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Diversity and Abundance of Avifauna of Haigam Wetland and Its Adjoining Areas, J&K, India

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ABSTRACT: Valley of Kashmir is well known for its vast avian diversity and its full bloomed wetland ecosystems which encompass four Ramsar sites and many other wetlands and lakes. The study was carried out at Haigam wetland, Kashmir from February 2015- March 2016, with the objectives to determine avian diversity and abundance. Strip-transect method and point count method was employed. The Haigam wetland provides habitat for a large number of birds belonging to 78 genera. Despite being distinguished for winter visiting waterfowl species, the wetland is dominated by passerine bird species with around 38 species known. About 103 species of birds have been recorded. The species composition was significantly different during different seasons. Diversity was calculated using both Shannon-Weiner index and Simpson's index of diversity. The diversity trend follows spring with highest diversity (H= 3.939), followed by summer (H=3.848), autumn (H=2.696) and lowest in winter (H=2.538). Spring season showed more evenly distributed avifauna (E=0.524) and lowest evenness during winter season (E=0.328). Typha spp. harvesting, hunting and cattle grazing are major threats to the wetland birds.

KEYWORDS: Haigam wetland, Diversity, Evenness, Abundance, Strip-transect method, Waterfowl.

I.INTRODUCTION

Wetlands are found throughout the biosphere and are the most important habitat as they perform a variety of functions. Kashmir valley is speckled by water bodies like rivers, wetlands, lakes, paddy fields and artificial reservoirs. All these habitats support a rich biodiversity, and provide important habitats for migratory water-birds within the Central Asian Flyway (Wetlands International 2007). Wular, and Hokersar, have already been declared Ramsar sites, owing to their biodiversity value. Also, Wular, Hokersar, Haigam, and Shalabugh have been documented in the network of Important Bird Areas [1] [2].The famous ornithologist of India, Salim Ali once pronounced "Kashmir is heaven for migratory birds". Kashmir valley has always been considered as wealthy in floral and faunal diversity. About 187 species of birds have been recorded from the valley. More than 3 lakh water-birds migrate to Kashmir wetlands during winter season for feeding, as wetlands of Kashmir provide ambient environment for survival of these migratory birds including Graylag goose, Mallard, Pochard, Eurasian coot, Gadwall etc. Wetlands act as transition zone between terrestrial and aquatic ecosystems and are highly diverse and productive habitats [3].

Present study is unique in the sense that it is the first endeavour to explore the avifaunal diversity of Haigam wetland including all the genera as only water-bird fauna of the area has been described separately. This study also provides statistical evaluations for avifaunal diversity documentation.

II. RELATED WORK

Majority of work has been carried out on the bird fauna , diversity, their breeding biology and behavior. A few studies show avifaunal diversity of waterfowl species which include 13 waterfowl species at Haigam wetland. Understanding

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the diversity and abundance of bird communities is essential to demarcate the significance of regional or local landscapes for conservation of birds [4]. Birds are considered to be noble indicators of environmental quality and are frequently being used to monitor environmental and ecosystem health [5]. Bird assemblages based on species composition, abundance, richness and diversity along with other attributes such as rarity and endemism are often used for ornithological evaluations and assignment of protection value to sites [6].

III.STUDY AREA

The study was carried out at Haigam wetland, a biosphere reserve commonly called as ***Hygamrakh*** which is located in Baramulla district of Kashmir valley, about 44km northwest of capital city Srinagar. It is ovoid in outline and has an area of about 4.5km^2. The coordinates of the wetland location are 34°13′30″—34°16′4″N latitudes and 74°30′27″ - 74°32′33″E longitudes at an altitude of 1585m (a.m.s.l) on the flood plains of river Jhelum with a maximum depth of 1.2m (Fig.1). The major part of the wetland is dominated by extensive reed-beds with boat channels (1-3.5m in width) in between the belts and pools of open water areas, scattered in the reeds.

The wetland is recognized as important bird area (IBA) and is one of the waterfowl census areas. Thousands of winter visiting water birds can be found diving and feeding in the pools of the wetland. The wetland provides a scenic view during winter season because of these winter visitors.

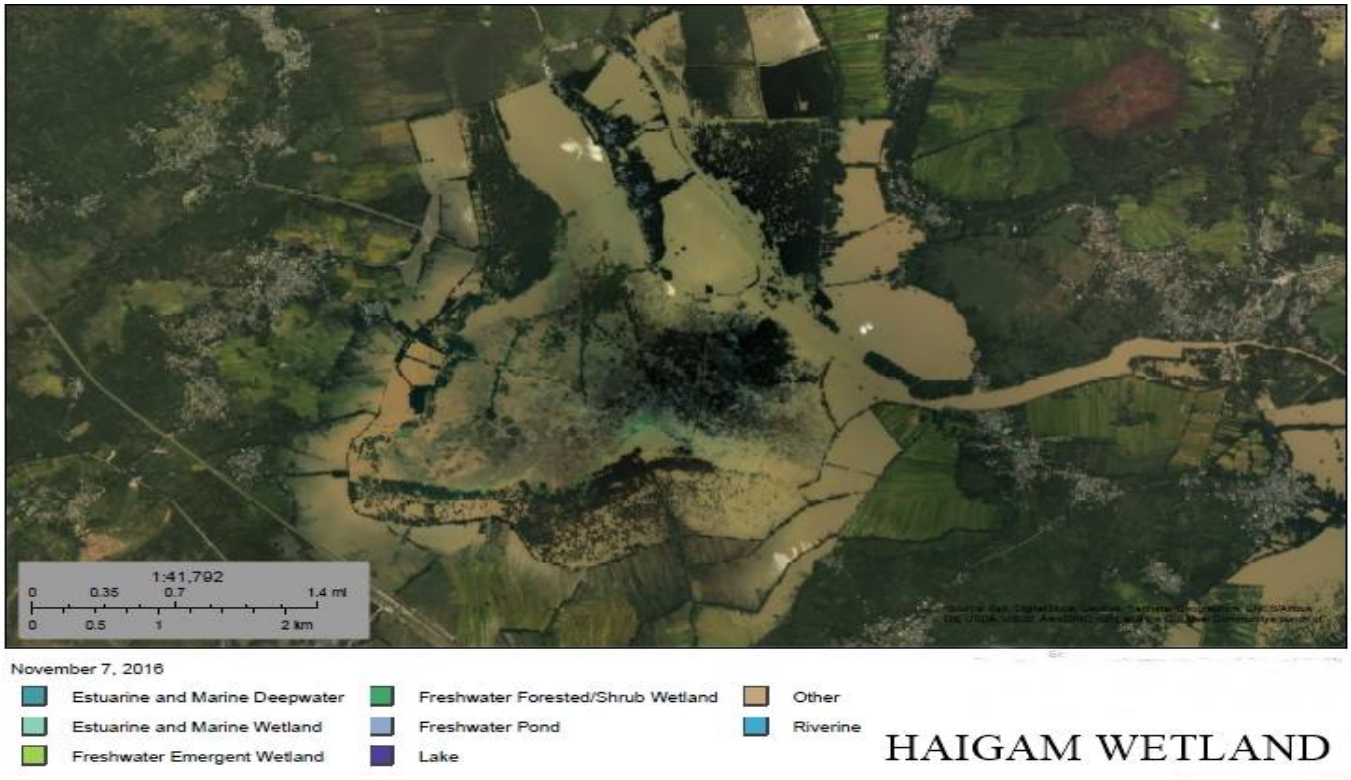

Fig 1: Satellite view of Haigam wetland.

IV. METHODS

The Haigam wetland and its adjoining areas are the specific sites where the study was carried out. The study was conducted from February 2015- March 2016, covering all the four seasons.

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Stratification of study area and its sampling design:
The study area was stratified according to habitat type and the sampling unit within the habitat was determined and assigned on the basis of area coverage and vegetation type. Stratification was made following the methods of [7], [8] and [9]. Four sampling sites were chosen in this wetland. Site A-Inlet site, Site -B macrophyte infested site, Site-C Open water site and Site D-plantation site which usually dries up during summer season. For bird counting two transect methods were used, strip transect method and point count method. Strip transect method was employed while travelling through the boat channels and birds were counted 50 meters on left and right sides from the boat, covering a distance of 200m for every transect. Point count method was employed for counting birds while travelling on foot through the dry areas of the wetland and along the wetland edges. Sampling sites followed the established transect on the terrestrial area and with an interval of 100 m apart. A total of 7 observation sites were established in plantation zones of wetland with an interval of 100 m apart, [10]. In the interior of the wetland i.e., the open water and macrophyte infested zones, about 5 observation sites were established. Monitoring of transects was done during early hours in morning and late in evening, since peak activity of birds lasts 1 to 2 hours after sunrise and before sunset as done by [11] and [12]. For each transect, an observer recorded any species and its number in the area with the help of binoculars. Birds were counted as bird seen or heard. Birds were photographed using Sony alpha camera with 70mm to 300mm zoom lens. For getting proper visuals of birds Nikon binoculars (10X×50X) were used and a field guide by [13] and [14] was also used for bird identification.

Statistical Analysis: For the statistical analysis PAST version 2.17C was used (Hammer*et al.,* 2001) to find out the Simpson diversity, Shannon Weiner diversity (H) and Evenness (E).

V.**RESULTS AND DISCUSSION**

The present study on bird community structure of Haigam wetland revealed the presence of 103 species of birds belonging to 78 genera and spread over 45 families belonging to 15 orders. Wetlands in Kashmir are well known feeding grounds for winter migratory waterfowl often in spectacular concentrations. [15] and [16] [17], reported that winter migratory waterfowl use wetlands for rest and other activities while waiting for the favorable condition of their homeland, as winter in their homeland is very severe and is devoid of food because lakes and ponds freeze. These birds feed actively in the wetlands of Kashmir that gives them the opportunity to store enough fats for the journey back to Europe for breeding [15]. It was observed that seeds produced by various aquatic plants and the fish (carp Spp.) attract several bird species, like ducks, geese and cormorants. [18] Reported that there is a positive correlation between the avian species diversity and richness with the vegetation cover. [19] Pointed out that bird diversity and richness increases with increase in availability of food. Even though water-birds are one of the most obvious indicator of richness and diversity of Haigam wetland, it is more dominated by passerine birds with 38 species as compared to other groups. Seasonal distribution, and residential status of the birds has been done and different categories like resident, summer visitor, winter visitor and altitudinal migrant have been assigned with reference to the study area. Bird species were categorized as very common, common, uncommon and rare [20]. Analysis of data on residential status revealed that out of 103 species of birds, 41.74% were resident (43 species), 29.12% were summer visitors (30 species), 24.27% were winter visitors (25 species) and 4.8% were local altitudinal migrants (5 species) {fig.2}. The relative abundance scores of species showed, 13 species were abundant, 37 species were common, 27 species were frequent 19 species were uncommon and 7 species were rare {fig.3}.

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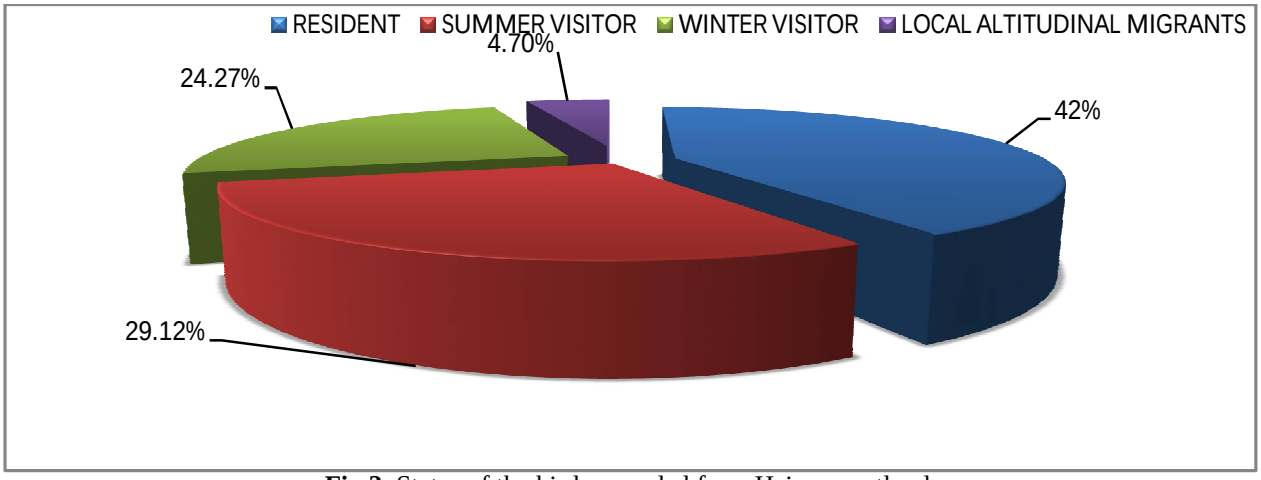

Fig 2: Status of the birds recorded from Haigam wetland.

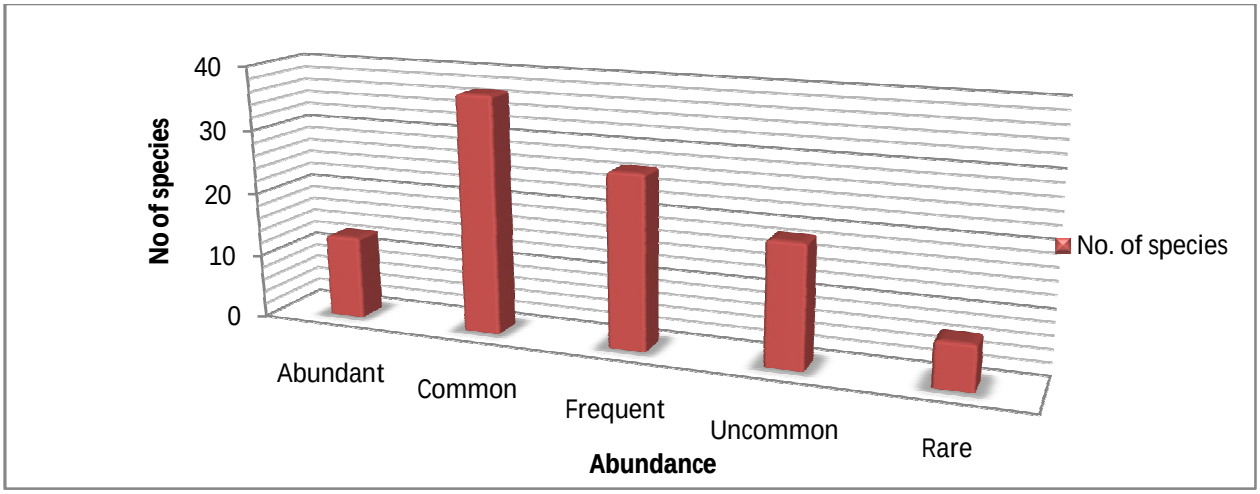

Fig: 3: Relative abundance of bird species at Haigam wetland Kashmir.

Both Shannon-Wiener index and Simpson's index of diversity were used to determine the diversity and evenness of avifauna at the wetland. The results show highest diversity as well as evenness of avifauna during spring followed by summer, autumn and lowest in winter. Table. 1. (Shannon-Wiener Index and Simpsons Index of Diversity) {Fig 4}. In Spring season highest species richness (76) was found followed by summer (66), winter (48) and lowest during autumn (21). Autumn season shows low species richness of both residents and summer migrants. This is due to the fact that summer migrants leave back to their feeding grounds and resident birds move towards residential areas and nearby paddy fields. Burning of emergent vegetation like *Typha*spp. in October and November by wildlife authorities making grounds for the winter migrants which hampers the nesting and breeding sites for birds that breed in early spring. [17] also reported the effect of vegetation destruction affects breeding success of birds in Haigam wetland. Towards the end of autumn season about 60% of the wetland dries up. Haigam wetland is under threat due to its destruction by local poachers and indiscriminate cattle grazing, which in turn affect the diversity of birds. Destruction of wetland habitat pose a threat to breeding birds, combined with illegal egg collection, and indiscriminate poaching, caused mallards to discontinue breeding in Kashmir, reducing their number, although they do overwinter here in huge

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numbers [21] [17]. Also reported by [22], that degradation of wetlands and the loss of suitable upland habitats that surround wetlands may contribute to the reduction in avifaunal population.

season	No of species	No of individuals	H	E	D	SID	SRD
winter	48	2256	2.538	0.328	0.077	0.92	12.98
spring	76	1841	3.939	0.524	0.018	0.982	55.55
summer	66	2187	3.848	0.5	0.02	0.98	50
autumn	21	573	2.696	0.44	0.074	0.926	13.51

Table.1: Avian species diversity and Evenness at Haigam wetland during four seasons by Shanon Weiner index and Simpson's index of diversity.

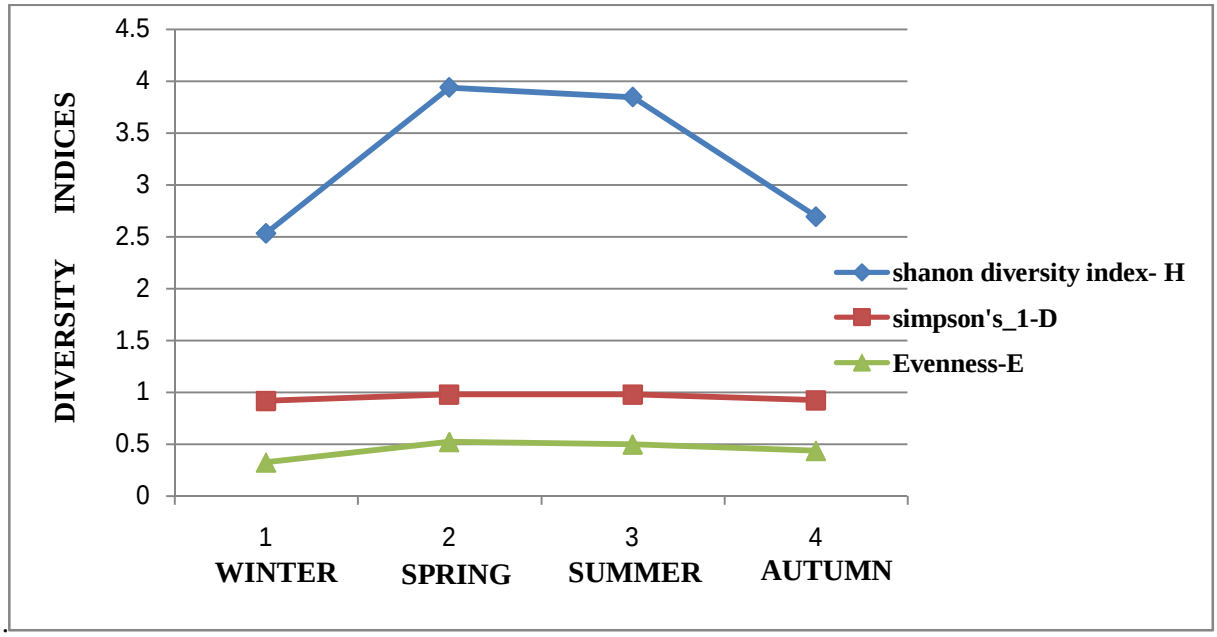

Fig:-4. Species diversity indices during four seasons at Haigam wetland

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S. No.	Common name	Scientific name	Conservation status				Residential status	Abundance status	Population trend
			Globally threatened	CITES(2002) Appendix	CMS Appendix	W(P)Act1972 schedule			
		Podicipediform Podicipedidae							
1	Little grebe	*Tachybaptusruficolis*				IV	R	A	INC
2	Great-crested grebe	*Podicepscristatus*				IV	WV	F	SS
		Suliformes Phalacrocoracidae							
3	Little cormorant	*Phalacocoraxniger*				IV	WV	C	
4	Great cormorant	*Phalacocorax carbo*				IV	WV	C	
		Pelicaniformes Ardeidae							
5	Little egret	*Egrettagarzetta*				IV	LAM	C	
6	Cattle egret	*Bubulcus ibis*				IV	LAM	C	
7	Indian pond heron	*Ardeolagrayii*				IV	R	C	
8	Grey heron	*Ardeacinerea*				IV	R	F	
9	Black crowned night heron	*Nycticoraxnycticorax*				IV	LAM	C	STA
10	Little bittern	*Ixobrychusminutus*				IV	LAM	C	
		Anseriformes Anatidae							
11	Graylag goose	*Anseranser*				IV	WV	C	INC
12	Mallard	*Anasplatyrhynchos*				IV	R/WV	A	
13	Northern pintail	*Anasacuta*				IV	WV	A	DEC
14	Common teal	*Anascreca*				IV	WV	A	DEC
15	Northern shoveller	*Anasclypeata*				IV	WV	C	DEC
16	Eurasian wigeon	*Anas Penelope*				IV	WV	C	INC
17	Garganey	*Anasquerquedula*				IV	WV	A	
18	Gadwall	*Anasstrepera*				IV	WV	C	
19	Common pochard	*Aythyaferina*				IV	WV	C	STA
20	Tufted pochard	*Aythyafuligula*				IV	WV	C	INC
21	Red-crested pochard	*Nettarufina*				IV	WV	F	DEC
22	Ferruginous pochard	*Aythyanyroca*	NT		I	IV	WV	F	DEC
23	Ruddy shelduck	*Tadornaferruginea*				IV	WV	F	
24	Common shelduck	*Tadornatadorna*				IV	WV	F	
		Falconiformes Accipitridae							
25	Palla's fish eagle	*Haliaeetusleucoryphus*	GT/Vu	I	I	I	WV	Ra	DEC
26	Black kite	*Milvus migrans*				IV	R	C	
27	Eurasian Marsh harrier	*Circus aeruginous*				I	WV	F	
28	Eurasian sparrowhawk	*Accipter nisus*				IV	R	Ra	
		Pandionidae							
29	Osprey	*Pandion haliatus*			II	I	WV	Ra	
		Strigiformes Strigidae							
30	Tawny owl	*Strix aluco*					R	Ra	
		Tytonidae							
31	Barn owl	*Tyto alba*				IV	R	Ra	
		Gruiformes Rallidae							
32	Water rail	*Rallusaquaticus*				IV	WV	F	
33	Baillon's crake	*Porzanapusilla*			II	IV	R	Ra	
34	Common moorhen	*Gallinulachloropus*				IV	R	A	

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35	Grey-headed Swamphen	*Porphyriopoliocephalus*				IV	R	F	
36	Eurasian coot	*Fulicaatra*				IV	WV	A	
			Charadiformes Jacanidae						
37	Pheasant-tailed jacana	*Hydrophasianuschirurgus*				IV	SV	C	
			Recurvirostridae						
38	Black winged stilt	*Himantopushimantopus*				IV	R	F	
			Charadriidae						
39	Northern lapwing	*Vanellusvanellus*	NT		II		WV	UC	
			Ibidorhynchidae						
40	Ibisbill	*Ibidorhynchastruthersii*	BRD(05)			IV	R	F	
			Scolopacidae						
41	Common snipe	*Gallinagogallinago*				IV	R	C	
42	Jack snipe	*Lymnocryptesminimus*				IV	WV	UC	
43	Common sandpiper	*Actitishypoleucos*				IV	R	F	
44	Wood sandpiper	*Tringaglareola*				IV	SV	UC	
			Sternidae						
45	Whiskered tern	*Chlidoniashybrida*				IV	SV	C	
			Laridae						
46	Brown headed gull	*Chroicocephalusridibundus*	BRD(05)			IV	WV	UC	
			Columbiformes Columbidae						
47	Rock Dove	*Columba livia*				IV	R	A	
48	Eurasian collared dove	*Streptopeliadecaocta*				IV	SV	A	
49	Oriental turtle dove	*Streptopeliaorientalis*				IV	SV	UC	
			Psittaciformes Psittaculidae						
50	Rose-ringed parakeet	*Psittaculakrameri*				IV	R	F	
51	Slaty-headed parakeet	*Psittaculahimalayana*					R	UC	
			Cuculiformes Cuculidae						
52	Eurasian cuckoo	*Cuculuscanorus*				IV	SV	UC	
53	Himalayan cuckoo	*Cuculussaturatus*				IV	SV	F	
54	Lesser cuckoo	*Cuculuspoliocephalus*				IV	SV	F	
			Coraciiformes Alcedinidae						
55	Common kingfisher	*Alcedoatthis*				IV	R	C	
			Halcyonidae						
56	White-throated kingfisher	*Halcyon smyrnensis*				IV	R	C	
			Cerylidae						
57	Pied kingfisher	*Cerylrudis*				IV	R	C	
58	Crested kingfisher	*Magacerylelugibris*				IV	R	C	
			Meropidae						
59	European bee-eater	*Meropsapiaster*				IV	SV	Ra	
			Coraciidae						
60	Eurasian roller	*Coraciasgarrulus*				IV	SV	C	
			Bucerotiformes Upapidae						
61	Common hoopoe	*Upupaepops*				IV	SV	C	
			Piciformes Picidae						
62	Himalayan woodpecker	*Dendrocoposhimalayensis*				IV	R	F	
63	Brown-fronted pied woodpecker	*Dendrocoposauriceps*				IV	R	UC	
64	Scaly-bellied woodpecker	*Picussquamatus*				IV	SV	F	
65	Eurasian wryneck	*Jynxtorquilla*					SV	UC	

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Passeriformes Passeridae									
66	House sparrow	*Passer domesticus*				IV	R	A	
Hirundinidae									
67	barn swallow	*Hinundorustica*				IV	SV	C	
Alaudidae									
68	Oriental skylark	*Alaudagulgula*				IV	SV	UC	
69	Eurasian skylark	*Alaudaarvensis*				IV	SV	UC	
Dicruridae									
70	Ashy drongo	*Dicrurusleucophaeus*				IV	R	C	
Laniidae									
71	Long-tailed shrike	*Laniusschach*				IV	SV	C	
Oriolidae									
72	Indian golden oriole	*Orioluskundoo*				IV	SV	C	
Monarchidae									
73	Indian paradise flycatcher	*Terpsiphone paradise*				IV	SV	C	
Sturnidae									
74	Common myna	*Acridotherestristis*				IV	R	C	
75	Common starling	*Sturnus vulgaris*				IV	SV	C	
Pycnonotidae									
76	Himalayan bulbul	*Pycnonotusleucogenys*				IV	R	A	
Paridae									
77	Coal tit	*Periparusater*				IV	SV	UC	
78	Great tit	*Parus major*				IV	SV	C	
Corvidae									
79	House crow	*Corvussplendens*				IV	R	A	
80	Eurasian jackdaw	*Corvusmonedula*				IV	R	A	
81	Jungle crow	*Corvusmacrorhynchos*				IV	R	C	
82	Short-billed minivet	*Pericrocotusleucogenys*				IV	SV	F	
83	Yellow-billed blue magpie	*Urocirraflavirostris*				IV	R	C	
Muscicapidae									
84	Pied bushchat	*Saxicolacaprata*				IV	SV	UC	
85	Common stonechat	*Saxicolatorquata*				IV	SV	F	
86	Plumbeous water redstart	*Rhyacornisfuliginosa*				IV	R	F	
87	White-caped redstart	*Chaimarrornisleucocephalus*				IV	R	UC	
88	Little forktail	*Enicurusscouleri*				IV	R	F	
89	Spotted forktail	*Enicurusmaculatus*				IV	R	UC	
90	White-tailed rubythroat	*Lucinia pectoralis*				IV	LAM	F	
91	Blue-whistling thrush	*Myiophonuscaeruleus*				IV	R	C	
Turdidae									
92	Tickell's thrush	*Turdus unicolor*				IV	R	UC	
Leiothrichidae									
93	Streaked laughing thrush	*Garrulaxlineatus*				IV	R	C	
94	Variegated laughing thrush	*Garrulaxvariegatus*				IV	R	F	
Acrocephalidae									
95	Clamorous reed warbler	*Acrocephalusstentoreus*				IV	R	F	
96	Blyth's reed warbler	*Acrocephalusdumetorum*				IV	WV	UC	
Phylloscopidae									
97	Lemon-rumped warbler	*Phylloscopuschloronotus*				IV	R	F	

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98	Blyth's leaf warbler	*Phylloscopusreguloides*				IV	SV	UC	
Troglodytidae									
99	Winter wren	*Troglodytes troglodytes*				IV	R	F	
Cinclidae									
100	Brown dipper	*Cincluspallassii*				IV	R	UC	
Motacillidae									
101	White wagtail	*Motacilla alba*				IV	SV	C	
102	Grey wagtail	*Motacillacinerea*				IV	SV	F	
103	Citrine wagtail	*Motacillacitreola*				IV	SV	C	

CHECKLIST OF BIRDS IN AND AROUND HAIGAM WETLAND, KASHMIR