

# INTRODUCTION

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### 1.1. Pheasant

Pheasants represent the most distinctive bird family due to their charismatic features, act as bio-indicators for owing to their sensitivity to habitat degradation and climate change, and indicate habitat quality of forest, vulnerability to human exploitation and central position in the food web (Kaul, 1989; Fuller & Garson, 2000; Chhetri et al., 2018). They are large-bodied, brightly coloured, ground-dwelling birds, exhibiting greater sexual dimorphism in both size and plumage, and belonging to the taxonomic order Galliformes and family Phasianidae. The pheasants are recognized by a total of 51 species (excluding one extinct species Double-banded Argus, *Argusianus bipunctatus*, IUCN, 2007) under 16 genera (Ghose, 1999). Out of the total, 50 species of pheasants are Asian in origin and found in wide range of area occupying a diversity of habitats, which range from lowland tropical rainforest (e.g. Crested Fireback, *Lophura ignita*) to alpine meadows (e.g. Chinese Monal, *Lophophorus ihuysii*). For long, many biologists have pursued studies relating to the distribution and abundance of birds to their natural environment, knowledge of abiotic clues, and its influence on the birds and interactions (Gaston, 1980; Davidson, 1981; Chettri, 2000; Basnet & Badola, 2010). Such pieces of evidence have provided a better understanding of the distribution patterns of birds in natural ecosystems (Gaston, 1980; Chettri, 2000). Nevertheless, habitat destruction and loss of biodiversity due to anthropogenic factors and climate changes are considered to be the most important influencing forces towards sustainability of the pheasants. However,

other factors such as social, economical and political also play a crucial role in enhancing biodiversity loss (Machilis & Forester, 1996; Badola & Aitken, 2010).

### **1.2. Environment and Climate change**

#### **1.2.1. Role of the Habitats**

The interaction between plants and animals is directly associated within and between the ecosystems and their external environmental variables, which play a significant role to balance the ecosystem stability, is a priority area of research in the present scenario for on-going biodiversity conservation theme (Chhetri et al., 2017). Worldwide, the biodiversity is under tremendous environmental and anthropogenic pressures, which apply equally to its natural elements including floral and faunal components. This might be driven by the risk of vulnerability as some species show the extremely poor level of adaptation to altered habitat (Lovejoy, 1986; Vermeij, 1986), which may result in some species fall under the risk of extinction (Terborgh & Winter, 1980; Slobodkin, 1986). In Sikkim Himalaya, many threatened birds species are found (Acharya & Vijayan, 2010) and most of which are confined to restricted elevation range (Acharya et al., 2011) for their possible specific ecological niche requirements (Chhetri et al., 2017). Due to anthropogenic pressure and habitat fragmentation, these birds are becoming more sensitive within their restricted range. Therefore, the immediate task is needed for their improved conservation and management practices in protected areas (Basnet & Badola, 2012; Chhetri et al., 2017). Baseline data are needed from wildlife protected areas on the availability of birds. Scientific data are required on the ecological status, distribution, diversity of bird species and associated habitats, which may offer vital clues on the disturbance

level for the effective implementation of conservation management of the same (Chettri, 2000; Nawaz et al, 2000; Basnet & Badola, 2012; Klerka et al., 2004; Fernández-Juricica et al., 2004). Greater focus has been paid on the high biodiversity areas and the accelerated rate of deforestation (Myers, 1988). Biodiversity loss has also been associated with specific - land use changes, such as urbanisation (Leidy & Fiedler, 1985), colonisation adjacent to protected areas (Neuman & Machilis, 1989), and the fragmentation of forest due to resource exploitation (Harris, 1984). The comparative studies in this field are insufficiently available, and predictive ability is inadequate; hence there is a gap left to understand better the relationship between anthropogenic actions, habitat alternation, and biodiversity loss (Machilis & Forester, 1994). Therefore, it is imperative to have ecologically inter-related studies on the pheasants' diversity and abundance, along with understanding on their habitat relationships as part of complete quality research assessment (Chhetri et al., 2017).

### **1.2.2. Role of the Climate change**

Climate change issues are topical all across the globe and predicted to alter species distributions, life histories, community composition, and ecosystem functions (McLaughlin et al., 2002). In particular, population loss, altering distribution and abundance of many species are caused by climate change threaten both species diversity and the delivery of critical ecosystem services (Guisan & Zimmermann, 2000; McLaughlin et al., 2002; Malcolm et al., 2006; Peh, 2007; Velasquen-Tibata et al., 2012). Predictions of climate-induced population extinctions are supported by correlational evidence that numerous species are shifting their ranges in response to climatic warming. Nevertheless, few mechanistic studies have linked extinctions to recent climate change (Pounds, et al., 1999). Furthermore, most climate change

research and forecast focus on shifts in climatic means. Global climate models also predict changes in climatic variability, but biotic impacts of those increases have received less attention. It has been documented that varieties of species (both fauna and flora) have recently changed their elevation and latitudinal distribution and many species may be pushed to higher elevations, effectively shrinking their distributions as the climate warms (Grabherr et al., 1994; Parmesan et al., 1999; Bakkenes et al., 2002; Peh, 2007; Seimon et al., 2007; Chen et al., 2009, 2011). Various field studies and predictive spatial modelling have provided strong proof that these species range shifts is due to climate change (Root, 1988; Parmesan, 1996; Pounds et al., 1999; Chhetri et al., 2018). Current scenario of global changes in climate has aroused considerable interest in the field of distributional patterns and conservation strategies for native species (Parmesan, 1996; Pounds et al., 1999). Strong evidence of significant relationships between climate and the distribution patterns of birds have been studied (Ashmole, 1963; Root, 1988; Currie, 1991; Peh, 2007; Velasquen-Tibatata et al., 2012). There are recent studies available from Indian Himalayan Region, suggesting the early flowering phenomena due to climate change, improving understanding level of the effect of the climate change on species (Badola, 2010; Gaira et al., 2011, 2014). Such consequences possibly synchronize the habitat dynamism and the pheasant diversity in Himalaya could be susceptible to such changes. Climate change is not the lone factor for the distribution of birds but is also affected by the availability of suitable habitats, which in turn, may be influenced by the climate change (Matthews, 2004; Acharya et al., 2011).

### 1.3. Himalayan pheasants

Amongst all the mountain systems of the world, Himalaya is one of the highest and youngest, which extends over 2400 km from northwest to southeast and covers 150 to 250 km in width (Devan, 1988). The Himalayan mountain range is considered to be one of the most significant bio-geographical zones in India because it is a hub of three bio-geographical realms viz., Palaearctic, Africo-tropical and Indo-Malayan (Mani, 1974). Due to this unique feature, varieties of wildlife species freely move from different faunal realms into Himalaya. Out of 51 pheasant species in the world, 20 (39%) are endemic to Himalaya, some of which includes the genera of *Ithaginis* (Blood Pheasant), *Tragopan* (Tragopans or Horned Pheasants), *Lophophorus* (Monal Pheasants), *Lophura* (Kalij Pheasant), *Pucrasia* (Koklass Pheasant), *Catreus* (Cheer Pheasant), *Crossoptilon* (Eared Pheasant) and *Polypectron* (Peacock-Pheasant). Indian Himalaya is represented by 16 species, which occupy various vegetation and altitudinal gradients (Ramesh et al., 1999). The severe climatic condition has been controlling the life of the Himalayan pheasant population. However, the large size and heavily built plumage in pheasants are possibly due to the physiological requirements to withstand the typical climate, terrain, and low-atmospheric pressure in high altitudes. As a result, the winter season in this region plays a vital role in their survival. During winter, when the ground is snow-covered and very little resources are available, pheasants are compressed to move to lower elevations where they face inter and intra-specific competition for resources and also get easily poached for meat and plumage by people. However, a recent study showed migratory movements of some pheasants along elevation gradients, offering newer

findings (Nawang et al., 2013), suggesting strongly more studies in the Himalayan region.

### **1.3.1. Indian Himalayan Region (IHR)**

Out of the 17 pheasant species in India, 16 species (94%) occur in Himalaya, except for the endemic Grey Junglefowl, *Gallus sonneratii*, which is confined to the Peninsular of India, however, five pheasant species are listed as 'threatened' (Sathyakumar & Sivakumar, 2007). In terms of species diversity, Eastern Himalaya of India represents 11 species as compared to eight in Western Himalaya of India, whereas, four species, namely Satyr Tragopan, Himalayan Monal, Kalij Pheasant, and Red Junglefowl are common across the two regions. In Western Himalaya (India), eight of the species of pheasants found, five species are recorded from the Great Himalayan National Park. They are the Western Tragopan (*Tragopan melanocephalus*), Koklass Pheasant (*Pucrasia macrolopha*), Himalayan Monal (*Lophophorus impejanus*), Cheer Pheasant (*Catreus wallichii*), and Kalij Pheasant (*Lophura leucomelana*) (Ramesh et al., 1999). Out of the eleven pheasant species found in Eastern Himalaya, four are recorded in Khangchendzonga Biosphere Reserve. They are the Blood Pheasant (*Ithaginis cruentus*), Satyr Tragopan (*Tragopan satyra*), Himalayan Monal (*Lophophorus impejanus*), and Kalij Pheasant (*Lophura leucomelana*) (Sathyakumar et al., 2011; Badola & Subba, 2012). Comparing both Great Himalayas National Park and Khangchendzonga Biosphere Reserve, it seems that two species of pheasants are widely scattered in both regions that is Himalayan Monal (*Lophophorus impejanus*), and Kalij Pheasant (*Lophura leucomelana*).

## 1.4. Description of the study species

### 1.4.1. Taxonomy

Phylum: CHORDATA

Class: AVES

Order: GALLIFORMES

Family: PHASIANIDA

### 1.4.2. Biology and Ecology

#### 1.4.2.1. Blood Pheasant (*Ithaginis cruentus* Hardwicke)

**Morphological Features:** Crested head, and red orbital skin and legs/feet. Male has a blood-red throat, grey upperparts streaked with white, and greenish underparts and plumage is splashed with red (Figure 1.1).



Figure1.1: Male Blood Pheasant in the field.

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Female has grey crest and nape, rufous-orange face, dark brown upper part and black on head (Figure 1.2). Both sexes are 38 cm in length. They sound like a repeated chuck and aloud, grating kzeeuk-cheeu-cheeu-chee (Grimmett et al., 2011). Blood Pheasant, *Ithaginis cruentus* is only single species of genus *Ithaginis*.

**Distribution:** Blood Pheasant is a resident and fairly common pheasant that is distributed in the Central and Eastern Himalaya (Sikkim and Arunachal Pradesh) [Figure 1.3].



Figure 1.2: Female Blood Pheasant in the field.

**Habitat:** The species mainly dwells the alpine areas but is also seen in the sub-alpine habitats of the area. The species is the state bird of Sikkim and found to occur in groups of up to 70-80 individuals.

**Breeding:** Breeding season probably occurs in April-May as small chicks have been seen in June and early July (WPA- India, 2008).

**Threats:** It is found in high altitude region. Although, it is not under human pressure, hunting for local consumption by shepherd and poachers during and after monsoon cannot be ignored (Yonzon & Lelliott, 1980).

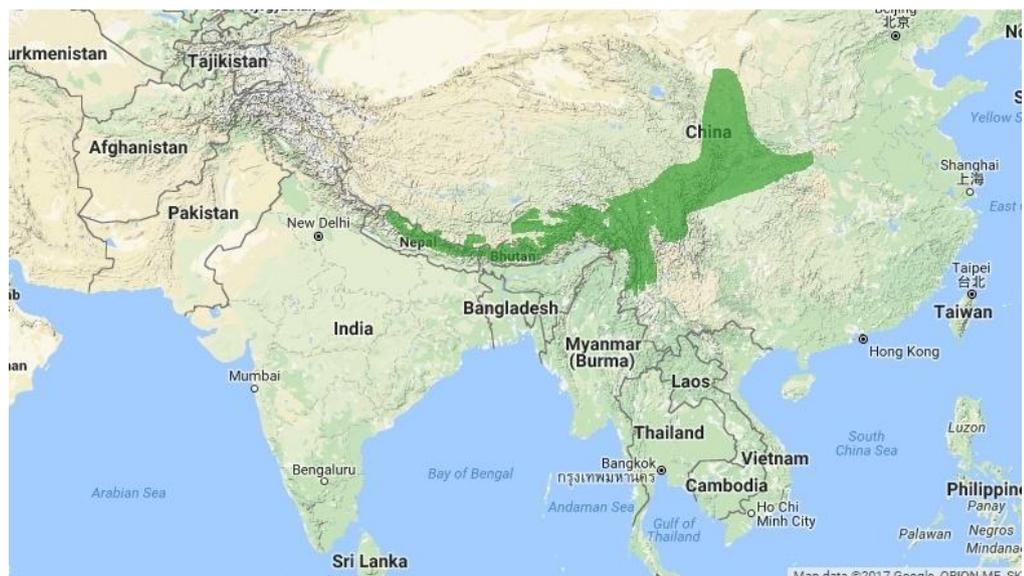


Figure 1.3: Global geographical distribution of Blood Pheasant  
(Source: BirdLife International, 2017).

### 1.4.2.2. Himalayan Monal (*Lophophorus impejanus* Latham)

**Morphological Features:** Male is iridescent green, copper and purple, with small white patch on back and cinnamon-brown tail, and spatulate-tipped crest (Figure 1.4), female has pale streaking on under parts, prominent white throat, short crest and

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bright blue orbital skin (Figure 1.5). The size of a male is 70 cm and a female is 63.5cm in length. They sound like a series of upward-inflected whistles, kur-leiu or klee-h-vick, alternated with kwick-kwick (Grimmett et al., 2011).



Figure 1.4: Male Himalayan Monal in the field.

**Distribution:** Himalayan Monal is a resident and fairly common pheasant that is distributed in Bhutan, China, India, Myanmar, Nepal, and Pakistan. Its distribution in Afghanistan is uncertain (Birdlife International, 2016) [Figure 1.6].

**Habitat:** It occupies upper temperate oak-conifer forests interspersed with open grassy slopes, cliffs, and alpine meadows.



Figure 1.5: Female Himalayan Monal in the field.



Figure 1.6: Global geographical distribution of Himalayan Monal (Source: BirdLife International, 2017).

**Breeding:** Breeding season starts from May-June (WPA –India, 2008). Their nest is a simple scrape, often under the shelter of a bush, a rock, or in the hole of some large tree (Johnsgard, 1986)

**Threats:** The main threats to the species from poaching during winter for local consumption and its plumage, when the bird descends to the lower altitude (Yonzon & Lelliott, 1980).

### 1.4.2.3. Kalij Pheasant (*Lophura leucomelanos* Latham)

**Morphological Features:** Both sexes have red facial skin and down curved tail. Male has blue -black upperparts and variable amounts of white on rump and under parts (Figure 1.7). Female varies from dull brown to reddish -brown, with greyish -buff fringes producing scaly appearance (Figure 1.8).



Figure 1.7: Male Kalij Pheasant in the field.

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Subspecies variation marked with males varying in colour of crest and under parts and extent of pale barring to upperparts. The size of a male is 65-73cm in length and a female is 50-60 cm in length. They make a loud sound like whistling chuckle or chirrup; guinea pig –like squeaks and chunkles when flashed (Grimmett et al., 2011).

**Distribution:** Mainly found in the Himalayan foothills, from the Indus River to western Thailand. The Kalij Pheasant is distributed in the northwestern, western, central and eastern Himalayas (Jammu & Kashmir, Himachal Pradesh, Uttarakhand, Sikkim, Arunachal Pradesh and north-west Bengal) usually < 2,700 m and in the hills of north east India (Assam, Meghalaya, Manipur, Mizoram, Nagaland and Tripura)[Figure 1.9].



Figure 1.8: Female Kalij Pheasant in the field.

**Habitat:** It inhabits all types of forest with dense undergrowth and thickly overgrown steep gullies, usually not far from water (Sathyakumar & Kaul, 2007). The species inhabits the temperate habitat of the study area.

**Breeding:** Breeding season starts from February to October but mainly in April-May (Johnsgard, 1986).

**Threats:** They found close to the village and they are easily the victim of local hunting (WPA- India, 2008).



Figure 1.9: Global geographical distribution of Kalij Pheasant (Source: BirdLife International, 2017).

#### 1.4.2.4. Satyr Tragopan (*Tragopan satyra* Linnaeus)

**Morphological features:** Male has red underparts with black -bordered white spots and olive -brown colouration to upper parts including rump and upper tail -coverts. Facial skin is blue (Figure 1.10). Female varies from rufous-brown to ochraceous -

brown in colouration; wings, tail and underpart are generally brighter and more rufescent (Figure 1.11). The size of a male is 67-72cm in length and a female is 57.5 cm in length. They make sound like a repeated deep, wailing drawn-out call wah! Oo-ah! Oo-aaaa! Ising in volume and becoming more protracted; alsoa wah, wah (Grimmett et al., 2011).



Figure 1.10: Male Satyr Tragopan in the field.

**Threats:** Major threats to the species include hunting for local consumption as well as habitat clearance and degradation due to timber harvesting, fuelwood and fodder collection and livestock grazing (Madge & McGowan, 2002).

**Habitat:** It is found in the moist evergreen forest with the dense undergrowth bamboo of cold temperate and sub-alpine forests.



Figure 1.11: Female Satyr Tragopan in the field.



Figure 1.12: Global geographical distribution of Satyr Tragopan (Source: BirdLife International, 2017).

**Distribution:** The Pheasant is found in the Himalayan reaches of India, China, Nepal, and Bhutan. It is a resident and rare pheasant that is distributed in the Western, Central and Eastern Himalaya (Figure 1.12).

**Breeding:** Breeding season starts from May-June (Madge & McGowan, 2002). The species is partial arboreal; nest have been seen in trees an also on the ground (Johnsgard, 1986).