Brazilian Journal of Biology®

ISSN 1519-6984 (Print)
ISSN 1678-4375 (Online)

Original Article

Expansion of distribution ranges and current population status of Cheer pheasant (*Catreus wallichii*) in Northern Pakistan (AJ&K)

Expansão das faixas de distribuição e *status* populacional atual do faisão Cheer (*Catreus wallichii*) no norte do Paquistão (AJ&K)

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Abstract

We studied the distribution and population status of the Cheer pheasant (*Catreus wallichii)* in Azad Jammu and Kashmir (AJ&K). Study was mainly conducted in four localities Jhelum Valley (JV), Machiara National Park (MNP), Haveli and Nar Sher Ali Khan (NSAK) from 2016-2020, for five breeding seasons. Population status of Cheer pheasant was determined by the call counts method. In total 105 breeding pairs (210 birds) were estimated highest (134) being recorded from Jhelum valley followed by MNP, Haveli and Nar Sher Ali Khan While applying correction factor 158 birds were recorded. Extensive surveys were carried out in an area of 19.23 km^2. Our results indicate an expansion in distribution ranges of Cheer pheasant and population has established in several new sites. Highest Mean population density of 6.11 pair/km^2 was recorded in Qazi Nag area of Jhelum Valley. The mean population density of Cheer pheasant was slightly higher in the month of May. Furthermore, 58% of the calling birds were detected at elevations ranging from 2300-2600m, while 17% were found at elevations between 1900-2200m. Expansion in distribution ranges of Cheer might be due to reason that bird might have been underestimated in the past or conservation measures and community awareness programs taken by the Department of Wildlife and Fisheries, AJ&K.

Keywords: Cheer pheasant, Galliformes, ecology, threatened species, conservation.

Resumo

Este estudo teve como objetivo analisar a distribuição e o *status* populacional do faisão Cheer (*Catreus wallichii*) em Azad Jammu e Caxemira (AJ&K). A pesquisa foi realizada principalmente em quatro localidades: Vale Jhelum (JV), Parque Nacional Machiara (MNP), Haveli e Nar Sher Ali Khan (NSAK), de 2016 a 2020, durante cinco temporadas de reprodução. O *status* populacional do faisão Cheer foi determinado pelo método de contagem de chamadas. No total, 105 pares reprodutores (210 pássaros) foram estimados, com o maior número (134) registrado no vale Jhelum, seguido por MNP, Haveli e Nar Sher Ali Khan. Ao aplicar o fator de correção, 158 pássaros foram registrados. Pesquisas extensas foram realizadas em uma área de 19,23 km^2. Os resultados indicam uma expansão nas faixas de distribuição do faisão Cheer, com populações estabelecidas em vários novos locais. A maior densidade populacional média de 6,11 pares/km^2 foi registrada na área de Qazi Nag, no Vale Jhelum. A densidade populacional média do faisão Cheer foi ligeiramente maior no mês de maio. Além disso, 58% dos pássaros cantores foram detectados em elevações variando de 2.300-2.600 m, enquanto 17% foram encontrados em elevações entre 1.900-2.200 m. A expansão nas faixas de distribuição do Cheer pode ser devido ao fato de que o pássaro pode ter sido subestimado no passado ou medidas de conservação e programas de conscientização da comunidade implementados pelo Departamento de Vida Selvagem e Pesca de AJ&K.

Palavras-chave: faisão Cheer, Galliformes, ecologia, espécies ameaçadas, conservação.

1. Introduction

Cheer pheasant (*Catreus wallichii*) is the member of order Galliformes and family Phasianidae and is often referred to as 'game birds' (Delacour, 1977). Cheer pheasant (hereafter often referred as Cheer) has been classified as a Vulnerable since 1988 due to its small, fragmented and declining global population (BirdLife International, 2020; Kalsi, 1998). Moreover, the IUCN criteria C2a suggesting a continuous decline in its ranges and numbers along with habitat fragmentation (Collar et al., 1994).

Cheer is endemic to the Indian subcontinent, where it is confined to a narrow belt of the Himalayas from Nepal to Northern Pakistan including AJ&K and two States (Uttar

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Received: November 14, 2023 – Accepted: July 15, 2024

Pardeshand Himachal Pardesh) of India (McGowan and Garson, 1995). Historically, species had been common throughout Hazara, Murree hills, Swat and Margala Hills, Islamabad Districts (Severinghaus et al., 1979). However, currently extirpated from Pakistan in the wild (Mirza, 1980; Zaman, 2008). In AJ&K, Cheeris reported from Jhelum Valley, (Awan et al., 2004) MNP, Muzaffarabad, (Qayum, 1986; Baker, 1921-1930; Awan et al., 2014) Salkhala Game Reserve and its surroundings and west banks of the Neelum River, Trakama and Salampura in district Neelum (Mirza, 1980). Species is also found in Phalla Game Reserve in District Bagh (Khan et al., 2006). Survey report indicates that the bird is extirpated from Salkhala Game Reserve (Awan et al., 2012).

The growing human population, changing land use patterns, and poaching posed a huge pressure on the Cheer populations and contributed to extinction risk (Subedi, 2003). Poaching being the greatest threat to populations, habitat loss and changes in land use pattern, overgrazing of grassland and scrub areas, rapid conversion of forests to agriculture land, and timber and medicinal plant collection cause further degradation (Birdlife International,2006). The patchy, dispersed nature of this bird's specialized habitat is very important, particularly for the small isolated subpopulations, which are not only vulnerable to inbreeding but are at high risk of poaching. Unfortunately, habitat loss, habitat degradation and hunting are proving difficult to be controlled, even in protected areas (Birdlife International, 2004) since preferred habitat, open grasslands and scrub, have been prevented from reaching its climax state (Dowell, 1992).

International organizations have spent a bulk of money for reintroducing of this species in its natural habitat but all efforts beard no fruits. It is timely and rational to instead of reintroducing hand raised chicks, which are susceptible, the remaining wild populations of the area should be preserved in their natural habitat. In case of overpopulation beyond carrying capacity, the birds raised in the wild can be more suitable to be transferred and introduced in other suitable habitats of the country. Above mentioned factors are likely to drive threatened species into extinction if immediate conservation measures are not undertaken. Conservation and management are only possible if systematic scientific data of the species is available. Some of the research is two decades old while some isolated studies are limited to certain specific pockets. Therefore, we conducted extensive field study with following objectives:

- To explore current distribution and population status of globally threatened Cheer species in AJ&K;
- To determined the variation in mean population densities in breeding months and sub-localities;
- To set up permanent survey points for future monitoring.

2. Materials and Methods

2.1. Study area

Present study was conducted from 2016-2020, for five breeding seasons, throughout the potential distribution ranges of Cheer in AJ&K. The state of AJ&K lies between Longitude 73°-75° and Latitude 33°-36°, covering an area of 13,297 km^2. AJ&K falls within the Himalayan belt. Its topography is mainly hilly and mountainous, characterized by deep ravines, rugged, and undulating terrain. Present study was mainly undertaken in Northern districts of AJ&K. Average annual rainfall ranges from 1000 mm to 2000 mm. In the northern districts 30 percent to 60 percent precipitation is in the form of snow. In winter, snow line is around 1200 meters while in summer it is 3300 meters. Average maximum temperature ranges from 20°C to 32°C while the average minimum temperature range is 04°C to 07°C (GoAJ&K, 2018; Termizi and Rafique, 2001).

2.2. Reconnaissance surveys

Before going through the field surveys, all existing literature was reviewed to find out already reported places. On the basis of available literature (Garson, 1983; Kalsi, 1998), reconnaissance surveys were carried out in potential habitats of Cheer. Besides reviewing literature indigenous people i.e. wildlife staff, villagers, shepherds, knowledgeable people and hunters were involved in surveys and data gathering process about Cheer throughout its ranges (Ali and Ripley, 1987; Kaul, 1989). Potential habitat of Cheer was identified and detailed study surveys conducted throughout its distribution ranges, more specifically in already reported areas.

2.3. Study design & site selection

On the basis reconnaissance surveys and existing literature, study area was divided into four localities, i.e. Jhelum Valley (JV), Machiara National Park (MNP), Phalla Game Reserve (PGR) and Nar Sher Ali Khan (NSA). These localities were further divided into ten sub-localities and sixty-eight survey sites (SS).

2.4. Population estimation

Pheasants are usually cryptic and it is difficult to assess their population by direct sighting However, these species are often easily recorded during the mating season in spring. Cheer population estimation was carried out by call counts, the only reliable method used for pheasant population estimation (Gaston, 1980; Whale, 1995). Cheer pheasant produced regular calls at dawn and dusk during the breeding season and therefore call counts have been used for density estimates as the most reliable method (Ali and Ripley, 1987; Young, et al., 1987; Kalsi, 1998). Both male and female birds are vocal, giving loud calls in the morning and evening. However, it is evident that male birds are more vocal (Young et al., 1987).

Call count surveys were conducted at all Cheer predetermined survey sites, in AJ&K. At all localities, calling stations were marked and established the stations at vantage points (survey site). To minimize the double count or probability of missing out any calling bird, the observers were positioned 600 meters apart. For dawn calling surveys, observations began 30 minutes before sunrise and continued until 60 minutes after sunrise. Each observer covered an area of approximately 300 m radius. To minimize observer bias, the observers rotated positions so that no observer monitored the same calling

station on two consecutive days. Double counts were removed after the surveys were completed. Call counts were conducted on three consecutive mornings at each station, and surveys were not conducted in adverse weather conditions, such as heavy rainfall (Gaston, 1980). This method assumes that during the breeding season, each calling male is accompanied by at least one female (Subedi, 2003). Moreover, we used pre-recorded Cheer calls to playback to elicit the response of birds. It is probably the best method that can be used to know the presence of Cheer in a given area during breeding season in a short period of time with little man power, time and financial investments (Young et al., 1987; Kalsi, 1998).

2.5. Data analysis

2.5.1. Mean population density

The mean population density was estimated based on taking the mean number of calling birds divided by the total area covered in each station. The mean was a pooled mean estimate based on the formula given below. That estimate was then extrapolated for the entire population assuming that sex ratio of the species is 1:1 (Subedi, 2003) (Equation 1).

$$\text{Mean Population Density} = \frac{\left(\begin{array}{c}\text{mean number of calling}\\ \text{birds in an area}\end{array}\right)}{\begin{array}{c}\text{Total area covered}\\ \text{in each station}\end{array}} \quad (1)$$

2.5.2. Breeding Population Estimation (BPE)

The surveys were conducted during breeding season so multiplying the number of calling sites detected before sunrise by factors 0.75, produces the best available estimate of breeding population within the survey area (Young et al., 1987) (Equation 2).

$$\text{BPE} = \Sigma\overline{X} \times 0.75 \quad (2)$$

where $\Sigma\overline{X}$ = Total mean of the study area.

At each survey sites, data about different parameters like forest compartment, elevation above sea level (asl), geographical co-ordinates, aspect, slope (percent), sex of the bird, distance covered during survey and time of the survey were also counted in Cheer habitat. Geographical coordinates were recorded, using Garmin GPS, Slope was determined by using Clinometers, distance of birds from observer were measured by Bushnell Rangefinder (10×25) and compass was used for identification of ridge aspects. Indirect evidences, the likes of feathers, fecal matter, nests and ground scratches were collected during field surveys.

Coordinates were charted on the map by using ArcGIS (10.4) software to determine distribution ranges of Cheer in AJ&K (Figure 1). One way Analysis of Variance (ANOVA) was conducted to see the variation in densities between the breeding months, localities and sub-localities. Pearson's correlation coefficients were employed to examine the relationships between the number of calling Cheer birds and altitude.

3. Results

3.1. Distribution of Cheer pheasant

Present study indicated that the species is distributed between the elevation ranges of 1645 m to 3233 m in AJ&K. Pearson's correlation were applied between Cheers population with elevation, that shows ($r = 0.141101$, $P < 0.01$), there is significantly positive correlation between population density and altitude. Our data indicate that 58% of the birds were observed at elevations between 2300-2600 m, while 17% were found at elevations ranging from 1900-2200m. Additionally, only 1% of the birds were recorded at elevations above 3100 meters (Figure 2). Species expanded its distribution ranges from Qazi Nag and GarhiDuppta ranges of Jhelum valley towards North and North West in Leepa Valley and its surroundings (i.e., Lamnian and Reshian). Species was very first time reported from Leepa Valley. Species is likely to be present at some other sites in Leepa Valley that need to be explored. Recent sightings of the species at MNP, suggests its migration from PirChinasi and GarhiDuptta of Jhelum Valley and successfully inhabited in the park. Present study, Cheer was reported from three different localities and fourteen sites at MNP, indicated that species has expanded its range in MNP in recent years. Four new sites were also

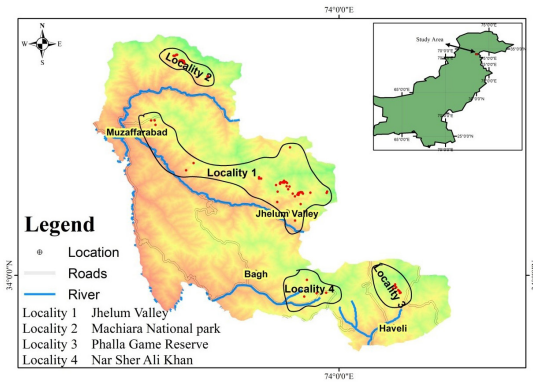

Figure 1. Distribution map of the study area showing four localities in AJ & K, where Cheer pheasant is currently distributed.

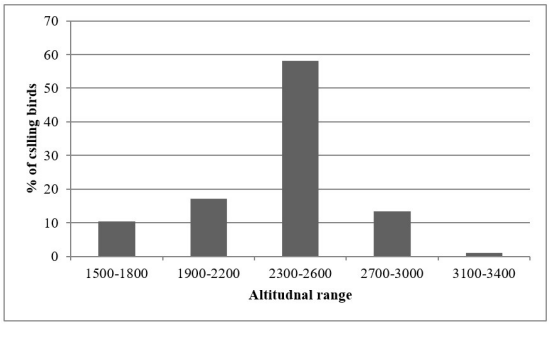

Figure 2. Distribution of Cheer Pheasant *(Catreus wallichii)* at different altitudinal ranges in AJ&K.

discovered from the NSA area of district Bagh. Species has possibly expanded its distribution ranges to North and North West towards SheroDahara and Lasdana. It might have been underestimated in the past.

3.2. Population estimation and density index

Extensive surveys were carried out in an area of 19.23 km², whereas, where the species was likely to be present throughout its distribution ranges (Table 1).

In Jhelum Valley, Qazi Nag Game Reserve harbors the largest known population of Cheer. Present study indicates that species is mainly distributed in five different sub-localities and 42 survey sites in Jhelum Valley. Thirty three of the survey sites were recorded in Qazi Nag Game Reserve, Hattian Bala. Four new survey sites of Cheer were discovered from Leepa Valley and its surroundings (i.e., Lamnian and Reshian). A population of 114 birds was estimated at Qazi Nag Game Reserve. The lowest population of 2 adult birds was documented at Garhi Dupatta, Muzaffarabad (Tables 1 and 2). In total, a population of 134 birds was estimated in Jhelum Valley. Present study has estimated an overall population density of 6.11 ± 0.54 (n= 42) pairs/km² in Qazi Nag Game Reserve of Jhelum Valley. Within Qazi Nag, Sangar Bari site experienced the highest population density of 14.15 pairs/km².

At MNP, first detail study on Cheer has been carried out since the establishment of Park in 1996. Population of 40 adult birds was estimated in an area of 3.97 km². We documented species from fourteen survey sites with a mean density of 5.05 ± 0.61 pairs/km² (Tables 1 and 3). A sum of eight survey sites (SS 57-64) was documented at Phalla Game Reserve, Haveli. We assessed a breeding population of 26 birds e.g. 13 breeding pairs at Phalla Game Reserve, Haveli, AJ&K. Ten breeding pair was recorded in forest compartment no. 37, whereas Trangar was found at compartment no 36 (Tables 1 and 4).

In District Bagh, Cheer was first ever reported from four new sites in Nar Sher Ali. Here the population density of 4.42 ± 0.88 pair/km² was calculated. Hence, the total population of 10 adult birds were recorded in 2020 (Tables 1 and 5).

The mean population density between localities was recorded to be 5.22 ± 0.72 (n = 68) pairs/km², whereas the mean population density index of sub-localities was recorded to be 4.52 ± 0.85 (n = 68) pairs/km² (Figures 3 and 4). Mean population density did not vary between the localities ($F_{(3, 64)}$ = 0.37, p=0.78, One-way ANOVA). Mean population density did not vary between different sub- localities ($F_{(9, 58)}$ = 0.87, P= 0.56, One-way ANOVA) (Tables 6 and 7). Mean density index over the breeding months was found to be 5.39 ± 0.61 (n= 68) pairs/km². Our results revealed mean population density of Cheer was slightly higher (6.68 ± 0.80, n= 19) in the month of May (Figure 5). However, there was non-significant difference of Cheer density across the months (April, May, June and July) of breeding season ($F_{(3, 64)}$ = 2.16, P= 0.10, One-way ANOVA) (Table 8).

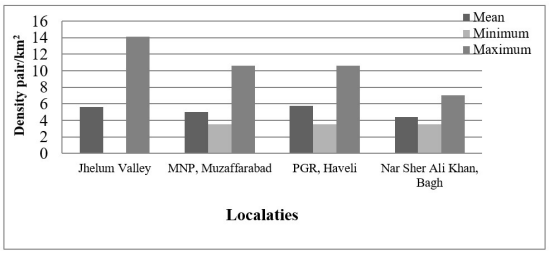

Figure 3. Population density pair/km²) of Cheer Pheasant *(Caters wallichii)* in different localities of AJ&K.

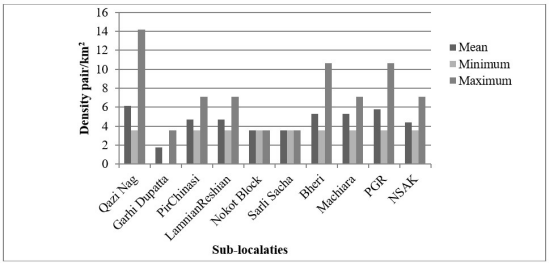

Figure 4. Population density pair/km² of Cheer Pheasant *(Caters wallichii)* in different sub-localities of AJ&K.

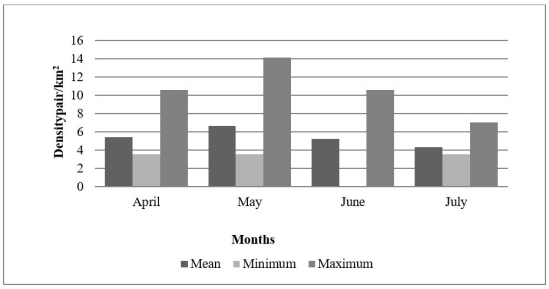

Figure 5. Population density pair/km² of Cheer Pheasant *(Catreus wallichii)* across the months in AJ&K.

4. Discussions

Cheer had patchy distribution with specialized habitat requirements (McGowan and Garson, 1995). At present, distribution of species is restricted to several small pockets in AJ&K and Western India. There are certain reports of species to be present in the Kaghan Valley and in various locations in District Kohistan. Wild population of Cheer in Pakistan is assumed to be locally extirpated (Zaman, 2008). In the past, AJ&K has always been known for potential habitat of the Cheer distribution. Qayum (1986) reported the species from Qazi Nag ranges of AJ&K in late 1980s. Earlier, Baker (1921-1930) described occurrences of a small population from Salkhala Game Reserve. Recent reports suggested that the bird is extirpated from Salkhala Game Reserve (Awan et al., 2012). Awan and Buner (2019) reported Cheer from seven different sites at MNP. Khan et al. (2006), reported Cheer from eight different sites of Phalla Game Reserve between the elevation ranges of 2600 and 2750m. Movement ranges from 1,300 m in winter to 3,200 m in summer, whereas during fall and spring they prefer

Table 1. Distribution and population density of Cheer pheasant (*Catreus wallichi*) in Azad Jammu & Kashmir during 2016-20.

Localities	Jhelum Valley					Machiara National Park			Haveli	Bagh	Total
Sub-localities	(Qazi Nag)	Garhi Dupatta	PirChinasi	LamnianReshian	Nokot (Leepa)	Sarli Sacha	Behari	Machiara	PGR	NSAK	
Total Area Surveyed	9.33	0.57	0.85	0.85	0.28	0.57	1.7	1.7	2.26	1.13	19.23
density=pair/km^2	6.11	1.77	4.72	4.72	3.54	3.54	5.31	5.31	5.75	4.42	4.52*
Breeding Population (pair) recorded in survey area	57	1	4	4	1	2	9	9	13	5	105
Total birds recorded	114	2	8	8	2	4	18	18	26	10	210
Breeding pop. Est.	85.5	1.5	6	6	1.5	3	13.5	13.5	19.5	7.5	157.5
$BPE = \Sigma\overline{X} \times 0.75$											

*Represents the average density of all ten sub-localities.

Table 2. Distribution and population density of Cheer pheasant (*Catreus wallichi*) in Jhelum Valley, AJ&K.

Name		Coordinates		Elevation	Aspect	Forest Compartment	Calling birds	Density
LocalityJhelum Valley		Latitude	Longitude	(m)		No.	Pair	pair/km²
Sub-locality.1 (Qazi Nag)								
SS 01	Jabarsaidian	N34°12.138'	E073°58.193'	1658	SW	6	1	3.54
SS 02	Tikki	N34°12.330'	E073°58.255'	1654	SE	5	1	3.54
SS 03	Braban	N34°12.682'	E073°52.514'	1793	NW	3	1	3.54
SS 04	Cheetah (Sankra)	N34°12.023'	E073°53.181'	1680	NE	6	2	7.07
SS 05	Kala Pahar	N34°12.105'	E073°54.635'	2426	SW	7	2	7.07
SS 06	Kopra	N34°12.027'	E073°54.713'	2450	NE	7	1	3.54
SS 07	Thera Sanja	N34°11.888'	E073°53.884'	2410	SW	7	2	7.07
SS 08	Renjha	N34°12.176'	E073°55.788'	2097	NE	7	1	3.54
SS 09	KhatarNar Khas	N34°10.794'	E073°50.916'	1659	NE	23	3	10.61
SS 10	KandarKozi	N34°10.500'	E073°54.356'	2005	SW	23	3	10.61
SS 11	AqabGogogran	N34°12.061'	E073°53.978'	2578	SW	6	2	7.07
SS 12	LundaraPaja	N34°12.135'	E073°54.031'	2619	SW	6	1	3.54
SS 13	Takki Battle	N34°12.158'	E073°54.094'	2440	SE	7	1	3.54
SS 14	Nanoorwala Naka	N34°12.244'	E073°54.307'	2673	NE	7	2	7.07
SS 15	Kopra-top	N34°12.243'	E073°54.470'	2624	SW	7	2	7.07
SS 16	Sangar Bari	N34°12.203'	E073°54.601'	2575	SW	7	4	14.15
SS 17	KhattPora	N34°12.101'	E073°54.141'	2540	NE	7	1	3.54
SS 18	CheetaLoonBan	N34°11.631'	E073°53.514'	2243	SW	7	3	10.61
SS 19	Battal	N34°13.472'	E073°51.327'	2437	SW	6	3	10.61
SS 20	Urani	N34°13.560'	E073°51.284'	2489	NE	6	1	3.54
SS 21	Nahrian	N34°13.688'	E073°51.377'	2660	NE	6	1	3.54
SS 22	Top Chagri	N34°13.677'	E073°51.652'	2754	SW	4	2	7.07
SS 23	Chichanan	N34°13.636'	E073°51.915'	2797	SW	4	1	3.54
SS 24	GrangNardajian	N34°13.920'	E073°51.916'	2748	NE	4	3	10.61
SS 25	Bag Naran	N34°13.744'	E073°52.177'	2611	NE	4	1	3.54

Table 2. Continued...

Name		Coordinates		Elevation	Aspect	Forest Compartment	Calling birds	Density
LocalityJhelum Valley		Latitude	Longitude	(m)		No.	Pair	pair/km²
Sub-locality.1 (Qazi Nag)								
SS 26	Ranjay da Nar	N34°13.602'	E073°52.359'	2296	SW	5	1	3.54
SS 27	Gail Top	N34°13.118'	E073°52.291'	2340	SE	4	2	7.07
SS 28	Gail Dana	N34°13.081'	E073°52.713'	2232	NE	5	1	3.54
SS 29	ShingerBaik	N34°13.735'	E073°51.767'	2726	SW	4	2	7.07
SS 30	Paja	N34°13.300'	E073°50.729'	1942	NE	5	1	3.54
SS 31	Nagatuk	N34°12.309'	E073°50.969'	2965	NE	3	3	10.61
SS 32	Sokha	N3408.078'	E073°53.538'	1545	NW	1	1	3.54
SS 33	TharaGali	N34°11.847'	E073°54.054'	2354	SW	4	1	3.54
						Sub-total	**57**	**6.11**
Sublocality-2 Garhi Dupatta								
SS 34	Tarareen	N34°15.463'	E7337.494'	1980	SW	19	0	0
SS 35	Low Gali	N34°16.515'	E7338.581'	2167	NE	19	1	3.54
						Sub-total	**1**	
Sub-locality-3 PirChinasi								
SS 36	Ban WaliGali	N34°22.116'	E073°32.974'	2089	SW	35	1	3.54
SS 37	Hari Wala Par	N34°22.771'	E073°32.485'	2348	NE	35	1	3.54
SS 38	Saran (SikkiWala)	N34°22.795'	E073°32.854'	2444	SW	35	2	7.07
						Sub-total	**4**	**4.72**
Sub-locality-4 LamnianReshian								
SS 39	Naryian	N34°14.249'	E073°48.539'	1892	NE	2	2	7.07
SS 40	Thromara	N34°14.257'	E073°48.223'	2148	SW	2	1	3.54
SS 41	Rajmar	N34°14.455'	E073°48.232'	2130	SW	2	1	3.54
						Sub-total	**4**	**4.72**
Sub-locality- 5 Nokot Block								
SS 42	Gojnar	N34°18.810'	E073°52.798'	2116	NE	25	1	3.54
						Sub-total	**1**	**3.54**

Table 3. Distribution and population density of Cheer pheasant (*Catreus wallichii*) at Machiara National Park, Muzaffarabad AJ&K.

Name		Coordinates		Elevation	Aspect	Forest Compartment	Calling birds	Density
Machiara National Park		Latitude	Longitude	(m)		No.	Pair	pair/km²
Sub-locality-6 Sarli Sacha								
SS 43	Kandiarywala Nala	N34°29.257'	E073°40.635'	2592	NE	11	1	3.54
SS 44	Lower Dapar	N34°29.271'	E073°40.693'	2678	SW	9A	1	3.54
						Sub-total	**2**	**3.54**
Sub-locality-7 Bheri								
SS 45	Magra top	N34°32.277'	E073°35.626'	2397	SW	9A	2	7.07
SS 46	Gora par (lower)	N34°32.269'	E073°35.816'	2403	SW	9A	3	10.61
SS 47	Kundi	N34°32.277'	E073°35.817'	2392	NW	9A	1	3.54
SS 48	Thora Ghatian	N34°32.431'	E073°36.166'	2795	SE	9A	1	3.54
SS 49	Kahalan	N34°32.433'	E073°36.036'	2671	SW	9B	1	3.54
SS 50	Kasi	N34°31.630'	E073°36.846'	2683	NE	9B	1	3.54
						Sub-total	**9**	**5.31**
Sub-locality-8 Machiara								
SS 51	Chanian	N34°31.486'	E073°36.500'	2324	SW	9A	2	7.07
SS 52	Chamkathanwala Nala	N34°31.576'	E073°36.595'	2532	NE	9A	1	3.54
SS 53	Thora	N34°31.538'	E073°37.050'	2730	SW	9B	2	7.07
SS 54	Upper Kayan	N34°31.485'	E073°37.169'	2611	SW	9B	2	7.07
SS 55	Phaidmar	N34°31.241'	E073°37.229'	2317	SW	9B	1	3.54
SS 56	Nala	N34°31.123'	E073°37.258'	2111	NE	9B	1	3.54
						Sub-total	**9**	**5.31**
Grand Total							**20**	**5.05**

Table 4. Distribution and population density of Cheer pheasant (*Catreus wallichii*) at Phalla Game Reserve (PGR), Haveli, AJ&K.

Name		Coordinates		Elevation	Aspect	Forest Compartment	Calling birds	Density
Sub-locality-9 (PGR)		Latitude	Longitude	(m)		No.	Pair	pair/km²
SS 57	Akhori Wala.1	N33°57.426"	E074°08.969'	2127	NE	37	1	3.54
SS 58	Akhori Wala.2	N33°57.476'	E074°09.085'	2288	SW	37	1	3.54
SS 59	Larr	N33°57.718'	E074°08.885'	2413	SW	37	1	3.54
SS 60	Nala Baidar	N33°57.858'	E074°08.737'	2380	NE	37	2	7.07
SS 61	Ban Dhoke	N33°58.258'	E074°08.443'	2559	NE	37	2	7.07
SS 62	Boli Wala Naila	N33°58.682'	E074°08.274'	2645	NE	37	2	7.07
SS 63	Trangar	N33°58.077'	E074°07.994'	2448	SW	36	3	10.61
SS 57	Akhori Wala.1	N33°57.426"	E074°08.969'	2127	NE	37	1	3.54
Grand Total							**13**	**5.75**

Table 5. Distribution and population density of Cheer Pheasant (*Catreuswallichii*) at Nar Sher Ali Khan (NSAK), Bagh, Azad Jammu & Kashmir.

Name		Coordinates		Elevation	Aspect	Forest Compartment	Calling birds	Density
Sub-locality-10(NSAK)		Latitude	Longitude	(m)		No.	Pair	pair/km²
SS 65	Bari-Raikot	N33°57.462'	E073°58.119'	2456	SE	11	1	3.54
SS 66	Joban	N33°57.394'	E073°56.714'	2429	NE	12	2	7.07
SS 67	Dobri	N33°56.910'	E073°54.891'	2362	SW	13	1	3.54
SS 68	Dana	N33°59.351'	E073°55.276'	2343	SW	17	1	3.54
							5	**4.42**

Table 6. Population density pair/km² of Cheer Pheasant *(Catreus wallichii)* in different localities of AJ&K.

Source of Variation	*SS	*DF	*MS	*F	*P-value	F crit
Between Groups	8.67	3	2.89	0.37	0.78	2.75
Within Groups	502.14	64	7.85			
Total	510.81	67				

*SS= the sum of squares; DF =degrees of freedom; MS= the mean sum of squares; F value= a value on the F distribution, the value can be used to determine whether the test is statistically significant; p-value= A p-value measures the probability of obtaining the observed results, assuming that the null hypothesis is true; F crit = a specific value that is used to determine whether the F statistic is statistically significant

Table 7. Population density pair/km² of Cheer Pheasant *(Catreus wallichii)* in different sub-localities of AJ&K.

Source of Variation	SS	Df	MS	F	P-value	F crit
Between Groups	60.79	9.0	6.75	0.87	0.56	2.05
Within Groups	449.74	58.0	7.75			
Total	**510.53**	**67.0**				

Table 8. Population density pair/km² of Cheer Pheasant *(Catreus wallichii)* across the months in AJ&K.

Source of Variation	SS	Df	MS	F	P-value	F crit
Between Groups	46.99	3	15.66	2.16	0.10	2.75
Within Groups	463.82	64	7.25			
Total	510.81	67				

elevations between 2,000 and 2900 m (Baker, 1921-1930). In Himachal Pardesh, Cheer are found at an elevation of 1,200 to 3,000 m which starts with subtropical pine forests and reaches to the sub-alpine meadow zones (Gaston et al., 1981). We found 75% of Cheer population resides between 1900-2600m elevations. Whereas, in winter we found bird in an elevation of 1545m in QaziNag, Jhelum Valley. We think that, in addition to food and shelter, one reason for the Cheer population residing between 1900 and 2500 m is that by mid or late May, when herders migrate to higher elevations, the birds have already begun their breeding season. During winter, when the herders with their livestocks return to their homes, the birds descend to elevations around 1500 meters.

We estimated a population of 134 birds in Jhelum Valley with a population density of 5.64 ± 0.47 pair/km^2. Our results are consistent with those of Awan et al. (2004). They estimated a population of 194 birds in 2002 and 126 in 2003 with a population density of 3.5±3.42 pairs/km^2 in Jhelum valley. A small population of Cheer was reported by Islam and Crawford (1986) in MNP. In the past, many survey records indicated the existence of species in MNP. The bird has been observed from different locations of MNP (Mirza, 1980). Awan and Buner (2019) reported 34 Cheer from seven survey plots at MNP. Moreover, they described a 14.38 km^2 of the habitat that appears highly suitable for the species survival. They reported a mean density 4.9 ± 0.6 (per survey plot) of calling birds from seven survey plots. We found 40 birds from MNP with a population density 5.05 ± 0.61 pairs/km^2. Our results show a strong agreement with the findings of Awan and Buner (2019). A previous study by Khan et al. (2006) in Phalla Game Reserve, Haveli estimated a population of 49 adult birds with a maximum density of 2.4 birds/km^2 and minimum density of 1.33 pair/km^2 (Table 5).

However, our results are in contrary with the results of Iftikhar et al. (2017) recorded a population of 462 adult birds in Jhelum Valley. Our estimates might be somewhat realistic, given that cheers are highly vulnerable to hunting and local eradication (Young et al., 1987). According to Awan and Buner (2019) all previous call count methods of density estimation lead to overestimation of Cheer density. Minor variations in call counts between different surveys are likely due to actual changes in bird numbers or inconsistencies in their calling behavior (Young et al., 1987). Such errors may occur if call counts last longer than 15-20 minutes (Gaston, 1980). One of the primary sources of error stems from variations in how individual observers perceive calls. We mitigate this issue by rotating observers between different points on different mornings. It may not entirely eliminate errors, particularly when faint calls are involved. Density indices derived from call counts may yield inaccurate results, particularly when surveys are conducted by inexperienced observers or when the duration of the survey is brief (Young et al., 1987). The cheer population faces persistent and heightened pressure due to the rising human population, resulting in habitat degradation, clearance, and conversion of cheer habitat into agricultural land (Awan, 2011). This pressure is further amplified by an increased conversion of land following a local food shortage subsequent to the Kashmir earthquake in 2005, which inflicted damage and destroyed a substantial portion of the existing agricultural lands in the region (Awan et al., 2012). We believe that our results are reliable because we have minimized errors during the call count method to a considerable extent. We conducted extensive research over a prolonged period and collected data from three morning surveys at each survey point. Additionally, to avoid double counting, we ensured that call counts did not exceed 15 minutes from the first call.

Discovery of new sites in district Bagh indicates that species has expanded its ranges from Phalla Game Reserve, Haveli, AJ&K to Nar She Ali Khan, suggested that species is likely to be present in several new pockets between Phalla Game Reserve and Nar Sher Ali Khan, e.g. SheroDahra, Las Dana and Behadi area of Dahara Haji peer that needs to be assessed. It might have been underestimated in the past. According to Iftikhar et al. (2017), it might be due to the availability of suitable habitats, strict ban on the hunting and less disturbed migrating routes. According to wildlife staff a bird was observed from the periphery of Toli Peer National Park in Oct 2018. But we didn't find any direct evidence about the existence of species in Toli Peer National Park.

5. Conclusions

Present study concludes that the distribution ranges of Cheer increased and species population has established in several new sites. It might have been underestimated in the past. It may be due to certain conservation measures and community awareness programs taken by the Department of Wildlife and Fisheries, AJ&K.

5.1. Recommendations

AJ&K represents a critical habitat for the Cheer, potentially supporting one of the highest global densities of this species in wild. Regular monitoring of various ecological aspects in other potential sites is an essential management strategy. Additionally, implementing conservation awareness programs in all potential habitats is strongly recommended for the long-term survival of the vulnerable species. Our study also suggests that there is an immediate need to declare all Cheer potential habitats as a protected area. Moreover, Qazi Nag Game Reserve and Phalla Game Reserve should be upgraded as a National Park, two important habitats of Cheer to ensure the further survival of this important species. The natural resources are exploited by the indigenous people and communities through their hereditary rights. To minimize the over exploitation of the natural resources and habitat, alternate resources should be allocated, particularly to the migrant shepherds. Besides capacity building, wildlife field staff should be equipped with necessary scientific equipment. Furthermore, shelters should be constructed to enable them to endure the harsh winter conditions in snow-covered mountainous areas.

Acknowledgements

Authors are indebted to the Director, Wildlife and Fisheries department government of AJ&K, field staff and

local community for their support during field surveys and data collection.

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