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Assessment of diversity and ethnopharmacological uses of birds in Chakar, Hattian Bala district, Azad Jammu and Kashmir-Pakistan

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ABSTRACT

Total 9042 avian species are documented from whole world, while 668 species of birds are recorded in Pakistan. Six zoogeographic regions present in world, out of total, some parts of 3 regions i.e. Ethiopian, Palearctic and Oriental are present in Pakistan. Human has interaction with the avian species from the origin of human; and relation of human-avian could be seen in ethnopharmacology, art, folklores, food, calligraphy, culture, entertainment, poetry, omens and religion. The avian species has direct use values i.e. important for sustainable ecosystem and indirect use values i.e. clothing, food, medicines and material; both are important for human being and ecosystem. Avian species are important for ecosystem and ecology as; pollinators, seed dispersers and recycling of nutrients. Main objectives of the study were as to know avian diversity and ethnopharmacological application of avian species in study area. The linear count surveys along with direct and indirect methods were applied. Total 90 avian species were recorded during the research. It is concluded that area has high diversity of birds. During the research it is noted that 10 species of birds i.e. house crow, large billed crow, common pigeon, hill pigeon, snow pigeon, common wood pigeon, Asian koel, mountain scops owl, spotted owlet and short-eared owl were used for different ailment e.g. piles, wound healing, spleen problems, paralysis and parasites.

Keywords: Birds, Ethnopharmacological, Food, Kashmir

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INTRODUCTION

Biological diversity is essential aesthetically (Lindemann-Matthies *et al.*, 2010), educationally (Caro *et al.*, 2003), scientifically (Heyer *et al.*, 2014), economically (McNeely, 1988), culturally (Maffi, 2005; Altaf *et al.*, 2017), socially (Cilliers, 2010) and ethnomedicinally (Umair *et al.*, 2017; Altaf *et al.*, 2018b; Farooq *et al.*,

2019) it is the one of the major character of the fauna (Daly *et al.*, 1978). Variety of species is called diversity (Altaf *et al.*, 2013; Altaf, 2016). Different species have different habitats and niches (Daly *et al.*, 1978; Wiens and Graham, 2005). Human activities produce positive impacts on diversity of some species like house sparrows, Indian kites and etc. while produce negative impacts on many avian species (Altaf *et al.*, 2018a).

Total 9042 avian species are reported till now worldwide (Sibley and Monroe, 1990; Sibley and Monroe Jr, 1993); while 668 species of birds have been recorded in Pakistan (Grimmett, 1998; Mirza and Wasiq, 2007). Six bio-geographic regions present in world, out of three i.e. Ethiopian, Palearctic and Oriental are present in Pakistan.

Human has interaction with the avian species from the origin of human (Anderson, 2014); and relation of human-avian seen in ethnopharmacology (Altaf *et al.*, 2017; Altaf *et al.*, 2018b), art (Barrett and Sommerstein, 2003), calligraphy (al-Dīn and al-Ahdāl, 1986), culture (Altaf *et al.*, 2017), folklores (Swainson, 1886), food (Bailey, 1921), poetry (Vendler, 2015), religion (Afzaltousi and Jalalianfard, 2015), entertainment (Connell, 2009; Altaf *et al.*, 2017) and omens (Şekercioğlu *et al.*, 2012). The wildlife has direct use values i.e. important for sustainable ecosystem (Diamond and Filion, 1987; Sibley and Monroe Jr, 1993; Altaf, 2016) and indirect use values i.e. food, medicines, shelter, clothing and material; both are important and vital for human being and ecosystem (Mols and Visser, 2007). Avian species are important for ecosystem and ecology as; pollinators, seed dispersers and recycling of nutrients (Heine and Speir, 1989).

OBJECTIVES

1. To assess the avian diversity of the study area.
2. To study of ethnoornithology of the study area.

MATERIALS AND METHODS

STUDY AREA

I have collected the data from Chakar district (Hattian Bala). The total population of the Chakar district (Hattian Bala) is about 230529. The temperature of Hattian Bala is moderate (Figure 1).

ASSESSMENT OF AVIAN DIVERSITY

The linear count method was applied and avian diversity was assessed through direct and indirect counts. The direct count includes physical presence and voices while indirect count viz. presence of nests, fecal pellets, eggs and group questionnaire survey. Binoculars (32x50) was be used to observe the birds (Grimmett, 1998; Mirza and Wasiq, 2007) was be consulted to correctly identify the species.

STATISTICAL ANALYSIS

MS Excel (2007) was used to find out diversity indices Shannon-wiener diversity Index.

$$H' = - [\sum PIINPI]$$

Where H'=Diversity index

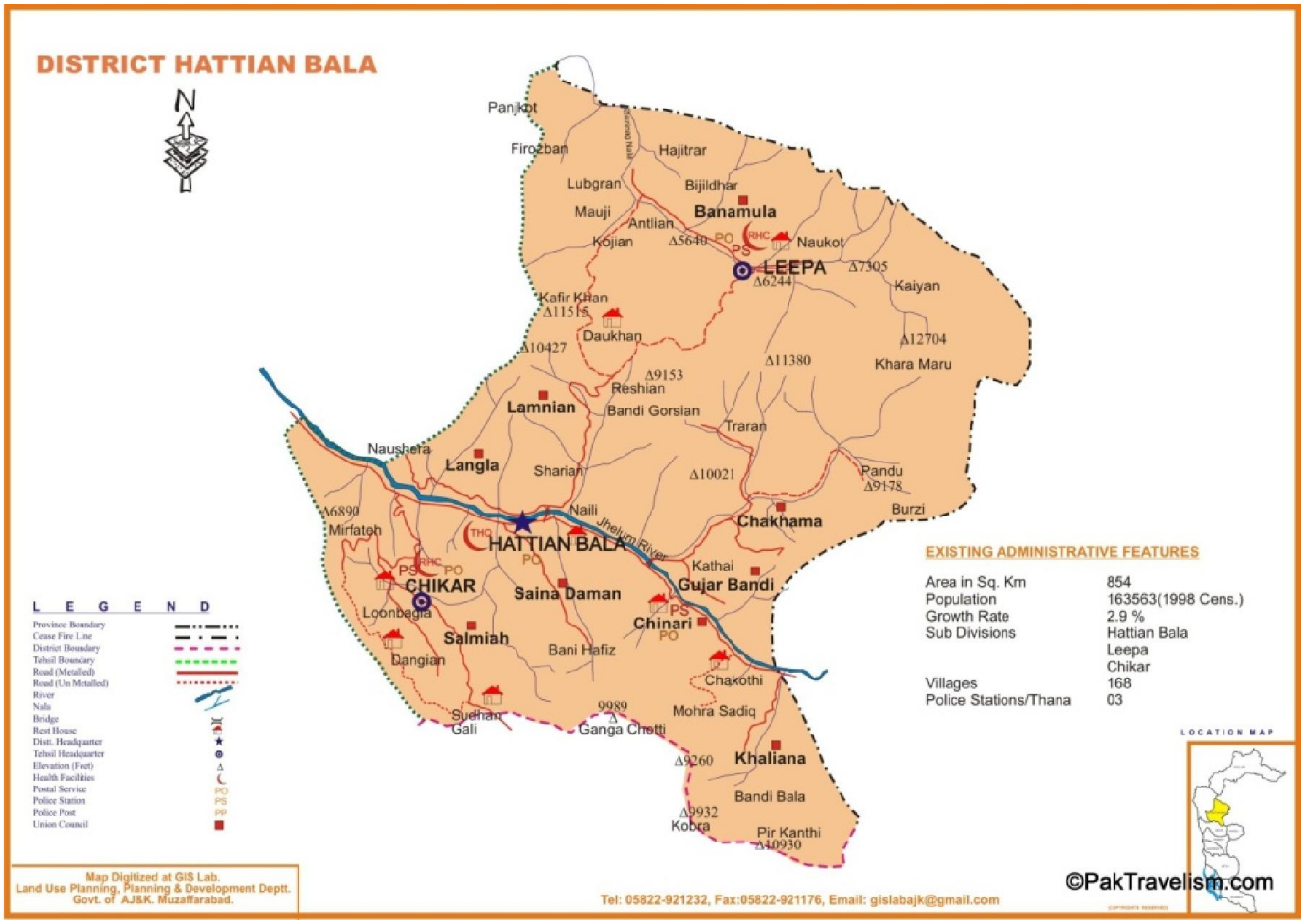

Figure 1: The map of the study area.

RESULTS AND DISCUSSION

The data collected from the study area respondent from Muslim male (n=64) and female (n=36) of adult, they lived in Qureshimuhala, Naangni, Shah kot, Kaiser kot, Jabber and Mehara, Chakar, district Hattian Balla. They belong to different casts as; Qureshi, Syed, Mughal, Meer, Khwaja and Raja. They were worked in different fields' like shepherds, student, laborer, farmer, shopkeeper, traditional healer and govt. employee. Most of respondents were educated 64% (Figure 2).

During the research noted that high diversity of birds was present in the study area. During the research 90 species of birds were present and population of total birds was 483. While Shannon-wiener diversity index was as 1.61831651.

Ali *et al.* (2017) noted 51 species of avifauna and 960 numbers were noted from coastline of Banbhore (Gharo creek), district Thatta, Sindh, Pakistan as shown in table 1. Dominance Index (D), Evenness Index (E), Margalef Index (R), Simpson diversity Index (S) and Shannon-wiener diversity Index (H') were recorded form the study area as; 0.03134, 0.7575, 7.268, 3.654 and 0.9687 respectively as shown in table 2. While Ali *et al.* (2016) recorded total 4280 population of birds from the Keti Bunder, District Thatta. Simpson Index (0.94), Shannon-wiener diversity Index (3.23), Margalef Index (5.74), Evenness Index (0.52) and Dominance Index (were noted as; 0.06). Altaf *et al.* (2015) total of 51 species of birds and 2531 numbers were recorded from head Marala. Simpson Index (0.86), Shannon-wiener diversity index (2.62), Margalef Index (6.38), Evenness (0.27) and Dominance Index (0.138) were documented.

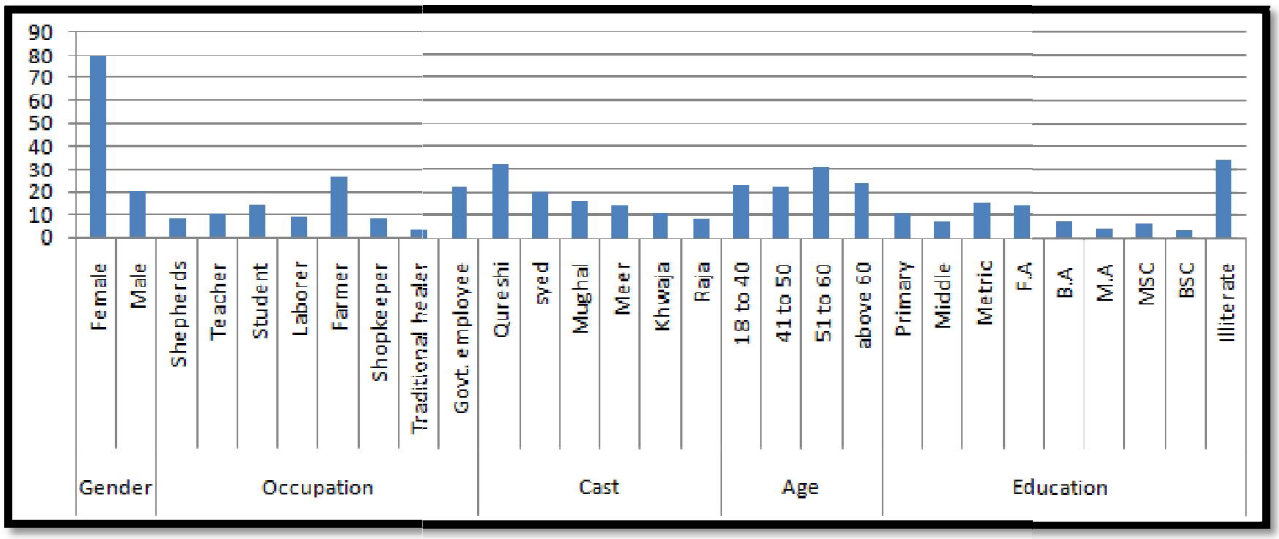

Figure 2: profile of respondents in study area.

During study 90 species were recorded i.e. grey- billed cuckoo, Indian cuckoo, Eurasian cuckoo, Eurasian sparrow hawk, common myna, common sandpiper, Oriental skylark, rosy pipit, little swift, common swift, cattle egret, European goldfinch, common rosefinch, red-rumped swallow, common pigeon, red-billed chough, large-billed crow, house crow, Asian house martin, rafous treepie, Himalayan woodpecker, black drongo, ashy drongo, little egret, spotted froktail, little froktail, Asian koel, verditer flycatcher, western tragopan, isabline shrik, kentish plover, northern lapwing, black-winged silt, mountain scopus owl, Asian barred owlet, griffon vulture, bam swallow, brown-flanked bush warbler, black bulbul, long tailed shrike, bay-backed shrike, yellow -crowned woodpecker, scaly- breasted munia, Himalayan monal, red crossbill, Asian paradise-flycatcher, black kite, chestnut-bellied rock thrush, citrine wagtail, Indian glogen oriole, common tailor bird, great tit, russet sparrow, house sparrow, plumbeous water redstart, tickills leaf warbler, lemon-rumped warbler, tytlers leaf warbler, scaly-bellied wood pecker, rufous-fronted prinia, straited prinia, graceful prinia, grey

breasted prinia, plain prinia, ashy prinia, blue-throat barbet, great barbet, plum-headed parakeet, Alexander parakeet, rose–ringed parakeet, slaty-headed parakeet, koklas pheasant, red–vented bulbul, Himalayan bulbul, white-eared bulbul, alpine chough, white throated fantail flycatcher, grey bush chat, common stone chart, spotted dove, Oriental turtle dove, spotted owlet alpine swift, Himalayan blue-tail robin, common wood shrike, white throated king fisher, streaked laughing thrush, yellow-billed magpie and Oriental white-eye recorded with relative abundance as; 0.002075, 0.004149, 0.002075, 0.002075, 0.045643, 0.002075, 0.004149, 0.002075,0.004149,0.004149, 0.045643, 0.002075, 0.004149, 0.006224, 0.012448, 0.002075, 0.0124481, 0.012448, 0.004149, 0.018672, 0.004149, 0.006224, 0.006224, 0.004149, 0.004149, 0.004149, 0.006224, 0.006224, 0.002075, 0.002075, 0.04149, 0.004149, 0.002075, 0.004149, 0.002075, 0.002075, 0.004149, 0.002075, 0.020747, 0.010373, 0.002075, 0.004149, 0.002075, 0.008229, 0.004149, 0.010373, 0.004149, 0.004149, 0.002075, 0.002075, 0.020747, 0.008229, 0.004149, 0.004149, 0.002075, 0.002075, 0.004149, 0.002075, 0.002075, 0.002075, 0.004149, 0.010373, 0.004149, 0.002075, 0.006224, 0.04149, 0.010373, 0.049793, 0.114108, 0.010373, 0.004149, 0.072614, 0.008229, 0.002075, 0.006224, 0.006224, 0.002075, 0.004149, 0.0006224, 0.002075, 0.004149, 0.004149, 0.006224, 0.002075, 0.004149, 0.002075, 0.093361, 0.006224 and 0.008299 respectively (Table 1).

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Table 1: the diversity of birds in the study area.

Sr	Common name	Scientific name	Pi/RA	LogPi	PiLogPi
1	Grey-billed Cuckoo	*Cacomantis passerinus*	0.002075	-2.68305	-0.005566488
2	Indian Cucko	*Cuculus micropterus*	0.004149	-2.38202	-0.009883888
3	Eurasian Cuckoo	*Cuculus canorus*	0.002075	-2.68305	-0.005566488
4	Eurasian Sparrowhawk	*Accipiter nisus*	0.002075	-2.68305	-0.005566488
5	Common Myna	*Acridotheres tristis*	0.045643	-1.34062	-0.061190323
6	Common Sandpiper	*Actitis hypoleucos*	0.002075	-2.68305	-0.005566488
7	Oriental Skylark	*Alauda gulgula*	0.004149	-2.38202	-0.009883888
8	Rosy pipit	*Anthus roseatus*	0.002075	-2.68305	-0.005566488
9	Little Swift	*Apus affinis*	0.004149	-2.38202	-0.009883888
10	Common Swift	*Apus apus*	0.004149	-2.38202	-0.009883888
11	Cattle egret	*Bubulcus ibis*	0.045643	-1.34062	-0.061190323
12	European goldfinch	*Carduelis carduelis*	0.002075	-2.68305	-0.005566488
13	Common rosefinch	*Carpodacus erythrinus*	0.004149	-2.38202	-0.009883888
14	Red-Rumped Swallow	*Cecropis daurica*	0.006224	-2.20593	-0.013729829

15	Common Pigeon	*Columba livia*	0.012448	-1.9049	-0.023712396
16	Red -billed Chough	*Corcorax melanorhamphos*	0.002075	-2.68305	-0.005566488
17	Large-billed Crow	*Corvus macrorhynchos*	0.124481	-0.9049	-0.112642629
18	House Crow	*Corvus splendens*	0.012448	-1.9049	-0.023712396
19	Asian House Martin	*Delichon dasypus*	0.004149	-2.38202	-0.009883888
20	Rafous Treepie	*Dendrocitta vagabunda*	0.024896	-1.60387	-0.039930269
21	Himalayan Woodpecker	*Dendrocopos himalayensis*	0.012448	-1.9049	-0.023712396
22	Black drongo	*Dicurus marcoccerus*	0.006224	-2.20593	-0.013729829
23	Ashy Drongo	*Dicrurus leucophaeus*	0.006224	-2.20593	-0.013729829
24	Little egret	*Egretta garzetta*	0.008299	-2.08099	-0.017269602
25	Spotted Forktail	*Enicurus maculatus*	0.012448	-1.9049	-0.023712396
26	Little Forktail	*Enicurus scouleri*	0.012448	-1.9049	-0.023712396
27	Asian Koel	*Eudynamys scolopaceus*	0.006224	-2.20593	-0.013729829
28	Verditer Flycatcher	*Eumyias thalassinus*	0.006224	-2.20593	-0.013729829
29	Western tragopan	*Francolinus francolinus*	0.002075	-2.68305	-0.005566488
30	Isabline Shrik	*Lanius isabellinus*	0.002075	-2.68305	-0.005566488
31	Kentish Plover	*Charadrius alexanderinus*	0.004149	-2.38202	-0.009883888
32	Northern Lapwing	*Vanellus indicus*	0.004149	-2.38202	-0.009883888
33	Black-winged stilt	*Himantopus himantopus*	0.002075	-2.68305	-0.005566488
34	Mountain scops owl	*Otus spilocephalus*	0.004149	-2.38202	-0.009883888
35	Asian Barred Owlet	*Glaucidium cuculoides*	0.002075	-2.68305	-0.005566488
36	Griffon Vulture	*Gyps fulvus*	0.002075	-2.68305	-0.005566488
37	Barn Swallow	*Hirundo rustica*	0.004149	-2.38202	-0.009883888
38	Brown-flanked Bush Warbler	*Horornis fortipes*	0.002075	-2.68305	-0.005566488
39	Black Bulbul	*Hypsipetes leucocephalus*	0.026971	-1.5691	-0.042320224
40	Long tailed Shrike	*Lanius schach*	0.010373	-1.98408	-0.020581712
41	Bay-backed Shrike	*Lanius vittatus*	0.002075	-2.68305	-0.005566488
42	Yellow-crowned Woodpecker	*Leiopicus mahrattensis*	0.002075	-2.68305	-0.005566488
43	Scaly-breasted Munia	*Lonchura punctulata*	0.004149	-2.38202	-0.009883888
44	Himalayan Monal	*Lophophorus impejanus*	0.002075	-2.68305	-0.005566488
45	Red crossbill	*Loxia curvirostra*	0.008299	-2.08099	-0.017269602
46	Asian Paradise –flycatcher	*Macropodus opercularis*	0.004149	-2.38202	-0.009883888
47	Black Kite	*Milvus migrans*	0.010373	-1.98408	-0.020581712
48	Chestnut-bellied Rock Thursh	*Monticola rufiventris*	0.004149	-2.38202	-0.009883888
49	Citrine wagtail	*Motacilla citreola*	0.004149	-2.38202	-0.009883888
50	Indian Golgen Oriole	*Oriolus kundoo*	0.002075	-2.68305	-0.005566488
51	Common Tailor Bird	*Orthotomus sutorius*	0.002075	-2.68305	-0.005566488
52	Great Tit	*Parus major*	0.020747	-1.68305	-0.034917988
53	Russet Sparrow	*Passer cinnamomeus*	0.008299	-2.08099	-0.017269602

54	House Sparrow	*Passer domesticus*	0.004149	-2.38202	-0.009883888
55	Plumbeous Water Redststart	*Phoenicurus fuliginosus*	0.004149	-2.38202	-0.009883888
56	Tickell'sLeaf Warbler	*Phylloscopus affinis*	0.002075	-2.68305	-0.005566488
57	Lemon-rumped Warbler	*Phylloscopus chloronotus*	0.002075	-2.68305	-0.005566488
58	Tytler's Leaf Warbler	*Phylloscopus tytleri*	0.004149	-2.38202	-0.009883888
59	Scaly-bellied Woodpecker	*Picus squamatus*	0.002075	-2.68305	-0.005566488
60	Rufous-fronted Prinia	*Prinia buchanani*	0.002075	-2.68305	-0.005566488
61	Striated Prinia	*Prinia crinigera*	0.002075	-2.68305	-0.005566488
62	Graceful Prinia	*Prinia gracilis*	0.004149	-2.38202	-0.009883888
63	Grey breasted Prinia	*Prinia hodgsonii*	0.010373	-1.98408	-0.020581712
64	Plain Prinia	*Prinia inornata*	0.004149	-2.38202	-0.009883888
65	Ashy Prinia	*Prinia socialis*	0.002075	-2.68305	-0.005566488
66	Blue-throat Barbet	*Psilopogon asiaticus*	0.006224	-2.20593	-0.013729829
67	Great Barbet	*Psilopogon virens*	0.041494	-1.38202	-0.057345106
68	Plum-headed Parakeet	*Psittacula cyanocephala*	0.010373	-1.98408	-0.020581712
69	Alexander Parakeet	*Psittacula eupatria*	0.049793	-1.30284	-0.064871492
70	Rose-ringed Parakeet	*Psittacula krameri*	0.114108	-0.94268	-0.107567716
71	Slaty-headed Parakeet	*Psittacula krameri*	0.010373	-1.98408	-0.020581712
72	Koklas pheasant	*Pucrasia macrolopha*	0.004149	-2.38202	-0.009883888
73	Red vented bulbul	*Pycnonotus cafer*	0.072614	-1.13898	-0.082705944
74	Himalayan Bulbul	*Pycnonotus leucogenys*	0.008299	-2.08099	-0.017269602
75	White -eared Bulbul	*Pycnonotus leucotis*	0.002075	-2.68305	-0.005566488
76	Alpine Chough	*Pyrrhocorax graculus*	0.006224	-2.20593	-0.013729829
77	White-throated fantail flycatcher	*Rhipidura albicollis*	0.006224	-2.20593	-0.013729829
78	Pied Bushchat	*Saxicola caprata*	0.002075	-2.68305	-0.005566488
79	Grey Bushchat	*Saxicola ferreus*	0.004149	-2.38202	-0.009883888
80	Common Stonechart	*Saxicola torquatus*	0.006224	-2.20593	-0.013729829
81	Spotted Dove	Spilopelia chinensis	0.002075	-2.68305	-0.005566488
82	Oriental Turtle Dove	*Streptopelia orientalis*	0.004149	-2.38202	-0.009883888
83	Spotted owlet	*Strix occidentalis*	0.004149	-2.38202	-0.009883888
84	Alpine Swift	*Tachymarptis melba*	0.006224	-2.20593	-0.013729829
85	Himalayan bluetail Robin	*Tarsiger rufilatus*	0.002075	-2.68305	-0.005566488
86	Common Woodshrike	*Tephrodornis pondicerianus*	0.004149	-2.38202	-0.009883888
87	White -throated Kingfisher	*Todiramphus godeffroyi*	0.002075	-2.68305	-0.005566488
88	Streaked Laughingthrush	*Trochalopteron lineatum*	0.093361	-1.02983	-0.096146377
89	Yellow- billed Blue Magpie	*Urocissa flavirostris*	0.006224	-2.20593	-0.013729829
90	Oriental White-eye	Zosterops palpebrosus	0.008299	-2.08099	-0.017269602
Shannon-wiener					-1.61831651

During the research it is noted that 10 species of birds i.e. house crow, large billed crow, common pigeon, hill pigeon, snow pigeon, common wood pigeon, Asian Koel, mountain scops owl, spotted owlet and short-eared owl for different ailment e.g. piles, wound healing, spleen problems, paralysis and parasites (Table 2). The presence of omega-3 fatty acid in fat that may treat inflammation (Wilson, 2015). this is also helpful in neural and aging affects (Breteler, 2000; Kalmijn, 2000; Haag, 2003).

Table 2: Ethno–avian observation of the study area.

Sr.	Common Name	Local Name	Part used	Mode of application	Treatments
01	House Crow	Kagh	Blood	Topical	Piles
02	Large billed Crow	Kank	Blood	Topical	Piles
03	Common Pigeon	Kalbootr	Soup	Oral	Wound healing
04	Hill Pigeon	Kalbootr	Soup	Oral	Wound healing
05	Snow Pigeon	Kalbootr	Soup	Oral	Wound healing
06	Common Wood Pigeon	Kalbootr	Soup	Oral	Wound healing
07	Asian Koel	Kal Cheat	Meat	Oral	Spleen problems
08	Mountain Scops Owl	Tand	Fat	Topical	Paralysis
09	Spotted Owlet	Mortun	Blood	Topical	Parasites
10	Short eared owl	Tand	Blood	Topical	Parasites

REFERENCES

Afzaltousi, E., N. Jalalianfard. 2015. Influence of Religion on symbolic birds in Islamic calligraphy.

al-Dīn, A.a.D., I.b.M.a.-Q. al-Ahdāl. 1986. Kitab al-Aqmār al-Muḍi'ah Sharh al-Qawā'id al-Fiqhiyyah Maktabah Jeddah.

Ali, A., M. Altaf, M.S.H. Khan. 2016. Winter survey of birds at Keti Bunder, district Thatha, Pakistan. Punjab Univ. J. Zool. 31: 203-208.

Ali, A., M. Altaf, M.S.H. Khan, A.M. Khan, S. Ashraf, S.A. Chattha. 2017. Avifauna diversity along the coastline of Banbhore (Gharo creek), district Thatta, Sindh, Pakistan. Journal of Wildlife and Ecology. 1: 8-16.

Altaf, M. 2016. Assessment of Avian and Mammalian Diversity at Selected Sites along river Chenab University of Veterinary and Animal Sciences, Lahore-Pakistan.

Altaf, M., A. Javid, Irfan, M.A. Munir, S. Ashraf, K.J. Iqbal, M. Umair. 2013. Diversity, distribution and ecology of birds in summer season at head Khanki, Punjab, Pakistan. BIOLOGIA (PAKISTAN). 59: 131-137.

Altaf, M., A. Javid, A.M. Khan, M. Khan, M. Umair, Z. Ali. 2018a. Anthropogenic impact on the distribution of the birds in the tropical thorn forest, Punjab, Pakistan. Journal of Asia-Pacific Biodiversity. 11: 229-236.

Altaf, M., A. Javid, A.M. Khan, M. Umair, Irfan, S. Ashraf, M. Idnan, M.S. Haider, Z. Ali. 2015. Assessment of water fowl diversity of River Chenab, Pakistan. The Journal of Animal & Plant Sciences. 25: 382-388.

Altaf, M., A. Javid, M. Umair, K.J. Iqbal, Z. Rasheed, A.M. Abbasi. 2017. Ethnomedicinal and cultural practices of mammals and birds in the vicinity of river Chenab, Punjab-Pakistan. Journal of ethnobiology and ethnomedicine. 13: 41.

Altaf, M., M. Umair, A.R. Abbasi, N. Muhammad, A.M. Abbasi. 2018b. Ethnomedicinal applications of animal species by the local communities of Punjab, Pakistan. Journal of ethnobiology and ethnomedicine. 14: 55.

Anderson, P.K. 2014. Social dimensions of the human–avian bond: parrots and their persons. Anthrozoös. 27: 371-387.

Bailey, E.H.S. 1921. Food Products: Their Souce, Chemistry, and Use. P. Blakiston's son & Company.

Barrett, D., A.H. Sommerstein. 2003. The Birds and Other Plays. Penguin UK.

Breteler, M.M. 2000. Vascular risk factors for Alzheimer's disease:: An epidemiologic perspective. Neurobiology of aging. 21: 153-160.

Caro, T., M.B. Mulder, M. Moore. 2003. Effects of conservation education on reasons to conserve biological diversity. Biological Conservation. 114: 143-152.

Cilliers, S. 2010. Social aspects of urban biodiversity–an overview. In: N. Müller, P. Werner & J. Kelcey, Urban biodiversity and design—implementing the convention on biological diversity in towns and cities. p 81-100.

Connell, J. 2009. Birdwatching, twitching and tourism: towards an Australian perspective. Australian Geographer. 40: 203-217.

Daly, H.V., J.T. Doyen, P.R. Ehrlich. 1978. Introduction to insect biology and diversity. McGraw-Hill Book Company.

Diamond, A., F.L. Filion. 1987. The Value of Birds: Based on the Proceedings of a Symposium and Workshop Held at the 19 World Conference of the International Council for Bird Preservation, June 1986, Kingston, Canada. ICBP.

Farooq, A., M.S. Amjad, K. Ahmad, M. Altaf, M. Umair, A.M. Abb. 2019. Ethnomedicinal knowledge of the rural communities of Dhirkot, Azad Jammu and Kashmir, Pakistan. Ethnobiology and Ethnomedicine. 15: 1-45.

Grimmett, R., Inskipp, C. & Inskip, T. 1998. Birds of the Indian subcontinent. Christopher Helm an imprint of A and C Black (Publisher) Ltd, 35 Bedford Row, London WCIR 4JH.

Haag, M. 2003. Essential fatty acids and the brain. The Canadian Journal of Psychiatry. 48: 195-203.

Heine, J., T. Speir. 1989. Ornithogenic soils of the Cape Bird Adelie penguin rookeries, Antarctica. Polar Biology. 10: 89-99.

Heyer, R., M.A. Donnelly, M. Foster, R. Mcdiarmid. 2014. Measuring and monitoring biological diversity: standard methods for amphibians. Smithsonian Institution.

Kalmijn, S. 2000. Fatty acid intake and the risk of dementia and cognitive decline: a review of clinical and epidemiological studies. Journal of Nutrition Health. Aging. 4: 202-207.

Lindemann-Matthies, P., X. Junge, D. Matthies. 2010. The influence of plant diversity on people's perception and aesthetic appreciation of grassland vegetation. Biological Conservation. 143: 195-202.

Maffi, L. 2005. Linguistic, cultural, and biological diversity. Annu. Rev. Anthropol. 34: 599-617.

McNeely, J.A. 1988. Economics and biological diversity: developing and using economic incentives to conserve biological resources. Iucn.

Mirza, Z.B., H. Wasiq. 2007. A field guide to birds of Pakistan Bookland, Lahore.

Mols, C.M., M.E. Visser. 2007. Great tits (Parus major) reduce caterpillar damage in commercial apple orchards. PloS one. 2: e202.

Şekercioğlu, Ç.H., R.B. Primack, J. Wormworth. 2012. The effects of climate change on tropical birds. Biological Conservation. 148: 1-18.

Sibley, C., B. Monroe Jr. 1993. A world checklist of birds. Ann Arbor, MI: Edwards Brothers Inc.

Sibley, C.G., B.L. Monroe. 1990. Distribution and Taxonomy of Birds of the World.

Swainson, C. 1886. The folk lore and provincial names of British birds. Folk-lore Society.

Umair, M., M. Altaf, A.M. Abbasi. 2017. An ethnobotanical survey of indigenous medicinal plants in Hafizabad district, Punjab-Pakistan. PloS one. 12: e0177912.

Vendler, H. 2015. The ocean, the bird, and the scholar: Essays on poets and poetry. Harvard University Press.

Wiens, J.J., C.H. Graham. 2005. Niche conservatism: integrating evolution, ecology, and conservation biology. Annu. Rev. Ecol. Evol. Syst. 36: 519-539.

Wilson, L. 2015. Fats and oils for optimum health. The Center for Development.

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