.
- ALI, S. & RIPLEY, S.D. (1998) *Handbook of the birds of India and Pakistan*. Compact edition. Delhi: Oxford University Press.
- BAKER, E.C.S. (1930) *Game birds of India, Burma and Ceylon*. London: John Bell and Son.

- BARAL, H.S. & INSKIPP, C. (2004) *State of Nepal's birds*. Kathmandu, Nepal. Kathmandu: IUCN-Nepal, DNPWC, BCN.
- BIBBY, C.J., BURGESS, N.D., HILL, D.A. & MUSTOE, S.H. (2000) *Bird Census Techniques*. 2nd Ed, Academic Press, London, UK.
- BIRDLIFE INTERNATIONAL (2001) *Threatened Birds of Asia*. Cambridge: BirdLife International.
- BUDHATHAPA, B.B. (2006) *Status and distribution of cheer pheasant Catreus wallichii in Rara National Park, Nepal*. Unpublished report to the Oriental Bird Club.
- DEL HOYO, J., ELLIOTT, A. & SARGATAK, J. (eds.) (1994) *Handbook of the Birds of the World. Vol.2. New World Vulture to Guinea-fowl*. Barcelona: Lynx Edicions.
- DNPWC (2010) *Protected Areas*. Department of National Park and Wildlife Conservation. www.dnpwc.gov.np. Downloaded on 30 March, 2010.
- DNPWC (2006) Brochure of Dhorpatan Hunting Reserve. Babarmahal Kathmandu: Department of National Park and Wildlife Conservation (DNPWC).
- FLEMING, R.L SR, FLEMING, R.L. JR & BANGDEL, L.S. (1976) *Birds of Nepal*. Kathmandu: Nature Himalayas.
- GARSON, P.J., YOUNG, L. & KAUL R. (1992) Ecology and Conservation of the cheer pheasants *Catreus wallichii*: Studies in the wild and the progress of a reintroduction project. *Biological Conservation* 59, 25 -35.
- GASTON, A.J., GARSON, P.J. & HUNTER, M.L. JR (1981) Present distribution and status of pheasants in Himachal Pradesh, Western Himalayas. *Journal of World Pheasant Association* 6: 10-30.
- GRIMETT, R., INSKIPP, C. & INSKIPP, T. (1998) *Birds of the Indian Subcontinent*. London: Christopher Helm.
- HMG/N (1973) *The National Park and Wildlife Conservation Act 2029*. Nepal Gazette 2029/11/28 as amended in 1974, 1982, 1989 and 1973. Kathmandu, Nepal: Ministry of Law and Justice, HMG/N.
- HMG/N (1999) *Buffer zone Management Guideline*, 1999. Kathmandu, Nepal: Ministry of Forest and Soil Conservation.
- INSKIPP, C. & INSKIPP, T. (1991) *A guide to birds of Nepal*. 2nd ed. London: Christopher Helm.
- IUCN (2009) *IUCN Red List of Threatened Species*. Ver 2009.1. www.iucnredlist.org. Downloaded on 16 September 2009.
- KASLI, R.S. (1998) *Density index and habitat association of the cheer pheasant Catreus wallichii*. Final report submitted to OBC, UK and WPA South Asia Regional Office. New Delhi
- LELLIOTT, A.D. (1981) Survey of cheer pheasant near Dhorpatan west Nepal 1981 In C.D.W. SAVAGE & M.W. RIDLEY (eds.) *Pheasants in Asia 1982*. pp. 58-61. Reading UK: WPA.
- SUBEDI, P. (2009) *Monitoring of cheer pheasant Catreus wallichii in Kaligandaki River Valley, Mustang District, Nepal*. An unpublished report submitted to National Trust for Nature Conservation-Annapurna Conservation Area Project, Unit Conservation Office, Jomsom, Nepal.
- SUBEDI, P. (2003) *Status and Distribution of cheer pheasant Catreus wallichii in Dhorpatan Hunting Reserve, Nepal*. Unpublished research report submitted to Institute of Forestry, Pokhara for the partial fulfilment of the requirement of B.Sc Forestry Degree.
- KALSI, R.S. (1998) *Density index and habitat association of the cheer pheasant Catreus wallichii*. Final report submitted to OBC, UK and WPA South Asia Regional Office, New Delhi
- KALSI, R.S. (1999) *Status and habitat of cheer pheasant Catreus wallichii in Himachal Pradesh*. World Pheasant Association, South Asia Regional Office, New Delhi
- KANDEL, R. (2000) Status Paper of Dhorpatan Hunting Reserve. In Camille, R., Basnet, K., SAH, J.P. & RAUT, Y. (Eds.) *Grassland Ecology and Management in Protected Areas of Nepal*. pp. 137-145. Kathmandu: DNPWC, ICIMOD and WWF-Nepal.
- PITTY A.F. (1968) A simple device for the field measurement of hill slopes. *The Journal of Geology* 76,6: 717-720
- SINGH, P.B. (2006) *Survey of cheer pheasant Catreus wallichii in and around Dhorpatan Hunting Reserve, Western Nepal*. An unpublished research report submitted to World Pheasant Association and Oriental Bird Club, UK.
- SINGH, P.B. (2009) *Cheer pheasant in peril in Rara National Park, Nepal*. The International Newsletter of World Pheasant Association 83. Fordingbridge, UK: World Pheasant Association.
- WRIGHT, H.L., BUCKINGHAM, D.L. AND DOLMAN, P.M. (2009) Dry season habitat use by critically endangered white-shouldered ibis in northern Cambodia. *Animal Conservation* 12: 1-9.
- YOUNG, L., GARSON, P.J. & KAUL, R. (1987) Calling behaviour and social organization in the cheer pheasant: Implications for survey technique. *Journal of World Pheasant Association*. 12: 30- 43.

YONZON, P.B. (2002) *The Wound of Neglect, Habitat Himalaya*. The Resource Himalaya Fact File. Vol IX. Lalitpur, Nepal: Resource Himalaya.

Biographical sketches

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PETER GARSON is professor at Newcastle University, UK, and co-chair of the IUCN Galliformes Specialist Group. He has been involved in pheasant conservation around the world through scientific research and education. He is interested particularly in producing young scientists around the world to support long-term conservation. LAXMAN POU DYAL is currently working in Chitwan National Park under the jurisdiction of the Department of National Parks and Wildlife Conservation. He has contributed extensively to wildlife conservation in different National Parks and Wildlife Reserves in Nepal as ranger and is still working in the field as a Conservation Officer. He has undertaken extensive research on Galliformes.