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Original Article

Population and risk assessment of sympatric pheasant species in Palas Valley, Pakistan

População e avaliação de risco de espécies simpátricas de Faisão no Vale Palas, Paquistão

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Abstract

Pheasants are declining everywhere in the world and therefore updated information about their population and habitats are important for conservation and management. The present study was conducted in the Palas Valley, District Kohistan, Pakistan in late spring (May and June) 2020 and early spring (March and April) 2021 to assess the population and anthropogenic stress. The major focus was on three sympatric pheasant species, including Western Horned Tragopan (*Tragopan melanocephalus)*, Himalayan Monal (*Lophophorus impejanus),* and Koklass Pheasant (*Pucrasia macrolopha)*. We used the "Call Count Method" for the population assessment in the field, and a questionnaire survey was conducted to document the risk assessment of local residents of the valley. The population assessments revealed that the Koklass Pheasant is more adapted to increasing anthropogenic activities and its population appeared more or less similar as 22 years ago. In the past 22 years, Western Tragopan and Himalayan Monal have lost about 40–50% of their populations. Human interference in the form of illegal hunting, deforestation, and overgrazing was found to be common in the valley. The study concludes that the Palas Valley habitat is ideal for pheasant species; however, human interference in the form of urbanization, habitat fragmentation, illegal hunting, and deforestation is occurring at a rapid pace, causing havoc in the pheasant population.

Keywords: population, threats, pheasant, Palas valley, call count, human pressure.

Resumo

Os faisões estão diminuindo em todo o mundo, por isso informações atualizadas sobre sua população e seus habitats são importantes para conservação e manejo. O presente estudo foi realizado no vale Palas, distrito de Kohistan, Paquistão, no final da primavera (maio e junho) de 2020 e início da primavera (março e abril) de 2021 para avaliar a população e o estresse antropogênico. O foco principal foram três espécies simpátricas de faisão, incluindo Tragopan de Chifres Ocidental (*Tragopan melanocephalus*), Monal-do-Himalaia (*Lophophorus impejanus*) e Faisão Koklass (*Pucrasia macrolopha*). Foi utilizado o "Método de Contagem de Chamadas" para avaliar a população em campo, e foi realizada uma pesquisa por questionário para documentar a avaliação de risco dos moradores locais do vale. As avaliações populacionais revelaram que o Faisão Koklass está mais adaptado às crescentes atividades antrópicas e que sua população se mantém mais ou menos semelhante à população de 22 anos atrás. Nos últimos 22 anos, Tragopan de Chifres Ocidental e Monal-do-Himalaia perderam cerca de 40 a 50% de suas populações. A interferência humana, sob a forma de caça ilegal, desmatamento e sobrepastoreio, era comum no vale. O estudo conclui que o habitat do vale Palas é ideal para espécies de faisão; no entanto, a interferência humana, por meio de urbanização, fragmentação de habitat, caça ilegal e desmatamento, está ocorrendo em ritmo acelerado, causando estragos na população de faisões.

Palavras-chave: população, ameaças, faisão, vale Palas, contagem de chamadas, pressão humana.

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1. Introduction

Pheasants display the highest sexual dimorphism, either in size or plumage, to their maximum level. The pheasants within species showed noticeable variations biologically, morphologically, and anatomically; wattle arrangements, feather coloration, size and type of crest, spurs, hackle, tail, the pattern of wings, shape, and size of bill (Gluckman, 2014). Family Phasianidae constituting of 51 species and 16 genera, 98.9% are Asian in origin; 29 (57%) species have been reported as threatened by IUCN, SSC, and Pheasants specialists (McGowan and Garson, 1995). Pheasants are the best indicators to judge the habitat quality and their wilderness (Soh et al., 2006; Ali and Ripley, 1987; Bhattacharya et al., 2007). To meet physiological requirements, Pheasants migrate in altitudes and also change aspects. It increases hunting, pouching, and intra-specific competitions (Thomas et al., 2004). Male pheasants have more attractive plumage and their feathers are used as ornamental headgear. They are observed to be under more hunting by the local community (Ramesh et al., 1999). Pheasants are easily being hunted due to their low flights, heavy body, ground-dwelling nature, and easy to locate (Guha, 2000). The most significant parameter leading towards planning, successful conservation, and management of avian fauna particularly the pheasants is to get knowledge about their abundance and distribution patterns in an area (Lee and Marsden, 2008).

Galliformes are highly sensitive to various anthropogenic activities especially their habitat disturbance (Fuller and Garson, 2000; Jolli and Pandit, 2011; Khan et al., 2014). The major threats to the pheasant population decline were habitat deprivation, unlawful hunting, and pouching. All of these three pheasant species have a very strong preference for desirable habitat conditions and any alteration to their natural habitat badly affects their distribution patterns and continuous interference leads towards population decline (Bhattacharya et al., 2007).

Variation has been observed in the habitat of Western Tragopan in cold temperate starting from 2000 m (Islam, 1982; Islam and Crawford, 1992) and 1800 m to 1350 m (Singh and Tu, 2008). Meanwhile, higher altitudinal habitat variation is also observed and it continues from 2800 m to 3600 m. In the cold season, Western Tragopan is likely to reside in the coniferous and mixed forest habitat. Monal strongly prefers the upper temperate forest of oak and conifers, grassy slopes between 2400 to 4500 m, population abundance has been observed in 2700 m to 3700 m. These astonishing creatures have shown their abilities to migrate as high as 4500 m in warm temperatures and to reside up to 2000 m in the cold season (Hussain and Sultana, 2013). It has been recorded that Koklass inhabits the same habitat of the Western Tragopan and Himalayan Monal and shows altitudinal migration as well. It has been observed that it does not extend its altitudinal range above the tree line (Awan et al., 2012). It has been also observed that all these three pheasant species share the common macro-habitat, residing in an area having the same type of vegetation but the only difference observed was in their microhabitat. They have been observed in the eastern Himalayas and the northwest part of the western Himalayas. The evolutionary tree discloses the fact that all these three pheasant species have been evolved from the common ancestor (Sukumal et al., 2010). Seemingly, Palas Valley can be stated as being well maintained in its natural conditions inhabiting the largest population of Tragopan (Bean et al., 1994). Generally, literature is not available for the subfamily Phasianinae. Although, a significant number of field surveys have been conducted in Pakistan under various assignments but restricted only to limited areas and for short durations, leaving behind many uncovered areas that need to be explored scientifically (Fuller et al., 2003). To attain clear and accurate knowledge regarding Galliformes, there should be more field surveys and intensive research work on these species (Fernandes et al., 2009). The current study will set the baseline for population status, prevailing habitat conditions, and identify some major threats to the pheasant species, which helps to better management and conservation of pheasants. This is the first-ever study in this specific region about pheasant conservation, the objectives of the study were, population Assessment of pheasant species in Palas Valley, Pakistan and to assess the major threats of three sympatric pheasants species of the valley.

2. Materials and Methods

2.1. Study area

Palas Valley is located in District Koli Palas Kohistan, Khyber-Pakhtunkhwa Province, Pakistan (Figure 1). Palas Valley lies 34-52° to 35-16° NL and 72-52° to 73-53° EL. From north and north-east positioned with Jalkot Valley District Kohistan upper, on the east by Kaghan Valley District Mansehra, on the west by River Indus, and south by Allai Valley District Battagram. The valley comprises two distinct forest divisions; Bar Palas and Kuz Palas; Bar Palas the core zone of pheasants is the most significant area for biodiversity especially birds (ICBP, 1992). Palas Valley renowned to be the best refuge to the world's largest known population of the Worldwide threatened Western Tragopan and provided the initial drive to the famous Himalayan Jungle Project (Duke, 1989; Grimmett et al., 2008) Topographically the valley is characterized by steep, undulating, and rugged mountains, ranging between 594 m to 4853 m. The water channels mostly comprised of small Nallas or streams finally meet with River Indus. Thick forests are mostly high canopied with a variety of temperate, sub-alpine, and alpine regional plants. Forest cover is owned by local masses residing in the valley for many years and even for centuries and they have relished their limitless right, unfortunately for the legal settlement of the area, no such land record is available. Lately, the Khyber Pakhtunkhwa (KPK) Forest Ordinance 2002 has been circulated for all legal categories of forest in Khyber Pakhtunkhwa province. The main masses of the human population observed in the study area were the permanent villages, while some seasonal summer villages were also there occupied only in summer season by the local communities.

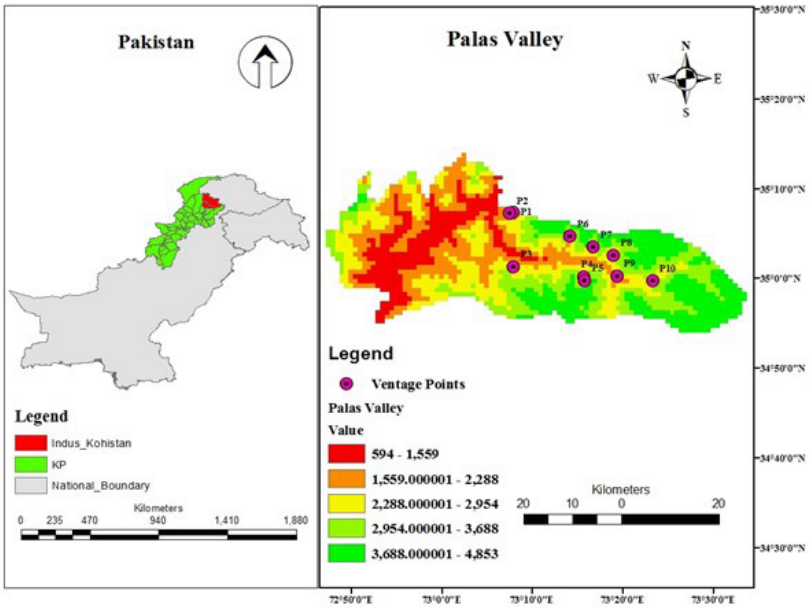

Figure 1. Palas Valley the distribution of pheasants (2461-3680m), Pink spots determine vantage points.

2.2. Filed surveys

"Call Count Method" is a widely used technique and this protocol has been used multiple times in a survey of Himalayan pheasants (Awan and Buner, 2014). This technique seems to be more appropriate to make the population assessment of the pheasants that are characterized by loud calling behaviour during the breeding season Palas valley has mostly mountainous and wilder areas so the call count method is preferable for assessments of the pheasant population, preferably during early morning and evening (Duke, 1989; Ramesh, 2003; Jain and Rana, 2013; Awan and Buner, 2014). The calling pheasants were estimated within a circle of 300 m around each survey point and all survey points were recorded by GPS to be used as a reference for future monitoring. This study was conducted in late spring (May, June) 2020 and early spring (March, April) 2021 consecutively. Ten call count points/survey plots (Figure 1) were selected from the core zone of the pheasant's habitat in the valley. These points were selected by taking help from residents, previous literature, and visual assessments to suitable habitat and easily accessible from base camp at sharp dawn and dusk. Vantage points were selected from the Northern side/left side of the Palas Valley and similarly from the Southern side/right side of the valley. The northern side points were Domo Serta (Khabkot Nalla) (P1), Buja Dar (Khabkot Nalla) (P2), Pochi Tiko (Khabkot Nalla) (P3), Palwan Darobaik (Dewan Nalla) (P4), Barro Baik (P5) and the southern side points were Char Gadar (P6), Sapri Sharaid (7), Singara (P8), Takhto (P9), and Kundul (P10). These points were surveyed at early dawn and dusk spent one hour in each vantage point. Finally, a simultaneous survey was also conducted to cover all vantage points by taking the help of Wildlife Watchers. The tape recorder was also used during the study to ensure the sound of the pheasants. To find the effect of human pressure, a questionnaires survey was conducted (Bello et al., 2007) from 10 villages of the study area. From each village, 15 questionnaires were documented and recorded the views of people belonging to different ages and professions with good knowledge of biodiversity of the area.

3. Results

3.1. Distribution and abundance

The distribution of Western Tragopan ranged from the altitude of 2461 m to 3680 m in the valley. From lower to higher altitudes up to certain limits the population increased and then decreased. The distribution of Himalayan Monal was similar to that of western Tragopan but at slightly higher ranges, starting from 2522 m to 3680 m. In late spring it reaches subalpine and alpine ranges. Abundant calls of the Himalayan Monal were recorded at the upper altitudinal range of the study points (Table 1). The distribution pattern of the Koklass pheasant was easily identified due to loud chorus calls. This species resides mostly near human settlements compared to both Western Tragopan and Himalayan Monal showing preference to the slightly lower altitudinal range. The preferred zone of all the three species appeared in the altitudinal range of 3000-3500 m of the valley.

The study was conducted in late spring 2020, with a total of 173 calls while the survey was conducted in early spring 2021 a total of 187 calls were recorded from all 10 call count points (Table 1 and 2). Most of the pheasants reside and roost in pairs especially in spring (breeding

Table 1. Population estimation of three sympatric Pheasant species calls/km² in late Spring (May, June) 2020.

lPlot No.	GPS locations	Altitude (m)	Tragopan calls (calls/km² area)	Koklass calls (calls/km² area)	Monal calls (calls/km² area)	Total calls (calls/km² area)
Vantage points of Northern/left side of the valley						
P1	N 35⁰.122188 E 73⁰.131882	2461	08(0.2824)	16(0.5648)	09(0.3177)	33(1.1649)
P2	N 35⁰.121119 E 73⁰.125308	2701	01(0.0353)	14(0.4942)	02(0.0706)	17(0.6001)
P3	N 35⁰.022073 E 73⁰.132435	3009	06(0.2118)	11(0.3883)	07(0.2471)	24(0.8472)
P4	N 35⁰.00312 E 73⁰.26156	3332	05(0.176)	18(0.6354)	11(0.3883)	34(1.2002)
P5	N 34⁰.99594 E 73⁰.26396	3680	08(0.2824)	13(0.4589)	10(0.353)	31(1.0943)
Vantage points of Southern/right side of the valley						
P6	N 35° 4'42.42 E 73°14'9.87	3113	03(0.1059)	03(0.1059)	01(0.0353)	07(0.2471)
P7	N 35° 3'31.07 E 73°16'46.06	3135	01(0.0353)	06(0.2118)	02(0.0706)	09(0.3177)
P8	N 35° 2'35.04 E 73°18'58.58	3045	01(0.0353)	04(0.141)	02(0.0706)	07(0.2471)
P9	N 35° 0'17.79 E 73°19'21.51	2792	02(0.0706)	02(0.0706)	0	04(0.1412)
P10	N 34°59'43.38 E 73°23'19.46	2840	0	05(0.1765)	02(0.0706/ km²)	07(0.2471)
	Total calls (calls/km²)		35 (1.236 calls/ km²)	92 (3.248 calls/km²)	46 (1.624 calls/ km²)	173 (6.107 calls/ km²)

Table 2. Population estimation of three sympatric Pheasant species calls/km² area in early spring (March, April) 2021.

Plot No.	GPS locations	Altitude (m)	Tragopan calls (calls/km² area)	Koklass calls (calls/ km² area)	Monal calls (calls/km² area)	Total calls (calls/km² area)
Vantage points of Northern side/left side of the valley						
P1	N35⁰.122188 E73⁰.131882	2461	03(0.1059)	10(0.353)	02(0.0706)	15(0.5295)
P2	N35⁰.121119 E73⁰.125308	2701	01(0.0353)	08(0.2824)	02(0.0706)	11(0.3883)
P3	N35⁰.022073 E73⁰.132435	3009	03(0.1059)	06(0.2118)	02(0.0706)	11(0.3883)
P4	N 35⁰.00312 E 73⁰.26156	3332	02(0.0706)	12(0.4236)	06(0.2118)	20(0.706)
P5	N 34⁰.99594 E 73⁰.26396	3680	03(0.1059)	09(0.3177)	04(0.1412)	16(0.5648)
Vantage points of Southern side/right side of the valley						
P6	N 35°4'42.42 E 73°14'9.87	3113	06(0.2118)	09(0.3177)	03(0.106)	18(0.6354)
P7	N 35°3'31.07 E73°16'46.06	3135	07(0.2471)	13(0.4589)	09(0.3177)	29(1.0237)
P8	N 35°2'35.04 E73°18'58.58	3045	02(0.0706)	13(0.4589)	05(0.176)	20(0.706)
P9	N 35°0'17.79 E73°19'21.51	2792	06(0.2118)	11(0.3883)	06(0.212)	23(0.812)
P10	N34°59'43.38 E73°23'19.46	2840	07(0.2471)	10(0.353)	07(0.247)	24(0.847)
	Total calls (calls/km²)		40 (1.412calls/ km²)	101 (3.565calls/km²)	46 (1.624calls/ km²)	187 (6.601calls/ km²)

periods) that's why expected that the partners of calling individuals are also found there and the total abundance of pheasants has been guessed 346 and 374 individuals respectively. In early spring the calls of all pheasants from the Southern side (face to sunlight) were abundant than that of the Northern side of the valley while in late spring the calls were mostly recorded from the Northern side. The total study points calling density in late spring 2020, recorded for Koklass pheasant as highest i.e. 3.248 calls/km^2 area followed by Himalayan Monal 1.624 calls/km^2 area and Western Tragopan 1.236 calls/km^2 area. The study points that Western Tragopan has the highest call density 0.2824 calls/ km^2 at P1 and P3 and zero calls at P10 (Table 1). The highest density of Himalayan Monal was 0.6354 calls/km^2 area at P4 vantage point and lowest 0.0706 calls/km^2 areas at P9 vantage point. The Koklass Pheasant was more common and has relatively little variation in calling density at all study points. In the study conducted in early spring 2021, the total density of Koklass pheasant was again highest 3.565 calls/km^2 area followed by Himalayan Monal with same abundance 1.624 calls/km^2 area and Western Tragopan 1.412 calls/km^2 area. In the study points the Western Horned Tragopan has the highest calling density 0.247 calls/ km^2 area at P7 and P10 while the lowest 0.0353 calls/km^2 at P2 vantage point. The density of Himalayan Monal was 0.318 calls/km^2 at P7 vantage point while lowest 0.0706 calls/km^2 area at P1, P2, P3 vantage points.

3.2. Encounter rate

Encounter rates (ER) show an abundance of individuals or the number of pheasants observed per unit effort or per unit time. In the present study, 600 minutes were spent to listening the calls of pheasants at 10 survey points, i.e. 60-minute effort at each study point. In late spring 2020, the encounter rate for Western Tragopan, Koklass, and Himalayan Monal was 3.5 calls/hours, 9.2 calls/hours, and 4.6 calls/hours respectively. However, in early spring 2021 encounter rate was recorded at 4.00 calls/hours, 4.6 calls/hours 10.1 calls/hours for Tragopan, Monal, and Koklass respectively (Table 3).

3.3. Human pressure and conservation issues

The increasing human population and their settlements led to declining the pheasant population, the study reveals that lower altitudes of the study area have less abundance of pheasants due to more human interference in the form of crop cultivation, on the other hand where human settlements and interference is low more pheasant were recorded. The lower altitudinal vantage points include Domo Serta, Bujadar, and Char Gadar, where maize crop is source of income for local peoples in summer, so people depend more on agriculture and are mostly permanent residents of the area. The families rearing cattle, goats, and other domesticated animals were found more at the higher altitudinal areas but migrating for short periods and residing in Goths (temporary seasonal houses) which were few only to have surveillance on their pets that's why less affecting the pheasant population (Figure 2).

Different types of vegetation; herbs, shrubs, and trees, and their local use in different survey plots were observed. Deforestation is on peak and trees (timber) were mostly being used as fuel-wood, house construction, furniture, and some tree fruits also used as medicine like *Aesculus indica* and *Betula utilis* are used for making local sheets to store ghee and butter. Roots, leaves, and fruits of shrubs, and herbs are essential ingredients of local foods and medicines. The nest, eggs, and chicks of pheasants were also seen disturbed during the study by wild animals especially Monkeys, Foxes, Grey Languor, and Jackals. Pheasants are mostly hunted for game and food but the male Monal pheasants have aesthetic value according to villagers and interviewer; the most expensive pheasant for income is male Monal, so people more interestingly hunted Monal to overcome their financial issues. The questionnaire survey result reveals that 65% of framers and laymen are involved in pheasant hunting. It is also obvious from secondary data that 93% of hunting occurs in winter due to the migratory behavior of pheasants toward lower altitudes.

Table 3. Encounter Rate (ER) of Western Tragopan, Himalayan Monal, and Koklass pheasant.

ER (Birds/Hours)	Western Tragopan	Koklass	Monal
Late spring 2020	3.5	9.2	4.6
Early Spring 2021	4.0	10.1	4.6

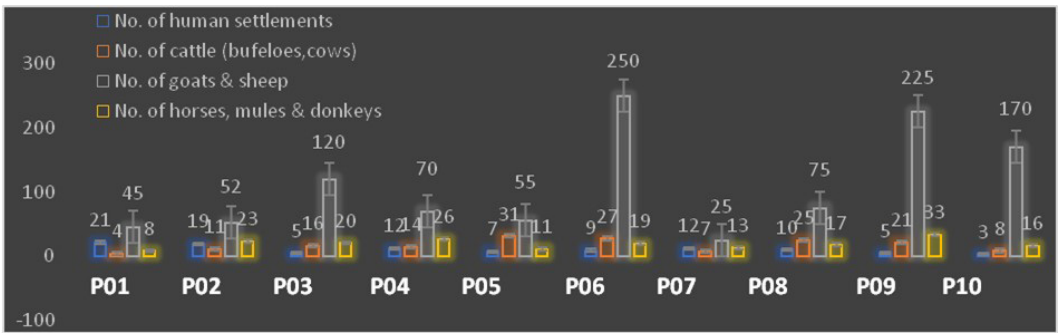

Figure 2. Anthropogenic pressures in the form of human settlements and pet animals.

4. Discussion

4.1. Distribution and population assessments

The study indicates pheasants mostly prefer higher altitudes in summer and lower altitudes in winter. Eighty-five percent of native observers revealed winter season forces pheasants to migrate from higher to lower altitudes and vice versa during summer. They also experience behavioral adaptations that favor seasonal migration from Southern aspects to Northern aspects during late spring and summer to avoid direct sun fall and warm environmental conditions and reversed in winter. Past studies conducted by the Himalayan Jungle Project and Palas Conservation and Development Project in the periods; 1991, 1994, 1997, 1999, and 2008 also supported the seasonal migration in pheasants. Both harsh climatic conditions and scanty resources of food in winter forces pheasants to show seasonal migration from high altitude to the low altitude which puts their survival into danger due to severe competition and human interference (Ramesh et al., 1999; Swadling et al., 2017). The results of the questionnaire survey revealed that hunting occurs maximum in winter due to easy access to actual habitat; pheasants are easily hunted at night due to smooth access of hunters to their roosting sites after proper surveillance. According to local hunters, in summer hunting is difficult because of more availability of bushes for hiding and edge due to camouflage. Both factors reduce the detection probability of roosting sites.

In summer Western Tragopan generally prefers thick herbs and shrubs under mixed coniferous forests, which range from 2400 m to 3600 m. Himalayan Monal pheasant inhabits upper temperate coniferous and broad leaves forests having slopes rich with dense vegetation at an altitude range from 2400 m to 4500 m. The home range of both Monal and Western Tragopan is also shared by Koklass pheasant (Ramesh, 2003; Gluckman, 2014). The present study reveals Koklass altitudinal range is slightly lower than that of Tragopan. Moreover, no calls of Koklass pheasant listened on the highest call recording point that showed abundant calls record of Monal pheasant. A rich call record of Koklass pheasant was noticed at lower altitudinal ranges as compared to that of both Monal and Western Tragopan. The preferred zone of all the three species appeared in the altitudinal range of 3000-3500 m of the valley.

The population assessments revealed that Koklass Pheasant is more adapted to increasing anthropogenic activities and its population appeared more or less similar as 22 years ago. However, the trend of population decline is clear in Western Tragopan and Monal. Both these pheasant species have lost about 40-50% of the population in the past 22 years due to increasing anthropogenic pressure (Table 4). In the present study, we recorded abundant calls in the thick floristic areas; herbs and shrubs canopied by deciduous and coniferous forests. Western Tragopan is a highly touchy bird that prefers thick, shady floristic areas for concealment and never crosses the upper tree line. The dominant vegetation included *Picea smithiana, Abies pindrow, Prunus cornuta,* and *Quercus floribunda* among trees; Shrubs that were observed at calling plots were; *Berberis brandisiana, Ribes* spp, and *Sambucus wightianum.* The herbs were *Catha alba, Cichorium intybus, Fragaria nubicola, Valerina stracheyi*, *Bunium,* and *Jurinea dolomiaea.*

Monal and Koklass pheasants prefer trees of Oak, Deodar, and Pine or vegetation of Rhododendron. Koklass generally is found and prioritizes the thicker under canopy than Monal. However, occasionally in early spring overlapping of foraging and home ranges occurs (Gaston et al., 1983; Ali and Ripley, 1987). Our result of the Koklass pheasant is comparable with this statement. Koklass pheasant shows a rich diversity in habitat preference and occasionally overlaps with those of Monal and Western Tragopan. Koklass altitudinal range is slightly lower than that of Western Tragopan and Monal. It generally prefers thicker underlying canopied floristic zones of the forest. Koklass pheasant never over limits the timberline and inclines to thickets. Monal inhabits the upper temperate forests of conifers and broad-leaved plants with thickened floristic slopes (Delacour, 1977). Monal pheasant commonly occupies the upper temperate zone and sometimes ascends to the sub-alpine zone. In this study, we recorded Monal sometimes crosses the tree line and conceals in a shrub area in spring; the small floristic composition with patched distributed trees observed from calling sites included; *Picea smithiana, Abies pindrow, Betula utilis, Salix*

Table 4. Comparison of previous population survey results of HJP and PCDP from 1989 to 1999 and current study 2020 and 2021 in Palas Valley.

Year	Locality	Tragopan No.	Koklas No.	Monal No	Reference
1989	Middle Palas*	200	------	-----	(Duke, 1989)
1991	Middle Palas	26	28	18	(Bean et al., 1994)
1994	Mid + Bar Palas	325	97	29	(Bean et al., 1994)
1995	Mid Palas	6	27	53	(Wildlife Department survey data)
1996	Bar Palas	73	78	76	(Duke, 1989)
1999	Bar Palas	74	88	0	(Wildlife Department survey data)
2020	Bar Palas	40	101	46	Current study
2021	Bar Palas	35	92	46	Current study

*HJP-Himalayan Jungle Project; PCDP-Palas Conservation and Development Project

tetrasperma, Quercus floribunda; shrubs were; *Viburnum, Skimmia anquetilia* and herbs were; *Bergenia ciliata, Berberis brandisiana, Corydalis govaniana* and *Rheum webbianum.*

4.2. Human pressure and conservation issues

Pheasants are very shy birds and they prefer wilder habitats. In this study secondary information collected through different ages and professions people about human pressure resulted that in old days (~30 years back) there were Kalij and Cheer pheasants present in the lower altitudes of the valley, however in the current study, not a single call listened from any sampling sites. It revealed that these pheasants are exterminated from the study area or a few with high detection issues. Among pheasants, only a few species will have survived significantly in number, which can withstand human pressure while others wiped out due to the inability to bear the pressure. Galliformes particularly pheasants have experienced a detrimental impact on livestock and humans (Soh et al., 2006; Bhattacharya et al., 2007). This study observed that human pressure pushed the population of pheasants toward the wilder area of the valley and also squeeze the pheasant habitat. The pheasant population observed more where human pressure was low. Pheasant extinction occurred due to overhunting coined with anthropogenic economic, cultural values, and meat demand (Gaston et al., 1983; Islam and Crawford, 1992; Ramesh, 2003). The questionnaire survey supported the above postulates that pheasants are rapidly declining by illegal hunting and poaching and the people are fond of hunting particularly male pheasant of Monal for their aesthetic values and also for recreations. Pheasants are immensely threatened due to their bright full magnificent texture, illegal hunting, and other anthropogenic activities that adversely affect the population. The questionnaire survey of this study revealed and supported the cited statement and frequently answered during an interview that the population of pheasants declining gradually due to Guzara type forest (owned property forest) since the area has a feudal system and government writ is not as strong to control illegal hunting and deforestation.

5. Conclusion

Palas Valley had a significant number of pheasant populations, encounter rate was also satisfactory. The study concluded that the pheasant population fragmentally divided in the entire Palas Valley as well as all over the district of Kohistan. The habitat of the valley is suitable for the pheasant population and their breeding but human pressure disturbs the wilderness. It is also concluded that the pheasant population mainly decreases due to habitat loss, illegal hunting, and overgrazing. These anthropogenic activities are mainly carried out by laymen and formers. The population assessments revealed that Koklas Pheasant is more adapted to increasing anthropogenic activities and its population appeared more or less similar as 22 years ago. However, the trend of population decline is clear in Western Tragopan and Monal. Both these pheasant species have lost about 40-50% of the population in the past 22 years due to increasing anthropogenic pressure. Strong awareness campaigns and education for the local communities are required to change the attitude of the people towards pheasant conservations.

References

ALI, S., and RIPLEY, S. 1987. *Handbook of the birds of India and Pakistan*. Compact edition Reino Unido: Oxford University Press, New Dehli, India.

AWAN, M.N. and BUNER, B., 2014. Conservation of the Western Tragopan *Tragopan melanocephalus* around Salkhala Game Reserve, Azad Kashmir, Pakistan.*Chinese Journal of Zoological Research*, vol. 35, no. 4, pp. 1-8.

AWAN, M.N., ALI, H. and LEE, D.C., 2012. An annotated checklist of birds and conservation issues in Salkhala Game Reserve, an isolated Important Bird Area in Azad Kashmir, Pakistan. *Forktail*, vol. 28, pp. 38-43.

BEAN, N.J., BENSTEAD, P.J., SHOWLER, D. and WHITTINGTON, P.A., 1994. *Survey of Western Tragopan in the Palas Valley, NWFP.* Cambridge, UK: BirdLife International. Final Report to Himalayan Jungle Project, Islamabad, Pakistan and BirdLife.

BELLO, F., LEPS, J. and SEBASTIA, M., 2007. Grazing effects on the species-area relationship: variation along a climatic gradient in NE Spain.*Journal of Vegetation Science*, vol. 18, no. 1, pp. 25-34. http://dx.doi.org/10.1111/j.1654-1103.2007.tb02512.x.

BHATTACHARYA, T., SATHYAKUMAR, S. and RAWAT, G.S., 2007. Distribution and abundance of Galliformes in response to anthropogenic pressures in the buffer zone of Nanda Devi Biosphere Reserve. *International Journal of Galliformes Conservation*, vol. 1, pp. 78-84.

DELACOUR, J., 1977. *Pheasants of the world*.Spur Publications.

DUKE, G., 1989. Using call count surveys to obtain comparative population figures for Western Tragopan in NWFP Pakistan. In: D. A.HILL, P. J. GARSON and D.JENKINS, eds. *Pheasants in Asia 1989*. Reading, UK: World Pheasant Association, pp. 116-123.

FERNANDES, M., SATHYAKUMAR, S., KAUL, R., KALSI, R. and SHARMA, D., 2009. Conservation of red junglefowl *Gallus gallus* in India. *International Journal of Galliformes Conservation*, vol. 1, pp. 94-101.

FULLER, R. and GARSON, P., 2000. Pheasants: status survey and conservation action plan 2000-2004.*IUCN*, vol. 8, no. 3, pp. 66.

FULLER, R.A., MCGOWAN, P.J., CARROLL, J.P., DEKKER, W. and GARSON, P.J., 2003. What does IUCN species action planning contribute to the conservation process?*Biological Conservation*, vol. 112, no. 3, pp. 343-349. http://dx.doi.org/10.1016/S0006-3207(02)00331-2.

GASTON, A., GARSON, P. and HUNTER JUNIOR, M., 1983. The status and conservation of forest wildlife in Himachal Pradesh, Western Himalayas.*Biological Conservation*, vol. 27, no. 4, pp. 291-314. http://dx.doi.org/10.1016/0006-3207(83)90088-5.

GLUCKMAN, T.L., 2014. Pathways to elaboration of sexual dimorphism in bird plumage patterns.*Biological Journal of the Linnean Society. Linnean Society of London*, vol. 111, no. 2, pp. 262-273. http://dx.doi.org/10.1111/bij.12211.

GRIMMETT, R., ROBERTS, T., INSKIPP, T. and BYERS, C., 2008. *Birds of Pakistan*. London: Christopher Helm London /Yale University Press USA

GUHA, R., 2000. *The unquiet woods: ecological change and peasant resistance in the Himalaya*. Berkeley: University of California Press.

HUSSAIN, M.S. and SULTANA, A., 2013. Social organization and sex ratio among four species of Himalayan Pheasants during

Breeding and Non Breeding Seasons.*International Journal of Economic Development*, vol. 24, no. 1, pp. 81-94.

ICBP, 1992. *ICBP/IUCN Red Data Book*. Cambridge, UK: International Council for Bird Preservation.

ISLAM, K. and CRAWFORD, J., 1992. Sex ratio in Western Tragopan and its implications for population estimation. In: D. JENKIS, ed. *Proceedings of the 5th International Symposium*, 1992. Lahore, Pakistan. Lahore, Pakistan: World Pheasant Association, pp. 131-133.

ISLAM, K., 1982. Status and distribution of the western tragopan in northeastern Pakistan. In: C.D.W. SAVAGE and M.W. RIDLEY (eds) *Pheasants in Asia*, 1982. Reading, UK. Reading, UK: World Pheasant Association, pp. 44-50.

JAIN, D. and RANA, S., 2013. Population indices and habitat association of Indian Peafowl (*Pavo cristatus*) in Haryana using line transect and call count method.*Indian Journal of Animal Research*, vol. 47, no. 2, pp. 152-155.

JOLLI, V. and PANDIT, M.K., 2011. Influence of Human Disturbance on the Abundance of Himalayan Pheasant (Aves, Galliformes) in the Temperate Forest of Western Himalaya, India.*Vestnik Zoologii*, vol. 45, no. 6, pp. 40-47. http://dx.doi.org/10.2478/v10058-011-0035-0.

KHAN, B., ABLIMIT, A., ALI NAWAZ, M., ALI, R., ZAFAR KHAN, M., UD DIN, J. and BANO, R., 2014. Pastoralist experience and tolerance of snow leopard, wolf and lynx predation in Karakoram Pamir Mountains.*Journal of Biological and Environmental Sciences*, vol. 5, pp. 214-229.

LEE, D.C. and MARSDEN, S.J., 2008. Adjusting count period strategies to improve the accuracy of forest bird abundance estimates from point transect distance sampling surveys.*The Ibis*, vol. 150, no. 2, pp. 315-325. http://dx.doi.org/10.1111/j.1474-919X.2007.00790.x.

MCGOWAN, P.J.K. and GARSON, P.J., 1995. *Status survey and conservation action plan*.Gland: IUCN.

RAMESH, K., 2003. *An ecological study on pheasants of the Great Himalayan National Park, western Himalaya.*. Dehradun: Wildlife Institute of India. Unpublished Report.

RAMESH, K., SATHYAKUMAR, S. and RAWAT, G., 1999. *Ecology and conservation status of the pheasants of Great Himalayan National Park, Western Himalaya*.Wildlife Institute of India.

SINGH, S. and TU, F.A., 2008. A preliminary survey for Western Tragopan Tragopan melanocephalus in the Daranghati Wildlife Sanctuary, Himachal Pradesh.*Indian Birds*, vol. 4, no. 2, pp. 42-55.

SOH, M., SODHI, N., LIM, S.L., PARRA, G.J., CORKERON, P.J., MARSH, H., PYWELL, R., WARMAN, E., HULMES, L. and HULMES, S., 2006. High sensitivity of montane bird communities to habitat disturbance in Peninsular Malaysia.*Biological Conservation*, vol. 129, no. 2, pp. 149-166. http://dx.doi.org/10.1016/j.biocon.2005.10.030.

SUKUMAL, N., GALE, G. and SAVINI, T., 2010. Sub-montane habitat selection by a lowland pheasant.*The Raffles Bulletin of Zoology*, vol. 58, pp. 391-401.

SWADLING, P., WAGNER, R. and LABA, B., 2017. *Plumes from paradise*. Papua-Nova Guiné: Papua New Guinea National Museum.

THOMAS, C.D., CAMERON, A., GREEN, R.E., BAKKENES, M., BEAUMONT, L.J., COLLINGHAM, Y.C., ERASMUS, B.F.N., DE SIQUEIRA, M.F., GRAINGER, A., HANNAH, L., HUGHES, L., HUNTLEY, B., VAN JAARSVELD, A.S., MIDGLEY, G.F., MILES, L., ORTEGA-HUERTA, M.A., TOWNSEND PETERSON, A., PHILLIPS, O.L. and WILLIAMS, S.E., 2004. Extinction risk from climate change.*Nature*, vol. 427, no. 6970, pp. 145-148. http://dx.doi.org/10.1038/nature02121. PMid:14712274.