Ethno-Ornithological Insights: Traditional Uses of Avian Fauna Among Ethnic Communities in the Kashmir Valley

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***Abstract*- Indigenous knowledge (IK) plays a crucial role in enhancing resilience and sustainability. Humans have long interacted with avian fauna, utilizing bird species and their products for various cultural and medicinal purposes. This study, conducted in the Kashmir Valley from January 2021 to December 2024, examines the ethnobiological significance of birds among three ethnic communities—Gujjar, Pahari, and Kashmiri. Data were collected through semi-structured interviews and validated via group discussions. Statistical indices, including Frequency of Citation (FC), Use Value (UV), and Fidelity Level (FL), were applied, along with Principal Component Analysis (PCA) and Venn diagrams for cross-cultural comparisons. A total of 51 bird species from 17 families were documented, with Phasianidae being the most dominant (23%). Ethnomedicinal use was reported for 30 species, addressing 28 ailments, with flesh being the most commonly utilized part (72% medicinally, 50% culturally). Cough was the most frequently treated condition (N=6), with species such as *Nettapus coromandelianus, Columba livia, Streptopelia decaocto, Streptopelia turtur, Columba rupestris,* and *Columba leuconota* used for its treatment. *Columba livia* exhibited the highest FC (83), UV (93.25), and FL (75.90) for treating cough and paralysis. Cross-cultural analysis revealed that nine species (17%) were commonly utilized across all three communities. The highest similarity in bird usage (17%) was observed between Gujjar and Pahari, while the lowest (2%) was recorded between Gujjar and Kashmiri. This study provides a foundation for understanding the cultural significance of avian species in the northern Himalayas, promoting their sustainable use and conservation. Furthermore, the findings may aid in identifying bird-derived compounds for potential pharmaceutical applications.**

***Keywords*- Cross-culture; Birds, Kashmir valley; ethno-medicinal.**

I. INTRODUCTION

The relationship between fauna and humans varies across cultures, reflecting diverse uses of animal species for medicine, decoration, food, recreation, and spiritual practices (Alves et al., 2016; Altaf et al., 2020). Birds, in particular, have been utilized for subsistence by economically disadvantaged populations through poaching (Anderson, 2010). Traditional knowledge regarding the use of species for specific purposes has been acquired over generations and passed down as cultural heritage (Altaf et al., 2017).

Zootherapy remains a significant alternative healing practice worldwide, with an estimated 80% of the global population relying on animal- and plant-based medicines (WHO, 1993; Alves & Rosa, 2005). Traditional pharmacopeias incorporate a wide range of biological resources, including birds, for medicinal purposes (Alves & Rosa, 2005). In traditional Chinese medicine alone, approximately 500 fauna species are used for primary healthcare, underscoring their medical significance (Mussarat et al., 2021). Moreover, around 8.7% of essential chemical compounds in allopathic medicine are derived from fauna (Altaf et al., 2020). Despite the recognized medicinal value of animal-based remedies, plant-based treatments continue to receive greater emphasis in pharmacological research and applications (Kapoor et al., 2020).

Situated at the crossroads of the Palearctic and Oriental biogeographic realms, the region harbors a diverse range of wildlife (Suhail et al., 2020). It supports both tropical and subtropical species while also providing habitat for unique high-altitude avian fauna (Suhail et al., 2020). Notably, the Kashmir Valley falls within the Western Himalayan Endemic Bird Area (EBA 128), emphasizing its ecological importance and rich bird diversity. The region receives diverse bird species from the other parts of the world for food, and breeding during winter. The valley is also having different cultural communities like Gujjar, Pahari, and Kashmiri (Hassan et al., 2021). All these communities have a cultural legacy in the form of culture, food, and medicine (Hassan et al., 2021a). A number of studies have been carried out to evaluate the use of flora across these communities (Haq et al., 2021, Hassan et al., 2021; Hassan et al., 2021a; Asif et al., 2021; Haq et al., 2020, Mir et al., 2021), revealing the importance of the variety of floral species across the valley, however as per our knowledge, we don't found any study which reports the cultural analysis on the use of birds. Hence, finding the research gap, we aimed to document and investigate the cross-cultural uses of bird species found throughout the year in the valley. This documentation of cultural analysis will reveal the potential uses of the bird species in the endemic traditional medicinal and hence will lay a path for the possible elucidations of a novel molecule with a particular medicinal attribution. According to Aziz et al., (2018) the documentation of ancestral knowledge in ethnobiological surveys may cover the existing gap to discover effective drugs. Further, the study will also provide an insight to the local researchers, which can assist them to draft research projects and will make a further assessment to understand the interaction between local avian fauna and the local population.

II. MATERIALS AND METHODS

Ethnography

Kashmir, a part of the union territory of Jammu and Kashmir in the Republic of India, spans across ten administrative districts (https://www.jk.gov.in/jammukashmir/?q=districtdisplay). The region is characterized by a lush green landscape, towering mountains, and rich biodiversity. It experiences four distinct seasons: Spring (March–May), Summer (June–August), Autumn (September–November), and Winter (November–February) (Haq et al., 2020). The highest recorded temperature reaches 34°C in summer, while winter temperatures can drop as low as -9°C. Based on the Köppen climate classification, the region falls under the Dfb category, indicating a humid continental climate (Ul et al., 2019).

Kashmir is endowed with abundant water resources, including rivers, lakes, and wetlands, along with vast forest and grassland ecosystems (Qayoom et al., 2019; Haq et al., 2020). These diverse habitats support a wide array of bird species, some of which migrate from distant regions for breeding and foraging. The region is also home to a rich cultural mosaic, with Kashmiri, Pahari, and Gujjar being the most prominent ethnic groups, each following distinct religious traditions. According to the 2011 Census (https://uidai.gov.in/images/state-wise-aadhaar-saturation.pdf), the population of Jammu and Kashmir was 13,606,320, comprising Muslims (67%), Hindus (30%), Sikhs (2%), and Buddhists (1%) (https://jk.gov.in/jammukashmir?q=demographics).

Socio economic background of the study area

The people of Kashmir engage in diverse economic activities, with agriculture and allied services serving as the primary occupations. Kashmiris are largely involved in agriculture and horticulture, while many also work in government sectors, trade, craftsmanship, and daily wage labor. The Gujjar and Bakarwal communities primarily rely on livestock rearing, though some are also engaged in herding, daily wage labor, and small-scale trade. In remote areas where access to modern medicine is limited, strong cultural beliefs influence healthcare practices. Traditional healers, locally known as *Hakeems*, possess extensive knowledge of indigenous remedies and utilize plants, animals, and birds to treat various ailments.

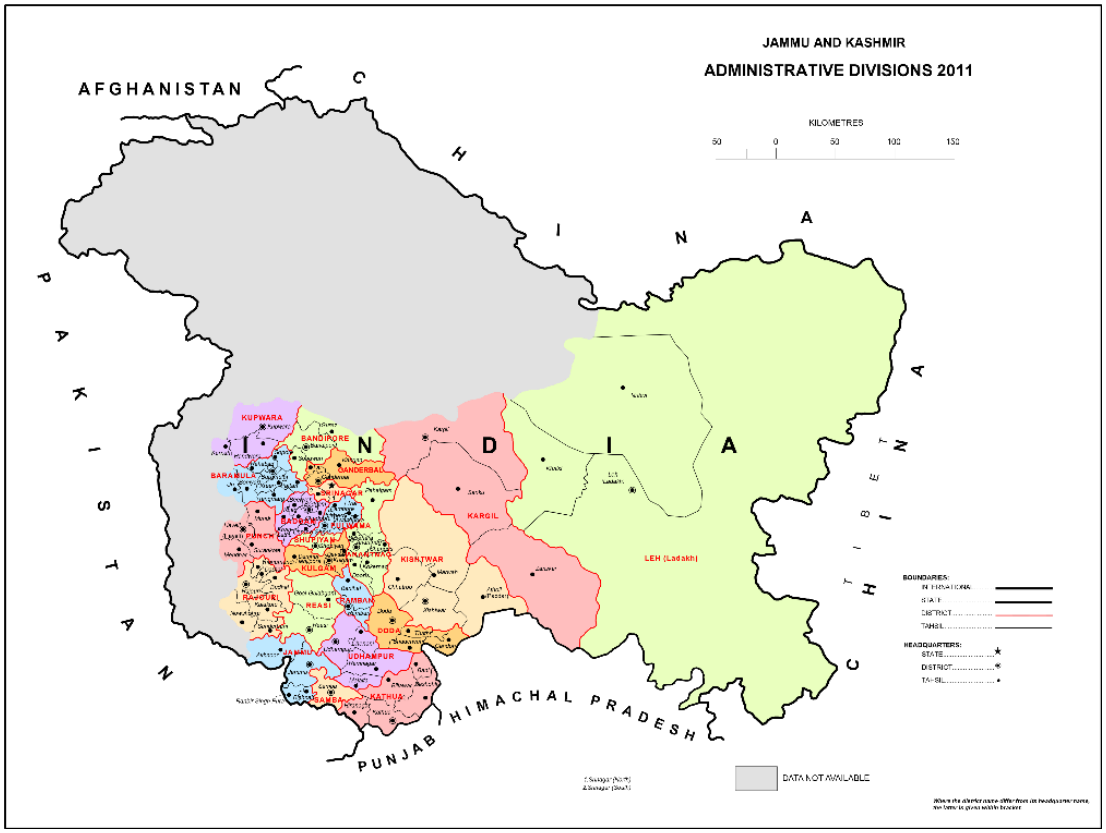

Figure 1. Map of the Kashmir valley, India.

Data analysis

We employed Frequency of Citation (FC), Use Value (UV) and Fidelity Level (FL) indices to evaluate the data.

Frequency of Citation (FC)

Frequency of citation (FC) is the number of informants who reported the medicinal uses of each documented species.

Use Value (UV)

The use value (UV) is used to reveal the relative importance of the species. It was calculated by the following equation (Altaf et al., 2018).

$$\mathrm{UV} = \sum \mathrm{FC/N}$$

FC= number of citations per species, N= number of informants.

Fidelity Level (FL)

Fidelity Level (FL) was used to identify the most preferred species used by the informants for treating certain diseases and was calculated by using formula (Altaf et al., 2017).

$$\mathrm{FL}\ (\%) = \frac{\mathrm{NP}}{\mathrm{FC}} \times 100$$

NP= number of informants for major aliment (IMA) for particular bird species.

FC= number of citations per species.

Further, data was analyzed using Principal Component Analysis (PCA) (Altaf et al., 2018). PCA was used to identify hypothetical variables (components) that account for as much as possible of the variance in our multidimensional data. The relationship between frequency of citation (FC) and information of major aliment (IMA) and PCA was achieved by R Studio 4.0.1. To determine the uniqueness and commonality of species utilization among ethnic groups a Venn diagram was created using Bioinformatics and Evolutionary Genomics software (Hassan et al., 2021). Finally, for the dendrogram, the presence/absence of data was used to show the distribution of species in the specific clusters due to the same supplying services. Using Past software ver.3.14, the Sorensen's (Bray-Curtis) distance was used to identify significant differences among various supplying services and bird resemblances (Haq et al., 2020).

Informant selection and ethno-zoological data collection

Between May 2021 and September 2024, we conducted ethnobiological documentation among three ethnic groups—Gujjar, Kashmiri, and Pahari—as part of the present study. Before initiating data collection, a reconnaissance survey was carried out to assess feasibility and ensure necessary preparations. The research team, comprising the first and second

authors along with a taxonomist, visited various selected sites across the valley.

Informants were identified using the snowball sampling technique, selecting only those individuals who demonstrated substantial knowledge of avian species in the region. Ethical protocols, including the *International Society of Ethnobiology Code of Ethics* (2006), were strictly followed, and informed consent was obtained before data collection. Traditional knowledge was documented through semi-structured interviews, supplemented by group discussions (Hassan et al., 2021; Haq et al., 2020).

A total of 89 informants participated in the study, comprising 61 males and 28 females (Table 1), representing various age groups. Before interviews commenced, the study's objectives were clearly explained to all participants. Communication was conducted in the native languages of the respective ethnic groups—Gujjari, Pahari, and Kashmiri (https://www.ethnologue.com/).

Table 1. Demographic information of respondents from valley of Kashmir-India.

Demographic features	Total Percentage	Kashmir Valley		
Ethnic Groups		Kashmiri	Pahari	Gujjar
Total informants	89	30 (33.70%)	30 (33.70%)	29 (32.58%)
Male	61 (68.53%)	20	20	21
Female	28 (31.46%)	10	10	8
Approximate number of populations		2580000	395379	547697
Age range (27-75)		Average age	Average age	Average age
Original Language		Kashmiri	Pahari	Gujari
Other Language		Urdu	Urdu	Urdu
Religion		Islam Sikhism	Islam Hinduism	Islam Hinduism
Socio-economic status		Horticulture Cattle rearing	Horticulture Cattle rearing	Horticulture Pastoralism

III. RESULTS AND DISCUSSIONS

Taxonomy

In this study, we documented 51 bird species from 23 families with ethnobiological significance across three ethnic groups—Gujjar, Pahari, and Kashmiri. Among the recorded families, *Phasianidae* was the most dominant (14%), followed by *Columbidae* (10%), *Corvidae* (10%), and *Anatidae* (8%) (Figure 2). The predominance of the *Phasianidae* family can be attributed to its rich diversity in the region (Dar and Khuroo, 2020), along with the strong reliance on its species for traditional medicine due to deep-rooted beliefs in indigenous healthcare practices. Additionally, these birds hold cultural significance, being an integral part of local traditions and rituals.

This study represents the first comprehensive survey of the traditional medicinal and cultural use of avian species in the Kashmir Valley, India. Similar findings have been reported globally, highlighting the role of birds in traditional medicine and cultural practices. Bezerra et al. (2013) documented the use of various bird species in ethno-medicinal and cultural contexts, while Altaf et al. (2017) reported the utilization of avian fauna for treating ailments in the Himalayas of Pakistan. Williams et al. (2014) highlighted the use of birds in traditional healing practices across Africa, and Boakye et al. (2019) identified the role of birds in ethno-medicine among traditional practitioners in Ghana.

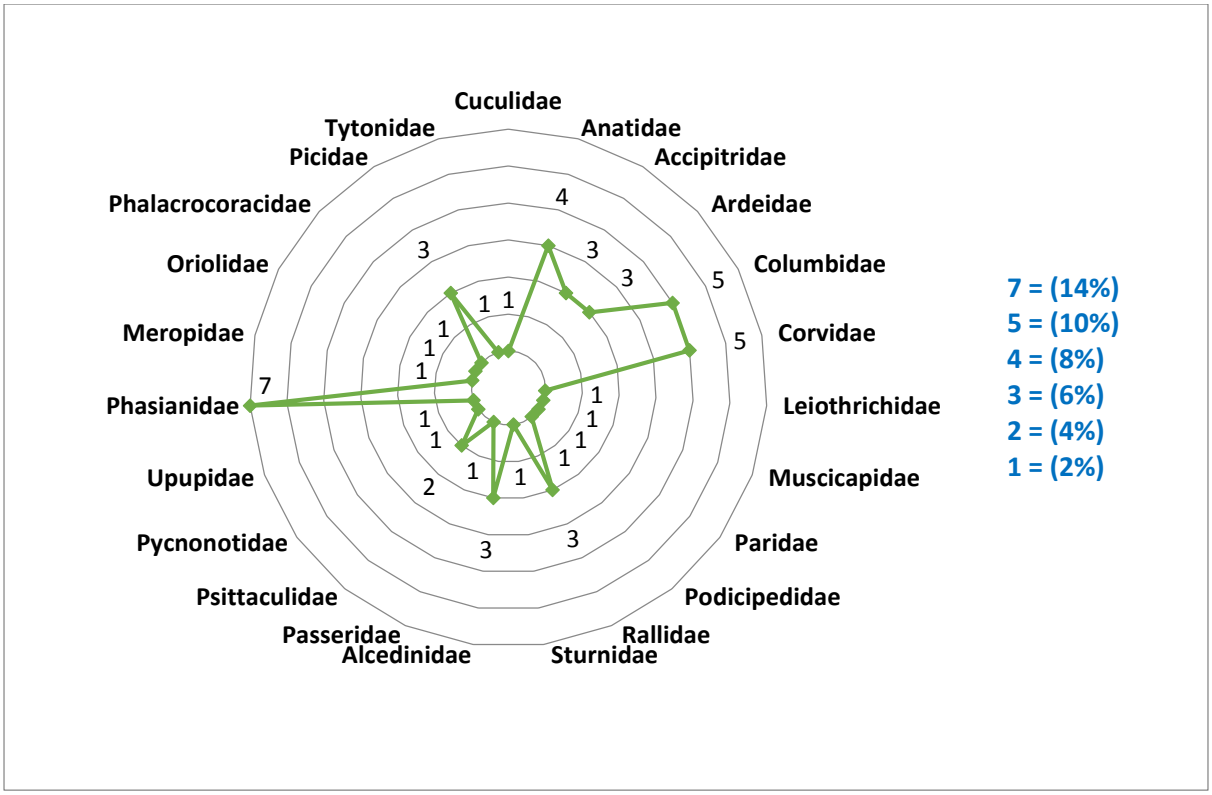

Figure. 2 Percentage of families

Among the 51 documented bird species, 30 species (58.82%) were utilized in traditional medicine, while 21 species (41.17%) held cultural significance (Table 2). Various parts of these birds were used for medicinal purposes, while others played important roles in cultural practices such as food, recreation, and symbolism (Table 2).

Analysis of the results indicated that among the species used in ethnomedicine, flesh was the most frequently utilized part (72%) for treating various ailments, followed by eggs (16%), droppings (3%), fat (3%), gizzard (3%), and tongue (3%) (Figure 3a). The preference for bird flesh in traditional medicine is attributed to a local belief in its inherent properties, known as *taaseer*, which is thought to influence health. This concept categorizes foods into two types: *Garm* (warm) and *Srad* (cold). It is believed that *Garm* foods, considered nutritionally and medicinally rich, are more effective for treating a variety of ailments, while *Srad* foods have limited but significant therapeutic applications. Traditionally, *Srad* species are consumed in summer, whereas *Garm* species are preferred in winter, though there are no strict rules. For instance, the flesh of *Columba livia* is considered *Garm* and is typically consumed in winter, whereas *Passer domesticus* is regarded as *Srad* and is mainly eaten in summer.

In cultural practices, bird flesh was also the most frequently used part (50%), followed by the whole body (17%), beak (9%), gizzard (7%), and blood (7%) (Figure 3b). Similar uses of avian species in traditional medicine and cultural practices have been reported in various studies. Solanki and Chutia (2009) documented the medicinal and cultural use of different bird parts among tribal communities in Arunachal Pradesh, India. Likewise, Jaroli et al. (2010) reported the use of avian species for traditional healing and cultural rituals in the areas surrounding Mount Abu Wildlife Sanctuary, India.

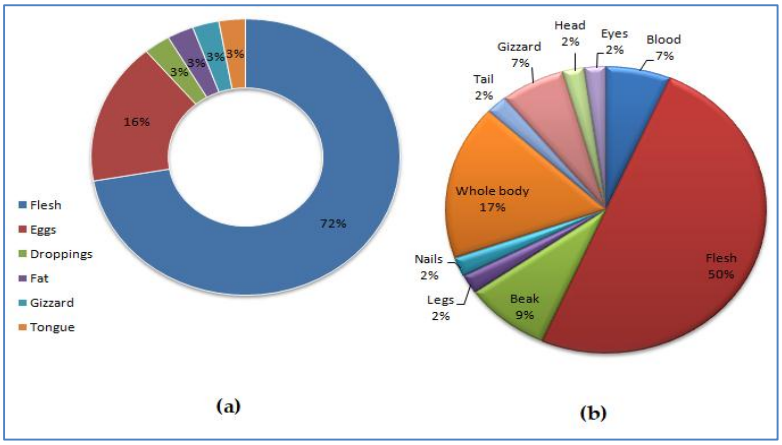

Figure.3. (a) Percentage of parts in ethno-medicinal usage (b) Percentage of parts in cultural usage

Ethno-medicinal usage of bird species

Present study recorded 28 diseases treated by enlisted 30 species (Figure 4). Cough was treated by the maximum number of bird species (N=6) i.e,. *Nettapus coromandelianus, Columba livia, Streptopelia decaocto, Streptopelia turtur, Columba rupestris, Columba leuconota*, followed by Body weakness treated by 5 bird species (*Alectoris chukar, Tetraogallus himalayensis, Lophura leucomelanos, Tachybaptus ruficollis, Acridotheres tristis*), Paralysis treated by 4 species (*Alcedoatthis, Columba rupestris, Columba leuconota, Eudynamysscolopaceus*) (Table.2; Figure 3). Jugli et al., 2020 reported the use of birds like *Columba livia* for weakness, from North-East India. Weliange et al., 2015 reported the use of *Spizaetus nipalensis* for body weakness, typhoid and Rheumatic pains. Castillo and Ladio. (2019) reported the use of *Gallus gallus domesticus* for burns from Argentina. In the valley (Kashmir), people living in remote areas have strong belief in the local traditional medicine in which use of birds for the treatment of diseases is having a vital role. People generally believe that the birds are nurtured by nature which impart them an utmost healing potential with least or no side effects. Further, local people have a strict belief that birds are the apex resources provided by nature in the region to overcome almost all common ailments like cough, body weakness, pain, postpartum weakness due to the presence of immune boosting constituents.

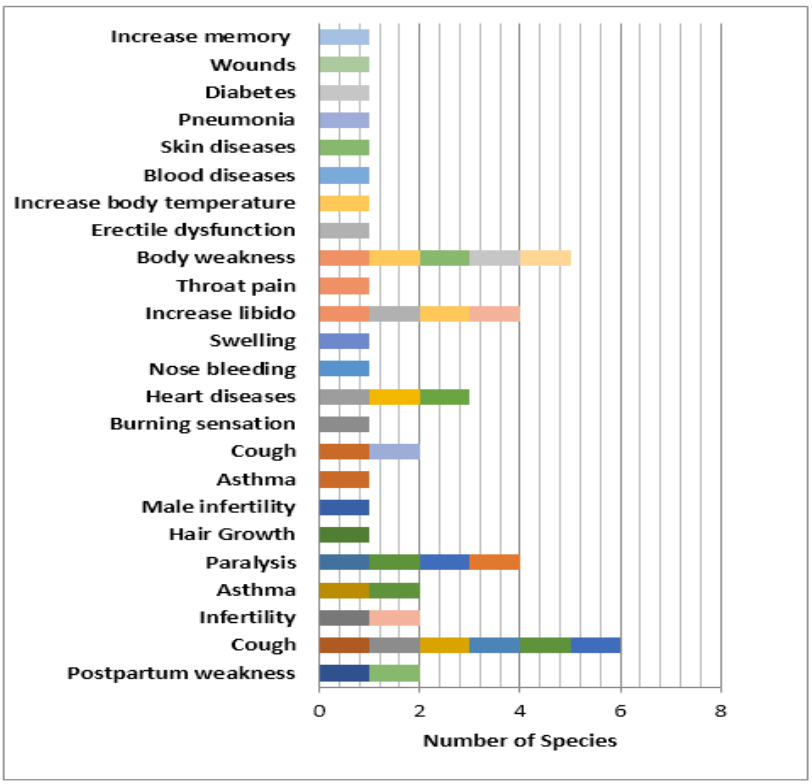

Figure. 4 Enlisted diseases treated by a number of bird species.

Frequency of Citation (FC)

In the present study, the number of informants reporting each bird species varied. Species cited by a higher number of respondents as being regularly used for treating various ailments exhibited a higher frequency of citation (FC). The FC values ranged from 4 to 83 (Table 2), with *Columba livia* having the highest FC (83).

Across all three ethnic groups (Gujjar, Pahari, and Kashmiri), the flesh of *Columba livia* was commonly used to treat cough and paralysis, while its droppings were traditionally used to alleviate foot-burning sensations. In contrast, the lowest FC was recorded for *Nettapus coromandelianus*, which was used exclusively by the Kashmiri ethnic community. Its flesh was typically roasted and consumed to treat cough (Table 2).

Use Value (UV)

The maximum use value of the species certifies the consistent use of species in the treatment of diseases (Altaf et al., 2018). Upon interpreting the results, it was revealed that the use value ranged between 4.49-93.25 (Table.2).The highest use value was recorded for *Columbia livia (*93.25*)* followed by *Columba rupestris* (89.88) *Columba leuconota* (82.02), *Alectoris chukar* (77.52), *Tetraogallus himalayensis* (52.80), *Lophophorus impejanus* (48.31), *Tragopan melanocephalus* (47.19) and the least use value was recorded for *Parus major* (Table.2).The maximum use value of these species is due to consistent use of these species for the treatment of diseases in the region. Further, it is important to mention that the highest number of informants and maximum number of citations from the region depicts that these are well known in the region, and frequently utilized for medicinal purposes.

Fidelity Level (FL)

According to Altaf et al. (2018), the Fidelity Level (FL) is used to identify the most preferred species in a region for treating various ailments. Species with the highest medicinal use among local inhabitants are considered to have the highest FL (Srithi et al., 2009). A comprehensive list of FL values for the documented bird species is provided in Table 2.

Among all recorded species, *Columba livia* exhibited the highest FL (75.90) (Figure 5), primarily used for treating cough and paralysis. This was followed by *Columba rupestris* (75.00) and *Columba leuconota* (72.60), both utilized for asthma, paralysis, and chronic cough. *Lophophorus impejanus* had an FL of 67.44, commonly used for addressing sexual health issues and erectile dysfunction. *Tetraogallus himalayensis* (59.57) was valued for treating weakness, enhancing libido, and increasing body warmth in winter, while *Alectoris chukar* (52.17) was used for ear and throat pain, weakness, and libido enhancement.

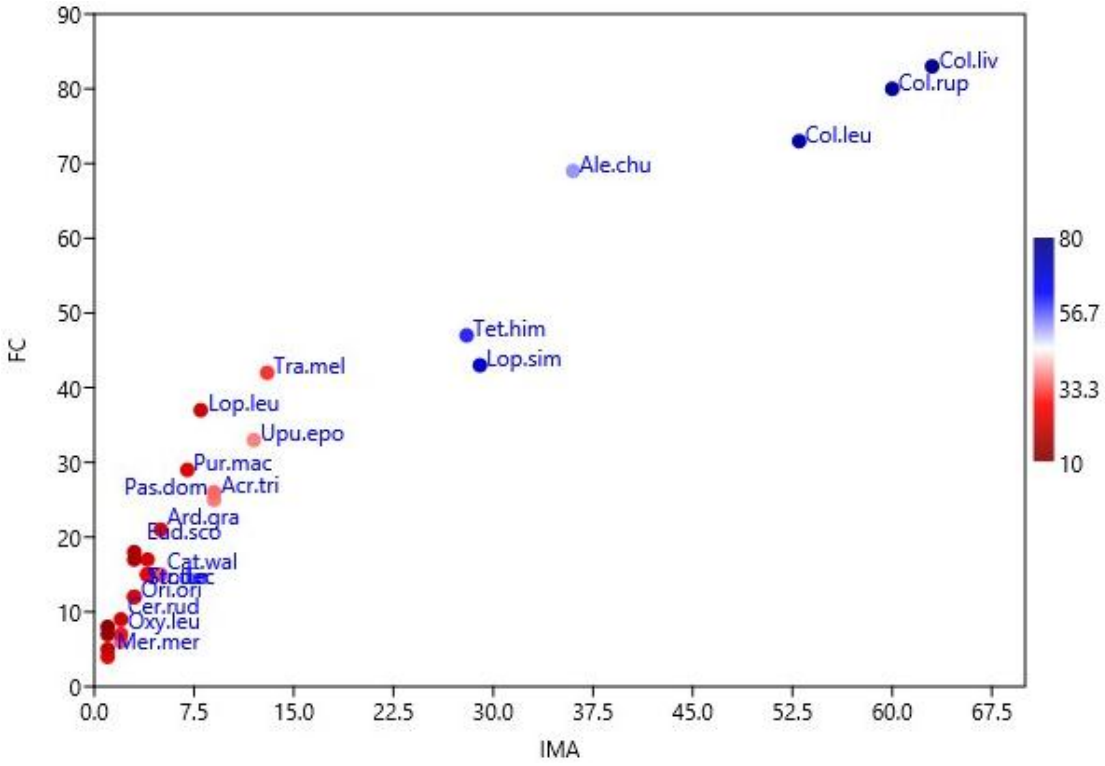

Figure.5 The relationship between frequency of citation (FC) and information of major aliment (IMA). The complete names of the bird species is provided in table.2.

Quantitative ethno-zoological analysis

Sorensen's (Bray-Curtis) distance was applied to assess significant differences among various provisioning services, including food, medicine, black magic (Bla-mag), recreation, indication, and evil-eye protection, as well as to evaluate bird species similarity. The analysis identified two primary clusters of ethno-zoological use categories (Figure 6). Cluster 1 encompassed food and medicinal uses, grouping species such as *Columba livia*, *Trochalopteron lineatum*, *Alectoris chukar*, *Lophophorus impejanus*, *Tetraogallus himalayensis*, *Tragopan melanocephalus*, *Lophura leucomelanos*, and *Pucrasia macrolopha*. These species were primarily valued for their nutritional and therapeutic properties. Cluster 2 included uses related to black magic, evil-eye protection, recreation, and indication. Notable species in this cluster included *Corvus splendens*, *Corvus macrorhynchos*, *Coloeus monedula*, *Corvus corax*, and *Pycnonotus leucogenys*, which were often associated with omens. For instance, the chirping of *Pycnonotus leucogenys* near a home was believed to signal an impending visitor, while large gatherings of crows were thought to indicate the presence of a dead organism.

Additionally, various bird body parts were used in mystical practices. The blood and flesh of *Milvus migrans* and *Milvus milvus*, the legs of *Halcyon smyrnensis*, the beak of *Bubulcus ibis* and *Urocissa erythrorhyncha*, the gizzard of *Columba rupestris*, *Columba leuconota*, and *Columba livia*, the head of *Phalacrocorax carbo*, and the eyes, blood, and flesh of *Tyto alba* were reportedly used by magicians for black magic rituals. The whole body of *Merops orientalis* and *Corvus corax* was also employed for similar purposes.

For recreational purposes, *Psittacula krameri* and *Psittacula himalayana* were commonly kept in cages. Meanwhile, the nail of *Egretta garzetta* was fashioned into an amulet believed to protect against the evil eye.

Similar clustering patterns in ethno-zoological usage have been documented worldwide. Santos et al. (2016) identified two primary clusters when analyzing zoo-therapeutic practices across four villages in the semiarid region of Brazil. Alves et al. (2007) reported three main clusters in the use of fish fauna in Northeast Brazil. Multivariate analysis techniques have also been employed by Leduc et al. (2006), Caneva et al. (2017), and Hassan et al. (2021a) to classify ethno-zoological applications.

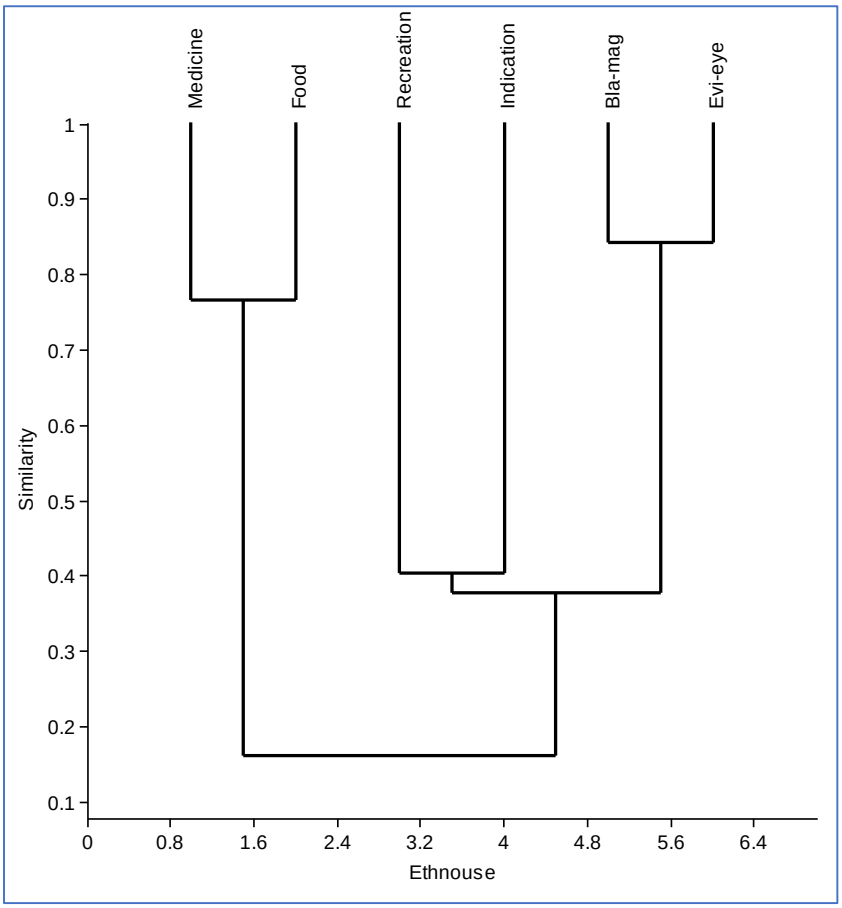

Figure. 6 Cluster diagram of the different provisioning services based on usage pattern

Cross cultural analysis

Present study evaluated the use of documented species across three ethnic communities (Gujjar, Pahari and Kashmiri). A cross-cultural analysis showed that 9 species (17%) (*Columba livia, Lophophorus impejanus, Tyto alba, Columba rupestris, Streptopelia turtur, Streptopelia decaocto, Columba leuconota, Pucrasia macrolopha, Corvus corax*) were commonly used by the all said ethnic groups. The common usage of the said species is due to wide distribution in all areas of the valley except *Pucrasia macrolopha* which is mostly found in high altitude areas and forests where mostly Gujjar and Pahari inhabit, Kashmir often purchase the said species from the Gujjar and Phari communities mostly for food due to its delicious taste. 25 species (49%) (*Egretta garzetta, Fulica atra, Milvus milvus, Ardeola grayii, Coloeus monedula, Phalacro corax carbo, Marmaronetta angustirostris, Halcyon smyrnensis, Tachybaptus ruficollis, Merops orientalis, Milvus migrans, Oriolus oriolus, Psittacula himalayana, Gypaetus barbatus, Passer domesticus, Lophura leucomelanos, Bubulcus ibis, Alcedo atthis, Mergus merganser, Oxyura leucocephala, Nettapus coromandelianus, Eudynamys scolopaceus, Ceryle rudis, Zapornia fusca, Gallinula chloropus*) were idiosyncratic to Kashmiri; 1 species (4%) (*Parus major*) was idiosyncratic to Gujjar (Figure.7a). This highest number of idiosyncratic species for Kashmiri is due to the reason that Kashmiri is the dominant ethnic community compared to Gujjar and Pahari in the valley. This dominance is of population, socio-economic condition, culture and language. Gujjar and Pahari communities are also recognized as minority tribal communities by the government, (https://jksocialwelfare.nic.in/notifications/SO127.pdf) (https://tribal.nic.in/downloads/CLM/CLM_1/17.pdf).While evaluating the similarity between the ethnic groups (Figure.7b), our study revealed that Kashmiri and Pahari are more similar (16%) on the use of bird species and least similarity (2%) is in between Gujjar and Kashmiri. The maximum similarity between Kashmiri and Pahari is due to that both communities are associated with same socio-economic conditions (Table.1), also many Kashmiri people use to buy species like *Tetraogallus himalayensis, Lophophorus impejanus, Alectoris chukar* from the Pahari people which in turn creates a potential similarity between both communities upon bird utilization. Meanwhile, Kashmiri and Pahari are also exogamous to each other which assists in the flow of traditional knowledge between both communities. The least similarity between Gujjar and Kashmiri can be ascribed to that both communities have socio-economic, language and geographic differences (Table.1). Haq et al., 2021 reported the similarity of Gujjar and Pahari on the plant usage from Jammu and Kashmir.

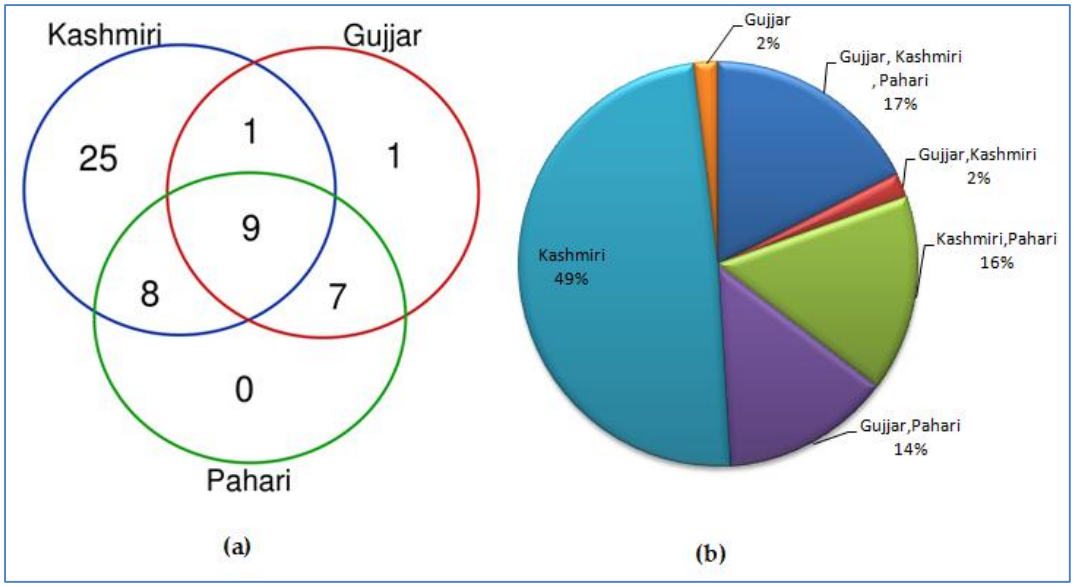

Figure. 7(a) Cross cultural usage of species; (b) Similarity of ethnic groups upon species usage

Table 2. Ethno-zoological inventory of documented species columns

Family	Scientific Name (English Name) (Local Name) (Abbreviation)	Zoo therapy						Cultural uses						Ethnic Groups
		Parts Used	Medicinal Use	FC	IMA	UV	FL	Parts Used	Fo	Mg	Rc	Ee	In	
Accipitridae	*Milvus migrans* (Boddaert, 1783) (Black Kite) (Gaant) [K] (Mil.mig)							Blood / Flesh	×	√	×	×	×	Kashmiri
	Gypaetus barbatus (Linnaeus, 1758) (Bearded Vulture) (Graid) [K] (Gyp.bar)							Beak	×	√	×	×	×	Kashmiri
	Milvus milvus (Linnaeus, 1758) (Red Kite) (Gaant) [K] (Mil.mil)							Blood / Flesh	×	√	×	×	×	Kashmiri
Anatidae	*Mergus merganser* (Linnaeus, 1758) (Common Merganser) (Aasmain bakat) [K] (Mer.mer)	Flesh	Flesh is made into soup, used to treat postpartum weakness.	6	2	6.74	33.33							Kashmiri
	Nettapus coromandelianus (Gmelin, 1789) (Cotton pygmy goose) (Safid kal) [K] (Net.cor)	Flesh	Flesh is roasted, used to treat cough	4	1	4.49	25							Kashmiri
	Oxyura leucocephala (Scopoli, 1769) (White headed Duck) (But) [K] (Oxy.leu)	Flesh	Flesh is meshed, made into small meatballs and cooked with walnuts and almonds, used to treat infertility.	7	2	7.86	28.57							Kashmiri

	Marmaronetta angustirostris (Menetres, 1832) (Marbled Duck) (Taichal) [K] (Mar.ang)	Flesh	Flesh is made into soup, used to treat Asthma.	7	1	7.86	14.28							Kashmiri
Alcedinidae	*Alcedo atthis* (Linnaeus, 1758) (Common Kingfisher) (Gaad seah) [K] (Koll-toonch) [K] (Alc.att)	Flesh	Flesh grinded to paste, mixed with goat milk and honey is used to treat paralysis.	12	3	13.48	25.00							Kashmiri
	Ceryle rudis (Linnaeus, 1758) (Pied Kingfisher) (Gaad seah) [K] (Koll-toonch) [K] (Cer.rud)	Eggs	Eggs shells are powdered and mixed with grape water and applied on the head to grow hair.	9	2	10.11	22.22							Kashmiri
	Halcyon smyrnensis (Linnaeus, 1758) (White-throated Kingfisher) (Gaad seah) [K] (Koll-toonch) [K] (Hal.smy)							Legs	×	√	×	×	×	Kashmiri
Ardeidae	*Ardeola grayii* (Sykes, 1832) (Indian Pond Heron) (Shataan) [K] (Ard.gra)	Eggs	Eggs are roasted and given to treat male infertility	21	5	23.59	23.80							Kashmiri
	Egretta garzetta (Linnaeus, 1766) (Little Egret) (Paaz) [K] (Egr.gar)	Flesh	Flesh is roasted and painted with vinegar or lime to treat Asthma. Roasted flesh is consumed to treat cough .	18	3	20.22	16.66	Flesh	×	√	×	×	×	Kashmiri
								Beak	×	√	×	×	×	
								Nail	×	×	×	√	×	
								Flesh	×	√	×	×	×	

	Bubulcus ibis (Linnaeus, 1758) (Cattle Egret) (Gav Paaz) [K] (Bub.ibis)							Beak	×	√	×	×	×	Kashmiri
Corvidae	*Corvus splendens* Vieillot, 1817 (House Crow) (Kaav) [K] Kaaga [G,P] (Cor.spl)							Whole body	×	×	×	×	√	Kashmiri Pahri Gujjar
	Corvus macrorhynchos Wagler, 1827 (Jungle Crow) (Jangli Kaav) [K] (Jagli Kaga) [G,P] (Cor.mac)							Whole body	×	×	×	×	√	Kashmiri Pahri Gujjar
	Coloeus monedula (Linnaeus, 1758) (Eurasian Jackdaw) (Kaav) [K] Col.mon							Whole body	×	×	×	×	√	Kashmiri
	Urocissa erythroryncha (Boddaert, 1783) (Red-billed blue magpie) (Lait raaz) [K,P] (Uro.ery)							Beak Tail	×	√	×	×	×	Kashmiri Pahari
	Corvus corax (Linnaeus, 1758) (Common Raven) (Kaav) [K] Kaga [G,P] (Cor.cor)							Whole body	×	√	×	×	√	Kashmiri Pahri Gujjar
Columbidae	*Columba livia* Gmelin, 1789 (Rock Pigeon) (Qaotar) [K] Kubotar [P,G] (Col.liv)	Flesh	Flesh is roasted, given to treat asthma paralysis and chronic cough.	83	63	93.25	75.90	Flesh	√	√	×	×	×	Kashmiri Pahri Gujjar
								Gizzard	×	√	×	×	×	
		Droppings	Dropping are painted to the lower side of the feet to overcome the burning sensation.											

	Streptopelia decaocto (Frivaldszky, 1838) (Eurasian Collared Dove) Kokial [K] Kogi [G,P] (Str.dec)	Flesh	Flesh is cooked, used to treat coughs.	15	4	16.85	26.66							Kashmiri Pahri Gujjar
	Streptopelia turtur (Linnaeus, 1758) (European turtle Dove) Vankukil [K] Kogi [G,P] (Str.tur)	Flesh	Flesh is cooked, used to treat coughs.	15	4	16.85	26.66							Kashmiri Pahri Gujjar
	Columba rupestris (Pallas, 1811) (Hill Pigeon) (Qaotar) [K] Kubotar [P,G] (Col.rup)	Flesh	Flesh is roasted, given to treat asthma, paralysis and chronic cough.	80	60	89.88	75.00	Gizzard	×	√	×	×	×	Kashmiri Pahri Gujjar
	Columba leuconota (Vigors, 1831) (Snow Pigeon) (Qaotar) [K] Kubotar [P,G] (Col.leu)	Flesh	Flesh is roasted, given to treat asthma paralysis and chronic cough.	73	53	82.02	72.60	Gizzard	×	√	×	×	×	Kashmiri Pahri Gujjar
Cuculidae	*Eudynamys scolopaceus* (Linnaeus, 1758) (Asian Koel) Kukil [K] (Eud.sco)	Flesh	Flesh is made into soup, used to treat paralysis.	17	4	19.10	23.52							Kashmiri
Leiothrichidae	*Trochalopteron lineatum* (Vigors, 1831) (Streaked Laughing thrush) (Yakud) [K] (Sheen-pipin) [K] (Yakda) [G] (Tro.lin)	Flesh	Flesh is cooked and given to treat heart problems.	15	4	16.85	26.66	Flesh	√	×	×	×	×	Gujjar, Kashmiri
Meropidae	*Merops orientalis* (Latham, 1801) (Asian Green Bee-enter) [Mancher seah] [K] (Mer.ori)							Whole body	×	√	×	×	×	Kashmiri

Muscicapidae	*Myophonus caeruleus* (Scopoli, 1786) (Blue Whistling Thrush) (Tel Kaach) [K] (Haazaar Dastaan) [K] (Myo.cae)	Flesh	Flesh is cooked and given to treat heart problems.	15	4	16.85	26.66							Kashmiri
Oriolidae	*Oriolus oriolus* (Linnaeus, 1758) (Eurasian Golden Oriole) (Pooshnool) [K] (Ori.ori)	Flesh	Flesh is made into soup, used to treat nose bleeding.	12	3	13.48	25.00							Kashmiri
Passeridae	*Passer domesticus* (Linnaeus, 1758) (House Sparrow) (Chear) [K] (Pas.dom)	Flesh	Flesh is cooked or made into soup, used to treat heart problems.	25	9	28.08	36.00							Kashmiri
Paridae	*Parus major* Linnaeus, 1758 (Great Tit) (Chutu) [G] (Par.maj)	Flesh	Flesh is made into soup, used to treat swelling due to hard hits.	5	1	5.61	20.00							Gujjar
Phasianidae	*Alectoris chukar* (J.E.Gray, 1830) (Chukar Partridge) (Chukoor) [G,P] (Ale.chu)	Fat	Fat is boiled to treat ear throat pain	69	36	77.52	52.17	Flesh	√	×	×	×	×	Gujjar Pahari
		Flesh	Flesh is cooked and used to increase libido.											
		Egg	Eggs are boiled and given to treat weakness.											
	Lophophorus impejanus (Latham, 1790) (Himalayan Monal) (Van kukur) [K] (Bund kukud) [P] (Van kukdii) [G] (Lop.sim)	Flesh	Flesh is cooked and used to increase libido. Roasted flesh is taken to treat erectile dysfunction.	43	29	48.31	67.44	Flesh	√	×	×	×	×	Gujjar Pahari Kashmiri
	Tetraogallus himalayensis (G. R. Gray, 1843) (Himalayan Snow Cock) (Jangli murug) [G,P] (Jangli Kukud) [G,P]	Flesh	Flesh is cooked and used to increase libido.	47	28	52.80	59.57	Flesh	√	×	×	×	×	Gujjar Pahari
			Cooked flesh is consumed to treat weakness.											

	(Tet.him)		Cooked flesh is also used to warm the body during winters.											
	Tragopan melanocephalus (Gray, 1829) (Western Tragopan) (Van Kukud) [G] (Jangli Murgi) [P] (Band kukud) [P] (Tra.mel)	Flesh	Flesh is roasted, or boiled and taken to treat blood diseases.	42	13	47.19	30.95	Flesh	√	×	×	×	×	Pahari Gujjar
	Lophura leucomelanos (Latham, 1790) (Kalij Pheasant) (Wan kukur) [K] (Lop.leu)	Flesh	Flesh is steamed and taken to treat body general and postpartum weakness.	37	8	41.57	21.62	Flesh	√	×	×	×	×	Kashmiri
		Eggs	Eggs are boiled and taken to treat skin diseases in children.											
	Pucrasia macrolopha (G. R. Gray, 1841 (Koklass Pheasant) (Kalgee)[G] (Takay de mugri) [P] (Chetear) [K] (Pur.mac)	Gizzard	The internal layer of gizzard is dried, powdered and taken with lukewarm water to treat dry cough Pneumonia	29	7	32.58	24.13	Flesh	√	×	×	×	×	Gujjar Pahari Kashmiri
	Catreus wallichii (Hardwicke, 1827) (Cheer Pheasant) (Ratee siree) [G] Chubkee [P] (Cat.wal)	Flesh	Flesh is cooked, used to increase labido.	15	5	16.85	33.33							Gujjar Pahari
		Eggs	Eggs are boiled, used to treat infertility.											
Phalacrocoracidae	*Phalacrocorax carbo* (Linnaeus, 1758) (Great Cormorant) (Karean) [K] (Pha.car)							Head	×	√	×	×	×	Kashmiri
Podicipedidae	*Tachybaptus ruficollis* (Pallas, 1764) (Little Grebe) (Pinditch) [K] Tac.ruf	Flesh	Eggs are roasted and given to treat body weakness.	8	1	8.98	12.5	Flesh	√	×	×	×	×	Kashmiri
		Eggs	Diabetes											

Picidae	*Dendrocopos himalayensis* (Jardine and Selby, 1835) (Himalayan Woodpecker) (Kuil tathol) [K] (Thetiera) [P] (Den.him)							Flesh	√	×	×	×	×	Pahari Kashmiri
	Dendrocopos atratus (Blyth, 1849) (Stripe-breasted Woodpecker) (Kuil tathol) [K] (Thetiera) [P] (Den.art)							Flesh	√	×	×	×	×	Pahari Kashmiri
	Dendrocopos macei (Vieillot, 1818) (Fulvous-Breasted Woodpecker) (Kuil tathol) [K] (Thetiera) [P] (Den.mac)							Flesh	√	×	×	×	×	Pahari Kashmiri
Psittaculidae	*Psittacula krameri* (Scopoli, 1769) (Rose-ringed Parakeet) (Toat) [K] (Shoag) [K] (Psi.kra)							Whole body	×	×	√	×	×	Kashmiri
	Psittacula himalayana (Lesson, 1832) (Slaty Headed Parakeet) (Toat) [K] (Shoag) [K] (Psi.him)							Whole body	×	×	√	×	×	Kashmiri
Pycnonotidae	*Pycnonotus leucogenys* (Gray, JE, 1835) (Himalayan Bulbul) (Bil buchur) [K] (Buchbula) [P] (Pyc.leu)							Whole body	×	×	×	×	√	Kashmiri Pahari

Rallidae	*Fulica atra* (Linnaeus,1758 (Coot) (Kolar) [K] (Ful.alt)							Flesh	√	×	×	×	×	Kashmiri
	Gallinula chloropus (Linnaeus, 1758) (Common Moorhen) (Teach) [K] (Gal.chl)	Flesh	Flesh is made into soup, used to treat injuries and wounds.	17	3	19.10	17.64	Flesh	√	×	×	×	×	Kashmiri
	Zapornia fusca (Linnaeus, 1766) Ruddy –breasted Crake (Gill) [K] (Zap.fus)							Flesh	√	×	×	×	×	Kashmiri
Sturnidae	*Acridotheres tristis* (Linnaeus, 1766) (Common Myna) (Haaer) [K] (Sharak) [P] (Acr.tri)	Flesh	Flesh is made into soup, used to treat general weakness.	26	9	29.21	34.61	Flesh	√	×	×	×	×	Pahari Gujjar
Tytonidae	*Tyto alba* (Scopoli, 1769) (Barn Owl) (Raat mogul) [K] (Ana kokoo) [P,G] (Acr.tri)							Flesh Eyes Blood	×	√	×	×	×	Kashmiri Gujjar Pahari
Upupidae	*Upupa epops* Linnaeus, 1758 (Common Hoopoe) (Satut) [K] (Hud hud) [P] (Satutaa) [P] (Upu.epo)	Tongue	Roasted tongue is given to children believed to increase memory.	33	12	37.07	36.36	Flesh	√	×	×	×	×	Pahari Kashmiri

FC: Frequency of Citation; IMA: Information of major ailment; Fo: Food; Mg: Magic; Rc : Recreation' Ee: Evil eye; In: Indication; [K]: Kashmiri; [P]: Pahari; [G]: Gujjar;
[K], [P], [G] presented against the Common name depicts the name spoken by the ethnic group.

Comparison with other ethno-biological studies in the nearby regions

We compared the present study with the early published ethno-ornithological literature from the nearby regions like Pakistan, Bangladesh, Nepal and different parts of India (Altaf et al., 2017; Bagde and Jain. 2015; Shams et al., 2019; Altaf et al., 2018; Agnihotri and Si. 2018; Dixit et al., 2010; Solanki and Chutia. 2009; Altaf et al., 2021; Lohani. 2011, Solanki and Chutia. 2004; Jugli et al., 2020; Negi at al., 2007; Mahawar and Jorali. 2007; Mishra and Rout. 2009; Khatun et al., 2013). This comparison revealed the use of some species is new to ethno-zoological literature. i.e., Flesh of *Mergus merganser* is used to treat postpartum weakness. Flesh of

Nettapus coromandelianus, and *Streptopelia turtur* is used to treat cough. Flesh of *Oxyura leucocephala* used to treat infertility. Flesh of *Marmaronetta angustirostris* is used to treat Asthma. Flesh of *Eudynamys scolopaceus* is used to treat paralysis. Flesh of *Trochalopteron lineatum* is to treat heart problems. Fat of *Alectoris chukar* is used to treat ear and throat pain, flesh is used to increase libido and eggs used to treat weakness. Flesh of *Tetraogallus himalayensis* is used to increase libido. Flesh of *Tragopan melanocephalus* is used to treat blood diseases. The internal layer of gizzard of *Pucrasia macrolopha* is used to treat dry cough and Pneumonia. Flesh of *Zapornia fusca* is consumed as food. Eyes, flesh and blood of *Tyto alba* are used to perform black magic, flesh of *Fulica atra, Dendrocopos macei, Dendrocopos atratus, Dendrocopos himalayensis* is consumed as food, head and beak of *Phalacrocorax carbo* and *Gypaetus barbatus* are used for black magic.

Acquisition, maintenance and trade

During the present study, it was also revealed that some of the birds *like Columba livia, Columba rupestris, Columba leuconota, Psittacula krameri, Psittacula himalayana, Lophura leucomelanos, Lophophorus impejanus, Alectoris chukar,* and *Tetraogallus himalayensis* were acquired via purchase, capture or sometimes gifted from friends or relatives. In the case of *Columba livia, Columba rupestris,* and *Columba leuconota,* Kashmiri people make necessary maintained structures called as *Kotarmor*, where said species are provided food, hygiene, and overall care. A proper care of breeding is also taken to increase population rapidly. These species are then sold at high prices, providing a livelihood generation to a small chunk of people. Similarly, *Psittacula krameri* and *Psittacula himalayana* are captured and sold; people usually purchase these species for recreational purposes for their children. The species is often caged in metallic or sometimes box locally called as *Panjere*. *Lophura leucomelanos, Lophophorus impejanus, Alectoris chukar,* and *Tetraogallus himalayensis* are mostly captured from Local forests and hilly areas and sold. People who are economically weak capture these species and sell them to economically sound people. The flesh of these bird species is commonly known as *Shakarmaaz.* In the valley this *Shakaarmaaz* is considered as tasty, royal people pay very good values to the people who make this *Shakaarmaaz* available. The capturing of the birds is done locally via different methods like snares, Pellet guns. Alves et al., 2010 reported the acquisition, maintenance and trade from the Brazil

In the valley of Kashmir, the pigeons do possess a cultural legacy, as they are employed in pigeon flying locally known as *KabootarBazi*, believed to be centuries old. People rear and train the pigeons, locally called as *Kabootarbaz*. After proper training, people send them in the air, among which one who spends the maximum time of flight is treated as the winner. People which are associated with pigeon flying have developed certain whistle like sounds to alarm their pigeon from predators, also a wooden structure known as *aad* is also built on the roof where pigeons take off, along with *aad* seating arrangement is made to watch pigeon flying. Meanwhile, pigeons sometimes go along with other pigeons of different owners, the new owner ties the leg of the newly arrived pigeon and doesn't let the pigeon go for more than two days, after spending tied to one place for two consecutive days, the pigeon adapts to the new place. Locals reveal that the pigeon flying in the valley traces its origin from Mughals Empire. Many people used to say that it is their hobby, as their forefathers were also fond of Pigeon flying. However, nowadays, Pigeon flying and rearing is losing popularity due to expensiveness and hard to rear and train

Cultural myths

Upon documentation it was revealed that across the cultures different bird species were attributed with negative attributions.

- In the Pahari and Gujjar community, the head of *Acridotheres tristis* contains poison, hence should not be eaten.
- In Kashmiri, continuous spotting *Milvus migrans* backyard of house is a sign of misfortune.
- Crowing of *Coloeus monedula*, *Corvus macrorhynchos* in the lawn of a house is treated as a bad omen in Kashmiri.
- Many people in Kashmiri treat *Ardeola grayii* as an alternate form of devil.

Our results are in agreement with Altaf et al., 2020.

IV. CONCLUSION

Present study is the first in its kind from the region (Kashmir) to evaluate the ethno-medicinal and cross-cultural usage of bird species. Results reveal that upon exploitation of bird species, older generations are having a potential traditional knowledge

compared with younger generation, clearly revealing that endemic traditional knowledge is vanishing from the region. This is due to rapid urbanization, which urges the people to change their mode of jobs, also forces them to migrate, and at the same time motivates the people to develop faith in allopathic medicine. Meanwhile, our study further highlights the intimacy of the cultures which are affected by socio-economic factors, and geography. In the region, it is need of hour to further document medicinal use of bird species across different ethnic cultures, which can assist the stakeholder to draft strategies for the utilization of bird species by modern scientific perspective and can further aware the common people about the sustainable use of their natural wealth, which in turn can assist for the long term preservation of local bird diversity. Further, the bio-profiling of the most used species in ethno medicine can pave a path for novel drugs.

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