

**POPULATION STATUS, HABITAT ASSESSMENT AND THREATS
OF CHEER PHEASANT *Catreus wallichii* (Hardwicke, 1827) IN
MYAGDI, NEPAL**



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Submitted to

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Declaration

I hereby declare that the work presented in this thesis has been done by myself, and has not been submitted elsewhere for the award of any degree. All sources of information have been specifically acknowledged by reference to the authors.

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RECOMMENDATION

This is to recommend that the thesis entitled "**Population Status, Habitat Assessment and Threats of Cheer Pheasant *Catreus wallichii* (Hardwicke, 1827) in Myagdi, Nepal**" has been carried out by Mr. Keshab Chokhal for partial fulfillment of the requirement for Master's Degree in Zoology with the special paper of Ecology. This is his original work and has been carried out under my supervision. To the best of my knowledge, this work has not been submitted for any other degree in any institutions.

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LIST OF ABBREVIATIONS

Abbreviated form	Details of abbreviations
ACAP	Annapurna Conservation Area
BCN	Bird Conservation Nepal
CITIES	Convention on International Trade in Endangered Species
DEM	Digital Elevation Model
DHR	Dhorpatan Hunting Reserve
DHM	Department of Hydrology and Metrology
GLM	Generalized Linear Model
GIS	Global Information System
GPS	Global Positioning System
IUCN	International Union for Conservation of Nature
SRTM	Shuttle Radar Topography Mission

ABSTRACT

Cheer Pheasant (*Catreus wallichii*) is a resident bird of Western Himalaya as a globally vulnerable and nationally endangered species. This study aimed to assess population status, determine the habitat use and explore the conservation threats of Cheer Pheasant in Myagdi. Dawn call count method was used to estimate the population of Cheer Pheasant and survey was conducted in 300m radius (n=25) call count station. As well as that quadrat method was laid down for the vegetation density quantification and major threats were identified by questionnaire method. Altogether 38 breeding individual with 96- 240 population size of Cheer Pheasant was estimated. Population density 7 bird/km² has been estimated in study area whereas entire detection rate was 1.50 bird/station. Elevation 1800-2400m was the specific range of Cheer Pheasant whereas a maximum of 8 individuals were recorded from lowest elevation 1800m in Daduwa. East and South aspects with moderately steep slope (10⁰-35⁰) and steep slope (35⁰-67⁰) were the favorable specific geographical features of this species. Corresponding to habitat feature was analyzed by generalized linear model methods however population was directly correlated with the ground cover (95%CF, P<0.00011), shrubs density (95%CF, P<0.0034) and soil temperature (95%CF, P<0.0293). Almost habitats were located in around the human settlement (95%CF, P>0.064) although the humidity (95CF, at P>-0.099) and tree density (95CF, at P>-0.021) were negative effects on the Cheer distribution. Poaching, grazing, fire and habitat deterioration were the major threats to Cheer Pheasant. Species action plan and conservation awareness program should be necessary for the minimization of these threats in Myagdi.

1 INTRODUCTION

1.1 Background

Cheer (Wallichs) Pheasant is the endemic species of Western Himalaya (Grimmett *et al.*, 1998) belongs to order Galliformes and family Phasianidae. In context of Nepal eight Pheasants have been recorded (Inskipp *et al.*, 2016). Globally, this species is distributed in the southern foothills of the Himalaya (Humes and Marshall, 1987), from Hazara district of Pakistan (Beebe, 1918) to the Kali Gandaki River (Ali and Ripley, 1968; Robert, 1970). Moreover, in India, Cheers have been reported from Great Himalayan National Park, Gharwal, Budhalnalla and Himachal Pradesh (Gaston *et al.*, 1981; Young *et al.*, 1987; Shah, 2004; Bisht *et al.*, 2007). Similarly, in Pakistan, this species is recorded from Jhelum Valley to Kashmir (Roberts, 1991; Awan *et al.*, 2004a; Iftikhar *et al.*, 2017) (Figure 1).

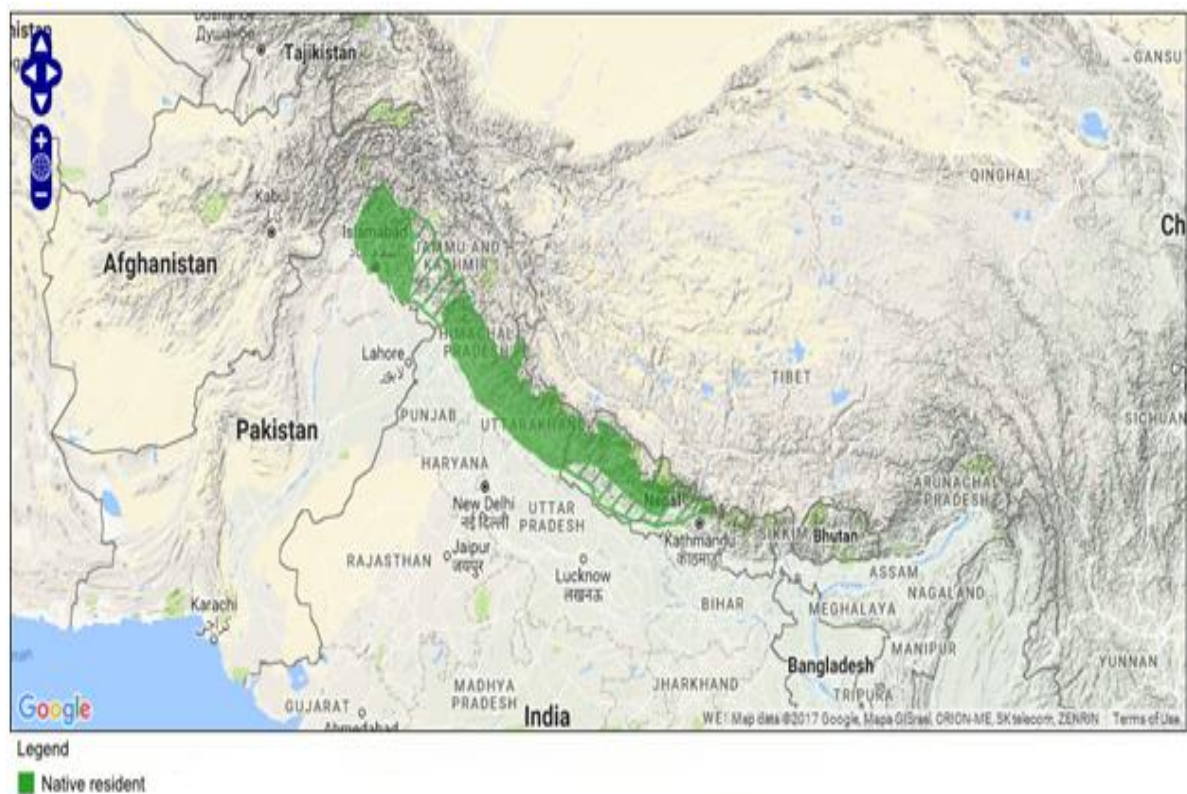


Figure 1: Global distribution of Cheer Pheasant (Sources: Bird Life International 2018)

Cheer Pheasant has been reported from Muri, Muna, Marang, Okarboot, Kuninekhani and Dana in Myagdi (Lelloit, 1981; Bird Life International, 2001; Singh *et al.*, 2006; Singh *et al.*, 2011; Kandel, 2013). The Dhorpatan Hunting Reserve is the most important habitat of Cheer (Lelloit, 1981; Subedi, 2003; Garson and Baral, 2007; Basnet, 2014). Similarly, this species is recorded from other protected areas such as Annapurna Conservation Area (Inskipp and Inskipp, 2003; Acharya *et al.*, 2004; Acharya, 2006).

Rara National Park (Budthapa, 2006; Singh and K.C, 2008; Thakuri, 2013) and Api Nampa Conservation Area (Thakuri and Prajapati, 2012). Furthermore, this Pheasant is reported from some non protected areas in Nepal such as Humla (Ghimirey, 2011), Bajura (Basnet, 2016), Achham (Budha, 2006), Baitadi, Doti, Jumla and Mugu, (Poudyal and Joshi, 2010) (Figure 2).

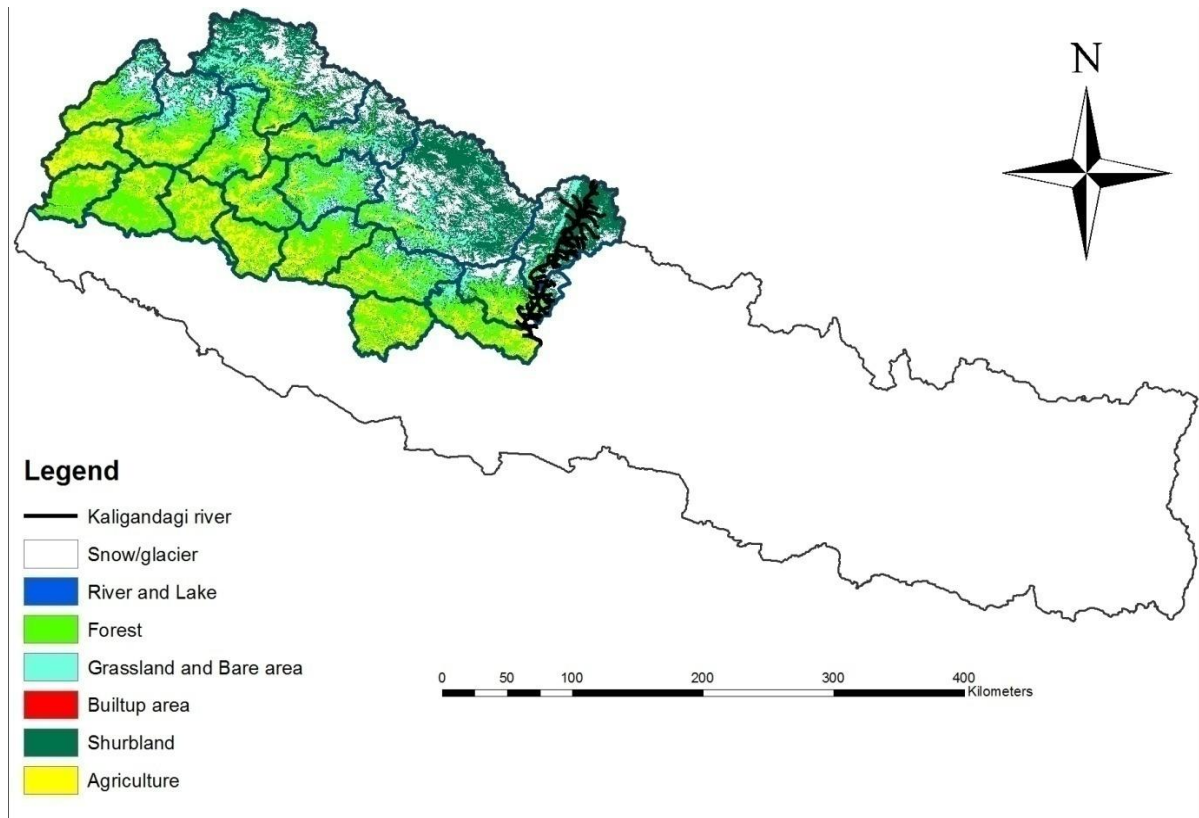


Figure 2: Distribution of Cheer Pheasant in Nepal

1.1.1 Habitat and Behavior

Cheer Pheasants are the gregarious and terrestrial bird; frequently live in the flock comprising about 5-15 individuals (Bisht *et al.*, 2003). The species preferred to live in North-West, and South East facing steep slopes ($65^{\circ} - 80^{\circ}$) with tall grasses, stunted trees and mixed vegetation (Awan *et al.*, 2004a). The Cheer Pheasant is typically avoided the dense forest, however occurred open forest (i.e., *Pinus wallichiana*, *Quercus spp.*, *Abies spectabilis*, *Rhododendron spp.*, *Schima wallichii*, *Myrica esculenta*, *Prunus nepalensis*), shrubs (*Rubus ellipticus* and *Berberis aristata*) and grasses (*Cynodon dactylon*, *Saccharum spontaneum*, *Thysanolaena maxima*, *Cyperus rotundus*, *Urtica dioica*, *Cynodon dactylon*) intermixed vegetation (Singh *et al.*, 2011).

The Cheer generally digs on the root, tubers and also feed seeds, berries, the larva of insects, grubs and small pebbles of stones (Ali and Ripley, 1983). During breeding season, the male gives a loud call for the courtship and territory defense (Finn, 1902). They generally, live in a pair and roost in areas with low crown cover, open forest and dense scrub vegetation (Ali and Ripley, 1983). Female Cheer makes nest on the bushes which is usually hidden under the shelter of rock and overhanging vegetation (Baker, 1930). Breeding Cheer composed on their nest with the grassy bush and tending to foot hills of the vertical cliff and down trail whereas nest is formed on the ground as that under the backwoods of dry grasses (Ali and Ripley, 1968). The breeding season of Cheer is April to June (Gaston and Singh, 1980) and incubation period is about 20 days and 8- 14 eggs are hatch out in one hatching period (Humes and Marshall, 1879; Bisht *et al.*, 2007).

The Population of this species is declining in Nepal due to poaching, overgrazing, fire and habitat deterioration (Subedi, 2003; Acharya *et al.*, 2004; Budthapa, 2006; Basnet, 2014; Bird Life International, 2015). The government of Nepal has protected this species under the NPWC Act (NPWC, 1973), IUCN categorized as vulnerable species and CITIES listed in Appendix I (Bird Life International, 2018).

1.2 Objectives

The main objective of the study was to determine the population, assess habitat and threats of Cheer Pheasant in Myagdi. The specific objectives were:

- Determine population status
- Assess habitat quality and use
- Explore the conservation threats of Cheer Pheasant

1.3 Significance of the study

Most part of the Myagdi district is located outside of the protected area system and this is the first intensive survey of Cheer Pheasant in Myagdi. This study has provided baseline information on the population, habitat quality, use and threats of Cheer. Such information has useful to design for conservation program in Myagdi.

1.4 Limitations of the study

During the present field studies following limitations were given below:

- Because of resource limitation, details quantification of habitats was impossible.
- Most parts of the, and Okharboot were victimized by a heavy landslide so that survey was carried out in limited parts of this area

2 LITERATURE REVIEW

Ecological research has continually updated the information on the status, distribution, population and habitat requirements of many avian as well as other wildlife species. The habitat requirements of species vary among species and entail the environmental conditions present within a species location.

2.1 Population status and distribution

Several researchers have done research on the distribution and population of Cheer. The distribution of Cheer Pheasant have been reported from Durung Galli Pakistan to West of the Kali Gandaki River in Nepal (Beebe, 1926; Ali and Ripley, 1968; Robert, 1970). Distribution of Cheer Pheasant was recorded in Dhorpatan Hunting Reserve (DHR), Muri and Khibang, Myagdi (Fleming *et al.*, 1976; Severinghaus, 1977; Roberts, 1970). Four pairs of Cheer Pheasant with 0.5 km² potential density were estimated by Lelloit (1981) in Athazar Parbat, Nepal (Muri and Muna). Singh *et al.* (2011), reported 7.5 bird/km² of Cheer in 13.5km² potential habitats in Muri Myagdi. Lelloit (1981) estimated 50 to 100 individuals of Cheer in Dhorpatan Hunting Reserve, Nepal. Later, Subedi using call count method estimated 170-276 Cheers with the density of 8 bird/km² Cheer Pheasant in DHR. The comparative study was carried out by Basnet (2014) in the same area and estimated 143-156 individuals with 7.08 bird/km² density of Cheer Pheasant.

There are some reports from other areas of Nepal. Young *et al.* (1987) reported 1.98 bird/km² population density of Cheer Pheasant in Lower Kali Gandaki Valley however Aacharya (2006) reported 11 Cheer Pheasant in 2.65 bird/km² in the same area. Similarly, seven calling Cheers with 7-10 birds were reported from Ghassa Mustang (Bird Life International, 2014). One and two Cheer Pheasant has been reported from Rara National Park (Budthapa, 2006; Singh and K.C, 2008). Similarly, 22 calls of Cheer Pheasant have been heard from Northern part of same study area (Thakuri, 2012). Six Cheer with 0.77pairs/km² density was estimated in Bajura district, Nepal (Basnet, 2016). Further, various distributions of Cheer Pheasant were recorded from far Western Nepal such as; Achham (Budha, 2006), Baitadi, Doti, Jumla and Mugu, (Poudyal and Joshi, 2010) and Api Nampa Conservation Area (Thakuri and Prajapati, 2012)

Worldwide distribution of Cheer Pheasant was described by Hardwicke (1827). Morphology, habitat preferences, calling and breeding behavior of Cheer was reported by Jerdon (1864) in India. Cheer Pheasant was recorded from Kumau, Garwal (Humes and Marshall, 1879), Chamba, Kumba (Whistler, 1926), Parshar, Kanthar, Tranagar (Mirza, 1978) and Bhandara district (Gaston *et al.*, 1981). However, common distribution of Cheer Pheasant was found in Himanchal Pradesh (Sharma *et al.*, 1990; Pandey, 1993; Jandrotia *et al.*, 1995; Shah, 2004). Further Cheer Pheasant was reported from other sites of India such as, Hemanta Nalla and Budha Nalla Reserve (Gaston *et al.*, 1981), Bhatal and Tundah

Wildlife Sanctuary (Kaul, 1989b) and Majtal Wildlife Sanctuary (Kalsi, 1998). Cheer population was estimated in different sites of Chail Wildlife Sanctuary in different time (Gaston and Singh, 1980; Garson, 1983; Akthar *et al.*, 2011), but the numbers of individuals recorded were different in different time.

In Pakistan, the Cheer has been explored from Pirchansi area (Young *et al.*, 1987), Jhelum Valley (Awan *et al.*, 2004a; Khan *et al.*, 2006; Awan *et al.*, 2014), Quzinag Game Reserve (Iftikhar *et al.*, 2017).

2.2 Habitat use

General distribution and habitat use of the Cheer Pheasant have been explored by various researchers, but much of the works are exploratory type. Such as, Lelliot (1981) reported distribution of Cheer in North and South facing aspects between 1400-3000 m altitudes in Athazar Parbat Region Nepal. Similarly, (Singh *et al.*, 2011) reported its preference of North and East facing aspects with 1700- 3200 m elevation in Muri Myagdi. This species was found at 2844-3005 m altitudes in South, South East, North facing aspects with 0-40⁰ slopes in Dhorpatan Hunting Reserve (Lelloit, 1981; Garson *et al.*, 1992; Subedi, 2004) while Cheer Pheasant was reported from North and East facing aspects in Dhorpatan Hunting Reserve (Basnet, 2014). At 2300- 3200m in more than 0-27⁰ slopes with South, West and North aspects has been specified habitats features of Cheer Pheasant in Ghasa, Mustang (Aacharya *et al.*, 2004; Aacharya, 2006). However, Budthapa (2006), Singh and K.C (2008) study was shown that; it has been distributed from 3700-4500m elevation with 30-45⁰ slopes in Botamalika grassland of Rara.

Different studies has been reported the various habitat features of Cheer Pheasant; steep, craggy hillside with stunted trees has been preferred habitats of Cheer Pheasant (Inskipp and Inskipp, 1991; Bird Life International, 2001). However, rough hillsides, overhanging grassy rocks, scrubby ledges forest and annual burning grass were commonly used habitats of Cheer Pheasant in Muri, Khibang and Dara village (Lelliot, 1981). As like as intermixed vegetation (grass and scrubs), rocky terrain with craggy hillsides were mostly preferred by Cheer Pheasant in Dhorpatan Hunting Reserve (Lelloit, 1981; Subedi, 2003). Intermingled vegetations (tall grass, steep terrain, dispersed trees with the shrub and herb) were specified habitats of Cheer Pheasant in Rara National Park (Budthapa, 2006; Singh and K.C, 2008; Thakuri, 2013). Distribution of Cheer Pheasant was negatively significant related with canopy cover but insignificants related with grass canopy cover in Muri Myagdi (Singh *et al.*, 2006). Its occupancy was positively associated with the distance of water resources in Dhorpatan Hunting Reserve (Basnet, 2014). Specifically 1850-2750 m and commonly 1200-3050 m elevation band were usually occupied by Cheer Pheasant in Western Himalaya foothills (Baker, 1930). Cheer Pheasant has been seasonally migrated towards lower elevation up to 600m in Pakistan (Robert, 1991; Johnsgard, 1999) although it was also reported from higher elevation up to 4550m in India (Ghosh, 1997). Shah (2004) reported

that the species preferred elevation between 2500- 2700m in the Great Himalaya National Park India. Similarly, 1880-2300m elevation range has been used by Cheer Pheasant in an outer valley of Salkhal Wildlife Sanctuary (Mirza, 1980). However, Cheer was recorded from 701 -2400m elevation in Chail Wildlife Sanctuary India (Gaston and Singh, 1980; Akthar *et al.*, 2004) which was preferred to live in South West, South and South East facing gentle slopes (Mani, 1974; Johnsgard, 1986; Kumar, 1997). South West (52%) and North East facing (38%) aspects were mostly occupied by Cheer Pheasant in Great Himalaya National Park India (Shah, 2004). However, Northeastern and Southeastern facing aspects were specified geographic features of Cheer Pheasant in Azad Jammu Kashmir (Iftikhar *et al.*, 2017).

Grassy hills, scattered oak forest, open precipitous terrain with scrub vegetation and tall grass has been preferred habitats of Cheer Pheasant (Murray, 1889; Whistler, 1926; Lelloit, 1981; Kaul, 1990) in outer hill range of Himalayas. But dense pine forest mostly occupied by Cheer Pheasant in Majtal Wildlife Sanctuary (Mishra, 1996; Kalsi, 1998). However, open jungle, scrub (Rhododendron) forest and tall grass cover was preferred habitats of Cheer Pheasant in Great Himalayan National Park India (Gaston *et al.*, 1981; Garson *et al.*, 1992; Shah, 2004). Dense grasses cover with short shrubs intermixed vegetations and limited human disturbances were identified as an important factor for the distribution of Cheer Pheasant in Himachal Pradesh (Sharma *et al.*, 1990; Garson *et al.*, 1992; Jandrotia *et al.*, 1995; Kalsi, 1999; Ramesh *et al.*, 1999; Jolli and Pandit, 2011b).

Distribution of Cheer Pheasant was insignificant related with ground cover, shrubs and shrubs canopy cover, tree canopy cover and grass canopy in Jhelum Valley Pakistan (Awan *et al.*, 2004a). Dispersed tree, rocky terrain, scrub forest and barren land with mixed moist temperate forest were generally used but oak forest was rarely used by Cheer Pheasant in Jhelum Valley and Jammu Kashmir Pakistan (Awan *et al.*, 2014; Iftikhar *et al.*, 2017). Post-fire habitat was most suitable habitat of Cheer Pheasant in Kashmir Pakistan (Omaston, 1927) which was strongly related with the successional grassland (Bird Life International, 2012).

2.3 Conservation Threats of Cheer Pheasant

Poaching, overgrazing, forest fire, habitat fragmentation, timber harvesting and collection of eggs were a major threats of Cheer Pheasant in Nepal (Subedi, 2003; Aacharya, 2006; Budthapa, 2006; Singh and K.C, 2008; Kandel, 2013; Basnet, 2014). Domestication of wild Cheer was also another threat of Cheer Pheasant in Nepalese Himalaya Region (Subedi, 2004; Aacharya, 2006; Singh *et al.*, 2006; Singh and K.C, 2008; Basnet, 2016). Its distribution has been negatively correlated with high human disturbance (Kandel, 2013), but positively affected by moderate disturbance (Kaul, 1989a; Garson *et al.*, 1992; Ramesh *et al.*, 1999). Relatively Cheer could be tolerated with specific human disturbances in Dhorpatan Hunting Region (Lelloit, 1981; Subedi, 2003). The medium intensity of grazing was

important factor for the distribution of Cheer Pheasant in around the Dhorpatan Hunting Reserve (Singh *et al.*, 2011).

The heavy fire and high habitat destruction were a negative factor for the Cheer population growth (Whistler, 1926). Snaring and poaching were common threats of Cheer Pheasant in Indian Himalayan (Baker, 1930; King, 1981; Singh and Singh, 1987). Habitat fragmentation, poaching, pesticides and human disturbances were identified as major factor for the population declining of Cheer Pheasant in Great Himalayan Park (Shah, 2004) and Gharwal Himalayan (Bisht *et al.*, 2003) and moderate disturbances (farming and grazing) has positive effects (Jolli and Pandit, 2011a). Distribution of Cheer Pheasant was affected by poaching, habitat degradation, overgrazing and burning in Jhelum Valley (Awan *et al.*, 2004; Khan *et al.*, 2006) and Azad Jammu Kashmir (Iftikhar *et al.*, 2017).

Cheer Pheasant has been reported from Jammu Kashmir, Jhelum Valley, Great Himalaya National Park, Utter Pradesh and Himachal Pradesh. Study was started from 19 century in Nepal and other researcher find out the distribution range of Cheer Pheasant in West of Kali Gandaki River. Continuously many studies were carried out in different sites of Nepal where they reported population was continuously declining. Specific distribution, few population, and limited studies are the major issue of Cheer conservation in Nepal. Dhorpatan Hunting Reserve and Lower Kali Gandaki Valley were also potential sites of Cheer Pheasant in Nepal; however, population is continuously declining in these two areas. Similarly, Myagdi is boarding between DHR and ACAP. Previously few study has been carried out in Myagdi and assess individuals was reported from this area (i.e Dana, Marang, Muna, Okarboot, Muna, Muri, Kuinekhani). However exact population trend was unknown and many unidentified potential sites are present there. Poaching and snaring is still common so for the minimization of threats and sustainable species conservation study might be helpful.

3 MATERIALS AND METHODS

3.1 Study Area

Myagdi is located in Dhaulagiri Zone Western Nepal and a total area of this district is 2207.06km². Geographically, Myagdi district is lies between 83.4686⁰E to 83.2448⁰E longitude and 28.3431⁰N to 28.6333⁰N latitude and altitude between 790m to 8167m. Kali Gandaki, Myagdi, and Raguganga are the main river systems of Myagdi district. Arje Khola, Ritung Khola, Dar Khola, Gurja Khola, Mara Khola are the major tributaries of these 3 river.

3.1.2 Climate

- **Rainfall**

According to topography and elevation feature, climatic patterns are various in Myagdi such as, Tropical (>1000m), Subtropical (1000-2000m), Temperate (2000-3000m), sub alpine (3000-4000m), Alpine (5000m) and Nival (<5000m). December is dry season and minimum rainfall occurring in November (39ml) however Highest rainfall occurs from July (239.75ml). Maximum 80% rainfall is occurs between May to October (Figure 3).

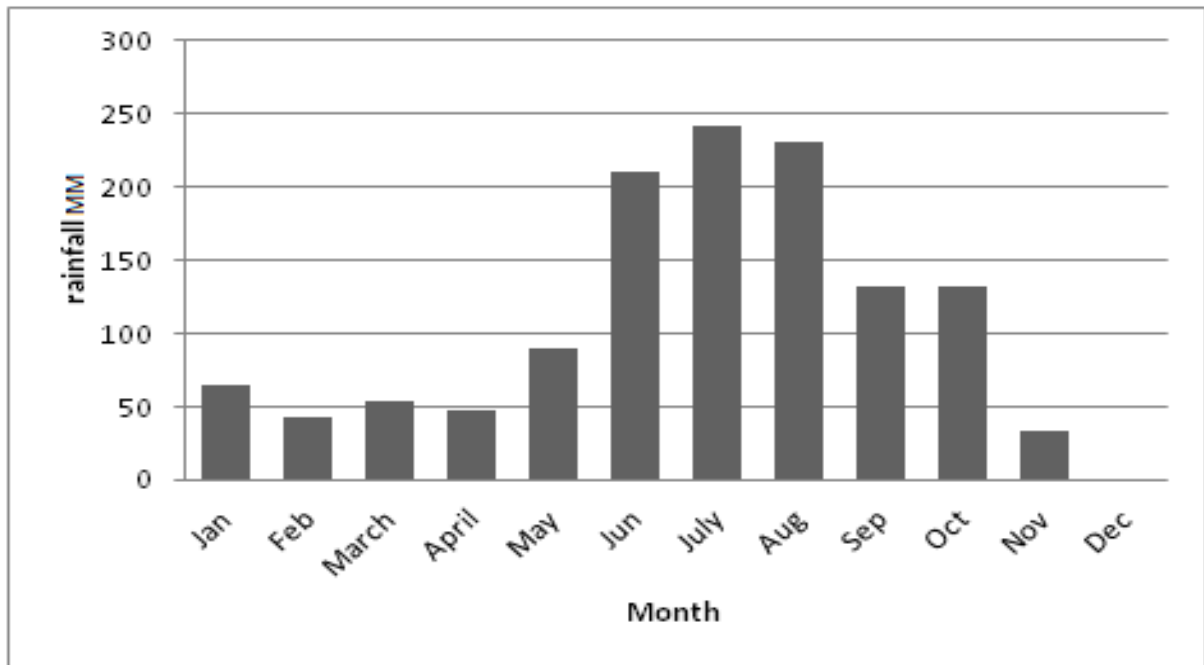


Figure 3: Average monthly rainfall recorded at the Meteorological station located at Beni (2008-2016) (Source: DHM Government of Nepal)

- **Temperature**

Hot months of the year are May, June, July and September where as the annually maximum temperature (35⁰C) recorded in May (Figure 4). After monsoon season to winter season is start and temperature is decreasing continuously. January and December is the coldest month of the year (Figure 4).

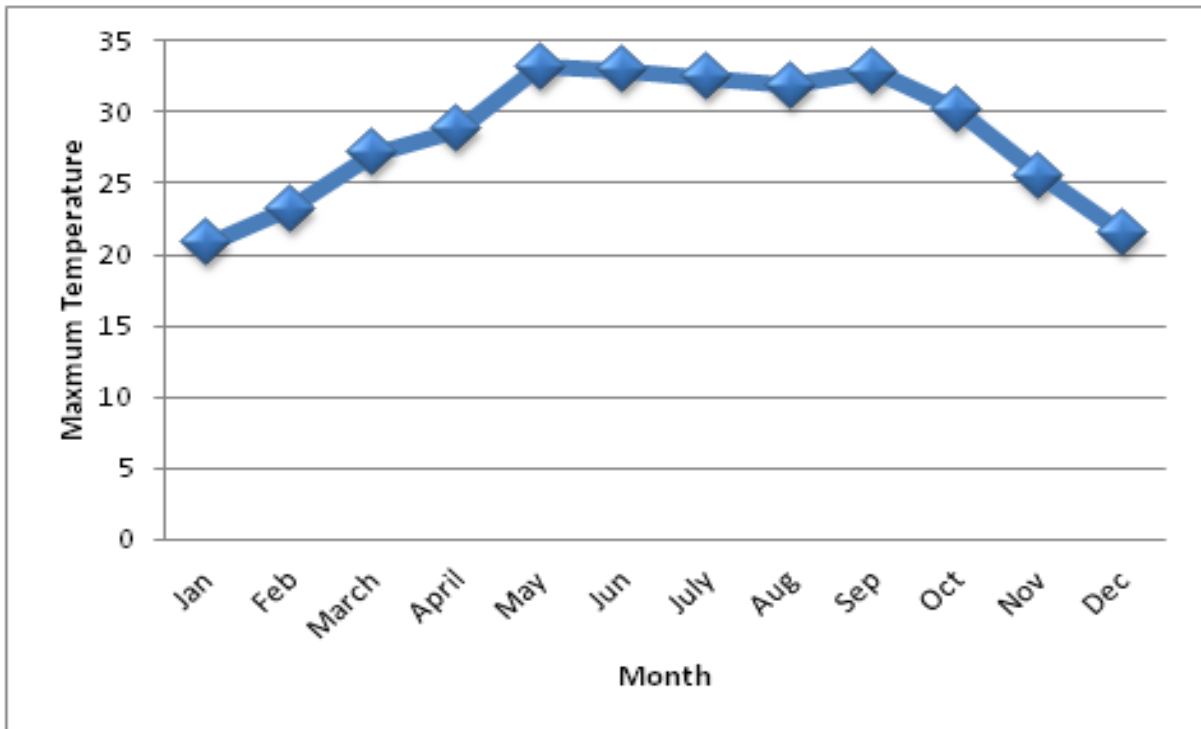


Figure 4: Average monthly temperature recorded at the Meteorological station located at Beni (2015) (Source: DHM Government of Nepal)

The Northern part is cold and Southern is warmer in Myagdi. Hottest temperature of the year is July (23.44⁰C) in Myagdi which temperature is recorded from Gurjakhani Station. December is the coldest month of the year (Figure 5). Sometimes climate is freezing. Snowfall, avalanche, and fogs are major climatic threats to Wild animals and human beings. Sometimes People shift their settlement from the higher elevation to lower elevation by the cause of cold Climatic effects and disaster in Myagdi.

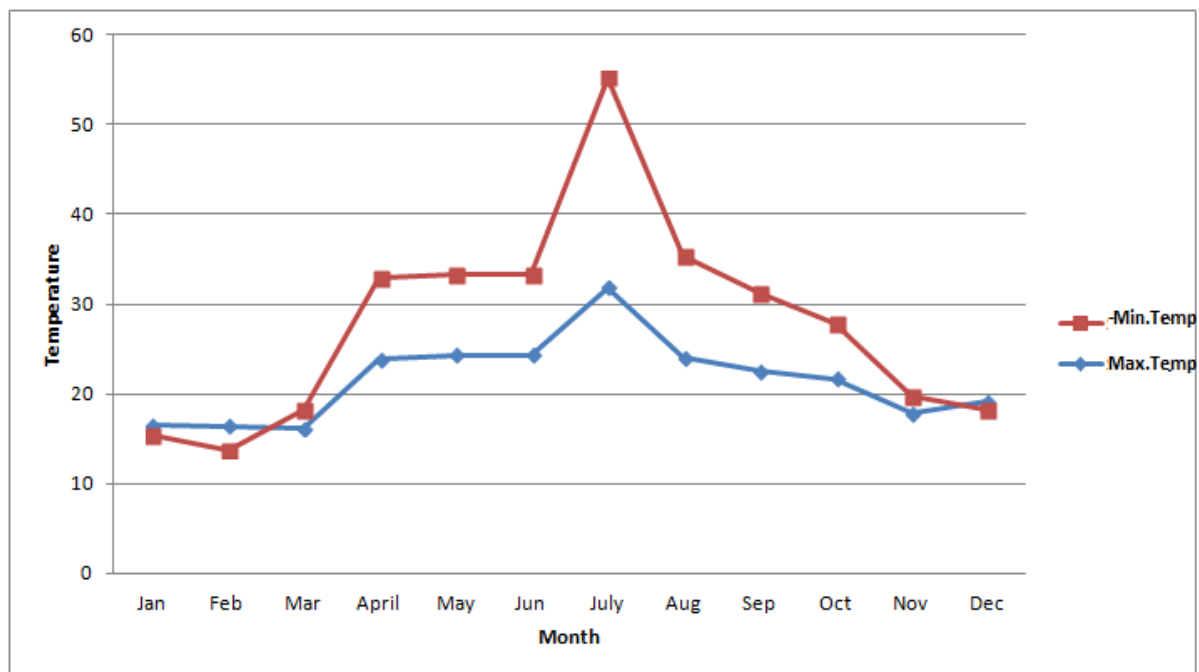


Figure 5: Average monthly rainfall recorded at the Meteorological station located at Beni (2015) (Source: DHM Government of Nepal)

3.1.5 Forest flora and fauna

Out of 2297.06km² area of Myagdi, 848.52 km² areas are covered by forest. Land use of the district comprise of forest (36.76%), Shrub (1.85%), Barren land (21.27%) and Rock cover (2.61%) (DFO, 2016). The forest of Myagdi is consists of conifer forest (13.99%), broadleaf forest (49.30%), mixed forest (31.375%) and scrubs (5.32%) (DFO, 2016). The *Schima wallichii*, *Abis pindrow*, *Alnus nepalensis*, *Ficus auriculata*, *Leucoseptrum canum*, *Saurauia napaulensis*, *Cryptomeria japonica*, *Alangium alpinum*, and *Quercus glauca*, etc. are common plants in the Eastern Mid-hills of Nepal (Magraw and Detling, 2002). Some important mammalian species recorded from Myagdi ae *Uncia uncia*, *Macca assamensis*, *Panthera pardus*, *Felis chaus*, *Muntiacus vaginalis* , *Ailurus fulgens* (Jnawali et al., 2011). Some common birds are found in Myagdi *Neophron percnopterus*, *Gyps himalayensis*, *Milvus migrans*, *Dicrurus macrocercus* etc. Lower Kali Gandaki is the only known area in Nepal whereas all six Himalayan Pheasant species are found *Catreus wallichii*, *Tragopan satyra*, *Ithaginis cruentus*, *Pucrasia macroloph*, *Lophophorus impejanus*, *Lophura leucomelanos* are recorded from this study area (Inskipp and inskipp, 2003).

3.1.4 Socioeconomic Status

Total Population of Myagdi district is 113641 with the density of 50/km². Residing a total household family number is 28024 (CBS, 2011) whereas a rate of population growth is 0.06%. According to CBS (2011) major ethnic communities of the study area is Magar (39.46%) however other ethnic communities are Chhetri (17.17%), Kami (15.51%), Brahman (8.04%), Sarki (3.33%) and other (10.62%). Hindu (87.16%), Budhha (10.33%), Christian (0.16%) and other (1.02%) religious people are inhabited in Myagdi whereas agriculture (86.5%), foreign employee (12.60%) others (0.9 %) occupations of the peoples in Myagdi.

3.1.5 Intensive Study area

Geographical location of the study area is (28.515⁰N to 28.575⁰N) to (83.323⁰E to 83.634⁰E). The intensive study area is located outside of the protected area between Dhorpatan Hunting Reserve and Annapurna Conservation Area. The survey area comprises 843km² between the elevations of 1400m-3000m. According to 3 river basins (Myagdi, Raguganga and Kali Gandaki), such intensive study area is divided into 3 parts (Figure 6).

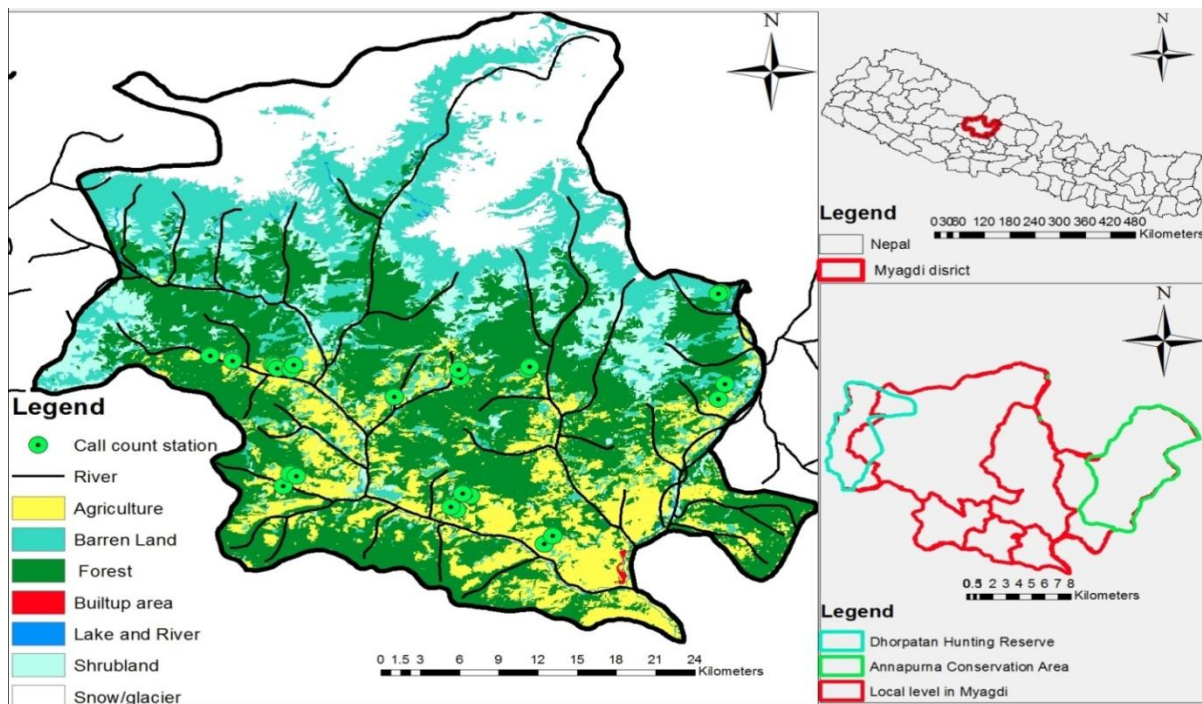


Figure 6: Land cover patterns and different call count station in study area

3.2 Materials used

- GPS (Garmin eTrex® 10)
- Densiometers (Forestry suppliers spherical Crown Densiometer, Convex, model c)

- Digital Thermocouple Thermometers (CDN DSP1)
- Infrared Thermometers (Holdpeak 320 non-contact Digital Laser Infrared Thermometer)
- Camera (Copiex 10)
- Rope
- Speaker
- Topography map (1:50,000)
- Field guide book (Grimmett *et al.*, 2003)

3.3 Research design

The potential sites were identified by analyzing topographic map, literature review and preliminary survey. The entire study area was divided into 3 parts within the three river system. Along with this river basin, 5*5 km² (16) grids were created in Arc GIS 10.1. From each grid, unsuitable sites were removed and 5 grids were randomly selected. Call count station each with 300m radii were set up among the selected grids. Field work was done during breeding season: April 23 to May 19 and May 30 to June 05, 2017.

3.3 Reconnaissance survey

A reconnaissance survey was carried out in between 13 to 26 October, 2016 by using the playback method (speaker). Potential locations of the Cheer were identified with the help of local people, shepherds, and medicinal plant collectors. The interactions were made with the expert of BCN, Bird Guides, and Pheasant expert and to find the potential habitat of Cheer.

3.4 Population estimation

The population of Cheer was estimated by call count method. A call count method is only reliable method for estimation of Pheasant population and widely used to the Himalayan Pheasant species (Young *et al.*, 1987). Call count is the best method to find out the abundance and population index of the Pheasants. Both sexes give loud call in morning as well as evening (Young *et al.*, 1987). Repetitively calls were counted within the sites in three consecutive mornings. Altogether 7.5 km² areas were covered and a survey was conducted in 33 days. Call count was started 30 minutes before sunrise and continue till 60 minutes after sunset. Survey points were to be managed for 15 minutes from the first time of a call, approximate distance and compass direction of all calling birds were noted from each survey point to avoid duplication by observers at nearby points.

3.6 Habitat analysis

In each 300m radii of call count station habitat parameter such as aspect, elevation, slope, distance to human settlement, distance to water resources, distance to cultivated land, fire, humidity, canopy cover, ground cover, shrub density, herbs density temperature, tree density, humidity, soil temperature and rock cover were estimated. Elevation, distance to human settlement, distance to water resources and cultivated land were measured by GPS and Densiometer was used for the canopy cover estimation. Humidity and temperature were measured by Digital Thermocouple Thermometers and soil temperature was also calibrated by Infrared Thermometers. Ocular estimation methods were used for the exploration of ground cover (%) rock cover (%) and fire. Fire impact area was identified by direct observation of soil colour, degradation and regeneration of vegetation structure. According to fire impact area; numerically it was categorized into different forms no fire (0), 25% less impact (1), 50% moderates impact (2) and more than 50% high impact (3) (Appendix 3).

3.6.1 Vegetation sampling

- **Quadrates method**

Heterogeneous, quadrates were randomly laid down in each 300m radii of call count station. Data were collected on 1*1 m² for herbs, 5*5 m² for shrubs and 10*10 m² size for tree (Poudyal, 2008) (Appendix 4).

3.7 Questionnaire survey

The semi-structured questionnaire survey was conducted among the 100 local respondents. Every Four questionnaires were randomly chosen from each call count station. Formal and informal interviews were conducted among the selected responded (Appendix 5).

3.8 Data analysis

3.8.1 Population estimation

- **Detection rate**

The detection rate was calculated by replicate number of birds estimated by call count station (Miller *et al.*, 2008).

$$\text{Encounter rate} = \frac{\text{ex(Replication days of total survey times)}}{\text{number of birds estimated by call count station}}$$

- **Mean population density**

Mean population density was estimated by dividing the mean number of calling birds by total area covered in each station (Subedi, 2006).

$$\text{Mean population density} = \frac{\text{mean number of calling birds in an area}}{\text{Total area covered in each station}}$$

- **Breeding Population Estimation**

The Breeding Population (BPE) was estimated by done the number of calling sites detected before sunrise by factors of 0.75 probably produces the best available estimate of a breeding population within the survey area (Young *et al.*, 1987).

$$\text{BPE} = \varepsilon \bar{x} * 0.75 \quad \text{Where } \Sigma \bar{X} = \text{Total mean of the individual}$$

- **Population estimation by descriptive statistics**

The populations were estimated by pool mean and pool variance. Variances were represented overall status of abundance of the species in this study area and sampling units is measures (Young *et al.*, 1987).

- **Pool mean of population**

$$\bar{\bar{X}} = \frac{n_1 \bar{x}_1 + n_2 \bar{x}_2 + n_3 \bar{x}_3 + \dots \dots \dots n_{17} \bar{x}_{17}}{n_1 + n_2 + n_3 + \dots \dots \dots n_{17} - N}$$

- **Pool variance of population**

$$\sigma^2 = \frac{(n_1 - 1)\sigma^2_1 + (n_2 - 1)\sigma^2_2 + \dots \dots \dots (n_{17} - 1)\sigma^2_{17}}{n_1 + n_2 + \dots \dots \dots n_{17} - N}$$

Where

$\bar{\bar{X}}$ = Pooled Mean

\bar{x} = Mean of each station

σ^2 = Variance

σ = Standard Deviation

n = number of repeated measures

3.8.2 Habitat selection of Cheer Pheasant

- **Vegetation density**

Vegetation density was calculated by the total number of individuals of the species in all samples dividing by total number of sampling units studies (Zobel *et al.*, 1987).

$$\text{Density } \left(\frac{\text{number}}{\text{ha}} \right) = \frac{\text{Number of individual plants counted} * 10000\text{m}^2}{\text{Number of plots} * \text{size of quardate}}$$

- **Canopy cover**

The spherical densitometer was used to measure the forest crown cover (Lemmon, 1957). Canopy filled square area was counted in densitometer. Canopy cover (%) was estimated by 1.04 multiply with number of filled square and it was subtracted by 100 (Huynh, 2005).
Canopy Cover (%) = 100- (Number of filled squares x 1.04)

- **Digital Elevation Model**

Digital Elevation Model (DEM) was used in the feature digitization of slope, aspect, and elevation. Digital data was downloaded from earth explorer SRTM (1ARC Second Global) feature. Slope was categorized as flat (0^0), gentle slope ($0-10^0$), moderately steep slope (10^0-35^0), steep slope (35^0-67^0) and very steep slope (67^0-90^0). Aspect was categorized into East, South, West, and North. Elevation range was categorized into 600-1200m, 1200-1800m, 1800-2400m, and 2400-3000m and above 3000m in spatial analysis tool of ARC GIS 10.1

- **Generalized linear model of habitat analysis**

The general linear model was used to determine habitat use of the Cheer. Cheer presence location data was response variable and habitat parameter (canopy cover, ground cover, scrubs number, tree number, human settlement distance, cultivated land distance, water resources distance, fire, soil temperature, temperature, humidity, and altitude) was the independent variable. This variable was analyzed by Generalized Linear Model in R Console version 2.15.2 which analysis tool was initiated by (R Development Core Team, 2012) and the model was developed by (Nelder and Wedderburn, 1972). The R-package GLM2 were used for the interpretation of response and independent variables (Table 1).

3.8.3 Questionnaire survey

Semi structure questionnaire was used to explore the conservation threats of Cheer Pheasant. Perception of peoples and conservation threats was shown by different charts (Figure 17, 18).

4 RESULTS

4.1 Population status and call duration

During the survey, of the 25 call count station, Cheer call was recorded from 17 stations only. The number of call ranged from one in Bhulukhase station to eight calls in Daduwa call count station (Figure 7). Estimated total mean call was 48.97 and maximum call 63. A total 38 breeding individuals were estimated from the surveyed area with detection rate 1.50 bird/station. Based on the pool mean 2.94 and 300m radii call count station, the mean population density of the species was 7 bird/km². Range between the population densities were 4 and 10 bird/km². By applying a correction factor on non calling proportion of Cheer which analysis was shown that 5 bird/km² mean density with 2 and 8 bird/km² range . Potential habitats of study area were estimated 24 km². The extrapolated of total population size was 96 - 240 pairs. Altogether 14 Cheers were directly observed in four different call count stations whereas maximum (n=11) individual Cheers were directly observed in Daduwa (Appendix 2).

Maximum call duration of Cheer Pheasant was 4:57 AM to 7:15 AM in Bhulekhase station. Early call was recorded from Lamkhorria at 3:14 AM and late call was recorded from Bhulukhase station at 7:15 AM. Repeated calls were 11 times which was observed in Surkepatal station. Highest eight call was recorded from Dadauwa Bhir station at (4:20-6:58). Duration of calling birds was variable from 0.1 sec to 1min and almost call was heard in the duration of 4:00- 6:30 AM.

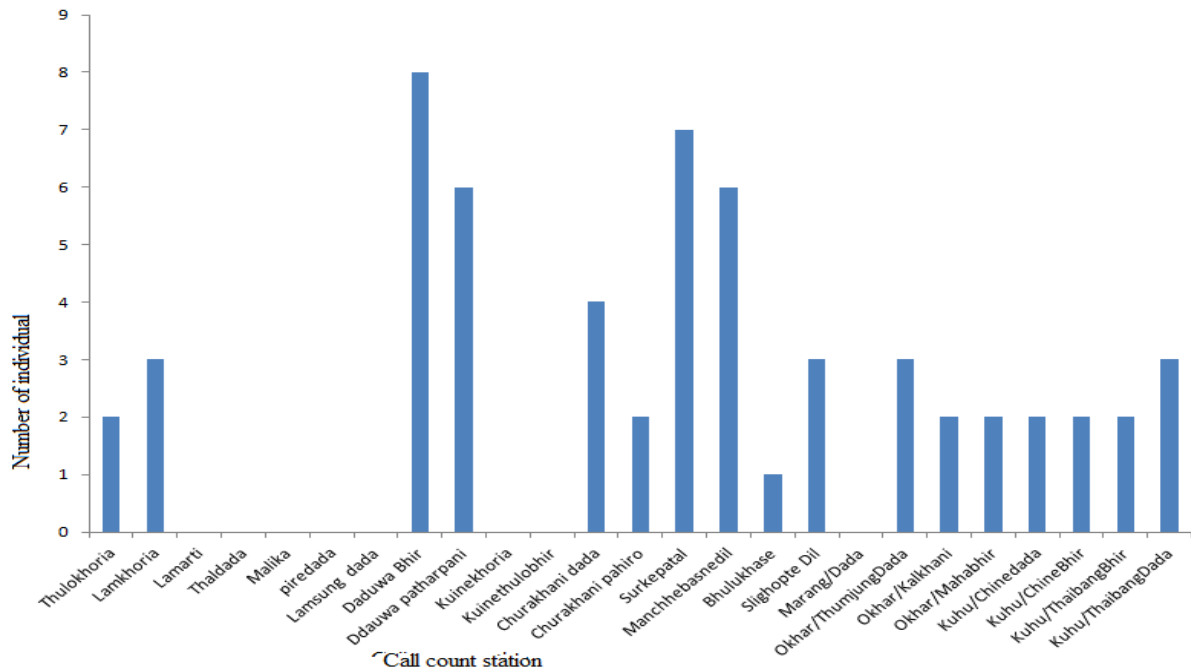


Figure 7: Number of individual Cheer call in different station

4.2 Habitat assessment survey of Cheer Pheasant

4.2.1 Quantification of Vegetation density

Average vegetation density; herbs (2551.09), shrubs (87.26) and tree (176.56) was estimated in per hector plot (Figure 8).

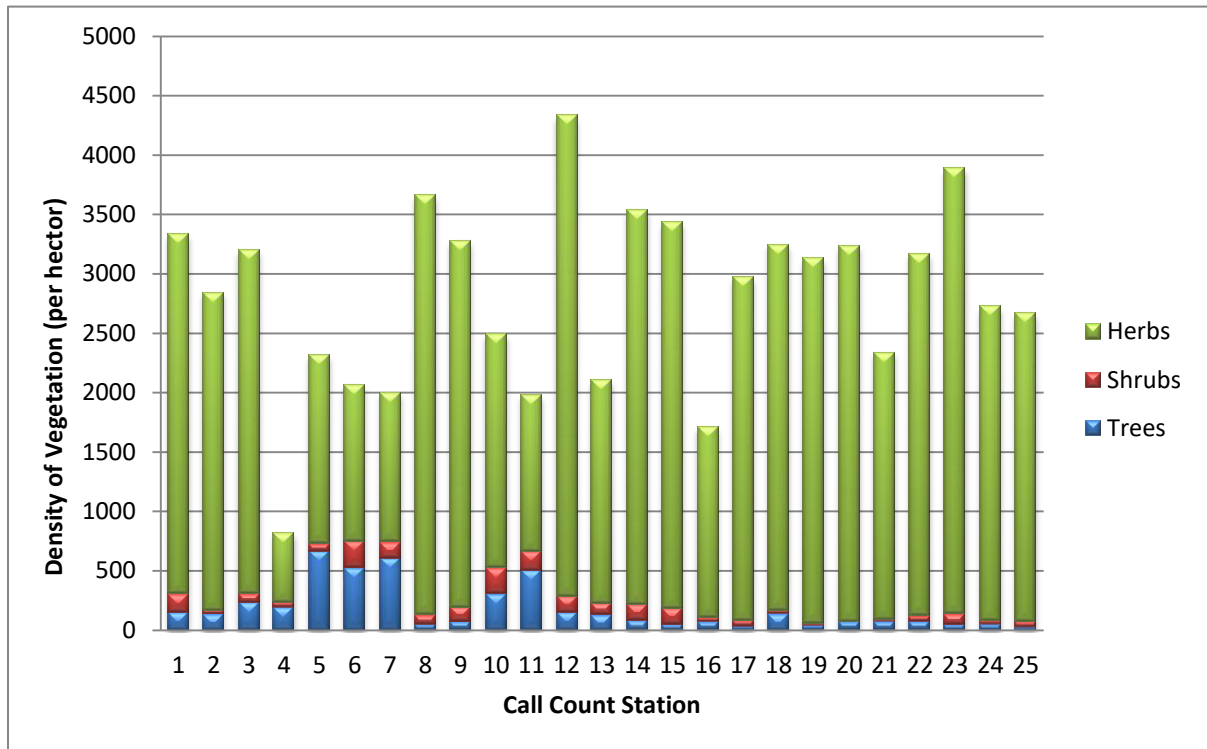


Figure 8: Vegetation density in different call count station of Myagdi district

4.2.2 Digital Elevation Model

- Slope

Majority of the individuals Cheers (35) were recorded in moderately steep slope (10° - 35°) and remaining 14 individuals were recorded in the steep slope (35° - 67°) (Figure 9).

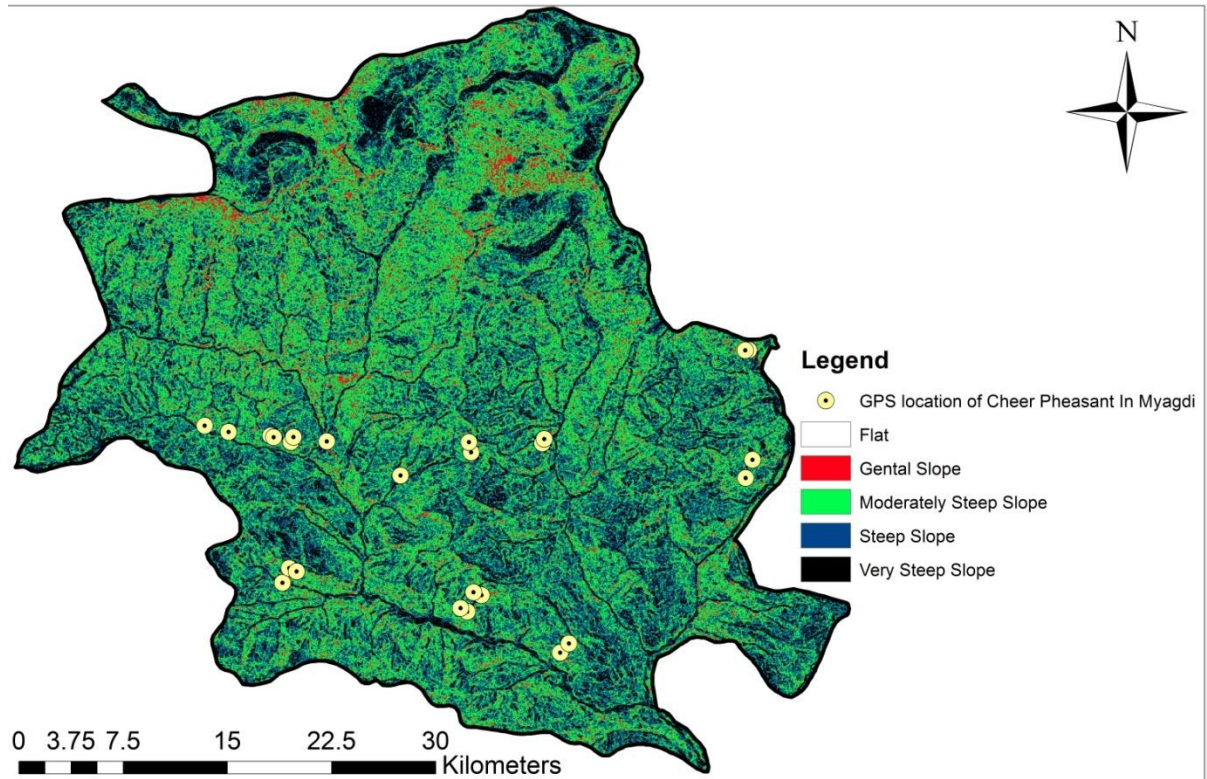


Figure 9: Distribution of Cheer Pheasant in different category of slopes in Myagdi

- **Aspect**

Majority of Cheer (37) were recorded from East facing Aspects whereas (12) individuals were recorded in South facing Aspect (Figure 10).

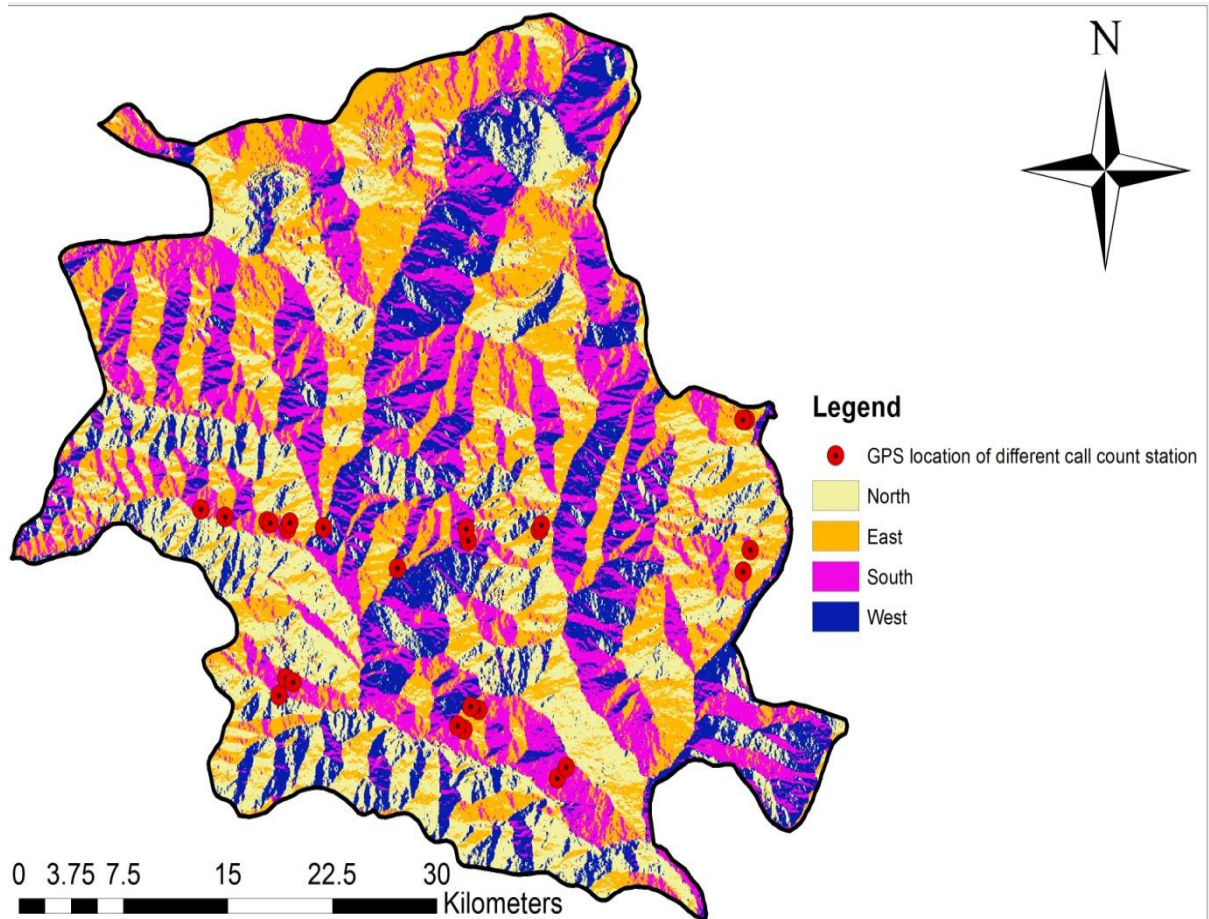


Figure 10: Distribution of Cheer Pheasant in different category of Aspects in Myagdi

- **Altitudes**

The Cheer was recorded altitudinal range between 1800-2400m, whereas maximum (n=8) Cheers were observed from lowest altitude 1800m in Dadauwa Myagdi (Figure 11).

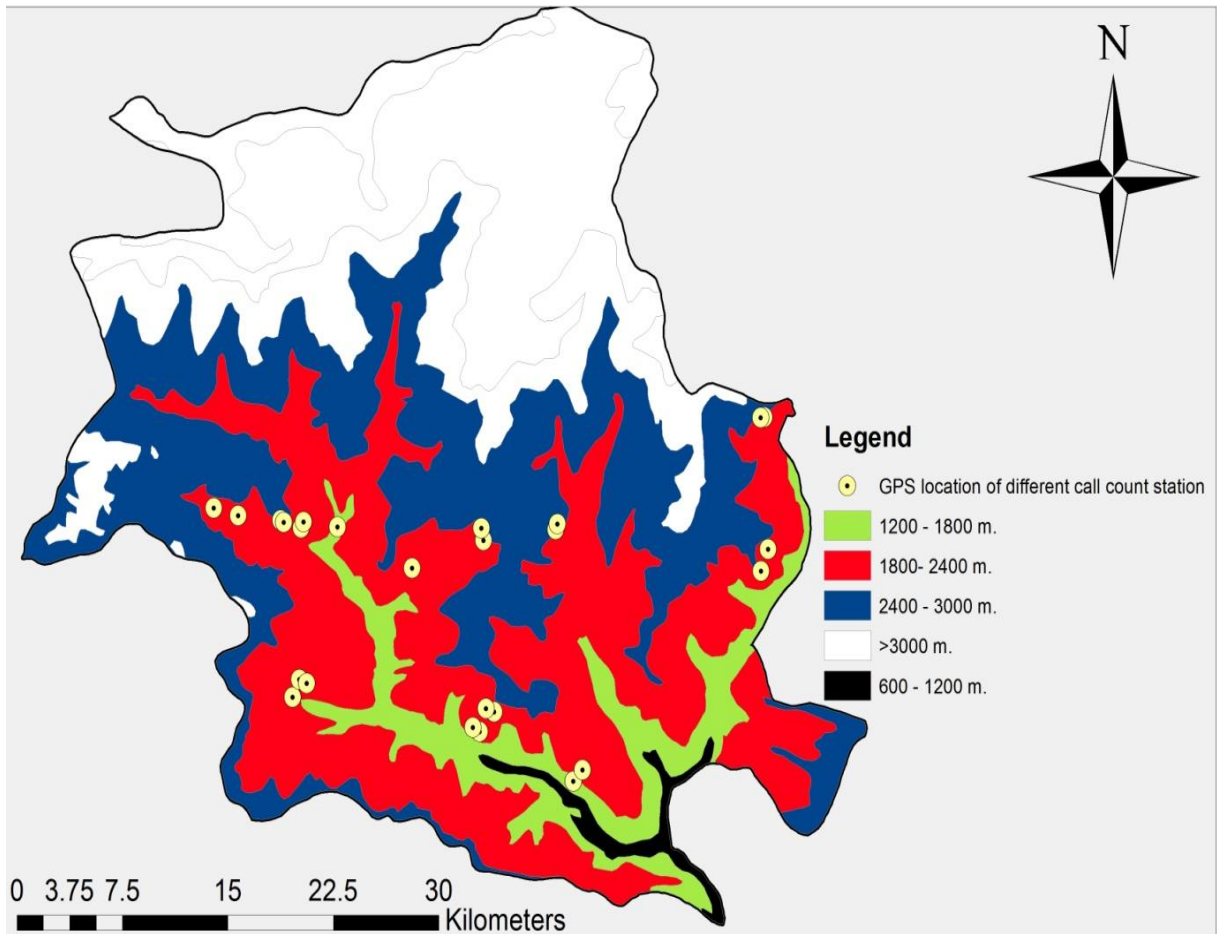


Figure 11: Distribution of Cheer Pheasant in different category of Elevation in study area

4.2.3 Habitat Preference of Cheer Pheasant

The Cheer Pheasant specially preferred habitat with dense ground cover, scrub vegetation and soil temperature of 18 to 21⁰C rather than the dense forest, dense canopy cover and high humidity (Table 1).

Table 1: Significance test of population with different habitat variables

Call:						
glm(formula = Popu ~ Huset + Cult.di + Fir + Alt + N.shr + Grco + Canco + Temp + Sot + Rco + Tre + Her + Hum + Wat.dis, family = gaussian)						
Min	1Q	Median	3Q	Max		
-0.15639	-0.06104	0.02375	0.04698	0.13236		
Coefficients:		Estimate	Std. Error	t value	Pr(> t)	
(Intercept)		0.089	0.709	0.125	0.904	
Hum set dist		0.00032	0.00016	2.084	.	
Cultivated la dist		0.00045	0.00038	1.178	0.267	
Fire		0.0185	0.0329	0.562	0.587	
Altitude		-0.000386	0.000246	-1.57	0.148	
Shrubs density		0.024	0.00510	3.89	0.0034	**
Ground cover		0.0136	0.00219	6.195	0.00011	***
Canopy cover		-0.0027	0.0035	-0.754	0.469	
Temperature		-0.0099	0.016	-0.618	0.551	
Soil Temp		0.051	0.0198	2.543	0.0293	*
Rock Cover		-0.0019	0.0031	-0.609	0.556	
Tree density		-0.011	0.0036	-2.746	0.021	*
Herbs density		0.00015	0.000110	0.787	0.459	
Humidity		-0.00724	0.00310	-1.822	0.099	.
Water distance		0.000209	0.00023	0.912	0.384	
Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1						
(Dispersion parameter for gaussian family taken to be 0.01244067)						
Null deviance: 5.44000 on 24 degrees of freedom						
Residual deviance: 0.12441 on 10 degrees of freedom						
AIC: 29.63						
Number of Fisher Scoring iterations: 2						

- **Normal QQ plot**

Data were not normal and samples ranged between -2 to 2 Quantiles. The regression analysis indicated that the distribution was positively associated with habitat factor (CF 95%, $P < 0.05$) and distribution was negatively associated with habitat factor (CF 95%, $P > 0.05$) (Figure 12).

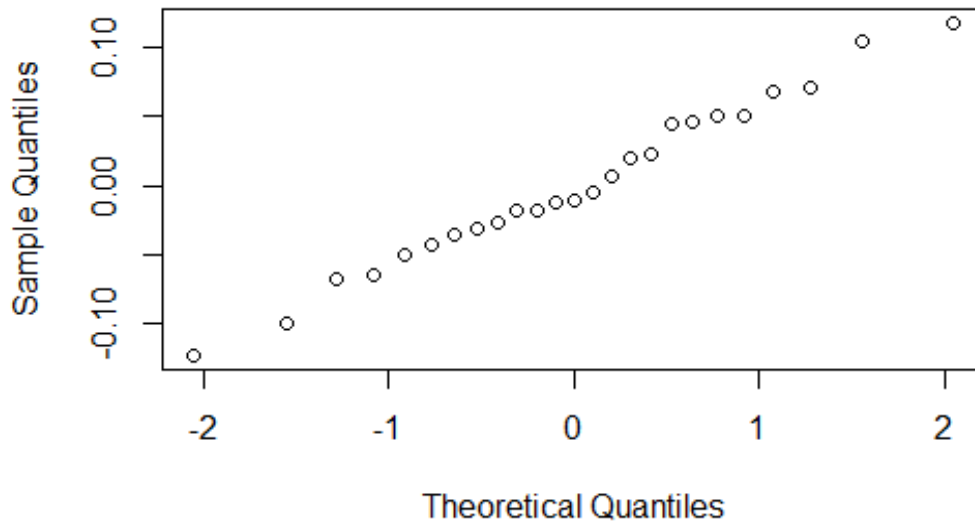


Figure 12: Deviation of sample with different quantiles

Effects of Ground cover (%), Shrubs density and Soil Temperature on the distribution of Cheer Pheasant

The GLM analyses showed that the ground cover (95%CF, $P < 0.00011$), number of shrubs (95%CF, $P < 0.0034$) and soil temperature (95%CF, $P < 0.0293$) were significant factor for distribution of Cheer Pheasant. The habitat with dense shrubs and high ground cover and soil temperature 18 to 21⁰C were the most significant habitats features of Cheer Pheasant distribution (Figure 13).

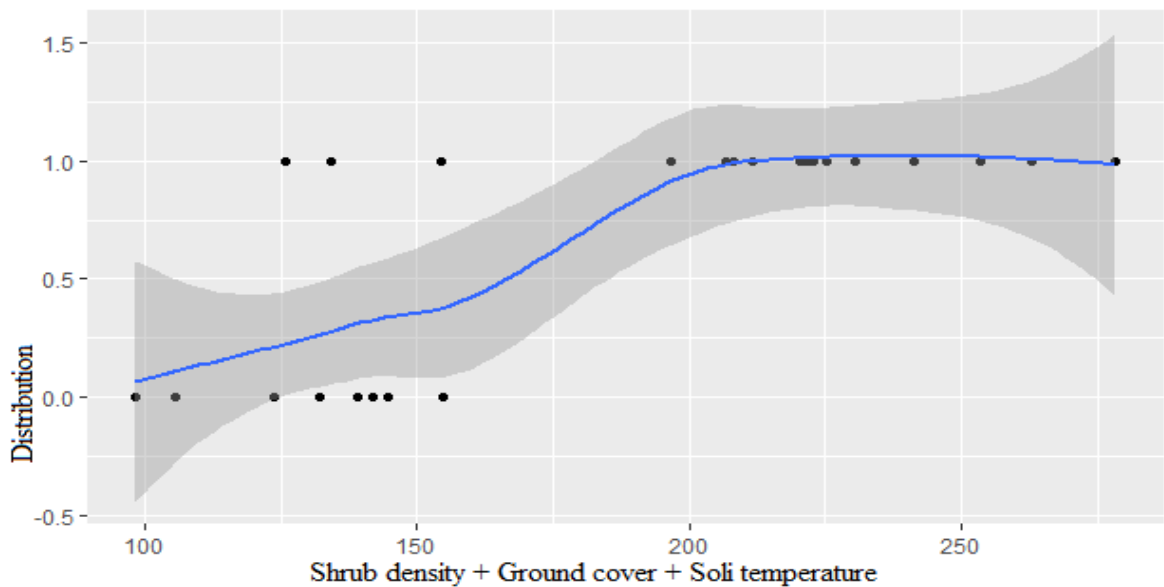


Figure13: Effects of ground covers (%), shrubs number and Soil temperature on the distribution of Cheer Pheasant

- **Effects of Human settlement on the distribution of Cheer Pheasant**

Distance of human settlement (95%CF at $P > 0.064$) was closely associated with the Cheer distribution (Figure 14).

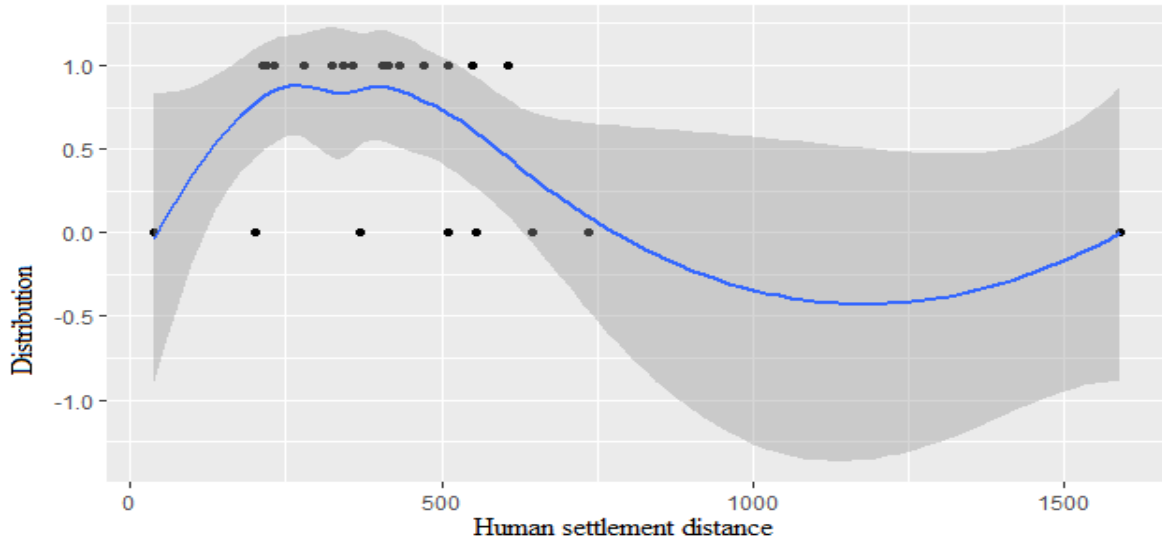


Figure 14: Effects of human settlement on the distribution of Cheer Pheasant

- **Effects of Humidity and Tree density on the distribution of Cheer Pheasant**

Cheers had been avoided habitats with dense forest (95CF, at $P > -0.021$) and high humidity (95CF, at $P > -0.099$) (Figure 15).

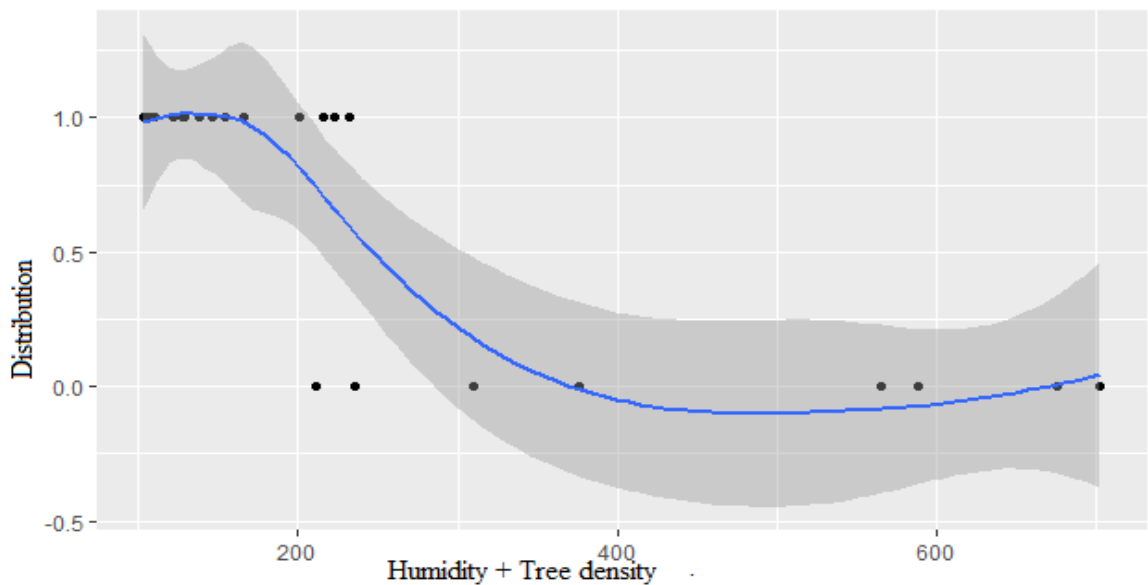


Figure 15: Effects of tree number and humidity on the distribution of Cheer Pheasant

- **Effects of Altitude on the distribution of Cheer Pheasant**

Elevation range Altitudinal range (95CF, at $P > -0.148$) was negatively effects on the distribution of Cheer Pheasant in Myagdi (Figure 16).

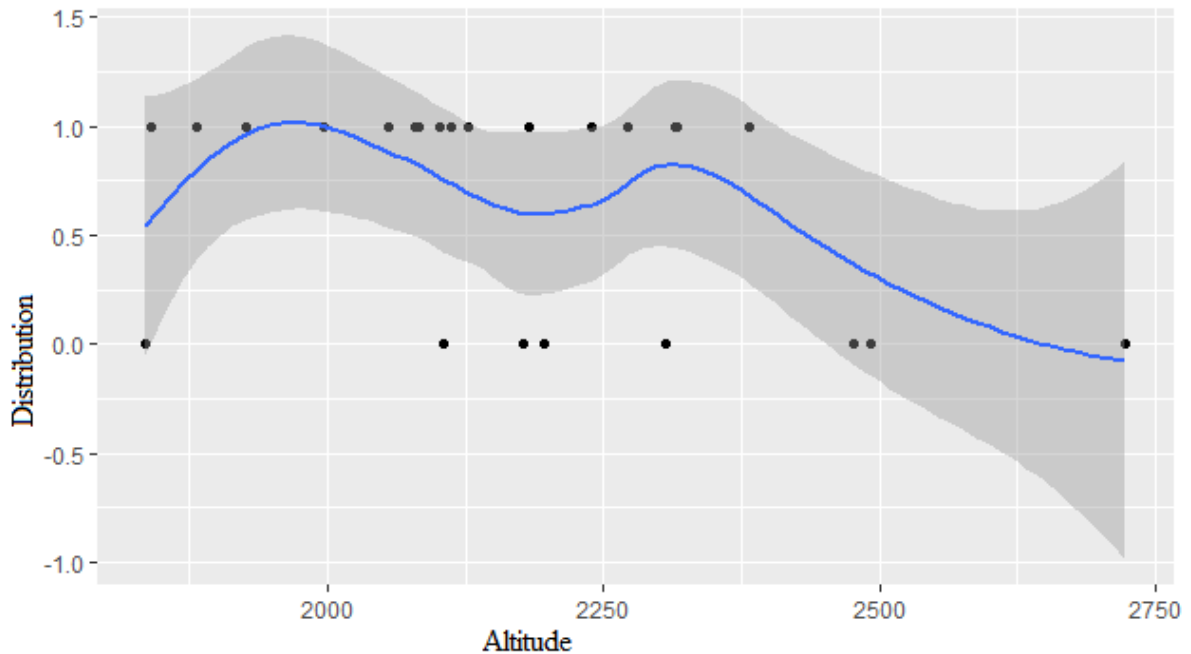


Figure 16: Negative correlation between numbers of individual with altitudes

- **Effects of herbs density distance to cultivated land and water source, fire, canopy cover(%), temperature and rock cover on the distribution of Cheer Pheasant**

Distance of cultivated land (95CF at $P > 0.267$), water sources (95CF at $P > 0.459$), herbs density (95CF at $P > 0.459$) and fire (95%CF at $P > 0.587$) has been positively insignificance related with the distribution of Cheer. Although, Canopy cover (95CF at $P > -0.469$), temperature (95CF at $P > -0.551$) and rock cover (95CF at $P > -0.556$) were negatively insignificance related with the distribution of Cheer Pheasant. This three parameter had not performed any role for the distribution of Cheer Pheasant (Table 1).

4.3 Perception and Conservation threats

4.3.1 Respondent's perception towards Cheer Pheasant

Among the hundred respondents, majority expressed positive thought and only 5% respondents did not give any answer (Figure 17). Almost 90% respondents had not seen nest and hatchling and 10% people were spotted nest and hatchling of Cheer Pheasant in Myagdi. Among the hundred respondents, majority expressed positive thought and only 5% respondents did not give any answer (Figure 17). Almost 90% respondents had not seen nest and hatchling and 10% people were spotted nest and hatchling of Cheer Pheasant in Myagdi.

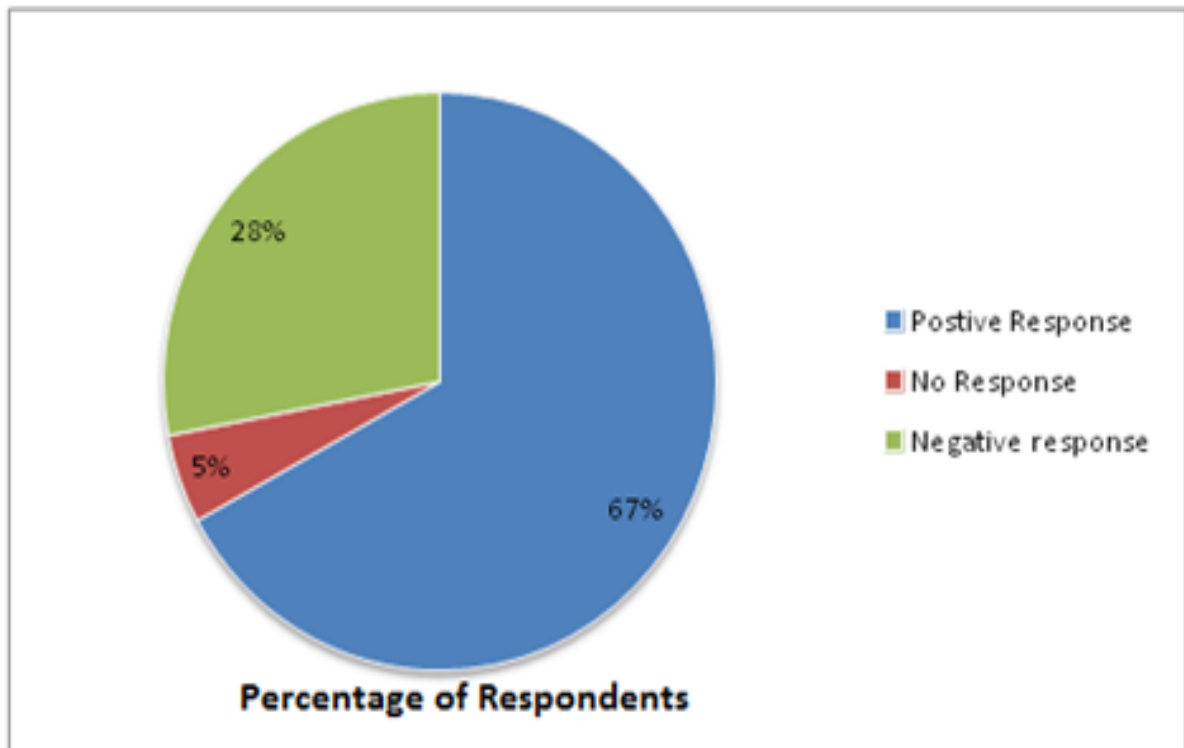


Figure 17: Respondent perception towards the Cheer Pheasant

4.3.2 Threats

Respondents identified grazing, poaching, fire and habitat degradation as major threats of Cheer Pheasant in the Myagdi (Figure 18). During the survey period, 10 trapping nets and 31 groups grazing goat and cattle were recorded. In addition, forest fire, construction of roads and NTFP collection commonly observed (Figure 18). Hatched egg, feathers, snare and catapult were spotted in field excursion time (Photo 2, 13, 4 and 6).

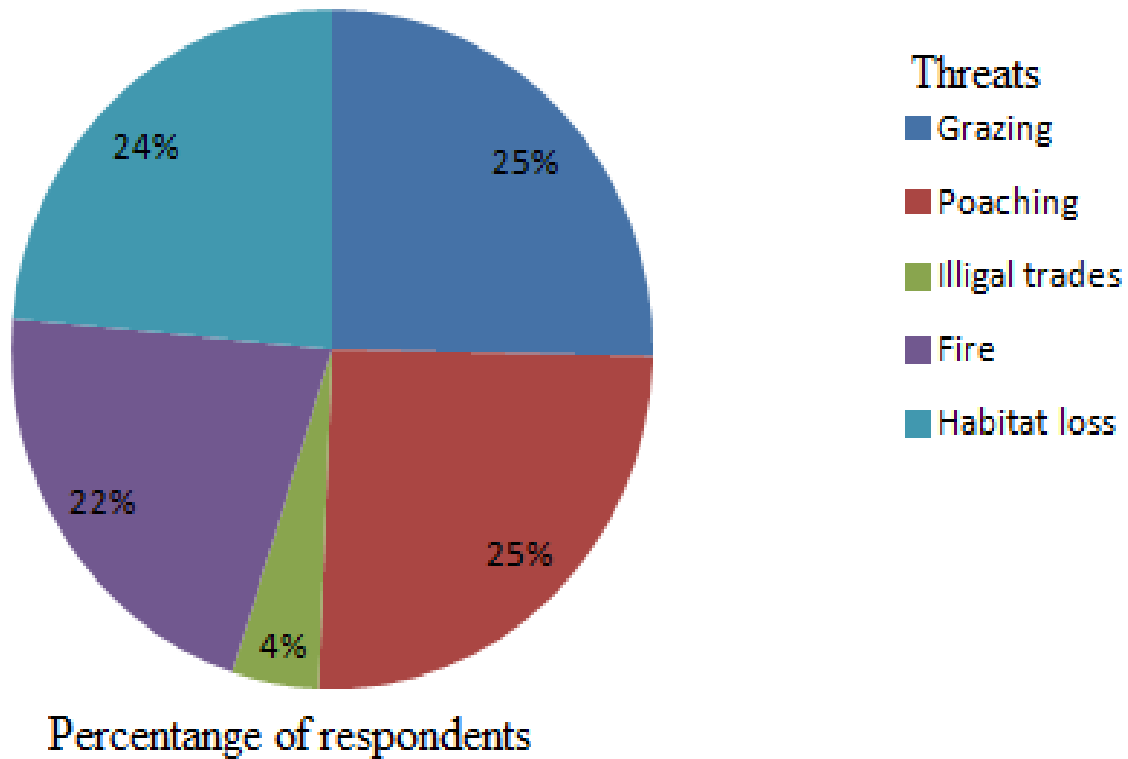


Figure 18: Perception of peoples towards the major threats of Cheer Pheasant

5 DISCUSSIONS

5.1 Population status

Present study estimated a population of 96- 240 pairs of Cheer Pheasant in Myagdi with density of 7 bird/km² and 1.50 bird/station. Similar density (7.5 bird/km²) was estimated by Singh *et al.* (2011) in the similar type of habitat in Muri Myagdi. Comparatively lower population densities: 2.65 bird/km² and 1.98 birds/km² of Cheer by Acharya (2006), Young *et al.* (1987), they reported in Lower Kali Gandaki Valley and Ghosa Mustang respectively. Probably population density of the species was affected by geographic range, resource availability, ecological effects and anthropogenic impacts. Similar, lower population densities; 1 birds/km² (Singh and K.C, 2008) and 2 birds/km² (Budthapa, 2006) were estimated in Rara National Park. This result might be their elevation range of study area was higher than present study area (Figure 11). Generally, 1400-3600 m elevation was used by Cheer Pheasant in Nepal (Inskipp *et al.*, 2016). Relatively stable population densities such as 8 birds/ km² (Subedi, 2003) and 7.08 bird/km² (Basnet, 2014) in DHR also support higher density (7.75 birds/km²) of Cheer (Basnet, 2016) in Bajura district. Probably suitability of habitat composition was effects in the density of Cheer Pheasant. Relatively, lower densities of Cheer were estimated in by researchers (Mirza, 1978; Garson, 1983; Kalsi, 1999; Shah, 2004; Khan *et al.*, 2006; Awan *et al.*, 2014) as 0.730 birds/km², 1.33 birds/km², 2.40pair/km², 6.47 pairs/km² and 24pairs/km² in Kanthar and Trangar, Majtal Wildlife Sanctuary, Great Himalaya National Park, Phalla Game Reserve and Jhelum Valley respectively. Comparatively, higher mean densities as 12.4 and 24 pairs/km² have been recorded by Gaston and Singh (1980), Garson (1983) in different location Himachal Pradesh and Great Himalaya National Park, India. This result might be due to elevation, geographic range and habitat compositions were different than the present study.

Present research result was concluded that almost call of Cheer Pheasant has been heard in between 4:00- 6:30 AM and duration of calls were variable from 0.1 sec to 1min. But, Shah (2004) reported mean call duration of 1:07 min to 4: 16 min. Falls (1985) argued high breeding density could have affects on song production and counter singing in males. Different result was obtained by Subedi (2003) reported call of Cheer Pheasant was heard at the duration was at 4:40-5:30 AM morning in Dhorpatan Hunting Reserve. The peak of call frequency was found variable with the season. Basnet (2014) recorded peak call between 4:38AM and 5:23AM in same study area. There exist altitudinal differences in call records in different studies, for instance Basnet (2014) recorded highest from higher elevation (3457m) in Chetung station Dhorpatan.

5.2 Habitat use of Cheer Pheasant

Present study found that dense ground cover, dense shrubs vegetation; soil temperature between 18 to 21⁰C was positively associated with a distribution of Cheer Pheasant although dense trees, high rock cover and high humidity were negatively associated with a distribution of Cheer Pheasant in Myagdi. This result was strongly supported the findings of Lelloit (1981), Singh *et al.* (2011), they suggested that distribution of Cheer is positively related to ground cover and shrub vegetation but negatively related to tree cover in Arthazar Parbat region. The dense ground cover and shrub vegetation helps to maintain organic matter and soil moisture in feeding ground (Singh and Rawat, 1999). Similarly, Subedi (2003), Basnet (2014) also concluded the sloppy grassland, successional forest, and shrubs vegetation are most suitable habitats for Cheer. Due to their shy nature, generally Cheer Pheasant uses undergrowth of bush cover. Acharya (2006), Singh and K.C (2008), Thakuri (2013) also reported that intermixed vegetation was the performed habitats of Cheer Pheasant in Rara National Park and Ghasa area of Mustang. The intermixed vegetation is important for the maintenance of ecological organization and niche differentiation (Stokes and Archer, 2010). Present result is consistent with the conclusions that Cheer Pheasants avoid the dense forest although shrubs vegetation, rocky terrain with scattered trees is favored habitats (Baker *et al.*, 1918; King, 1981; Johnsgard, 1986; Roberts, 1991; Garson *et al.*, 1992; Ali and Ripely, 1968; Awan *et al.*, 2004a; Bisht *et al.*, 2007). This result might be, due to nesting phenomena of ground dwelling birds have been directly correlated to shrub and ground level vegetation. Lelloit (1981), Singh *et al.* (2011) reported that the Cheer prefer elevation range between 1400-3200m with South and North facing aspect in Muri and Khibang Myagdi. Similarly, it was reported from wide elevation band 701 - 2400 m elevation in Chail Wildlife Sanctuary India (Gaston and Singh, 1980; Akthar *et al.*, 2004). Even, Cheer Pheasant has been also recorded from lowest elevation (600m) in Pakistan (Robert, 1991). This present study could be done only in summer (breeding) season. However, Cheer Pheasant was recorded from higher elevation (2844-3055) m in Dhorpatan Hunting Reserve (Lelliot, 1981), Nandar village (Gaston, 1987) and Ghasa Mustang (Acharya *et al.*, 2004). It has been also recorded from highest elevation (3700-4500) m in Rara National Park (Budthapa, 2006; Singh and K.C, 2008). All these report clearly indicates that the Cheer found in diverse altitude and distribution might be correlated with the local ecology and resource availability. South and East facing gentle slopes were also preferable habitat of Cheer Pheasant in Indian mountain range (Johnsgard, 1986; Kumar, 1997) which result was similar with the present study (Figure 9, 10), because of south facing slopes are dry and low tree cover in the Himalayan range (Mani, 1974). Present result was different with the findings of previous researches (Lelloit, 1981; Garson *et al.*, 1992; Subedi, 2003; Basnet, 2014), that the Cheer was reported from East, South, South East and North facing aspects with 0-40⁰ slopes in DHR. Similarly, it has been also reported from North and South facing aspects in Athazar Parbat Region Nepal (Lelliot, 1981). Acharya *et al.* (2004), Acharya (2006) reported South, West and

Northern aspects are occupied by Cheer Pheasant in Ghasa, Mustang. Because of south-facing slopes receive more sunlight which becomes more xeric and warmer which helps to formation of drought-resistant vegetation and less tree cover (Maren *et al.*, 2015) and also supports to formation of high organic matter and less soil moisture (Singh and Rawat, 1999). However, 30-45° slopes were favored by Cheer Pheasant in Botamalika grassland, Rara (Budthapa 2006; Singh and K.C, 2008). Present findings was different with the conclusion of Awan *et al.* (2004a), Bisht *et al.* (2005), they reported North West, North East and South Eastern aspect with 70-85° slopes and North East facing aspects were mostly occupied by Cheer Pheasant in Jhelum valley Pakistan and Gharwal Himalaya. This result might be, due to steepness of slope was determined by elevation range. This study indicated that distributions of Cheer Pheasant are closely association with the distance to human settlement (Figure 14). Similar conclusion was made by Anuwar (1989), however probability of Cheer-human conflicts increase whereas population will be also declined in near future. Jolli *et al.* (2012) stated that the probability of Cheer presence was increased with the increase of human settlement in Great Himalayan National Park, India. Although, limited human disturbances has potentially positive effects on the Cheer (Garson *et al.*, 1992). Fire is a disturbance factor of Cheer Pheasant. Omaston (1927) concluded the fire had a positive inclined factor for the Cheer population increment in Kashmir. The partial burn was found to be less harmful for the maintenance of habitat conditions and distribution of ground dwelling birds (Krush and Piehl, 1983) but succession grassland was most favored habitat of Cheer Pheasant in Nepal (BCN, 2006). Population variation of Cheer between pre-fire and post -fire season were not compared to determine exact trends of population. Soil temperature was positive covariate for the distribution of Cheer Pheasant although humidity was negatively related. Probably soil temperature has been related with the breeding and feeding phenomena of Cheer Pheasant. Microhabitat selection and nesting phenomena were changed by various microclimatic parameters in Khaio National Park (Round and Gale, 2008).

5.3 Conservation Threats

Present study has identified that livestock grazing, habitat loss, fire, poaching and illegal trades were the major threats of Cheer Pheasant in Myagdi. Previous studies also identified snaring, hunting, overgrazing, deforestation and forest fire as main threats for Cheer Pheasant in Nepal (Subedi, 2003; Singh *et al.*, 2006; Garson and Baral, 2007) as well as Jhelum Valley, Pakistan (Awan *et al.*, 2014) and Chail Wild Life Sanctuary, India (Akthar *et al.*, 2004). Captive Cheer is used for the hunting and trapping of wild Cheer (Singh, 2006; Subedi, 2003; Aacharya, 2006; Basnet, 2014) in Nepal, while trapping and poaching is common in Western Himalaya foothills (Baker, 1930; Mirza, 1980; King, 1981). Similarly, traps have been recorded in around the Dhorpatan Hunting Reserve (Singh *et al.*, 2011). The local people have collected and traded eggs for consumptions. Long series of snares were found in the forest of Anga and Yagu because the snaring is an easiest and cheapest method for the poaching of Pheasant (Khaling *et al.*, 1998). Hunting substantially reduced the

population of Cheer and a potential cause for the inbreeding depression and viability reduction of subpopulations (Heber and Briskie, 2010). However, habitat characteristics and land use patterns were also changed by grazing and NTFP collection in Great Himalayan National Park (Garson *et al.*, 1992; Jolli and Pandit, 2011a). First time Lelliot (1981) had been explored the distribution of Cheer Pheasant in Muna, Muri, and Marang areas. This study (Appendix 2) has been concluded only 5 Cheer was recorded from Muna however no any Cheer was recorded from Muri and Marang. According to Aacharya (2006), 80% habitat of Cheer Pheasant was lost by fire in Lower Kali Gandaki Valley whereas livestock grazing was another threat in Ghasa Mustang. Simultaneously livestock grazing and fire were also major threats of Cheer Pheasant in Myagdi which is the cause of habitat declining. Overgrazing and cutting of trees were the major issues for the habitat degradation that leads to decline Cheer population in Jhelum Valley Pakistan (Khan *et al.*, 2006). Due to blasting, dumping and road construction were serious possess of habitat destruction in Great Himalaya National Park (Jolli, 2017). Range of development activities has threats of Pheasant in the Great Himalaya National Park (Jolli and Pandit, 2011b). Power line formation and road constructions were the main factor of deforestation and habitat fragmentation (Small and Hunter, 1988; Sisk *et al.*, 1994) that were the fact of climate and vegetation change in Great Himalaya National Park (Jolli, 2017). Corresponding in Myagdi, road construction was the major cause of Cheer habitat destruction in Daduwa. Due to road construction and hydropower development habitat of Cheer Pheasant were continuously changed in Myagdi.

6 CONCLUSIONS AND RECOMMENDATIONS

Myagdi district is the potential sites of Cheer Pheasant. Altogether 96-240 population size of Cheer Pheasant with 7 bird/km² population density was estimated in these study area. Similarly, 11 individuals were encountered and 14 calls were heard from 600 m call count station in Daduwa Myagdi which was the highest density of Cheer Pheasant recorded at lower elevation (1800m) in Nepal. Such as (i.e Daduwa, Kuhu, Tatopani, and Chaurakhani) were a new site which was first time identified in this study. Cheer Pheasant was most favored in moderately steep slope (10⁰-35⁰) and steep slope (35⁰-67⁰) with an East and South facing aspects. Specific elevation of Cheer was 1800-2400m in Myagdi. Similarly, first-time maximum eight individuals were recorded from lowest elevation 1800m in Nepal. Shrub density (95%CF, P<0.0034), ground cover ((95%CF, P<0.00011) and soil temperature (95%CF, P<0.0293) were the positive influence factor of Cheer distribution; however, soil temperature was the new factor which was identified in this study. Almost Cheers were occupied their habitat in nearby human settlement whereas Cheer Pheasant was avoided their habitat from tree cover in Myagdi. Throughout the perception of people, 67% positive and 28% had a negative thought for the Cheer conservation in Myagdi. Continuous habitat loss was the major threats to Cheer Pheasant. Simultaneously, fire, grazing, poaching and illegal trades were also cause of Cheer population declining in Myagdi.

Based on this study, some recommendations are given below for the Cheer Conservation in Myagdi.

- The survey is focused on few limited parts of Myagdi further new research is necessary for the new potential sites identification and long-term population monitoring.
- Poaching and fire are major threats of Cheer Pheasant in Myagdi for the minimization of these threats people-centric conservation awareness should be needed.
- Almost study and protection are focused inside the protected area even that most Cheer distribution are located outside the protected area for the long-term species conservation and habitat protection furthermore species action plan should be formulated.
- Study was limited in North, East, West and South aspect further all features of aspects identification and its effects in Cheer distribution study is mostly necessary.

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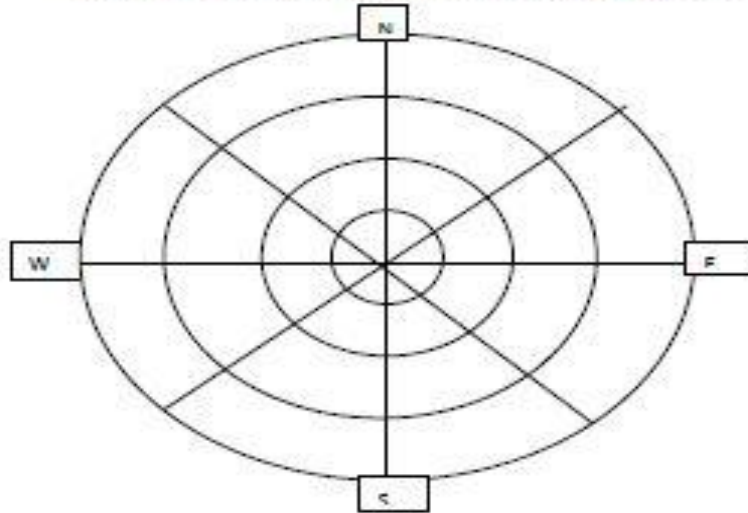
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APPENDICES

Appendix1: Call count survey data sheet

5. Dawn call counts census data sheet.

Dawn Call counts Census Method in Dhorpatan hunting reserve



Birds	Calling time 1	Calling time 2	Calling time 3	Calling time 4	Minimum Call duration	Maximum call duration
C1						
C2						
C3						
C4						

Date:
 Observer: Name:
 Name of Location:
 Site/Point no:
 Starting time:
 Starting Temperature:
 Finishing time:
 End Temperature:
 Time of sunrise:
 Air velocity:
 Weather: cloudy/rainy/windy
 Time of first call:
 Time of last call:
 Position:
 Altitude:

Appendix 2: Mean call, standard deviation and mean density in each call count station

Station Name	Number of call			Max call heard (X)	Cheer Seen	Mean± SD	mean density/ km ²
	1	2	3				
Muna/Thulokhori	2	2	2	2	0	2±0	6.67
Muna/Lamkhorla	3	3	3	3	0	3±0	10
Muna/Lamarti	0	0	0	0	0	0±0	0
Mudi/Thaldada	0	0	0	0	0	0±0	0
Mudi/Malika	0	0	0	0	0	0±0	0
Lulang/piredada	0	0	0	0	0	0±0	0
Lamsung dada	0	0	0	0	0	0±0	0
Daduwa Bhir	8	7	8	8	6	7.66±0.58	25.54
Ddauwa patharpa	6	6	5	6	5	5.66±0.58	18.87
Kuinekhoria	0	0	0	0	0	0±0	0
Kuinethulobhir	0	0	0	0	0	0±0	0
Churakhani/dada	3	4	2	4	0	3±1	10
Chura pahiro	2	2	2	2	0	2±0	6.67
Tatopani/ Surkepatal	7	6	4	7	2	5.66±1.53	18.87
Manchhebasnedil	5	6	6	6	1	5.66±0.58	18.87
Dana/ Bhulukhase	4	2	0	4	0	2±2	6.67
Dana/Slighopte Dil	0	5	2	5	0	2.33±2.52	7.67
Marang/Dada	0	0	0	0	0	0±0	0
Okhar/ThumjungDada	1	0	3	3	0	1.34±1.53	4.45
Okhar/Kalkhani	2	2	0	2	0	1.34±1.16	4.45
Okhar/Mahabhir	0	2	2	2	0	1.34±1.16	4.45
Kuhu/Chinedada	2	2	2	2	0	2±0	6.67
Kuhu/ChineBhir	2	0	2	2	0	1.34±1.15	4.45
Kuhu/ThaibangBhir	1	0	2	2	0	1±1	3.34
Kuhu/ThaibangDada	3	2	0	3	0	1.67±1.53	5.57
				63	14	48.97	

Appendix 3: Data Sheet of Habitat assessments

Human settle dist	Cultivate d dist	Fire			Water distanc e	Alti u	Gro cover	Cano py Cover	Soil Tem p	Rock Cover	Hu m	Te m
		les s	mode rate	hi gh								

Appendix 4: Data sheet of vegetation density

Quadrates	Herbs (1*1)m	Shrubs (5*5)m	Tree (10*10)m
Q1			
Q2			
Q3			
Q4			
Q5			
Q6			
Q7			
Q8			
Q10			
Q11			

Appendix 5: Questionnaire Survey Data Sheet

Survey number:-... Name of Respondent:-..... Date:-
Age:-..... Sex:-..... Occupation:-..... Address:-.....

- 1) Do you know about Cheer Pheasant? If yes, then describe its descriptive physical feature.....
- 2) Indicate what kind of evidences of Cheer Pheasant found with below mentioned Droppings..... Sighting..... Scratching..... Other.....
- 3) Mention the places where the signs were found (Trail, Base of tree, bushes of dense forest, Rocky area, steep slope)?
- 4) Have you seen the nests of Cheer Pheasant? Yes..... No..... If seen, in which habitat the nests were found? a. Tree b. Bush c. Ground d. Any.....
- 6) How many eggs does the Cheer Pheasant hatch in one hatching? Do you like to collect egg this bird?
- 7) Does the Cheer Pheasant live with other birds? Yes.....No.....
- 8) What is your intention about Cheer Pheasant? a. Good b. Bad c. No option
- 9) Should they be conserved or eliminated and why?
.....
- 10) Do you know Cheer Pheasant is protected in Nepal and hunting is illegal? Yes... ..
No.....
- 11) Do people get any kinds of benefits from Cheer Pheasant?
- 12) Have you deliberate the fire in Cheer habitat? Yes..... No.....
- 13) In which season you deliberate the fire in steep?? Summer----- Winter----- other---
- 14) When you see Cheer Pheasant? Which type of firing habitat is mostly prefer??
A> low fire B> moderate fire C> High fire
- 15) Do the human activities affect the Cheer Pheasant? Yes.....No..... If yes, which type of activities did you see?
- 16) Do NGOs, INGOs, Government run program for the conservation of habitat of Cheer Pheasant itself? Yes..... No.....
- 17) Have you seen somebody snaring, illegal trading of the bird? Yes..... No.....
- 18) Do the people poach Cheer Pheasant? Yes..... No.....
- 19) What type of tools do they use in poaching?

a. Snare b. Catapult c. Hand catch d. Gun e. Other (mention).....
- 20) If they are punished, what type of punishment does the concerned body give?
.....
- 21) Mention the other major threats for Cheer Pheasant

PHOTOGRAPHS



Photo 1: Adult Cheer Pheasant



Photo 2: Hatched Egg



Photo 3: Habitats of Cheer Pheasant



Photo 4: Snaring



Photo 5: Road construction in Cheer's habitat



Photo 6: Catapult



Photo 7: Cattle grazing



Photo 8: Fire in study area



Photo 9: Measurement of soil temperature

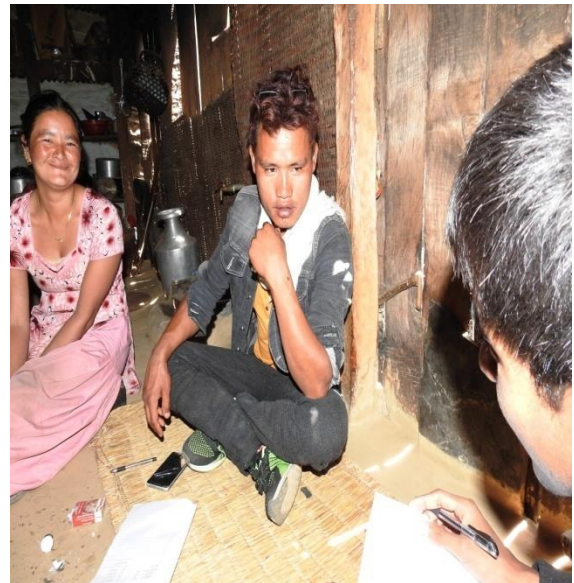


Photo10: Questionnaire survey with local respondents



Photo 11: Quadrates laid down in study area



Photo 12: Researcher travelling towards the call count station



Photo 13: Feathers spotted in the field



Photo 14: Researcher using playback method

