

## Factors Affecting Waterfowl Diversity at Wetland Area, Punjab (Pakistan)

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### Recommended Citation

Bhatti, Z., Nazir, F., & Malik, I. (2019). Factors Affecting Waterfowl Diversity at Wetland Area, Punjab (Pakistan), *Journal of Bioresource Management*, 6 (3).

DOI: <https://doi.org/10.35691/JBM.9102.0108>

ISSN: 2309-3854 online

(Received: Dec 31, 2019; Accepted: Dec 31, 2019; Published: Aug 12, 2019)

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## FACTORS AFFECTING WATERFOWL DIVERSITY AT WETLAND AREA, PUNJAB (PAKISTAN)

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### ABSTRACT

Different wetlands are being selected through WWF to improve their conditions and to create awareness about their importance in public of Pakistan. The study will help in providing sound basis for the future conservation activities and management of waterfowl population, on sounder footing. The study was conducted at Marala wetlands from October 2000 to September 2001. The State of Jammu and Kashmir lies in the north. Three rivers, i.e., Tawi, Chenab and Manawar Tawi, coming from Jammu and Kashmir, flow into Game Reserve and meet to enter the Head Marala water storage reservoir. At river Jammu Tawi, 58 species of migratory birds belong to 10 families were recorded. At river Manawar Tawi, 43 species were recorded. At river Chenab, 47 species were recorded.

**Keywords:** Waterfowl, ducks, avian, wetland, population

### INTRODUCTION

The importance of wetlands in Pakistan was first brought to the notice of the world community in 1967 in a technical meeting as wetland conservation at Ankra Bursa, Istanbul. Indus Flyway Commission was formulated in Pakistan in 1976. The birds' migration occurs through Indus Flyway or the 4<sup>th</sup> Flyway Route from Siberia (Russia) via Afghanistan and China to Pakistan and India. When Indus Flyway Commission was formulated, Pakistan also became the member of Ramsar convention. Since, then the annual waterfowl counts have been taken on major wetlands of Pakistan.

The most remarkable aspect of wetlands in Pakistan is the abundance of birds present there. Wetlands provide an ideal habitat for migratory waterfowl for the purpose of resting, preening, nesting and breeding. Migratory birds are an abundant renewable source of great economic,

recreational and aesthetic value. They face different unique and difficult problems, because of number of species and individual, wide spread distribution, seasonal migration and difference in population characteristics and mainly due to decline of wetlands habitat used for wintering in Pakistan due to different reasons such as hunting pressure, drainage/conservation of land for agricultural purposes and human settlement, illegal or over fishing, cutting of wood for domestic purpose, pollution from different sources, overgrazing, commercial logging, cutting of aquatic vegetation for fodder, fuel etc., and eutrophication in lakes.

Due to above mentioned reasons more than 50% of the previously existing wetlands have been destroyed since 1964. Different wetlands are being selected through WWF to improve their conditions and to create awareness about their importance in public of Pakistan. The study will help in providing sound basis for the

future conservation activities and management of waterfowl population, on sounder footing. Some of the literature is given in reference to the effects of grazing on waterfowl activities and population. As early as Bennette (1937) and Furniss (1938) indicated that overgrazing degraded habitat for ducks that nest along marsh borders or over water. Sowl (1951) noted that unglazed dense edges of wetlands attracted few breeding ducks and stated that ducks might increase if such areas were moderately grazed. Evans and Black (1965) reported that overgrazing small wetlands created unsuitable habitat for brood in South Dakota.

## **MATERIALS AND METHODS**

The study was conducted at Marala wetlands from October 2000 to September 2001. The State of Jammu and Kashmir lies in the north. Three rivers, i.e., Tawi, Chenab and Manawar Tawi, coming from Jammu and Kashmir, flow into Game Reserve and meet to enter the Head Marala water storage

reservoir. The area of study near river Jammu Tawi was from Kikar Post to Head Marala. The area of study near river Chenab was from Kalyal to Head Marala marshy area. The area of study near river Manawar Tawi was from Rangpur Kuri to Head Marala.

Census of the waterfowl population was conducted on monthly basis by moving through the rivers and using binoculars (8 x 30 mm), spotting scopes of (15 – 60 x 60 mm zoom) and a counter. It was tried during every tour that maximum areas, i.e., river banks, respective marshy areas and adjacent terrestrial areas were visited for birds count as well to observe them on feeding, resting and preening during day times. The field notes were also recorded. The observations were taken preferably from concealed and raised positions such as river banks, bands in order to broaden the vision without disturbing the fowls. Observations were taken, keeping a distance from the birds at least of 50-100 m and sometimes 150-200 m so as not to disturb the birds' activities.

**Table 1. Number of migratory waterfowl species observed at river Jammu Tawi during the months (Oct. 2000 to Sep. 2001)**

Common	Scientific Name	Months											
		Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Arochet	<i>Recurvirostra avosetta</i>	25	31	37	40	31	26	14	-	-	-	-	11
Bar Headed Goose	<i>Anser indicus</i>	-	1173	1550	1710	1470	137	-	-	-	-	-	-
Black Crowned Night Heron	<i>Nycticorax nycticorax</i>	21	27	34	31	29	20	17	-	-	-	-	9
Black Headed Gull	<i>Larus ridibundus</i>	15	20	37	21	23	19	7	-	-	-	-	11
Black Necked Grebe	<i>Oediceps nigricollis</i>	4	3	7	5	3	2	-	-	-	-	-	-
Black Necked Stork	<i>Ephippiorhynchus asiaticus</i>	14	40	64	51	57	21	9	-	-	-	-	-
Black Stork	<i>Ciconia Niger</i>	37	41	47	49	40	33	27	-	-	-	-	-
Black Winged Stilt	<i>Himantopus himantopus</i>	31	40	69	61	37	25	11	-	-	-	-	27
Common Coot	<i>T-ulica atra</i>	67	71	79	63	41	23	11	-	-	-	-	9
Common Pochard	<i>Aythya ferina</i>	415	971	1147	1070	715	305	-	-	-	-	-	-
Common Sandpiper	<i>Actitis hypoleucis</i>	41	54	59	47	44	23	15	-	-	-	-	-
Common Shell Duck	<i>Tadorna tadorna</i>	-	6	18	11	8	-	-	-	-	-	-	-
Common Snipe	<i>Gallinago gallinago</i>	27	49	63	57	51	41	17	-	-	-	-	23

Common Teal	<i>Anas crecca</i>	151 9	1719	2346	2117	715	619	413	-	-	-	-	-
Common Tern	<i>Sterna hirundo</i>	49	67	89	71	43	25	14	-	-	-	-	17

Common	Scientific Name	Months											
		Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Demoiselle Crane	<i>Anthropoides virgo</i>	-	-	15	-	-	-	-	-	-	-	-	-
Eurasian Wigeon	<i>Anas panelope</i>	219	419	1902	936	414	210	-	-	-	-	-	-
Ferruginous Duck	<i>Aythya nyroca</i>	9	13	27	29	19	10	-	-	-	-	-	-
Gadwal	<i>Anas Strepera</i>	315	469	1526	1317	971	241	-	-	-	-	-	-
Great Black Headed Gull	<i>Larus Ichthyaetus</i>	14	17	21	27	25	13	-	-	-	-	-	-
Great Cormorant	<i>Phalacrocoran carbo</i>	317	413	519	570	467	211	-	-	-	-	-	-
Green Shank	<i>Tringula Nebularia</i>	27	31	35	39	29	17	11	-	-	-	-	-
Grey Heron	<i>Ardea cinerea</i>	41	59	64	51	43	27	19	-	-	-	-	16
Grey Lag Goose	<i>Anser anser</i>	-	1917	2317	3167	4117	150	-	-	-	-	-	-
Herring Gull	<i>Larus argentatus</i>	9	11	17	15	14	16	9	-	-	-	-	-
Indian River Tern	<i>Sterna aurantia</i>	45	77	81	67	45	24	13	-	-	-	-	-
Indian Shag	<i>Phalacrocorax fuscicollis</i>	31	67	82	69	51	33	17	-	-	-	-	-

Little Cormorant	<i>Phalacrocoran niger</i>	117	215	417	319	210	75	-	-	-	-	-	27
Little Grebe	<i>Tachyhaptus ruficollis</i>	9	17	20	17	11	7	7	-	-	-	-	8
Little Ringed Plover	<i>Charaditus dublus</i>	29	31	47	37	24	11	9	-	-	-	-	21
Little Stint	<i>Calidris minruta</i>	31	50	67	47	37	25	10	-	-	-	-	15
Mallard	<i>Anasplatyhynchos</i>	-	2275	4997	4197	2721	-	-	-	-	-	-	-
Moorhen	<i>Callinula chloropus</i>	41	53	67	61	59	44	27	-	-	-	-	37
<b>Common</b>	<b>Scientific Name</b>	<b>Months</b>											
		<b>Oct</b>	<b>Nov</b>	<b>Dec</b>	<b>Jan</b>	<b>Feb</b>	<b>Ma r</b>	<b>Ap r</b>	<b>May</b>	<b>Jun</b>	<b>Jul</b>	<b>Aug</b>	<b>Sep</b>
Northern Lapwing	<i>Vancllus vanellis</i>	51	63	77	79	61	52	13	-	-	-	-	11
Northern Pintail	<i>Anas acuta</i>	210	1719	3296	3170	4115	972	75	-	-	-	-	-
Northern Shoveler	<i>Anas clypeata</i>	150	1926	2769	2512	2719	714	-	-	-	-	-	-
Purple Heron	<i>Ardea purpurea</i>	29	43	45	47	39	27	17	-	-	-	-	19
Purple Swamphen	<i>Porphyrio porphyrio</i>	17	21	23	19	14	12	10	-	-	-	-	13
Red Crested Pochard	<i>Netta rufina</i>	85	97	115	119	81	37	-	-	-	-	-	-
Red Shank	<i>Tringatotanus</i>	61	75	81	71	57	41	37	-	-	-	-	29
Ruddy Shelduck	<i>Tadorna ferruginea</i>	-	1515	2838	3137	2912	-	-	-	-	-	-	-

Spotted Red Shank	<i>Tringa erythropus</i>	33	41	57	51	31	25	27	-	-	-	-	27
Spotbilled Duck	<i>Anas poecilorhyncha</i>	43	57	108	110	91	13	-	-	-	-	-	
Stone Curlew	<i>Burhinus oedinemus</i>	15	27	36	24	21	19	17	-	-	-	-	-
Sand Lesser Plover	<i>Charadrius monogolus</i>	62	71	87	81	72	47	14	-	-	-	-	-
Tufted Duck	<i>Aythya fuligula</i>	29	31	45	41	23	13	-	-	-	-	-	-
Unidentified Ducks		119	215	413	375	225	137	95	-	-	-	-	-
White Breasted Water Hen	<i>Halcyon smyrensis</i>	29	31	37	34	30	22	31	-	-	-	-	21
White Necked Stork	<i>Ciconia episcopus</i>	19	21	27	-	-	-	-	-	-	-	-	7
White Spoon Bill	<i>Platalea leucordia</i>	-	77	79	65	67	-	-	-	-	-	-	-
White Stork	<i>Ciconia ciconia</i>	-	51	21	23	27	19	11	-	-	-	-	10
Wood Sand Piper	<i>Tringa glareola</i>	-	27	43	47	41	39	23	-	-	-	-	21



**Table 2. Number of migratory waterfowl species observed at river Chenab during the months (Oct. 2000 to Sep. 2001)**

Common Name	Scientific Name	Months											
		Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Arochet	<i>Recurvirostra avosetta</i>	20	26	40	50	42	26	14	-	-	-	-	10
Black Crowned night heron	<i>Nycticorax nycticorax</i>	33	40	51	42	33	27	-	-	-	-	-	-
Black headed gull	<i>Larus ridibundus</i>	45	50	100	75	60	40	13	-	-	-	-	30
Black Necked Grebe	<i>Podiceps nigricollis</i>	5	7	5	4	3	-	-	-	-	-	-	-
Barhead goose	<i>-Ansar indicus</i>	30	45	50	45	20	15	10	-	-	-	-	-
Black necked stork	<i>Ephipporhyncins asiaticus</i>	21	29	44	23	31	7	-	-	-	-	-	-
Black stork	<i>Ciconia niger</i>	-	20	25	20	15	12	8	-	-	-	-	-
Black winged stilt	<i>Himantopus himantopus</i>	25	30	60	50	40	30	10	-	-	-	-	16
Barheaded Goose	<i>Anser indicus</i>	-	1170	3500	2500	800	150	-	-	-	-	-	-
Common coot	<i>Fulico atra</i>	17	20	25	35	40	31	27	-	-	-	-	-
Common poachard	<i>Aythya ferina</i>	150	500	700	700	400	200	-	-	-	-	-	-
Common sandpiper	<i>Actitis hypoleucis</i>	-	400	600	500	200	100	-	-	-	-	-	-
Common snipe	<i>Gallinago gallinago</i>	150	200	400	300	100	50	-	-	-	-	-	100
Common Shelduck	<i>Toderna tadorna</i>	-	50	200	170	150	75	-	-	-	-	-	-

Common Name	Scientific Name	Months											
		Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Common teal	<i>Anas crecca</i>	150	400	2000	1800	175 0	800	-	-	-	-	-	100
Common tern	<i>Sterna hirundo</i>	15	30	60	80	50	30	-	-	-	-	-	-
Canadian Goose	<i>Branta canadensis</i>	-	-	4	2	4	-	-	-	-	-	-	-
Common Crane	<i>Antrropoids virgo</i>	-	-	-	-	-	-	-	15	-	-	-	-
Eurasian Wigeon	<i>Anas panelope</i>	15	35	47	51	45	23	-	17	-	-	-	-
Ferrugmnous duck	<i>Aythya myroca</i>	-	200	300	200	100	50	-	-	-	-	-	-
Gadwal	<i>Anas strepera</i>	115	150	275	250	175	85	-	-	-	-	-	-
Great cormorant	<i>Phalacrocoran carbo</i>	-	100	125	130	115	-	-	-	-	-	-	-
Greater whistling teal	<i>Dendrocygna fulva</i>	65	85	111	85	75	33	-	-	-	-	-	-
Great crested grebe	<i>Podiceps cristatus</i>	50	110	115	120	75	55	-	-	-	-	-	-
Green sand piper	<i>Tringa ockropus</i>	13	29	27	35	23	14	-	-	-	-	-	-
Greylag goose	<i>Anser anser</i>	210	1310	1215	200	175	-	-	-	-	-	-	-
Herring Gull	<i>Larus argentatus</i>	125	140	120	115	40	-	-	-	-	-	-	-
Indian river torn	<i>Sterna anrantia</i>	60	75	100	80	60	25	-	-	-	-	-	-
Little cormorant	<i>Phalocrocoran niger</i>	110	415	435	413	310	225	95	-	-	-	-	37
Little grebe	<i>Tachyhaptus ruficollis</i>	11	15	24	21	13	9	-	-	-	-	-	-
Little ringed plover	<i>Charaditus dublus</i>	-	77	85	71	65	35	-	-	-	-	-	-
Little stint	<i>Calravis minuta</i>	57	68	77	63	45	32	-	-	-	-	-	-

		50	1500	1769	1675	413	75	-	-	-	-	-	-
Mallard	<i>Anas platyrhynchos</i>												
Common Name	Scientific Name	Months											
		Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Moor hen	<i>Gallinula chloropus</i>	30	40	50	47	33	25	21	15	10	8	12	15
Northern lapwing	<i>Vanellus vanellus</i>	-	25	30	33	35	21	15	-	-	-	-	-
Northern pintail	<i>Anas acuta</i>	275	315	370	385	715	835	70	-	-	-	-	-
Northern shoveler	<i>Anas clypeata</i>	75	115	217	275	345	217	-	-	-	-	-	-
Purple heron	<i>Ardea purparia</i>	35	40	60	55	45	27	7	-	-	-	-	25
Purple swamphen	<i>Porphyrioporphyrus</i>	15	25	30	24	21	15	-	-	-	-	-	10
Red crested pochard	<i>Netta rufina</i>	115	150	250	215	215	50	-	-	-	-	-	-
Red shank	<i>Tringa totanus</i>	45	95	85	97	65	37	-	-	-	-	-	-
Ruddy shelduck	<i>Tadorna ferrungnea</i>	150	2065	2160	2250	2500	700	300	15	-	-	-	-
Spotbilled duck	<i>Anas poecilorhyncha</i>	45	70	95	87	73	55	-	-	-	-	-	-
Tufted duck	<i>Aythya fuligula</i>	-	25	35	37	27	17	-	-	-	-	-	-
Unidentified ducks		310	410	517	491	379	279	-	-	-	-	-	-
White breasted water hen	<i>Halcyonmyrensis</i>	75	17	31	94	92	70	77	85	15	43	25	37
White spoon bill	<i>Platalea leucordia</i>	-	150	170	215	180	75	-	-	-	-	-	-
White stork	<i>Ciconia ciconia</i>	70	85	135	125	140	63	40	-	-	-	-	-
Great black head gull	<i>Larus ridibundus</i>	-	17	15	12	7	6	-	-	-	-	-	-

**Table 3. Number of migratory waterfowls species observed at river Manawar Tawi during months (Oct. 2000 to Sep. 2001)**

Common Name	Scientific Name	Months											
		Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Arocet	<i>Recurvirostra avosetla</i>	18	23	37	31	26	14	-	-	-	-	-	15
Black Crowned Night Heron	<i>Nycticorax nycticorax</i>	15	18	21	19	13	11	-	-	-	-	-	6
Black Headed Gull	<i>Larus ridibundus</i>	11	17	49	31	27	19	-	-	-	-	-	9
Black Necked grebe	<i>Podiceps nigricollis</i>	3	2	5	4	2	2	-	-	-	-	-	-
Black Necked Stork	<i>Ephippiorhynchus asiaticus</i>	21	27	33	29	17	13	-	-	-	-	-	11
Black Stork	<i>Ciconia nigra</i>	19	28	34	31	13	11	-	-	-	-	-	15
Black winged stilt	<i>Himantopus himantopus</i>	18	25	48	43	34	19	17	-	-	-	-	-
Barhead Heaaed goose	<i>Anser indicus</i>	-	597	873	1125	515	110	-	-	-	-	-	-
Common Coot	<i>Fulica atra</i>	29	35	81	47	25	15	12	-	-	-	-	-
Common Pochard	<i>Aythya ferina</i>	344	517	715	619	613	117	-	-	-	-	-	-
Common Sond piper	<i>Actitis hypoleucos</i>	25	41	47	34	33	29	18	-	-	-	-	17
Common Teal	<i>Anas crecca</i>	715	817	1127	1321	1113	719	411	-	-	-	-	513
Eurasian Wigcor	<i>Anas platyrhynchos</i>	77	211	315	477	367	93	-	-	-	-	-	-
Ferrasian Duck	<i>Aythya rorarius</i>	31	40	47	42	37	29	-	-	-	-	-	-

Common Name	Scientific Name	Months											
		Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Gadwal	<i>Anas strepera</i>	319	517	719	917	413	215	-	-	-	-	-	-
Great Cormorant	<i>Phalacrocoran carbo</i>	111	215	417	319	217	197	-	-	-	-	-	-
Greater whistling teal	<i>Dendrognna fulva</i>	40	65	89	67	42	37	31	-	-	-	-	70
Green Shank	<i>Tringa nebularia</i>	18	24	32	27	19	21	-	-	-	-	-	15
Grey heron	<i>Ardea cinerea</i>	19	28	31	26	21	14	16	-	-	-	-	17
Grey lag Goose	<i>Anser anser</i>		749	1219	879	417			-	-	-	-	
Indian River Tern	<i>Sterra anvantia</i>	54	69	73	61	53	44	27					19
Indian Shag	<i>Phalacrocorax Fuseicollis</i>	53	72	81	79	62	43	27	-	-	-	-	-
Little Cormorant	<i>Plalocvovovoxniger</i>	75	97	119	89	63	55	19	-	-	-	-	-
Little Grebe	<i>Tachyhaptis ruficdllis</i>	5	7	13	11	6	4		-	-	-	-	-
Little ringed plaver	<i>Charaditus dublus</i>	25	37	41	47	39	25	17	-	-	-	-	21
Little stint	<i>Calvidvis minuta</i>	29	48	52	60	52	43	18	-	-	-	-	14
Mallard	<i>Anas latyrhynchos</i>		817	2114	1920	512			-	-	-	-	-
Moorher	<i>Gallinula chlovopus</i>	41	53	65	57	44	31	27	-	-	-	-	19
Northern Lapwing	<i>Vanellus vanellus</i>	51	63	67	69	52	44	23	-	-	-	-	37
Northern pintal	<i>Anas acuta</i>	613	1107	1429	1522	1611	519	27	-	-	-	-	213
Northern Shoveler	<i>Anas clypeata</i>	95	970	1365	1119	780	217	-	-	-	-	-	-

Common Name	Scientific Name	Months											
		Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Pheasant tailed Jacana	<i>Hydrophasianus chirvrgus</i>	4	4	7	5	4	3	4	-	-	-	-	4
Purple Heron	<i>Ardea purpurea</i>	27	44	57	51	43	29	17	-	-	-	-	14
Purple Swampxen	<i>Porphyrioporphrio</i>	15	18	21	14	17	18	13	-	-	-	-	12
Red Crested pochard	<i>Netta rufina</i>	53	81	87	115	89	27	-	-	-	-	-	-
Red Shank	<i>Tringo totanus</i>	47	61	69	57	54	43	21	-	-	-	-	15
Ruddy Shelduck	<i>Tadorna ferrugnea</i>		1167	1375	1569	987	57	-	-	-	-	-	-
Tufted duck	<i>Aythya fuligata</i>	19	31	49	43	27	13	-	-	-	-	-	-
Unidentified ducks	-	217	310	415	470	219	113	-	-	-	-	-	-
White breasted water Hen	<i>Haleyon smyrensis</i>	17	29	35	27	21	19	-	-	-	-	-	17
White spoon bill	<i>Platalea leucordia</i>		65	77	85	67	44	-	-	-	-	-	-
White stork	<i>Ciconia ciconia</i>	19	23	37	49	27	21	-	-	-	-	-	18
Black headed Gull	<i>Larus ridibundus</i>	21	32	41	35	21	24	-	-	-	-	-	24

**Table 4. Census data of different species of waterfowls and waders collected during mid-winter (January) at head Marala during different years by Gatwala wildlife research institute, Faisalabad.**

Name of Species		1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Common	Scientific															
Common tern	<i>Sterna hirundo</i>	2	-	-	-	-	-	-	33	-	-	-	-	30	-	-
Eurasian wigeon	<i>Anas Penelope</i>	-	-	50	67	-	543	70	-	214	-	89	925	32	-	-
Ferruginous duck	<i>Aythya nyroce</i>	-	-	-	-	-	-	-	-	-	-	26	-	-	125	-
Gadwal	<i>Anas strepera</i>	-	-	-	-	-	-	-	2	-	-	-	-	150	9	5
Great black-headed gull	<i>Larus ichthyaetus</i>	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-
Great cormorant	<i>Phalacrocorax carbo</i>	9	2	-	-	-	-	-	-	-	-	19	160	-	-	-
Great egret	<i>Egretta alba</i>	5	-	2	-	-	49	8	-	42	89	35	-	-	13	5
Green shank	<i>Tringa nebularia</i>	-	-	-	-	-	-	-	-	8	-	36	-	-	35	28
Grey heron	<i>Ardea cinerea</i>	9	9	23	11	6	16	21	39	38		36	36	30	44	29
Greylag goose	<i>Anser anser</i>	-	-	48	65	-	-	-	-	-	-	-	-	-	-	-
Indian pond heron	<i>Ardeola grayii</i>	-	-	-	-	8	-	46	-	129	260	127	230	20	47	-
Indian river tern	<i>Sterna aurantia</i>	-	1	-	-	4	8	91	5	-	26	39	63	18	57	180
Intermediate egret	<i>Egretta intermedia</i>	-	-	-	-	5	1	3	7	-	-	-	-	60	-	38
Little cormorant	<i>Phalacrocorax niger</i>	21	21	-	2	-	30	14	250	167	147	58	220	200	19	60
Little egret	<i>Egretta garzetta</i>	13	51	94		13	-	76	12	87	278	129	220	140	73	185

Little grebe	<i>Tachybaptus ruficollis</i>	-	-	-	-	-	-	24	-	57	35	17	33	20	17	12
Little grebe	<i>Charadrius dubius</i>	-	-	-	-	-	-	-	-	97	-	78	36	-	36	-
<b>Name of Species</b>		<b>1987</b>	<b>1988</b>	<b>1989</b>	<b>1990</b>	<b>1991</b>	<b>1992</b>	<b>1993</b>	<b>1994</b>	<b>1995</b>	<b>1996</b>	<b>1997</b>	<b>1998</b>	<b>1999</b>	<b>2000</b>	<b>2001</b>
<b>Common</b>	<i>Scientific</i>															
Little stint	<i>Calidris minuta</i>	-	-	-	-	-	-	-	-	-	-	54	-	-	-	35
Mallard	<i>Anas platyrhynchos</i>	1830 6	204	4675	1735	550	331	767	870	3115	6215	105	1260	2200	357	125
Moor hen	<i>Gallinula chioropus</i>	-	-	-	-	-	-	27	-	29	75	58	63	50	-	-
Northern lapwing	<i>Vanellus vanellus</i>	-	-	-	-	-	7	10	8	27	-	9	-	-	8	-
Northern pintail	<i>Anas acula</i>	9216	-	250	600	8	653	385	35	173	550	18	750	3500	223	9
Northern shoveler	<i>A clypeata</i>	-	-	150	45	-	958	257	27	-	150	283	361	70	40	-
Pied king fisher	<i>Ceryte rudis</i>	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-
Purple heron	<i>Ardea purpurea</i>	3	-	-	-	-	-	-	15	-	-	11	20	-	-	-
Purple swamp hen	<i>Porphyrio porphyrio</i>	-	-	-	-	-	-	-	-	-	16	17	-	-	-	-
Red crested pochard	<i>Netta rufina</i>	-	-	140	19	-	-	-	-	-	-	-	-	-	-	-
Red shank	<i>Tringa tetanus</i>	-	-	-	-	-	-	-	13	15	12	10	18	8	56	35
Red wattled lapwing	<i>Vanellus indicus</i>	-	-	-	-	-	-	-	50	47	56	42	29	-	38	7
Ruddy shelduck	<i>Tadorna ferruginea</i>	2	23	62	141	28	98	78	197	57	2473	1023	315	500	230	854



Spotted Red shank	<i>Tringa erythropus</i>	-	-	-	-	-	-	-	-	-	-	27	-	-	-	-
Stone curlew	<i>Burhinus oedicnemus</i>	-	-	-	-	-	-	-	-	-	18	-	9	-	-	-
Tufted duck	<i>Aythya fuligula</i>	-	-	-	-	-	-	-	-	3	-	-	-	-	-	-
Unidentified ducks		-	225	-	-	-	-	-	21	-	-	-	-	-	-	-

Name of Species		1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Common	Scientific															
White-breasted king fisher	<i>Halcyon smyrensis</i>	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-
White-breasted water hen	<i>Amaurornis phoenicurus</i>	-	-	-	-	-	-	-	1	-	21	21	-	-	-	-
White-necked stork	<i>Ciconia episcopus</i>	-	-	-	-	-	-	-	-	1	-	-	-	5	-	150
White-spoon bill	<i>Platalea leucorodia</i>	84	64	-	98	47	31	71	60	46	111	63	71	-	-	36
White stork	<i>Ciconia ciconia</i>	-	20	-	-	2	-	2	-	-	-	2	18	-	-	-
White-tailed lapwing	<i>Vanellus leucurus</i>	-	-	-	-	-	-	-	-	-	-	13	-	-	-	-
Wood sand piper	<i>Tringa glareola</i>	-	-	-	-	25	-	-	-	-	-	-	-	-	6	25

## DISSCUSSION

River Jammu was visited by Greylag goose, (*Anser anser*) Barheaded goose (*Anser indicus*) Ruddy shellduck (*Tadorna ferruginea*) and Tufted duck (*Aythya fuligat*). In 1987 mid-winter counts no greylag goose were found. The Greylag goose was only reported in the year 1989 and 1990. Nobarheaded goose was observed in 1987–1989. In present study, the Greylag goose were observed in November, December and January with increasing trend up to January & then declined up to March, 2001. Similarly, ruddy shell duck observed in mid-winter counts in 1987 had an increasing trend up to 1996, the population then decreased up to 2001, but during present studies it was observed that the maximum population i.e. 3137 was recorded in January. Tufted duck recorded in mid-winter counts were only observed in 1995 where as in present study 45 were recorded in December 2000. There was an increase in geese population and ruddy shell duck population but a decrease in common teal population was observed. It was also observed that no considerable population of geese were observed in mid-winter count from 1987 to 1995 (Table 4), but in 1996 and onwards an increase in population was observed. This was probably due to some favorable conditions whereas decrease in duck population was probably due to the effect of declining habitat conditions, livestock grazing pressures and fisheries activities at Marala wetlands.

It was observed during present study that river Jammu area was favored for migration by waterfowl population as maximum species as well as their population density was observed in this area. However, a less number and population density of migratory waterfowls was observed at river Chenab

Marala wetlands, i.e. River Jammu, River Chenab and river Manawar tawi

provide a winter resort for migratory waterfowl as pond areas of these rivers provide a feeding points for these migratory water-fowls and rivers and their banks, provided a resting place for these water fowls. However, the population of ducks and waders has decreased considerably from 1987 to 2001 (Table 4).

Migration started by the end of August and early September, i.e. the end of monsoon period. After monsoon a good habitat develops for the migratory birds. At river Jammu 58 species of migratory birds belong to 10 families were recorded. The most dominant was the family anatidae. The other families were calidridae, chanadridae. Recurvirostridae, Rallidae, podicipitidae Ardeidae, Laridae, Hirandinidae and apodidae.

There were 47 species of waterfowl, which visited river Chenab. It was observed that Bar Headed Goose (*Anser indicus*) and Graylag Goose (*Anser anser*) were abundant from November to February. Canadian Goose (*Branta canadensis*) and common shellduck (*Tudorna tudorna*) were observed at river Chenab only i.e. November to March. Common Coot (*Fulica atra*), Common Teal (*Anas crecca*), Mallard (*Anas platyrhynchos*), Northern Pintat (*Anas acuta*), Ruddy Shellduck (*Tadorna ferruginea*) represented as dominant species visiting the river Chenab. The waterfowl population reached to its peak in January.

About 43 species of waterfowl visit river Manawar Tawi. Barheaded Goose (*Anser indicus*), Greylag Goose (*Anser anser*), Common Teal (*Anas crecca*), Eurasian Wigeon (*Ans panelop*), Common Pochard (*Aylhaferina*), Mallard (*Anas platyrhynchos*), Northern Pintail (*Anas acuta*), Northern Shoveler (*Anas clypeata*), Pheasant Tailed Jacana (*Hydrophasianus chirvigus*) were some of the dominant species exploiting the wetland. Lesser Whistling Teal were also observed at river

Manawar Tawi in September in large numbers at the river bank.

The highest number of water fowl recorded at river Jammu Tawi, river Chenab and river Manawar tawi were recorded in January 2001 as the maximum number of waterfowl reached in this area. The population of waterfowl started migration and reached in the end of August, to the maximum up to December and later on a gradual decline in ducks population started with the exception of pintail (*Anas acuta*) as its population suddenly rose in February with rainfall. In March the back-migration started and almost completed in April. Southward migration started by the end of monsoon. Common teal, whistling teal, pintail and coots were the first to arrive in September followed by Gargeny shovler. Common pochard, Ferruginous ducks, Wigeon and Mallard started to appear in November and reached their maximum by the end of December. Gargeny stayed at the study site to breed at pond area of river Chenab.

Among waders, Ringed plover (*Charadrius dubuius*), White tailed plover (*Vanelus leucurus*), Northern lapwing (*Vanellus vanellus*), Avocet (*Recurrirostra arocetta*) and wood sand piper were recorded in very small numbers. Black winged stilt was the dominant species and was present during September to April.

The number of water fowls recorded increased during September, October, November and December due to the migration of birds. At river Jammu Tawi mostly, the waders were recorded as compared to river Chenab and river Manawar Tawi. The family scorpaciade dominated among waders and the maximum birds were recorded from October to December. Members of five species of egretes i.e. cattle egret (*Bubuleus ibis*) little egret (*Egretta garzetta*) intermediate egret (*Egretta intermedia*) great egret

(*Egretta alba*) and pond heron (*Ardeola grayeii*) were present at river Jammu Tawi river Chenab and river Manawar Tawi throughout study period. The migratory water fowl were always observed close to typha community or with in the typha at three different rivers. The pheasant tailed Jakana (*Hydrophasianus chirvigus*) was observed walking on Nelumbium lotus. Similarly, purple gallinule and white breasted water hen also observed wandering over the flat leaves of nelumbium nucifera, near the banks of pond area of river Jammu Tawi river Chenab, and river Manawar Tawi.

The comparison of data regarding water in previous years with the current year tells us a gradual and alarming decrease in the water fowl population. It is obvious that there are many factors affecting waterfowl population including fisheries, livestock grazing, Typha cutting for cottage industry, severe hunting and lack of proper control on the part of Wildlife Department as Marala wetland is near border area and Bajwat and Jammu. Kashmir is a disputed boundary and rangers can be approached to help checking authority in the control of illegal hunting. Wildlife and presence of hunters often observed with great concern as it is a declared game reserve.

The hunters interviewed were of the opinion that water fowl big game and partridge should be conserved and there should be more game watchers in the area so that illegal hunting could be controlled as check posts of wildlife are in the control of Chenab rangers and there was no proper checking of wildlife staff due to interference of Chenab rangers in Bajwat area. The local people interviewed were also in favor of conservation and improving of Marala wetlands habitat for waterfowl as well as other birds, and mammals as wildlife is a scenic alive beauty of these Marala wetlands in Bajwat area.

Livestock appeared to be one of the important reasons for habitat destruction and declining water fowl population. Livestock is not always guided by their herders and roam freely. Overgrazing degraded the habitat for ducks as compared to the previous years. Over-grazing may cause a decrease in primary productivity (Reinold et al., 1975) an increase in water turbidity (Logan, 1975) and render areas devoid of vegetation (Bassett, 1980). Overgrazing also affects the invertebrate fauna. Similar results of grazing have been recorded at river Jammu Tawi areas. It is worth mentioning here that due to peter pump for watering and other machinery like tractors etc. the Bela land is developed for agriculture even up to the banks of river Jammu Tawi, Chenab and Manawar Tawi.

Fishing activities at the lakes were continuously disturbing the water fowl while netting of fish in pond areas as constant boating was observed that not only disturb the water-fowls, but they were also netted deliberately by them. Netting and boating affected the water fowl population as studied in Kharal lake by Chaudhary (1991) that there were 5000 ducks in 1991 but by 1992 and 1993 there were only 1780 and 354 ducks, respectively (Punjab Wildlife Research Centre files). Fish also compete for food with water fowl as fishes are herbivorous as well as omnivorous. Some species of fishes also got advantage that they may tolerate high level of pH (Lone, 1983). A formula needs to be worked out between the wildlife and Fisheries department to minimize the disturbance to the waterfowl because of fishing activities for better conservation of water-fowl in Marala wetlands as it is an important wintering ground for a variety of water fowls.

## CONCLUSION

At river Jammu Tawi, 58 species of migratory birds belong to 10 families were

recorded. The most dominant was the family anatidae. The other families were calidridae, chanadridae. Recurvirostridae, Rallidae, podicipitidae Ardeidae, Laridae, Hirandinidae and apodidae. At river Chenab, 47 species were recorded. Common Coot (*Fulica atra*), Common Teal (*Anas crecca*), Mallard (*Anas platyrhynchos*), Northern Pintat (*Anas acuta*), Ruddy Shellduck (*Tadorna ferruginea*) represented as dominant species visiting the river Chenab. At river Manawar Tawi, 43 species were recorded. Barheaded Goose (*Anser indicus*), Greylag Goose (*Anser anser*), Common Teal (*Anas crecca*), Eurasian Wigeon (*Anas panelop*), Common Pochard (*Aylhaferina*), Mallard (*Anas platyrhynchos*), Northern Pintail (*Anas acuta*), Northern Shoveler (*Anas clypeata*), Pheasant Tailed Jacana (*Hydrophasianus chirvigus*) were some of the dominant species exploiting the wetland.

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