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A Preliminary Study on the Avian and Mammalian Diversity in Gamgul-Siyabehi Wildlife Sanctuary, District Chamba, Himachal Pradesh, India

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Abstract: Gamgul-Siyabehi Wildlife Sanctuary is situated in the north-west of Chamba district, sharing its boundary with Jammu and Kashmir. Renowned for being the oldest and most prominent "Shikargarhs" (hunting grounds), during the pre-independence era, the area was famous for harboring a good population of brown bears, Kashmiri stag (Hangul), and Musk deer. The study reveals the presence of 58 species of birds under 53 genera, 23 families, and 8 orders. Analysis of data on abundance showed that there are 26 very common, 19 common, 9 uncommon, and 3 rare species of birds in the sanctuary. Feeding guild analysis of bird species showed that there are 6 carnivores, 6 frugivores, 7 granivores, 19 omnivores, and 20 insectivores, which depicts that over 67% of birds have restrictive or narrow feeding guilds.Himalayan Griffon Vulture (*Gyps himalayensis*), which is a nearly threatened species, and the elusive Koklass pheasant (*Pucrasia macrolopha*) were also reported during the study. Nine species of mammals, grouped into 8 genera, 7 families, and 4 orders, are recorded in the sanctuary.The Asiatic black bear (*Ursus thibetanus*) and leopard (*Panthera pardus*) are the two vulnerable species, reported in the sanctuary. As per IUCN Global Population Trend Assessment, 17 species of birds and 5 species of mammals reported in this study are listed in the global declining population trend. The study also reveals that the mammal known as the Hangul (Kashmiri Stag), after which the sanctuary was named, ceases to exist there.

Keywords: Gamgul-Siyabehi, Population trend, Feeding guild, Himalayan Griffon, Hangul, Kashmiri stag

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Introduction

The Himalayas constitutes the largest, highest, youngest and most populous mountain range on earth (Sharma, 2017; Payne *et al*., 2017). It is situated at the confluence of four biogeographic regions (Holt *et al*., 2013). The Himalayas harbours a varied assemblage of biodiversity with a high proportion of endemism; therefore, this has been recognized as a biodiversity hotspot (Myers *et al.*, 2000). Biodiversity is an umbrella term that incorporates the range of variation found in

nature, within the natural system. (Rawat and Aggarwal, 2015). It is the essence and manifestation of the evolutionary history of life on Earth (Negi and Banyal, 2016). The biodiversity of the Himalayas reflects a rich, diverse, distinctive, valuable, and long-standing history of resource exploitation (Dhar *et al.*, 1999).

Himachal Pradesh is a North Indian state which is acknowledged for its spectacular snow-capped Himalayan mountains, gushing rivers, extensive fruit orchards, lush deodar and pine forests, rich history, and diverse culture (Haberman, 2006). It covers an area of 55,673 square kilometers (ISFR, 2021). This hilly state boasts an abundance of biogeographic variety and is popular for its scenic and natural splendor (Chauhan *et al*., 2024). The region, which straddles the Shivalik, Western Himalayan, and Trans Himalayan zones is home to a diverse array of animals and plants (Raghavan and Bhardwaj, 2024). Himachal Pradesh is named after the enormous Himalaya ranges, which influence the state's terrain, climate, livelihood, and socio-economic trends. Chamba is one of the highest mountainous districts in Himachal Pradesh, with altitudinal range from 2,000 to 21,000 feet above sea level (Sharma and Sethi, 1997). The famous Pir Panjal range of the Himalaya, with an altitude of above 4500 meters also lies in the district (Punam, 2021).

Two of the most fascinating and ecologically relevant groups in the animal kingdom are Aves and Mammals. They exhibit an incredible diversity that includes a wide range of sizes, shapes, and ecological niches. Mammals vary in size from small shrews to large elephants, and birds have an incredible range of colors, melodies, and flight abilities (Jones and Safi, 2011). There are 11,000 species of birds grouped into 2381 genera, 253 families and 44 orders (IOC World Bird List, 2023). In India there are 1,353 species of birds arranged into 493 genera, 114 families and 26 orders (Praveen and Jayapal, 2022). The state of Himachal Pradesh is home to 618 bird species, clubbed into 91 families and 20 orders (Kumar, 2015). As per IUCN (2023), out of 11,000 species of birds 754 species are vulnerable, 413 species are endangered and 233 species are Critically Endangered.

A total of 6,400 species, distributed among 1300 genera, 167 families and 30 orders make up the mammalian fauna of the world (Greenspoon *et al.*, 2023). India is home to 427 mammalian species with 199 genera,14 orders and 52 families (Srinivasulu, 2018). Himachal Pradesh harbours 107 species of mammals arranged into 77 genera, 25 families and 9 orders (Chakraborty *et al.*, 2005). However, some studies estimate the number of Mammalian species in the state to be 111 (Sharma and Saika, 2009). According to IUCN Red list (2023), 6,495 species of mammals are present globally, of which 253 species are vulnerable, 444 are endangered and 444 are in critically endangered category.

Himachal Pradesh has 26 wildlife sanctuaries, 3 conservation reserves and 5 National parks (Kumar *et al.*, 2023). The Chamba district has 5 wildlife sanctuaries including Gamgul-Siyabehi wildlife Sanctuary. The sanctuary is nestled in the serene Bhandal valley and is the only sanctuary in the Himachal Pradesh reported to host the elusive Hangul (Kashmiri Stag). The present study is one of the maiden efforts to bring into light the Avian and Mammalian diversity present in this sanctuary.

Materials and Methods

Study Area

Gamgul-Siyabehi Wildlife Sanctuary (Fig. 1) is located between 75°-50° and 75°-80° E longitude and 32°-45° and 32-55° North latitude. Established in 1962, this high-altitude sanctuary is situated in the north-west of Chamba district, sharing its boundary with Jammu and Kashmir. It lies in Churah Subdivision of Chamba District. The sanctuary is situated in the extreme north-west of district. The sanctuary area starts right from Kainthly Nala and extends northwards towards Bhandal Langera, Kundimoral. It is situated in the Siul Nala catchment, which is a tributary of the

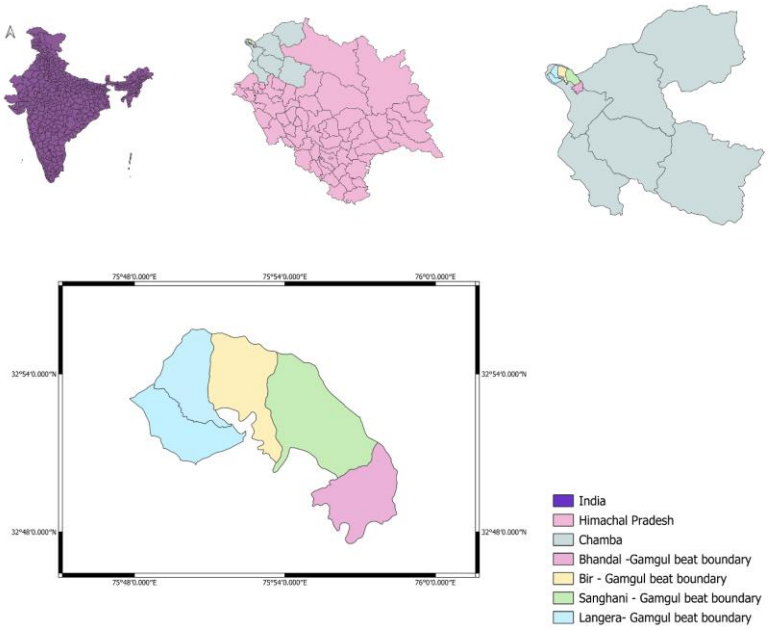

Fig. 1: Gamgul-Siyabehi Wildlife Sanctuary., the study area of District Chamba, Himachal Pradesh, India.

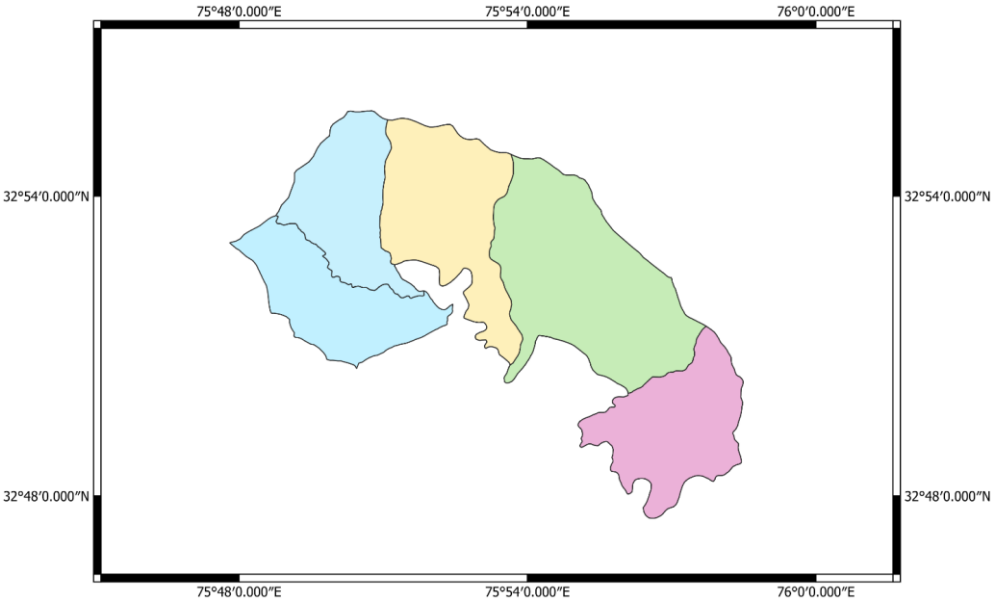

Fig. 2: The beats explored in sanctuary during the study.

Ravi River. The sanctuary is divided into four administrative beats namely Bhandal, Bir, Sanghani and Langera (Fig. 2). As per Government of Himachal Pradesh notification dated July 28, 2010, the sanctuary spreads over 109 square kilometers.Vegetation types include alpine pasturages at higher elevations and canopied forests of mixed coniferous species at lower elevations. The climate is generally cold, with temperature ranges from -10°C to 25°C. The average rainfall is between 800-1700 mm. This sanctuary records heavy snowfall in the months of December to February.

The survey was conducted from December 2023 to May 2024. For the study, a camp was set up at the Dhar (Gullu ki Mandi). All the four beats

namely Bhandal, Bir, Sanghani and Langera have been explored during the survey. Bird records were collected using the imaginary grid and line transect methods outlined by Gaston (1973). To study the birds, a line transect was initially selected and followed every morning at 5 a.m. In the evening, the entire process was carried out again. The same process was repeated at different sites in different beats. Olympus binoculars (10x 50) were used for close observation. Photographs of birds were taken using a high-resolution camera (p 900). Field identifications of birds were carried out with the help of various guides such as-- Ali and Ripley (1983) and Kazmierczak and Perlo (2000). Identification of the species and analysis were done using Microsoft Excel, AI app Merlin, Avi base and GoogleLens. The abundance status of the birds was also analysed, based on the number of sightings and occurrence of species during the survey. Birds were classified as very common (encountered daily in relatively large numbers), common (encountered daily but in small numbers), uncommon (occurred occasionally in fewer numbers or singly), and rare (encountered less than 10 times during the entire survey). The five categories of birds identified on the basis of feeding guild are frugivores (feeds on fruits), carnivores (feeds on only flesh), omnivores (feeds on flesh, seeds and fruits), insectivores (feeds on insects) and granivores (feeds on grains). Conser-vation status and population trends of bird species were also assessed as per IUCN Red List (2024).

To record the mammalian fauna, direct and indirect methods were used.The direct methods used animal sightings as the primary data source. Line transects were used to collect direct evidence of large and medium-sized mammals (Burnham *et al.*, 1980). Trap cameras were also installed at different locations in the sanctuary area where the possibilities of recording the mammalian diversity were higher like Jalari and Suppa Chollu Dhar. Additionally, a set of 4 trap cameras were installed specifically to record Hangul. The indirect method depended on the quantification of indirect evidences such as animal's footprints(pug and hoof marks), droppings, and kills (by road as well as predator). Interviews were also conducted with local people especially over the age of 70, in order to get information about the sanctuary's most prominent animal, the Hangul (Kashmiri Stag).

Results and Discussion

A total of 58 bird species representing 53 genera, 23 families and8 orders were recorded in the sanctuary (Table 1). The Passeriformes order, is the most diverse group with 15 families and 43 distinct species followed by order Piciformes with 2 families and 3 species (Fig. 3). The remaining 6 orders namely Accipitriformes, Bucerotiformes, Columbiformes, Falconiformes, Psittaciformes and Galliformes were represented by single family each. Family-wise analysis of data revealed that Muscicapidae is the most prominent family with 10 species followed by Corvidae with 5 and Fringillidae with 4 species. The family Accipitridae, Phasianidae, Pycnonotidae, Motacilidae, Paridae, Phylloscopidae, Turdidae were represented by 3 species each. Columbidae, Falconidae, Passeridae, Picidae, Leiotrichidae had 2 species each and Upupidae, Campephagidae, Emberizidae, Sturnidae, Cinclidae, Dicruridae, Megalaimidae, Psittaculidae were represented by single species each.

The results substantiate the fact that family Muscicapidae which is largest family of bird in India and Himachal Pradesh is also largest family in this sanctuary. Further analysis of data on the abundance shows that 26 (44.82%) species of birds are very common, 19 (32.75%) common, 9 (15.51%) uncommon and 3 (5.17%) are rare species in this sanctuary. The sanctuary area is bestowed with some unique and rare bird species which have been assigned different conservation status by IUCN. The Western Tragopan, a vulnerable species and Himalayan Griffon vulture, a Nearly Threatened bird species are found in this sanctuary. In addition to these the area also harbors good population of Monal and Koklass pheasants. The most frequently observed birds

Table 1: Table showing diversity of birds with their scientific names, abundance, feeding guild, IUCN status and Population Trend

S. No.	Common Name	Scientific Name	Abundance	Feeding Guild	IUCN status	Population Trend
Order-Accipitriformes						
Family- Accipitridae						
1	Himalayan Griffon	*Gyps himalayensis*	R	C	NT	Decreasing
2	Common Buzard	*Buteo buteo*	R	C	LC	Increasing
3	Shikra	*Accipiter badius*	UC	C	LC	Stable
Order- Bucerotiformes						
Family- Upupidae						
4	Eurasian Hoopoe	*Upupa epops*	C	I	LC	Decreasing
Order-Columbiformes						
Family- Columbidae						
5	Rock Pigeon	*Columba livia*	VC	G	LC	Decreasing
6	Oriented- turtle dove	*Streptopelia orientalis*	VC	G	LC	Stable
Order-Falconiformes						
Family- Falconidae						
7	Eurasian kestrel	*Falco tinnunculus*	UC	C	LC	Decreasing
8	Lesser kestrel	*Falco naunanni*	UC	C	LC	Stable
Order-Galliformes						
Family-Phasianidae						
9	Koklass Pheasant	*Pucrasia macrolopha*	R	O	LC	Decreasing
10	Black- Francolin	*Francolinus francolinus*	C	O	LC	Stable
11	Himalayan Monal	*Lophophorus impejanus*	R	O	LC	Decreasing
Order-Passeriformes						
Family-Campephagidae						
12	Long- tailed minivet	*Pericrocotus ethologus*	VC	I	LC	Decreasing
Family- Emberizidae						
13	Rock Bunting	*Emberiza cia*	VC	G	LC	Increasing
Family- Muscicapidae						
14	Pale Blue Flycatcher	*Cyornis unicolor*	VC	I	LC	Decreasing
15	Persian Wheatear	*Oenathechrypygia*	C	I	LC	Stable
16	Plumbeous Water Redstart	*Phoenicurus fuliginosus*	VC	I	LC	Stable
17	Gray Bushchat	*Saxiola ferreus*	VC	I	LC	Stable
18	White- capped redstart	*Phoenicurus leucocephalus*	VC	I	LC	Stable
19	Blue- Whistling Thrush	*Myophonus caeruleus*	C	O	LC	Unknown
20	Little Pied Flycatcher	*Ficedula westermanni*	C	I	Lc	Decreasing
21	Verditer Flycatcher	*Eumyias thalassinus*	VC	I	LC	Stable
22	Chestnut- bellied rock thrush	*Monticola rufiventris*	C	O	LC	Stable
23	Pied Bushchat	*Saxiola caprata*	C	I	LC	Stable

Family- Corvidae							
	24	Yellow- Billed Blue Magpie	*Urocissa flavirostris*	VC	O	LC	Stable
	25	Red- billed blue magpie	*Urocissa erythroryncha*	VC	O	LC	Stable
	26	Large- billed crow	*Corvus macrorhynchos*	VC	O	LC	Stable
	27	Eurasian Jay	*Garrulus glandarius*	C	O	LC	Stable
	28	Red-Billed Chough	*Pyrrhocorax pyrrhocorax*	UC	O	LC	Decreasing
Family- Sturnidae							
	29	Common Myna	*Acridotheres tristis*	VC	G	LC	Increasing
Family- Passeridae							
	30	House Sparrow	*Passer domesticus*	VC	G	LC	Decreasing
	31	Russet Sparrow	*Passer cinnamomeus*	VC	G	LC	Stable
Family- Cinclidae							
	32	Brown Dipper	*Cincluspallasii*	VC	C	LC	Stable
Family- Pycnonotidae							
	33	Himalayan Bulbul	*Pycnonotus leucogenys*	VC	F	LC	Increasing
	34	Red- Vented Bulbul	*Pycnonotus cafer*	VC	O	LC	Increasing
	35	Black Bulbul	*Hypsipetes leucocephalus*	C	O	LC	Stable
Family- Dicruridae							
	36	Ashy drongo	*Dicrurus leucophaeus*	VC	I	LC	Unknown
Family- Motacilidae							
	37	Gray Wagtail	*Motacilla cinerea*	VC	I	LC	Stable
	38	Eastern- Yellow Wagtail	*Motacilla tschutschensis*	VC	I	LC	Decreasing
	39	Tree- Pipit	*Anthus trivialis*	VC	I	LC	Decreasing
Family- Leiothrichidae							
	40	Streaked- Laughing Thrush	*Trochalopteron lineatum*	VC	O	LC	Stable
	41	Variegated- Laughing Thrush	*Trochalopteron variegatum*	UC	O	LC	Decreasing
Family- Fringillidae							
	42	Pink- Browned Rosefinch	*Carpodacus rodchroa*	C	O	LC	Stable
	43	Yellow- Breasted Greenfinch	*Chloris spinoides*	C	G	LC	Stable
	44	Black and Yellow Grosbeak	*Mycerobasicterioides*	UC	C	LC	Stable
	45	Plain Mountain Finch	*Leucosticte nemoricola*	UC	O	LC	Stable
Family- Paridae							
	46	Green-Backed Tit	*Parus monticolus*	VC	O	LC	Stable
	47	Cinerous Tit	*Parus cinereus*	C	O	LC	Stable
	48	Coal Tit	*Perparusater*	C	O	LC	Decreasing
Family- Phylloscopidae							
	49	Plain- Leaf Warbler	*Phylloscopus neglectus*	UC	I	LC	Stable
	50	Gray- Hooded Warbler	*Phylloscopus xanthoschistos*	C	I	LC	Stable
	51	Common Chiffchaff	*Phylloscopus collybita*	VC	I	LC	Increasing

Family- Turdidae							
	52	Chestnut Thrush	*Turdus rubrocanus*	UC	F	LC	Unknown
	53	Gray-Winged Blackbird	*Turdus boulboul*	C	F	LC	Decreasing
	54	Long-Tailed Thrush	*Zoothera dixoni*	C	F	LC	Unknown
Order-Piciformes							
Family-Megalaimidae							
	55	Great Barbet	*Psilopogon virens*	VC	F	LC	Decreasing
Family- Picidae							
	56	Brown-fronted woodpecker	*Dendrocoptes auriceps*	C	I	LC	Stable
	57	Himalayan-Woodpecker	*Dendrocopos himalayensis*	C	I	LC	Stable
Order- Psittaciformes							
Family-Psittaculidae							
	58	Slaty-headed parakeet	*Psittacula himalayana*	C	F	LC	Stable

Very Common- VC, Common- C, Uncommon-UC, Rare- R, Omnivores-O, Insectivores-I, Frugivores-F, Granivores-G, Carnivores-C, Least Concern-LC, Nearly Threatened- NT

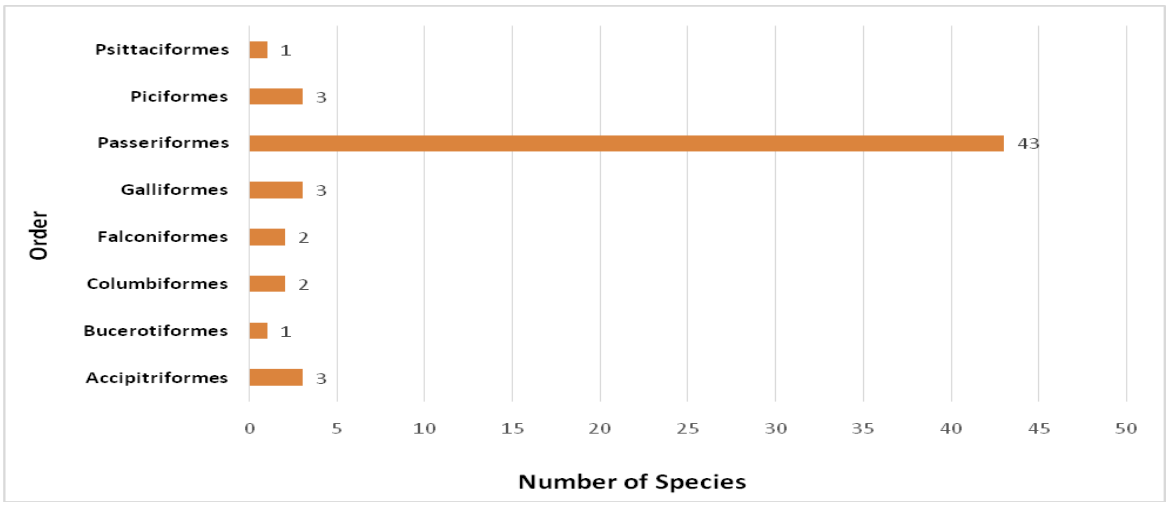

Fig. 3: Number of species for each order of birds recorded in the sanctuary.

were the large billed crow, Graywagtail, Plumbeous water redstart, Yellow- Billed blue magpie, and the Blue whistling thrush. The analysis of data on feeding guild shows that of the 58 recorded species, 6 species of birds are carnivores, 6 are frugivores, 7 are granivores, 19 are omnivores, and 20 are insectivores (Fig. 4).

As per IUCN global population trend assessment, the reported Avifauna in the sanctuary shows stable population trend for 31 species, increasing for 5 species and unknown for 4 species. However, 17 bird species present in this sanctuary shows a decreasing population trend worldwide.

The study reveals the presence of 9 species of mammals arranged into 8 genera, 7 families and 4 orders (Table 2). There are two primates, five carnivores, one Artiodactyla and one Lagomorpha (Fig. 5). The mammals reported in this sanctuary are namely – RhesusMacaque (*Macaca mulatta*), Langur (*Semnopithecus ajax),* Asiatic Black Bear (*Ursus thibetanus*), Leopard (*Panthera pardus*), Leopard Cat *(Panthera bengalensis*), Red Fox (*Vulpes vulpes*), Yellow- Throated Marten

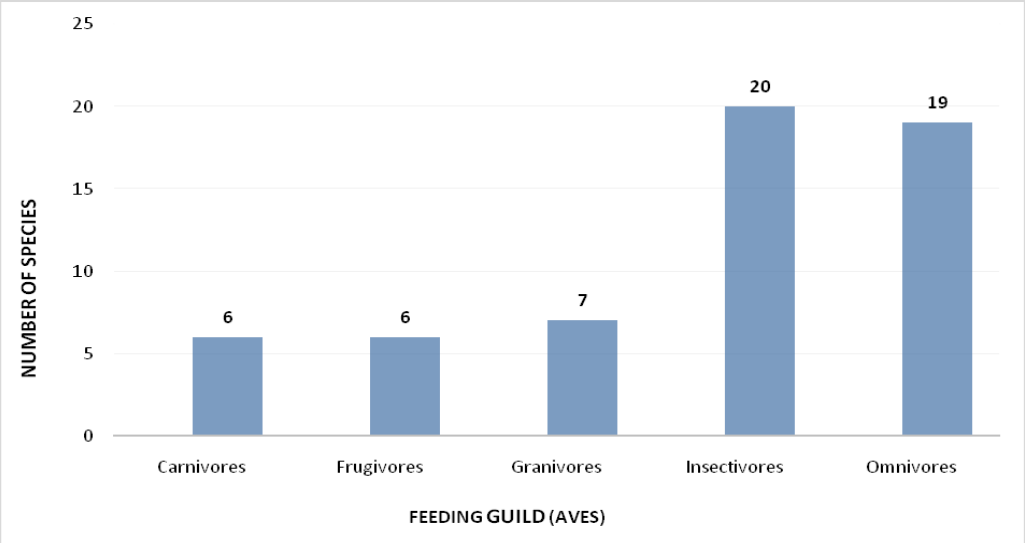

Fig. 4: A column graph representing Feeding guild of birds recorded in the Sanctuary.

Table 2: Table showing the diversity of animals with their scientific names, IUCN Status and Population Trend

	S. No.	Common Name	Scientific Name	IUCN Status	Population Trend
Order-Primates Family-Cercopithecidae					
	1	Rhesus Macaque	*Macaba mulatta*	LC	Unknown
	2	Grey Langur	*Semnopithecus ajax*	LC	Decreasing
Order-Carnivora					
Family-Canidae					
	3	Red Fox	*Vulpes vulpes*	LC	Stable
Family- Ursidae					
	4	Asiatic Black Bear	*Ursus thibetanus*	VU	Deceasing
Family- Mustelidae					
	5	Yellow-Throated Marten	*Martes flavigula*	LC	Decreasing
Family- Felidae					
	6	Leopard cat	*Panthera bengalensis*	LC	Stable
	7	Leopard	*Panthera pardus*	VU	Decreasing
Order-Artiodactyla					
Family- Bovidae					
	8	Goral	*Naemorhedus goral*	LC	Decreasing
Order-Lagomorpha Family-Ochotonidae					
	9	Pika	*Ochotona roylei*	LC	Stable

Least Concern-LC, Vulnerable-VU

(*Martes flavigula*), Goral (*Naemorhedus goral*), and pika (*Ochotona roylei*).

Among these mammals Asian Black Bear and leopard have been assigned Vulnerable status by IUCN. As per IUCN global population trend assessment, the reported mammals in the sanctuary shows stable population trend for 3 species and unknown for only one species. However, 5 species of mammals present in this sanctuary shows a decreasing population trend

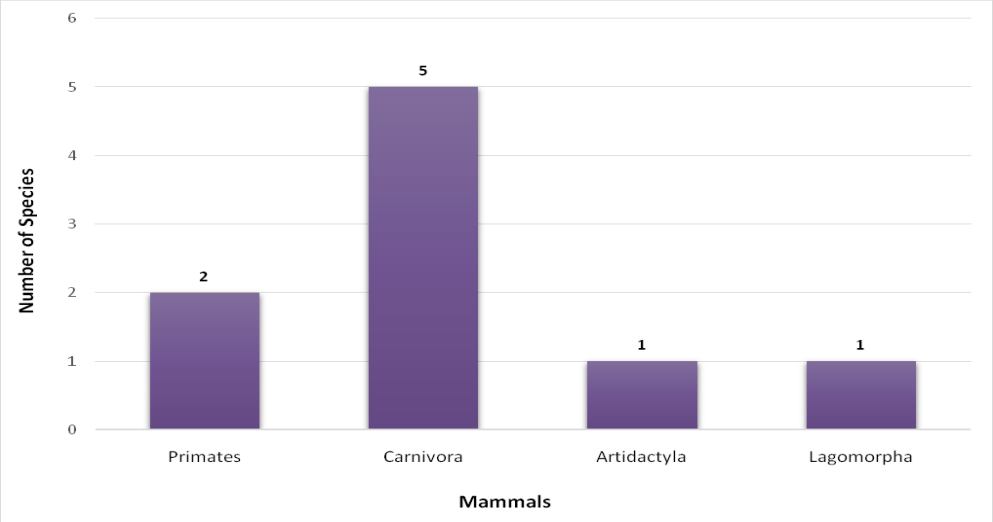

Fig. 5: Number of species for each order of mammals recorded in the sanctuary.

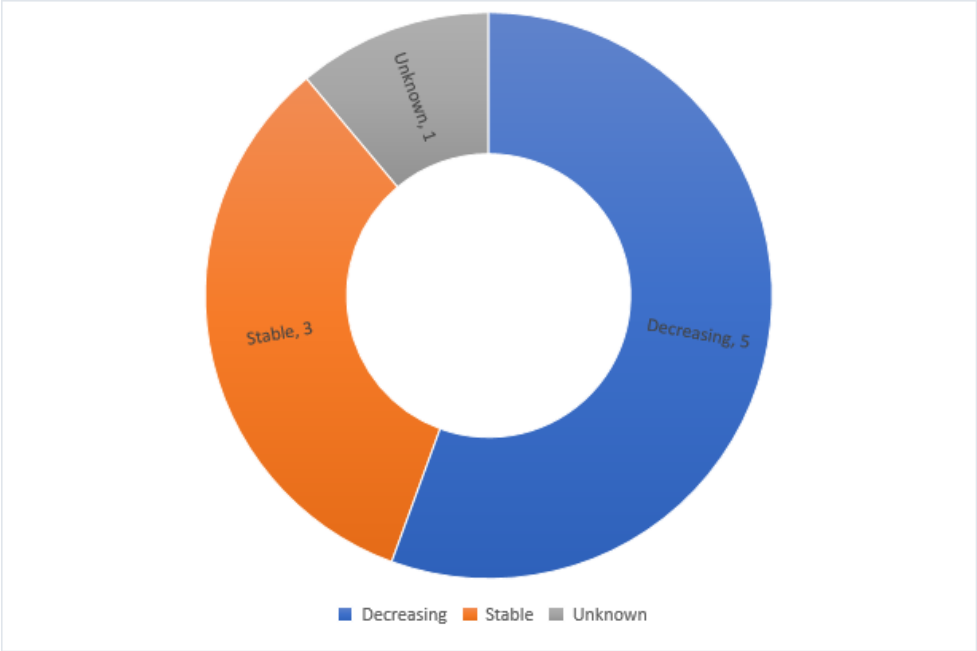

Fig. 6: Population trends of mammals recorded in sanctuary.

world-wide (Fig. 6).

Although no direct evidences were recorded but indirect evidence (Interview with the local people) suggests the presence of Himalayan Tahr. However, the same cannot be stated about the Hangul (Kashmiri Stag). Earlier, this sanctuary was the only area outside the state of Jammu and Kashmir that probably retained a few Hangul. In the present study no evidence of presence of animal (direct and indirect) was recorded. Unfortunately, it appears that the animal that inspired the sanctuary's name currently cease to exist there. As these two Himalayan species were not observed so they were not included in the results.

The Gamgul-Siyabehi Wildlife sanctuary is severely threatened by habitat destruction, livestock pressure, and biotic interference. The

magnificent Kashmiri stag (Hangul) was hunted in the 1940s by the kings of Chamba; that is the most prominent cause of its extinction today. Large number of people (Charwahe, Gaddi, and Gujjars) visit Dhar in the summer with their domesticated animals like sheep and cattles, causing human-wildlife conflict. The animal like Himalayan Tahr is rarely observed in the sanctuary and the Black Bears, which were once frequently spotted in the sanctuary area, are now rarely seen due to rising anthropogenic activities. Moreover, the sanctuary is home to 17 species of birds and 5 species of mammals, with a global decreasing trend in population; thereby, the natural habitat in this sanctuary must be conserved to protect these wild animals. Further analysis of data on feeding guilds of birds shows that about 67% of birds have very narrow or restricted feeding guild. Bird species abundance is influenced by vegetation structure, availability and abundance of food, because of increased human activity causing habitat degradation leading to the cessation of food, these species may become extinct in a very short period of time indicating that they have limited food supply. To save the unique wildlife of the sanctuary, the appropriate conservation measures must be implemented. Reducing human interruptions and other anthropogenic activity is important step in this regard. If conservation measures are not implemented immediately, the treasure chest will soon be empty.

Ethical Statement

This study was in accordance with the Research Advisory Committee (RAC) of the Department of Biosciences, Himachal Pradesh University, Shimla, India.

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Conflict of Interest

The authors declare no conflicts of interest.

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