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Wings in the Wild: Survey of Avian abundance in the vicinity of Musk Deer National Park and allied areas, Pakistan

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SUMMARY

Integrating the different biodiversity components like species richness, abundance and composition on qualitative and quantitative variables is crucial which plays a role in shaping ecosystem function. The current study carried out in the Guraiz Valley (Musk Deer National Park) and Minimerg Valley is a pioneering effort to document the avian fauna of both valleys to provide a baseline for national park managers and other stakeholders for effective management of the area. This study reported a total of 82 bird species belonging to 30 families. The birds' abundance and species richness surveys were carried out in all the major habitats, including settlements, agricultural land, forests, and Alpine Meadows. The highest bird abundance and species richness were observed in the forest habitat, followed by Alpine Meadows and Settlement/Agricultural Land. The most abundant species observed in the current study was the Red-fronted Serin, which was also abundant in Alpine Meadows, while Rock Bunting and Upland Pipit were the most abundant species in Forest and Agricultural/Settlement Habitats, respectively. The majority of the species reported from the area are of least concern except the Himalayan Griffon Vulture, which is near threatened according to the IUCN Red List. The presence of Monal Pheasant, Koklas Pheasant, Himalayan Griffon Vulture, and rich avian species in the area requires effective management of these species.

Keywords: Avian Fauna, IUCN, Valley, Musk Deer

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INTRODUCTION

In any ecosystem, biodiversity matters for the provision of ecosystem services and functions; however, little is known about the species assemblage in the real ecosystem (Strecker and Arnott, 2008). Integrating the different biodiversity components like species richness, abundance and composition on qualitative and quantitative components is crucial which plays a role in shaping the ecosystem function (García and Martínez, 2012). By attracting attention, birds are considered

acoustically and visually conspicuous components of the ecosystem (Whelan et al., 2008). From pollination to seed dispersal, birds play crucial roles including as predators, scavengers, seed predators and engineers of the ecosystem (Sekercioglu, 2006). The ability of birds to fly enables them to respond to irruptive or pulsed resources and leaves areas with sparse ecological resources. Moreover, their long-distance migratory behaviour links the distant ecosystem process and fluxes (Whelan et al., 2008). Until now, a greater amount of information is available on many aspects of birds, but little is known about the factors that determine the relative abundance of birds in a broader region (Tellería and Santos, 1994). In the geographic range of each species, the spatial variation of abundance is mainly determined by a combination of climatic, physiognomic, and biotic variables which are largely correlated (Brown, 1984).

Birds are diverse in terms of habitat selection and foraging strategy which is unparalleled to any other group of terrestrial vertebrates (Naish, 2014). Over time birds have developed intimate relationships with their habitat, and their prey and developed strong symbiotic associations with other counterparts. Owing to the conspicuous and relatively easy to study nature of birds has made them the best-studied group in many forested ecosystems (Sekercioglu, 2006). Although bird species are relatively easy to detect and identify till present they are continuously identified from different regions of the world. At the moment, about 10,300 to 10,546 extant bird species are reported to exist on the planet. Despite advances in science and the use of modern techniques the exact number of avian species is unknown and there is a race of discovery of new species and extinction of existing ones going hand in hand (Newton, 2003; Sodhi et al., 2011). Natural forests hosting about 75% avian species are considered as primary habitat for birds so their importance for birds cannot be overlooked (Şekercioğlu et al., 2004). The tropical and subtropical areas near the equator are rich in avian diversity, hosting over 5,000 species and this diversity declines towards the poles (Newton, 2003; Remsen Jr, 2015).

According to different resources, about 669 bird's species are present in Pakistan which is a fascinating mixture of Oriental and Palearctic origin in terms of their distribution (Grimmett et al., 2008). Geographically, Pakistan lies at the position where it serves as a crossroad for migratory birds. These migratory birds mostly harbour the plains of the country especially in Punjab, Sindh and Baluchistan which provide refuge and food resources during their stay. Azad Jammu and Kashmir, a state in the east of Pakistan, hosts about 480 species of birds which are distributed from the district Bhimber on the eastern side to the District Neelum on the western side of the state (Avibase, 2020). District Neelum is a remote area adjacent to District Astore of Gilgit-Baltistan (GB), both regions have similar climatic conditions and intermittent biodiversity. These regions have more than 70 recorded species and some of them are unique from the conservation point of view (Club, 2005). The unique avifauna of this region includes the Western Tragopan *Tragopan melanocephalus* and Cheer Pheasant *Catreus wallichii* both of which are Vulnerable according to IUCN. So far, no scientific study that can describe the avifauna diversity of the Guraiz and Minimerg Valleys, so this study is pioneering for documenting and recording the avifauna of both valleys. This study will provide the baseline for the future and will

also allow the managers to make crucial decisions for protecting the unique and indicator species of the area.

MATERIALS AND METHODS

STUDY AREA

The Minimer and Guraiz (Musk Dear National Park) valleys lie at 35.30-36.170 N and 74.88-76.410 E in the north-eastern part of Pakistan in district Astore of GB and district Neelum of Azad Jammu and Kashmir, Pakistan (Figure 1 and 2). The Minimerg River passes through the Minimerg Valley which has settlement and agricultural land on both banks of the river and forest and alpine pastures at higher elevation. The Neelum River enters the Guraiz Valley at Taobat from the east of Indian-administered Kashmir and divides the park into two parts with the human population settled on both sides. The Guraiz Valley is also declared as Musk Deer National Park by the Wildlife and Fisheries Department of AJK. The area by its location at high altitude has a very cold winter and moderate summer. The maximum daily air temperature varies from 20 – 35 °C during summer. The corresponding range for winter air temperature is 0 – 4 °C. The area is outside the monsoon range and receives very little rainfall during summer. Precipitation usually occurs in the form of snowfall in winter. The area supports moist temperate forests, dry temperate forests, sub-alpine scrub and alpine pastures. The prominent faunal species of the area include the Snow Leopard *Panthera uncia*, Brown Bear *Ursus arctos*, Asiatic Black Bear *Ursus thibetinus*, Grey Wolf *Canis lupus* and Musk Deer *Moschus chrysogaster* (Ahmad et al., 2016).

Figure 1: Map of Guraiz (MDNP) and Minimerg and valleys.

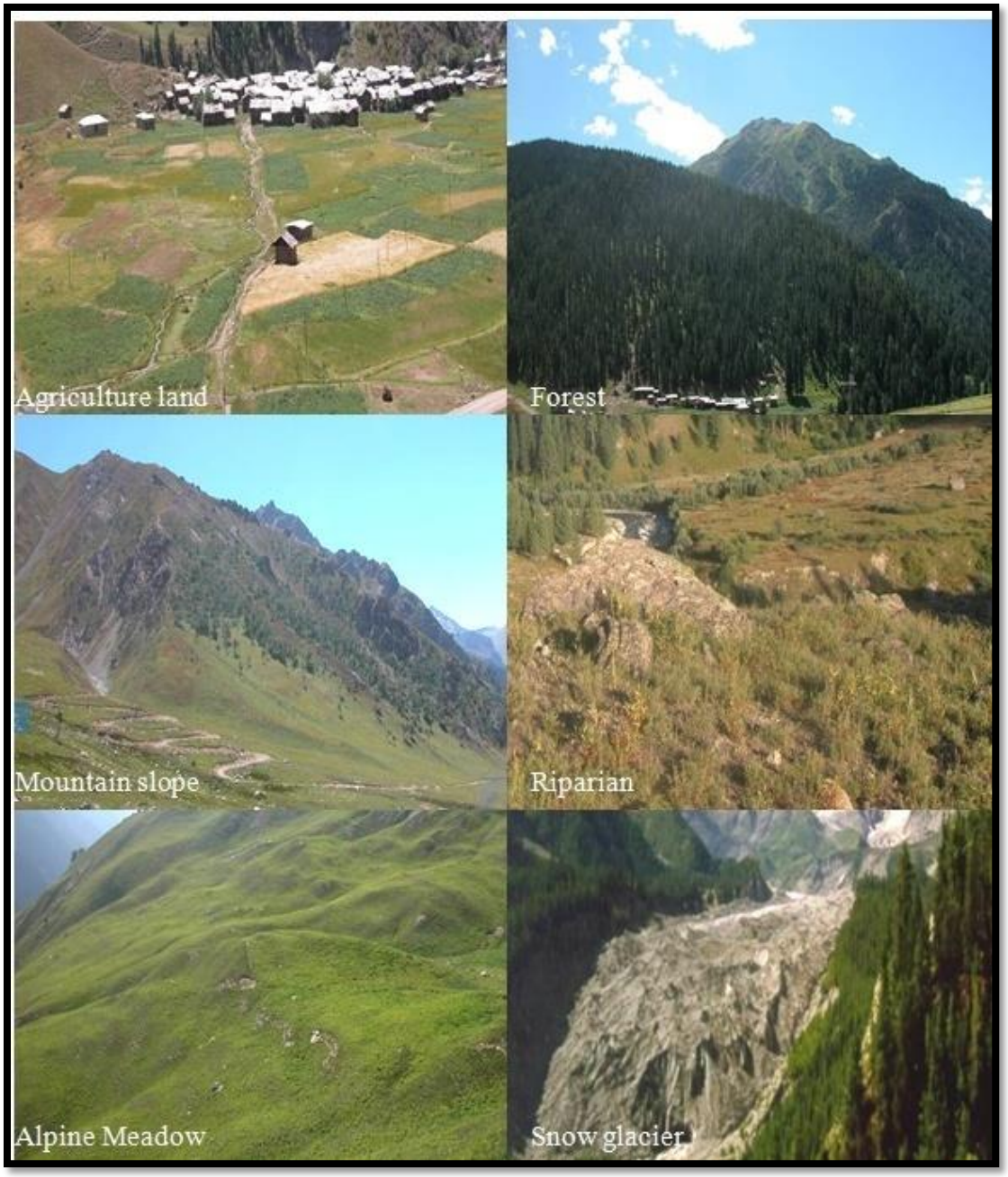

Figure 2: Habitat Types in Study Area, Minimerg and Guraiz Valleys.

LINE TRANSECT SURVEY

Understanding the determinants of bird species abundance and distribution requires a census technique, which estimates either the relative or absolute abundance of those bird species. The diversity of birds in the area was reported using the traditional line transect method. The whole study area was divided into the sub-sites representing all habitats of the study area. A total of eleven sampling sites were identified in both valleys which were representative of all major habitats of the area

In our study, these habitats include settlements/agricultural fields, forests and alpine pastures. Sampling was conducted in all of these habitat types to report all the

birds in the area. At each selected site of the study area in each habitat 500m transects were used. The most important aspect kept in mind while surveying the birds was the activity period of birds. The peak activity of birds lasts for 1 or 2 hours after sunrise or before sunset, so the recording of birds was done either in the early morning or late evening hours (Thakur et al., 2002). Efforts were made to survey in the morning and afternoon, as it appeared to be the active period for most of the birds. The survey was done between 05:30–11:00 hrs and 15:30–18:30 hrs during dusk and dawn, respectively. It helped to note the movements and calls of the birds, which were noticed easily to draw data more accurately. All birds seen while walking along transects, including those flying, were recorded. All observations were made by using binoculars and photographic documentation was done by using a digital camera. In the field, the birds were identified using the authentic field guide (Grimmett et al., 2008).

STATISTICAL ANALYSIS

Maps of the study area were developed using ESRI-ArcGIS technologies. Species richness and abundance estimates were calculated in MS Excel, and these were later further processed in ArcMap.

RESULT

In both valleys, Minimerg and Guraiz (Musk Dear National Park), eleven sampling points in three habitat types were surveyed using the line transect method. A total of 630 specimens belonging to 82 species and 32 families were reported from both valleys. At the family level, Muscicapidae was the most dominant family among all families observed in the Study Area with a total of 12 bird species followed by Accipitridae and Fringillidae with six species each and Phylloscopidae with five species (Table 1 and Figure 3).

The most abundant species from the study area was Red Fronted Serin *Serinus pusillus*, a total of 57 specimens of this species were observed. The greatest abundance and richness were observed in Forest Habitat with a total of 291 specimens belonging to 42 species, followed by Alpine Meadows Habitat with 197 specimens of 26 species. Bird's abundance and richness were lowest for Agriculture/Settlement Habitat type (Table 2 and Figure 4).

Except Himalayan Griffon Vulture which is Near Threatened (NT), all other species observed in the study area are Least Concern (LC). Out of 82 species, 36 species (43.90%) are migratory, whilst 31 species (37.80%) are resident, and 15 species (18.29%) are altitudinal migrants.

Table 1: List of Birds' Species along with Scientific Name, Family Name, IUCN Status and Migratory Status.

Sr. No.	Specie Family	Common Name *Scientific Name*	IUCN Status	Distribution
1	Corvidae	Alpine Cough *Pyrrhocorax graculus*	LC	Resident
2	Certhiidae	Bar Tailed Tree Creeper *Certhia himalayana*	LC	Resident
3	Pycnonotidae	Black Bulbul *Hypsipetes leucocephalus*	LC	Migratory
4	Corvidae	Black headed Jay *Garrulus lanceolatus*	LC	Resident

Sr. No.	Specie Family	Common Name *Scientific Name*	IUCN Status	Distribution
5	Muscicapidae	Blue Rock Thrush *Monticola solitarius*	LC	Migratory
6	Muscicapidae	Blue Whistling Thrush *Myophonus caeruleus*	LC	Altitudinal Migrant
7	Muscicapidae	Blue-capped Redstart *Phoenicurus coeruleocephala*	LC	Altitudinal Migrant
8	Muscicapidae	Blue-fronted redstart *Phoenicurus frontalis*	LC	Altitudinal Migrant
9	Accipitridae	Booted Eagle *Hieraaetus pennatus*	LC	Migratory
10	Cinclidae	Brown Dipper *Cinclus pallasii*	LC	Resident
11	Turdidae	Chestnut Thrush *Turdus rubrocanus*	LC	Altitudinal Migrant
12	Turdidae	Common blackbird *Turdus merula*	LC	Migratory
13	Accipitridae	Common Buzzard *Buteo buteo*	LC	Migratory
14	Cuculidae	Common Eurasian Cuckoo *Cuculus canorus*	LC	Migratory
15	Falconidae	Common Kestrel *Falco tinnunculus*	LC	Migratory
16	Fringillidae	Common Rosefinch *Carpodacus erythrinus*	LC	Migratory
17	Muscicapidae	Common Stone Chat *Saxicola torquatus*	LC	Migratory
18	Apodidae	Common Swift *Apus apus*	LC	Migratory
19	Emberizidae	Crested Bunting *Emberiza lathami*	LC	Altitudinal Migrant
20	Alcedinidae	Crested Kingfisher *Megaceryle lugubris*	LC	Altitudinal Migrant
21	Muscicapidae	Dark-sided flycatcher *Muscicapa sibirica*	LC	Resident
22	Fringillidae	Eastern Goldfinch *Carduelis caniceps*	LC	Migratory
23	Fringillidae	European Goldfinch *Carduelis carduelis*	LC	Resident
24	Coraciidae	European Roller *Coracias garrulus*	LC	Migratory
25	Regulidae	Goldcrest *Regulus regulus*	LC	Migratory
26	Accipitridae	Golden Eagle *Aquila chrysaetos*	LC	Migratory
27	Ramphastidae	Great barbet *Psilopogon virens*	LC	Migratory
28	Paridae	Great Tit *Parus major*	LC	Resident
29	Vireonidae	Green Shrike babbler *Pteruthius xanthochlorus*	LC	Altitudinal Migrant
30	Muscicapidae	Grey Bush Chat *Saxicola ferreus*	LC	Resident
31	Phylloscopidae	Grey hooded Warbler *Phylloscopus xanthoschistos*	LC	Resident
32	Emberizidae	Grey necked Bunting *Emberiza buchanani*	LC	Migratory
33	Accipitridae	Himalayan buzzard *Buteo refectus*	LC	Resident
34	Accipitridae	Himalayan Griffon *Gyps himalayensis*	NT	Migratory
35	Corvidae	Himalayan Jungle Crow*Corvus macrorhynchos*	LC	Resident
36	Phasianidae	Himalayan Snowcock *Tetraogallus himalayensis*	LC	Altitudinal Migrant
37	Picidae	Himalayan Woodpecker *Dendrocopos himalayensis*	LC	Resident
38	Upupidae	Common Hoopoe *Upupa epops*	LC	Migratory
39	Phylloscopidae	Hume's Leaf Warbler *Phylloscopus humei*	LC	Migratory
40	Muscicapidae	Indian Blue Robin *Larvivora brunnea*	LC	Migratory
41	Phasianidae	Kalij Pheasant *Lophura leucomelanos*	LC	Resident
42	Sittidae	Kashmir Nuthatch *Sitta cashmirensis*	LC	Resident
43	Phasianidae	Koklass pheasant *Pucrasia macrolopha*	LC	Resident
44	Cuculidae	Little Cuckoo *Coccycua minuta*	LC	Resident

Sr. No.	Specie Family	Common Name *Scientific Name*	IUCN Status	Distribution
45	Muscicapidae	Little Forktail *Enicurus scouleri*	LC	Resident
46	Accipitridae	Long-legged Buzzard *Buteo rufinus*	LC	Migratory
47	Laniidae	Long-tailed Shrike *Lanius schach*	LC	Migratory
48	Phasianidae	Monal Pheasant *Lophophorus impejanus*	LC	Resident
49	Phylloscopidae	Mountain Chiffchaff *Phylloscopus sindianus*	LC	Migratory
50	Strigidae	Mountain Scops Owl *Otus spilocephalus*	LC	Altitudinal Migrant
51	Accipitridae	Northern Goshawk *Accipiter gentilis*	LC	Migratory
52	Fringillidae	Orange bullfinch *Pyrrhula aurantiaca*	LC	Altitudinal Migrant
53	Muscicapidae	Orange flanked Bush Robin *Tarsiger cyanurus*	LC	Migratory
54	Cuculidae	Oriental Cuckoo *Cuculus saturatus*	LC	Migratory
55	Columbidae	Orientle Turtle Dove *Streptopelia orientalis*	LC	Migratory
56	Fringillidae	Pink browed Rose finch *Carpodacus rodochroa*	LC	Altitudinal Migrant
57	Muscicapidae	Plumbeous water redstart *Phoenicurus fuliginosus*	LC	Resident
58	Fringillidae	Red Fronted Serin *Serinus pusillus*	LC	Altitudinal Migrant
59	Emberizidae	Rock Bunting *Emberiza cia*	LC	Migratory
60	Motacillidae	Rosy Pipit *Anthus roseatus*	LC	Migratory
61	Paridae	Rufous Napped Tit *Periparus rufonuchalis*	LC	Resident
62	Tyrannidae	Rufous tailed Flycatcher *Myiarchus validus*	LC	Resident
63	Passeridae	Russet Sparrow *Passer cinnamomeus*	LC	Altitudinal Migrant
64	Picidae	Scaly bellied Green Woodpecker *Picus squamatus*	LC	Resident
65	Phasianidae	Snow Partridge *Lerwa lerwa*	LC	Resident
66	Picidae	Speckled Piculet *Picumnus innominatus*	LC	Resident
67	Columbidae	Speckled Wood Pigeon *Columba hodgsonii*	LC	Migratory
68	Fringillidae	Spectacled Finch *Callacanthis burtoni*	LC	Resident
69	Paridae	Spot winged tit *Paris melanolophus*	LC	Resident
70	Estrildidae	Spotted Munia *Lonchura punctulata*	LC	Migratory
71	Motacillidae	Tree Pipit *Anthus trivialis*	LC	Migratory
72	Phylloscopidae	Tytter Leaf Warbler *Phylloscopus tytleri*	NT	Migratory
73	Motacillidae	Upland Pipit *Anthus sylvanus*	LC	Resident
74	Certhiidae	Variegated Laughing Thrus *Certhia himalayana*	LC	Altitudinal Migrant
75	Phylloscopidae	Western Crowned Warbler *Phylloscopus*	LC	Migratory

Sr. No.	Specie Family	Common Name *Scientific Name*	IUCN Status	Distribution
		occipitalis		
76	Muscicapidae	White Capped Red Start *Phoenicurus leucocephalus*	LC	Altitudinal Migrant
77	Sittidae	White cheeked Nuthatch *Sitta leucopsis*	LC	Resident
78	Apodidae	White rumped Swift *Aerodramus spodiopygius*	LC	Resident
79	Apodidae	White throated Needle tail *Hirundapus caudacutus*	LC	Resident
80	Aegithalidae	White throated Tit *Aegithalos niveogularis*	LC	Resident
81	Motacillidae	White Wagtail *Motacilla alba*	LC	Migratory
82	Troglodytidae	Winter Wren *Troglodytes hiemalis*	LC	Migratory

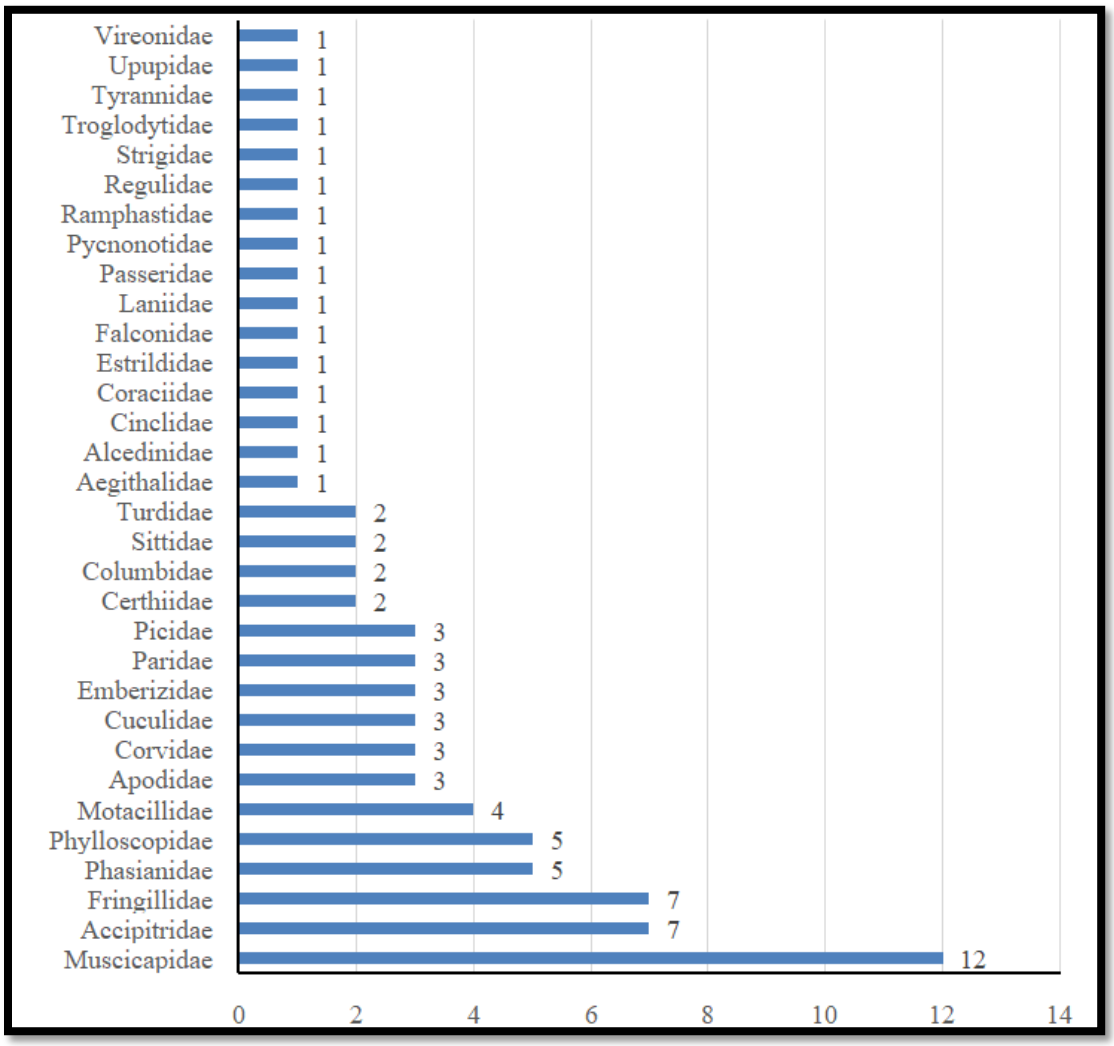

Figure 3: Family-wise avian species in Minimerg and Guraiz Valleys.

Table 2: Habitat-wise Abundance and Richness of Birds in Study Area.

Habitat Type	No. of Sampling Points	Abundance	Richness	Most Abundant Species
Agriculture/ Settlements	3	142	21	Rock Bunting
Forest	4	291	42	Upland Pipit
Alpine Meadow	3	197	26	Red Fronted Serin
Overall abundance, richness, and most dominant species		630	76	Red Fronted Serin

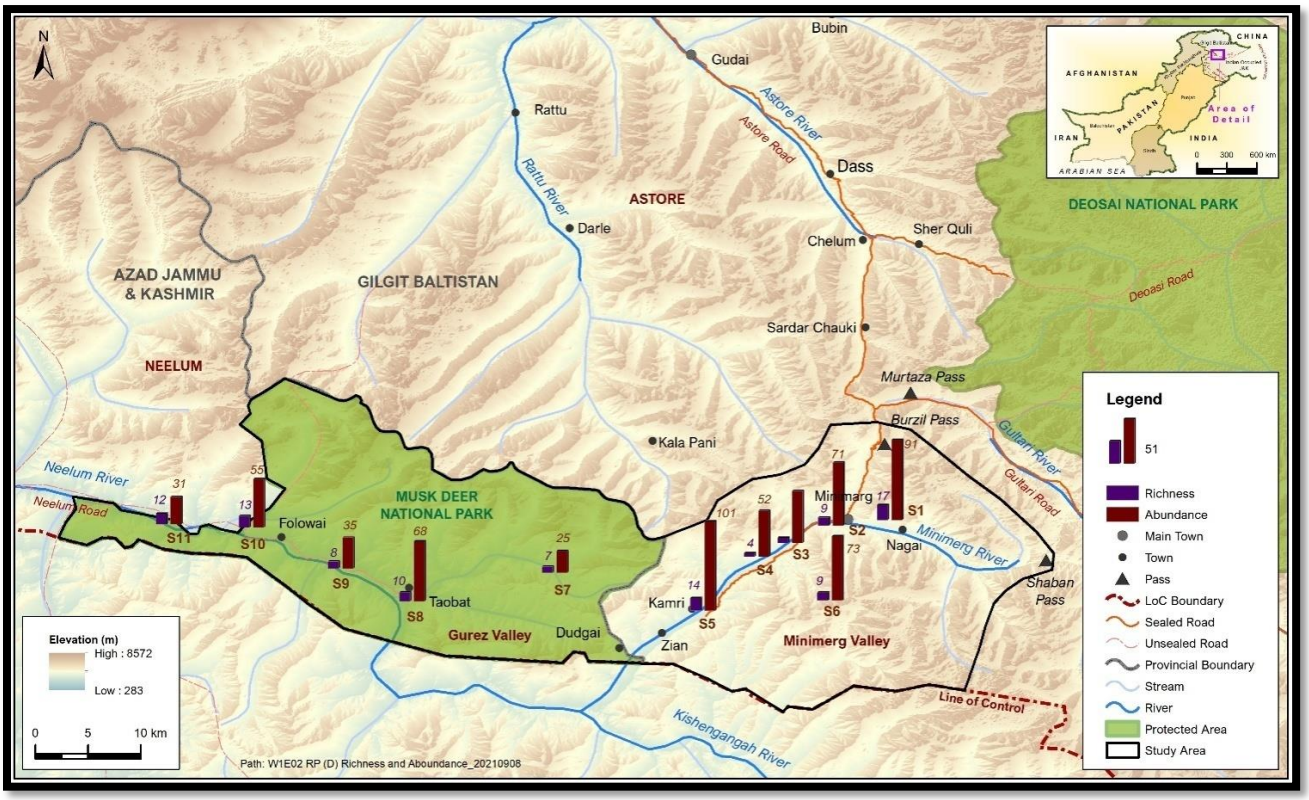

Figure 4: Birds' Abundance and Richness at different Sampling Locations.

DISCUSSION

As we ascend towards higher elevations, many environmental variables like temperature, moisture, and oxygen partial pressure vary from low valleys to high-elevation mountains. Such alteration in environmental variables leads to the restriction of species to specific habitats, resulting in species distribution to different elevation ranges. This linkage between species and habitat results in varied diversity in mountain areas which is usually higher than in another equivalent area (Graham et al., 2014). Having higher species richness and turnover, mountainous regions are considered as priority conservation areas under the imminent risks of global climate change (Sekercioglu et al., 2008).

Avifauna inhabiting the mountains exhibit diversity in their distributional range. Among them, some are restricted to the narrow elevation range while the rest

of them show a broader distribution. Some of the species adapted to the rugged and cold high-elevation area are resident in such conditions year-round (Price et al., 2011). The rest of the species that cannot survive in such harsh conditions undergo short-distance migration to lower elevations where the temperature is relatively lower, which is favourable for their breeding and wintering. These high-elevation mountains also serve as a refuge for some of the long-distance latitudinal migrants who stay in such areas, which have rich food resources, mild summers of the region for breeding and spend the winters at somewhat warmer latitudes (McCain, 2009).

The Himalayas, being the highest mountains in the world, are juxtaposed between the Tibetan plateau and low-elevation floodplains, which have hotspots of bird diversity (Price et al., 2011). The Western Himalayan mid and high-elevation habitats inhabit higher species richness between winter and summer (Somveille et al., 2013). The majority of the mountain ecosystem in the Western Himalayas is under threat from anthropogenic pressure in the form of habitat conversion for agricultural practices and global climate change which is badly affecting the entire landscape in the area (Telwala et al., 2013). The current study presents important ecological information about the avifauna of one of the most intact ecosystems in the North-East region of Pakistan (Dixit et al., 2016).

The concept that avian species inhabit natural habitats more often than built-up areas is supported in the current study. Although these open natural habitats offer little feed and make the small birds vulnerable to predators, they offer suitable resting sites for the rest of the species (Bergin et al., 2000). Such habitat, however, has a higher bird species richness, which may be due to the availability of higher assemblages of plants. These plants include nectar-producing flowers, fruit-bearing trees, and shrubs. Although settlement areas have a high concentration of domestic waste, which is also a source of bird food indirectly, the settlements in the high-elevation mountainous areas do not have a higher concentration of domestic waste and offer very little food to birds. The Forest and Alpine Meadows offer suitable hiding places due to natural vegetation and food resources comparable to the settlements. So, natural habitats with a mosaic of vegetation types offer many opportunities for bird foraging and nesting (Jokimäki and Kaisanlahti-Jokimäki, 2012). The Forest and Alpine Meadows have relatively uniform bird diversity because each of these habitats offers a range of suitable habitats for a range of bird species inhabiting the area (Gatesire et al., 2014).

This study provides a baseline of avian diversity in one of the remote and unexplored areas of the country which requires better management of the overall landscape and conservation of its rich avifaunal diversity. This also requires more comprehensive studies on species richness and habitat preferences of species for better management practices and policies.

Forests as a natural habitat for birds play a vital role in the completion of various life cycles and provide nesting sites, nestlings and food for bird's species inhabiting in it. Within a forest habitat, a variety of bird species from primary consumers to vertebrate predators, and omnivores to scavengers are distributed in various microhabitats. Certain microclimates within a forest serve as refugia for physiologically challenging environmental conditions like temperature. The forest habitat serves as a refuge for migratory birds which stay for days to months for food in the form of insects and

fruits and for resting spots on their long-distance migratory routes (Kirby et al., 2008). The human induced efforts have contributed to avian extinctions in the wake of occupying and expanding the human population in remote and sensitive natural habitats. Deforestation, forest fragmentation and habitat degradation, overexploitation of birds' species due to hunting, invasive species and emergent infectious diseases, Urbanization, and climate change are the major threats that are contributing towards the decline in birds' population, species richness and shift in the distribution range of birds (Stratford and Şekercioğlu, 2015).

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