

Avian Diversity Of Langh Lake Sindh And Their Response To The Disturbance.

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Cover Page Footnote

We are cordially thankful to Sindh Wildlife Department who facilitated us during this study.

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AVIAN DIVERSITY OF LANGH LAKE SINDH AND THEIR RESPONSE TO THE DISTURBANCE

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ABSTRACT

Birds and human interaction add harmful effects on conservation and behavior of bird. To develop a buffer between human activities and number of birds, a comprehensive study is necessary to assess the response of birds and their flight initiation distance. An experimental design was employed to record the bird's response and their flight initiation distance, for 109 birds of Langh lake, Sindh. Fifty percent of passerine birds showed medium response towards disturbance and 39% of water birds showed high response toward disturbance. 13 species of family Scolopacidae were recorded during study and 84.62% species of this family showed high response which was the highest response recorded from all families of birds recorded during study. It indicated that maximum representatives of this family were very sensitive towards disturbance. During the study period a total of 131 bird species belonging to 14 orders were recorded from Langh lake. From identified species, order of Passeriformes was recorded the highest. Fifty percent of species recorded were resident, 35% were winter migrant, 9% were passage migrant and only 5% were summer migrant.

Keywords: Birds, Sindh, response, flight distance, passerines

INTRODUCTION

Among vertebrates, birds are an apt beacon of biodiversity and environmental changes such as level of contaminations and impact of human activity on their ecosystem (Sutherland, 2000). Due to their highly adapted and diverse behavior, 10,000 bird species are reported from poles to equators. Which is followed by 21% species from Afro-tropical region, 18% species from Indo-malayan region, 17% from Australasian region, 10 % from Palearctic region, 8% from Nearctic region and 2% from Oceanic. 611 species of birds have been reported from Pakistan, which indicate that from total avian species, 6.11% are distributed in different regions of Pakistan, 33 species are globally threatened and 357 birds are migratory. Roberts (1992) reported 356 species of birds from Sindh. Ghalib et al. (2018) reported 420 birds from different areas of Sindh. Large

number of migratory species move to this lake in winter from far areas of world because of this particular reason, it was declared as a wildlife Sanctuary in 1972. Yet, the diversity of this region's avifauna has not been fully explored. However, some water birds have been documented. Over all birds are reported from different habitats of Sindh but current area remains unfocused. Birds are an integral part of their niche, being important part of food chain in an ecological unit of nature, so they are good indicators of ecological status of any given ecosystem (Hossain and Baki, 2015). Diversity status of class of an area indicate adaptations of individuals of that class. Anti-predator response is an important phenomenon for prey species to survive. Along with finding diversity pattern of avian fauna, the current study also focuses on finding flight initiation distance for different birds of the study site. Present study was

designed to assess the diversity of avian fauna along with this effect of disturbance on birds of Lang lake. Flight initiation distance is a behavioral measure of the distance at which potential prey take flight when approached by a predator (Heini, 1934). The response of birds to disturbance takes many forms, but most reported responses are behavioral and can be considered vigilance or flight responses (Heini, 1934). FID varies for all birds and it depends on many factors i.e. distance of disturbing point (Dandenong Valley Authority, 1979), body mass (Daniel, 2005) and group size. Current study was performed to investigate pattern of disturbance on birds due to presence of humans in their habitat and finding the avian diversity.

MATERIAL AND METHODS

Study Area

Langh Lake is located in District Qambar Shadkot, about 18 Km west of Larkana between 27°29'42" N latitude and 68°12'27" E longitude. Average precipitation fall annually is 85-mm, average temperature is 27.0 degrees C and the altitude ranges between 50 and 115 meters above sea level. The east side is surrounded by cultivated fields of rice and wheat. Almost all sides of lake are marshy and having muddy bottom and abundant Typha vegetation which is a habitat for many birds. Figure 1 shows map of the study site.

Study design and data collection methods

The lake was regularly visited every month from January-2018 to December-2018. Observations were made early morning and in evening by a single observer using binocular (8×30) and camera. Birds were identified by Helam Field Guide, Birds of Pakistan (Grimmett et al., 2009). Relative abundance and diversity of birds were recorded. The following three characteristics were applied to identify the bird species, upon external morphology (Color, shape,

size, beak, leg and tail), song and calls. Response of birds was also categorized according to following categories

- W- Weak response: moves slightly away, remains within area of site
- M- Moderate response: moves away from source of disturbance but remains in subsite and returns to the same position when activity ends.
- H- High response: bird flies away and does not return during survey time.

After a particular bird was sighted, the observer started moving towards it to initiate flight of bird. The distance between disturbing point and the point from where the bird flew was recorded.

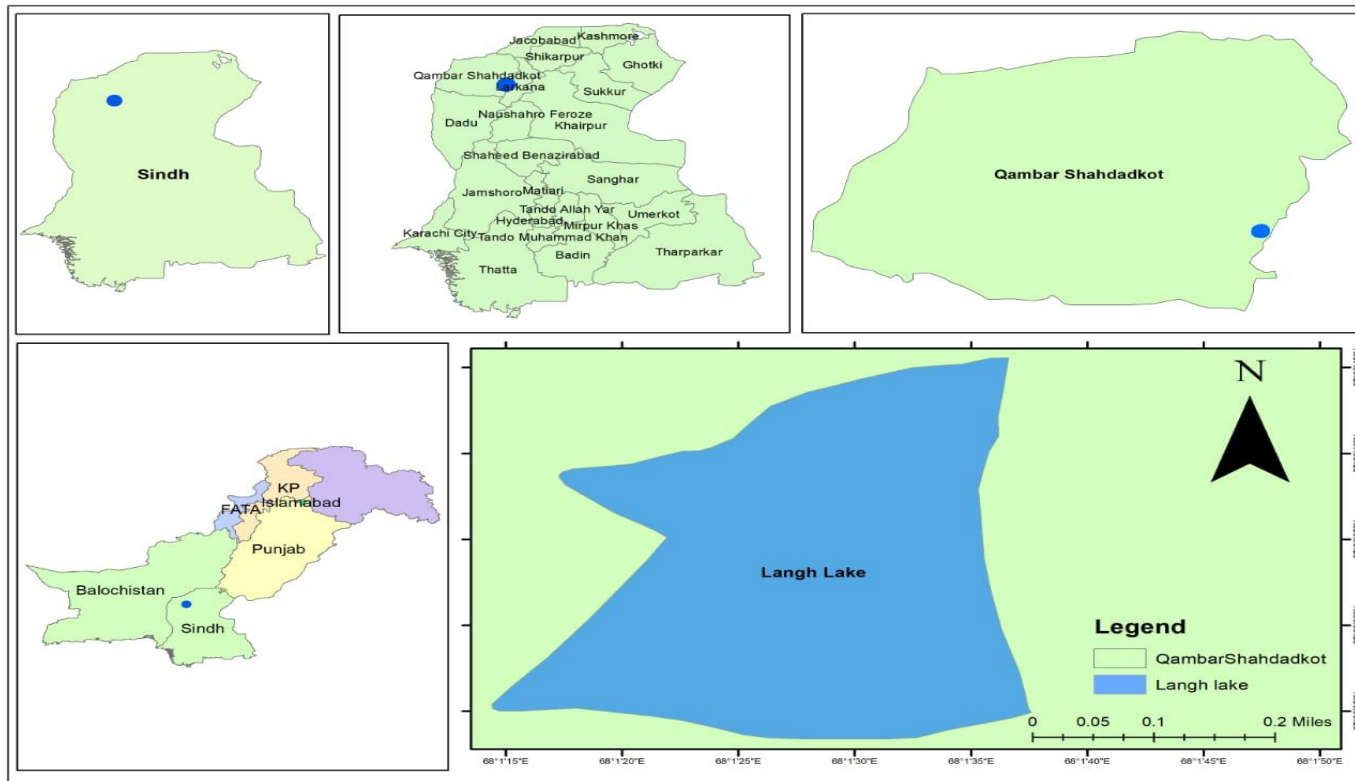


Figure 1; Map of study site

RESULT

Species Richness

During study period a total of 131 bird species belonging to 14 orders were identified in the study area (Table 1). From identified species, Passeriformes had the highest number of species (48), followed by Charadriiformes with 26 species, Anseriformes and Pelecaniformes had 11 species each. Accipitriformes had 9 species. Columbiformes and Coraciiformes had four species each, Suliformes had 3 species

and Strigiformes had 2 species. Podicipediformes, Cuculiformes, Caprimulgiformes and Piciformes had the lowest number of birds with only one species in each. According to the results of the study 50% of species recorded were resident, 35% were winter migrant, 9% were passage migrant and only 5% were summer migrant (Fig 3). Yellow-footed Green pigeon and Ruddy-Breasted crane were absent from Sindh (Robert, 1992). During this study, 26 individuals of Yellow footed green pigeon with 2.2 relative abundance and 3 individuals of Ruddy-Breasted crane with 0.2 relative abundance were recorded.

During the study period, Northern Shoveler (*Anas clypeata*) had the highest relative abundance (5.3%), whereas Marsh Harrier

(*Circus aeruginosus*) showed the lowest relative abundance (0.08%) in the study area (Table 1).

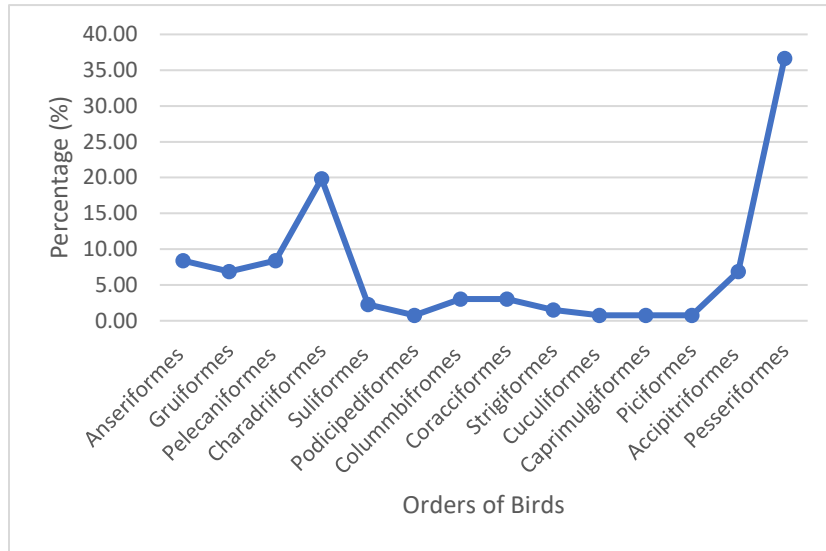


Figure 2: Proportion of different bird's belong to various orders

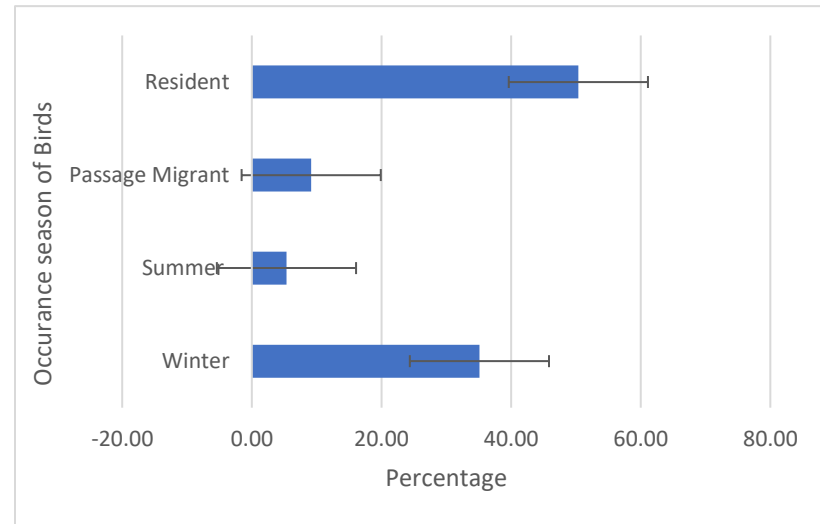


Figure 3: Seasonal Occurrence of different Birds species

Table 1. Occurrence and relative abundance of the bird species at Langh lake

#	Common Name	Scientific Name	Family	Order	Occurrence	R.A(%)
1	Pale Martin	<i>Riparia diluta</i>	Hirundinidae	Passeriformes	R	1.78
2	Wire Tailed Swallow	<i>Hirundo smithii</i>	Hirundinidae	Passeriformes	R	1.86
3	Barn Swallow	<i>Hirundo rustica</i>	Hirundinidae	Passeriformes	W	1.69
4	Common Whitethroat	<i>Sylvia communis</i>	Sylviidae	Passeriformes	P	0.68
5	White Tailed Stonechat	<i>Saxicola leucurus</i>	Muscicapidae	Passeriformes	R	0.59
6	Red Throated Flycatcher	<i>Ficedula parva</i>	Muscicapidae	Passeriformes	W	0.68
7	Common Stonechat	<i>Saxicola rubicola</i>	Muscicapidae	Passeriformes	P	0.59
8	Pied Bushchat	<i>Saxicola caprata</i>	Muscicapidae	Passeriformes	R	0.42
9	Rufous tailed Scrub Robin	<i>Cercotrichas galactotes</i>	Muscicapidae	Passeriformes	P	0.51
10	Spotted Flycatcher	<i>Muscicapa striata</i>	Muscicapidae	Passeriformes	P	0.34
11	Asian Desert Warbler	<i>Sylvia nana</i>	Sylvia	Passeriformes	W	0.76
12	Rufous Vented Prinia	<i>Prinia burnesii</i>	Cisticolidae	Passeriformes	R	0.59
13	Bay-Backed Shrike	<i>Lanius vittatus</i>	Laniidae	Passeriformes	R	0.42
14	Isabelline Shrike	<i>Lanius isabellinus</i>	Laniidae	Passeriformes	W	0.34
15	Long Tailed Shrike	<i>Lanius schach</i>	Laniidae	Passeriformes	R	0.51
16	Turkestan Shrike	<i>Lanius phoenicuroides</i>	Laniidae	Passeriformes	R	0.25
17	Baya Weaver	<i>Ploceus philippinus</i>	Ploceidae	Passeriformes	R	0.76
18	Streaked Weaver	<i>Ploceus manyar</i>	Ploceidae	Passeriformes	R	0.85
19	Chestnut Shuoldered Petronia	<i>Petronia xanthocollis</i>	Passeridae	Passeriformes	S	0.68
20	Spanish Sparrow	<i>Passer hispaniolensis</i>	Passeridae	Passeriformes	W	0.76
21	Black Redstart	<i>Phoenicurus phoenicurus</i>	Passeridae	Passeriformes	W	0.59
22	House Sparrow	<i>Passer domesticus</i>	Passeridae	Passeriformes	R	2.37
23	Paddy Field Warbler	<i>Acrocephalus agricola</i>	Acrocephalidae	Passeriformes	W	0.93
24	Clamorous Reed Warbler	<i>Acrocephalus stentoreus</i>	Acrocephalidae	Passeriformes	W	0.76
25	Oriental Sky Lark	<i>Alauda gulgula</i>	Alaudidae	Passeriformes	R	1.19
26	Crested Lark	<i>Galerida cristata</i>	Alaudidae	Passeriformes	R	1.02
27	Common Chiff Chaff	<i>Phylloscopus collybita</i>	Phylloscopidae	Passeriformes	W	0.76
28	Bluethroat	<i>Luscinia svecica</i>	Turdidae	Passeriformes	W	0.42

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29	Striated Babbler	<i>Turdoides earlei</i>	Leiothrichidae	Passeriformes	R	0.76
30	Jungle Babbler	<i>Turdoides striata</i>	Leiothrichidae	Passeriformes	R	1.27
31	Common Babbler	<i>Turdoides caudata</i>	Leiothrichidae	Passeriformes	R	1.02
32	Graceful Prinia	<i>Prinia gracilis</i>	Cisticolidae	Passeriformes	R	0.59
33	Rufous Fronted Prinia	<i>Prinia buchanani</i>	Cisticolidae	Pesseriformes	R	0.34
34	Yellow Bellied Prinia	<i>Prinia flaviventris</i>	Cisticolidae	Passeriformes	R	0.68
35	Plain Prinia	<i>Prinia inornata</i>	Cisticolidae	Passeriformes	R	0.93
36	Zitting Cicsticola	<i>Cisticola juncidis</i>	Cisticolidae	Passeriformes	R	0.34
37	Paddy Field Pipit	<i>Anthus rufulus</i>	Motacillidae	Passeriformes	R	1.36
38	Citrine Wagtail	<i>Motacilla citreola</i>	Motacillidae	Passeriformes	W	0.59
39	Yellow Wagtail	<i>Motacilla flava</i>	Motacillidae	Passeriformes	P	0.51
40	White Wagtail	<i>Motacilla alba</i>	Motacillidae	Passeriformes	W	0.76
41	White Cheeked Bulbul	<i>Pycnonotus leucotis</i>	Pycnonotidae	Passeriformes	R	2.03
42	Red Vented Bulbul	<i>Pycnonotus cafer</i>	Pycnonotidae	Passeriformes	R	0.42
43	Blyth's Reed Warbler	<i>Acrocephalus dumetorum</i>	Acrociphalidae	Passeriformes	P	0.51
44	Purple Sun Bird	<i>Dreptes thomensis</i>	Nectariniidae	Passeriformes	R	0.59
45	Common Myna	<i>Acridotheres tristis</i>	Sturnidae	Passeriformes	R	0.68
46	Blue Cheeked Bee Eater	<i>Merops persicus</i>	Meropidae	Passeriformes	S	0.76
47	Green Bee Eater	<i>Merops orientalis</i>	Meropidae	Passeriformes	R	1.36
48	Black Drongo	<i>Dicrurus macrocercus</i>	Dicruridae	Passeriformes	R	0.51
49	Red Collared Dove	<i>Streptopelia tranquebarica</i>	Columbidae	Columbiformes	S	0.76
50	Yellow Footed Green Pigeon	<i>Treron phoenicoptera</i>	Columbidae	Columbiformes	R	2.20
51	Laughing Dove	<i>Spilopelia senegalensis</i>	Columbidae	Columbiformes	R	2.46
52	Eurasian Collard Dove	<i>Streptopelia decaocto</i>	Columbidae	Columbiformes	R	2.63
53	Black Rumped Flameback	<i>Dinopium benghalense</i>	Picidae	Piciformes	R	0.34
54	Pied Kingfisher	<i>Ceryle rudis</i>	Alcedinidae	Coraciiformes	R	0.25
55	White Throated Kingfisher	<i>Halcyon smyrnensis</i>	Alcedinidae	Coraciiformes	R	0.59
56	Common Kingfisher	<i>Alcedo atthis</i>	Alcedinidae	Coraciiformes	R	0.17
57	Barn Owl	<i>Tyto alba</i>	Tytonidae	Strigiformes	R	0.25
58	Spotted Owl	<i>Strix occidentalis</i>	Strigidae	Strigiformes	R	0.17

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59	Eurasian Nightjar	<i>Caprimulgus europaeus</i>	Caprimulgidae	Caprimulgiformes	S	0.17
60	Indian Roller	<i>Coracias benghalensis</i>	Coraciidae	Coraciiformes	R	0.34
61	Asian Koel	<i>Eudynamis scolopaceus</i>	Cuculidae	Cuculiformes	S	0.25
62	Gad Wall	<i>Mareca strepera</i>	Anatidae	Anseriformes	W	4.32
63	Common Pochard	<i>Aythya ferina</i>	Anatidae	Anseriformes	W	3.56
64	Marbled Teal	<i>Marmaronetta angustirostris</i>	Anatidae	Anseriformes	W	1.44
65	Garganey	<i>Anas querquedula</i>	Anatidae	Anseriformes	P	0.42
66	Eurasian Wigeon	<i>Mareca penelope</i>	Anatidae	Anseriformes	W	3.31
67	Ferruginous duck	<i>Aythya nyroca</i>	Anatidae	Anseriformes	W	0.85
68	Ruddy Shelduck	<i>Tadorna ferruginea</i>	Anatidae	Anseriformes	W	2.20
69	Common Teal	<i>Anas crecca</i>	Anatidae	Anseriformes	W	2.20
70	Northern Shoveler	<i>Anas clypeata</i>	Anatidae	Anseriformes	W	5.34
71	Northern Pintail	<i>Anas acuta</i>	Anatidae	Anseriformes	W	2.80
72	Mallard	<i>Anas platyrhynchos</i>	Anatidae	Anseriformes	W	3.31
73	Purple Swamphen	<i>Porphyrio porphyrio</i>	Rallidae	Gruiformes	R	0.34
74	Spotted Crake	<i>Porzana porzana</i>	Rallidae	Gruiformes	W	0.42
75	Baillons Crake	<i>Porzana pusilla</i>	Rallidae	Gruiformes	W	0.17
76	Water Rail	<i>Rallus aquaticus</i>	Rallidae	Gruiformes	W	0.25
77	Ruddy Breasted Crake	<i>Porzana fusca</i>	Rallidae	Gruiformes	W	0.25
78	little Crake	<i>Porzana parva</i>	Rallidae	Gruiformes	W	0.17
79	Common Moorhen	<i>Gallinula chloropus</i>	Rallidae	Gruiformes	R	0.42
80	White Breasted Waterhen	<i>Amaurornis phoenicurus</i>	Rallidae	Gruiformes	R	0.25
81	Eurasian Coot	<i>Fulica atra</i>	Rallidae	Gruiformes	R	0.51
82	Cinnamon Bittern	<i>Ixobrychus cinnamomeus</i>	Ardeidae	Pelicaniformes	R	0.17
83	Black Bittern	<i>Ixobrychus flavicollis</i>	Ardeidae	Pelicaniformes	R	0.17
84	Great Bittern	<i>Botaurus stellaris</i>	Ardeidae	Pelicaniformes	R	0.25
85	Yellow Bittern	<i>Ixobrychus sinensis</i>	Ardeidae	Pelicaniformes	R	0.17
86	Purple Heron	<i>Ardea purpurea</i>	Ardeidae	Pelicaniformes	R	0.17
87	Great Egret	<i>Ardea alba</i>	Ardeidae	Pelicaniformes	R	0.25
88	Grey Heron	<i>Ardea cinerea</i>	Ardeidae	Pelicaniformes	R	0.17
89	Intermediate Egret	<i>Ardea intermedia</i>	Ardeidae	Pelicaniformes	R	0.34

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90	Indian Pond Heron	<i>Ardeola grayii</i>	Ardeidae	Pelicaniformes	R	0.25
91	Black Crowned Night Heron	<i>Nycticorax nycticorax</i>	Ardeidae	Pelicaniformes	R	0.34
92	Little Egret	<i>Egretta garzetta</i>	Ardeidae	Pelicaniformes	R	0.34
93	Temmink's Stint	<i>Calidris temminckii</i>	Scolopacidae	Charadriiformes	W	0.42
94	Marsh Sandpiper	<i>Tringa stagnatilis</i>	Scolopacidae	Charadriiformes	P	0.34
95	Wood Sandpiper	<i>Tringa glareola</i>	Scolopacidae	Charadriiformes	W	0.42
96	Common Sandpiper	<i>Actitis hypoleucos</i>	Scolopacidae	Charadriiformes	W	0.51
97	Green Sandpiper	<i>Tringa ochropus</i>	Scolopacidae	Charadriiformes	W	0.25
98	Common Snipe	<i>Gallinago gallinago</i>	Scolopacidae	Charadriiformes	W	0.17
99	Ruff	<i>Philomachus pugnax</i>	Scolopacidae	Charadriiformes	P	0.34
100	Common Greenshank	<i>Tringa nebularia</i>	Scolopacidae	Charadriiformes	W	0.51
101	little stint	<i>Calidris minuta</i>	Scolopacidae	Charadriiformes	P	0.25
102	Black Tailed Godwit	<i>Limosa limosa</i>	Scolopacidae	Charadriiformes	W	0.34
103	Common Red Shank	<i>Tringa totanus</i>	Scolopacidae	Charadriiformes	W	0.51
104	Jack Snipe	<i>Lymnocyrtus minimus</i>	Scolopacidae	Charadriiformes	W	0.42
105	Spotted Redshank	<i>Tringa erythropus</i>	Scolopacidae	Charadriiformes	W	0.59
106	River Tern	<i>Sterna aurantia</i>	Laridae	Charadriiformes	W	0.25
107	Gull Billed Tern	<i>Sterna acuticauda</i>	Laridae	Charadriiformes	W	0.25
108	Whiskered Tern	<i>Chlidonias hybrida</i>	Laridae	Charadriiformes	P	0.25
109	Black Headed Gull	<i>Chroicocephalus ridibundus</i>	Laridae	Charadriiformes	W	0.25
110	Heuglin's Gull	<i>Larus heuglini</i>	Laride	Charadriiformes	W	0.34
111	Little Ringed Plover	<i>Charadrius dubius</i>	Charadriidae	Charadriiformes	W	0.51
112	White Tailed Lapwing	<i>Vanellus leucurus</i>	Charadriidae	Charadriiformes	W	0.17
113	Red Wattled Lapwing	<i>Vanellus indicus</i>	Charadriidae	Charadriiformes	R	0.34
114	Greater Painted Snipe	<i>Rostratula benghalensis</i>	Rostratulidae	Charadriiformes	R	0.51
115	Black Winged stilt	<i>Himantopus himantopus</i>	Recurvirostridae	Charadriiformes	R	0.68
116	Collared Pratincole	<i>Glareola pratincola</i>	Glareolidae	Charadriiformes	S	0.25
117	Oriental Pratincole	<i>Glareola maldivarum</i>	Glareolidae	Charadriiformes	S	0.34
118	Pheasant Tailed Jacana	<i>Hydrophasianus chirurgus</i>	Jacanidae	Charadriiformes	R	0.34
119	Glossy Ibis	<i>Plegadis falcinellus</i>	Threskiornithidae	Suliformes	P	0.42
120	Little Cormorant	<i>Microcarbo niger</i>	Phalacrocoracidae	Suliformes	R	1.53

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121	Great Cormorant	<i>Phalacrocorax carbo</i>	Phalacrocoracidae	Suliformes	W	0.68
122	Little Gerebe	<i>Tachybaptus ruficollis</i>	Podicipedidae	Podicipediformes	R	0.59
123	Black Kite	<i>Milvus migrans</i>	Accipitridae	Accipitriformes	R	0.93
124	Sparrow hawk	<i>Accipiter nisus</i>	Accipitridae	Accipitriformes	W	0.17
125	Black Winged Kite	<i>Elanus caeruleus</i>	Accipitridae	Accipitriformes	R	0.25
126	Marsh Harrier	<i>Circus aeruginosus</i>	Accipitridae	Accipitriformes	R	0.08
127	Shikra	<i>Accipiter badius</i>	Accipitridae	Accipitriformes	R	0.17
128	Greater Spotted Eagle	<i>Clanga clanga</i>	Accipitridae	Accipitriformes	R	0.17
129	Common Buzzard	<i>Buteo buteo</i>	Accipitridae	Accipitriformes	W	0.17
130	Booted Eagle	<i>Hieraaetus pennatus</i>	Accipitridae	Accipitriformes	W	0.17
131	Red Necked Falcon	<i>Falco chicquera</i>	Falconidea	Accipitriformes	R	0.17

Abbreviations: RA: Relative Abundance, R: Resident, W: Winter, S: Summer, P: Passage Migrant

Response of birds towards stimulus

One hundred and nine birds from different orders were disturbed intentionally to access their response and record their flight initiation distance. 39% of water birds shows weak response toward disturbance, 33% shows weak response and 28% show high response as they didn't return in site area after the disturbance during survey time.

Eleven species of family Anatidae were recorded during the study period. More than 54 percent of the representatives of family Anatidae showed weak response; they flew away on disturbance but remained within sub-sites. Thirty-six percent showed high-medium response and 9% of the representatives showed high response and did not return during survey time at point of disturbance. Nine species of family Rallidae were recorded during survey time; 55% of species from this family showed weak response upon disturbance, 33% medium and 11 % showed high response. This indicated that family Anatidae and Rallidae showed almost the same type of response rate on disturbance.

Response recorded by species of family Ardeidae was highly variable as 45% showed weak response and 36% showed high response which indicated variation in producing same response against same stimuli among representatives of same family. Three representatives of family charadriiformes were recorded; two of them showed weak response and one showed high response.

Thirteen species of family Scolopacidae were recorded during study and 84.62% species of this family showed high response, which indicated that representatives of this family were very sensitive towards disturbance. Same type of response was recorded in representative of family Laridae as 60% of representative showed medium response, 40% shows high response. Weak response was totally absent in this family. Collared Pratincole, Oriental Pratincole, Greater Painted Snipe and Glossy Ibis showed high response and Pheasant Tailed Jacana, Black-Winged stilt and Little Cormorant showed medium response.

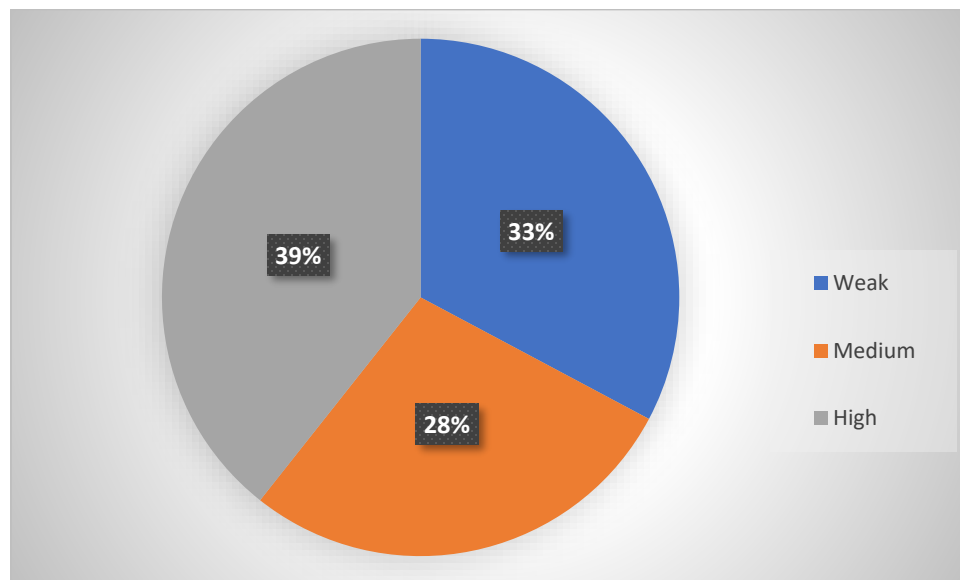


Figure 4: Percentage of Response type in species of water birds

Flight initiation distance (FID) of 61 species of water birds were recorded. Whiskered Turn showed maximum FID that is 39 m and Spotted Crake shows minimum FID that is 10 m (Table 2). More than 50% of water birds recorded showed more than 25 m FID and others lay below this range (Figure 5).

Table 2. Flight initiation distance of water birds at Langh lake

S. No	Common Name	Scientific Name	FID (meters)
1	Gad Wall	<i>Mareca strepera</i>	20
2	Common Pochard	<i>Aythya ferina</i>	30
3	Marbled Teal	<i>Marmaronetta angustirostris</i>	25
4	Garganey	<i>Anas querquedula</i>	26
5	Eurasian Wigeon	<i>Mareca penelope</i>	36
6	ferruginous duck	<i>Aythya nyroca</i>	30
7	Ruddy Shelduck	<i>Tadorna ferruginea</i>	24
8	Common Teal	<i>Anas crecca</i>	23
9	Northern Shoveler	<i>Anas clypeata</i>	22
10	Northern Pintail	<i>Anas acuta</i>	25
11	Mallard	<i>Anas platyrhynchos</i>	27
12	Purple Swamphen	<i>Porphyrio porphyrio</i>	18
13	Spotted Crake	<i>Porzana porzana</i>	10
14	Baillons Crake	<i>Porzana pusilla</i>	11
15	Water Rail	<i>Rallus aquaticus</i>	16
16	Ruddy Breasted Crake	<i>Porzana fusca</i>	20
17	little Crake	<i>Porzana parva</i>	23
18	Common Moorhen	<i>Gallinula chloropus</i>	17
19	White Breasted Waterhen	<i>Amaurornis phoenicurus</i>	18
20	Eurasian Coot	<i>Fulica atra</i>	15
21	Cinnamon Bittern	<i>Ixobrychus cinnamomeus</i>	30
22	Black Bittern	<i>Ixobrychus flavicollis</i>	25
23	Great Bittern	<i>Botaurus stellaris</i>	26
24	Yellow Bittern	<i>Ixobrychus sinensis</i>	25
25	Purple Heron	<i>Ardea purpurea</i>	28
26	Great Egret	<i>Ardea alba</i>	20
27	Grey Heron	<i>Ardea cinerea</i>	30
28	Intermediate Egret	<i>Ardea intermedia</i>	36
29	Indian Pond Heron	<i>Ardeola grayii</i>	29
30	Black Crowned Night Heron	<i>Nycticorax nycticorax</i>	26
31	Little Egret	<i>Egretta garzetta</i>	22
32	Temminck's Stint	<i>Calidris temminckii</i>	32
33	Marsh Sandpiper	<i>Tringa stagnatilis</i>	31
34	Wood Sandpiper	<i>Tringa glareola</i>	33
35	Common Sandpiper	<i>Actitis hypoleucos</i>	36
36	Green Sandpiper	<i>Tringa ochropus</i>	38

37	Common Snipe	<i>Gallinago gallinago</i>	35
38	Ruff	<i>Philomachus pugnax</i>	37
39	Common Greenshank	<i>Tringa nebularia</i>	35
40	little stint	<i>Calidris minuta</i>	34
41	Black Tailed Godwit	<i>Limosa limosa</i>	36
42	Common Red Shank	<i>Tringa totanus</i>	37
43	Jack Snipe	<i>Lymnocyptes minimus</i>	34
44	Spotted Redshank	<i>Tringa erythropus</i>	39
45	River Tern	<i>Sterna aurantia</i>	35
46	Gull Billed Tern	<i>Sterna acuticauda</i>	38
47	Whiskered Tern	<i>Chlidonias hybrida</i>	39
48	Black Headed Gull	<i>Chroicocephalus ridibundus</i>	35
49	Heuglin's Gull	<i>Larus heuglini</i>	34
50	Little Ringed Plover	<i>Charadrius dubius</i>	25
51	White Tailed Lapwing	<i>Vanellus leucurus</i>	15
52	Red Wattled Lapwing	<i>Vanellus indicus</i>	14
53	Greater Painted Snipe	<i>Rostratula benghalensis</i>	28
54	Black Winged stilt	<i>Himantopus himantopus</i>	26
55	Collared Pratincole	<i>Glareola pratincola</i>	30
56	Oriental Pratincole	<i>Glareola maldivarum</i>	32
57	Glossy Ibis	<i>Plegadis falcinellus</i>	29
58	Little Cormorant	<i>Microcarbo niger</i>	21
59	Little Gerebe	<i>Tachybaptus ruficollis</i>	19
60	Great Cormorant	<i>Phalacrocorax carbo</i>	18
61	Pheasant Tailed Jacana	<i>Hydrophasianus chirurgus</i>	20

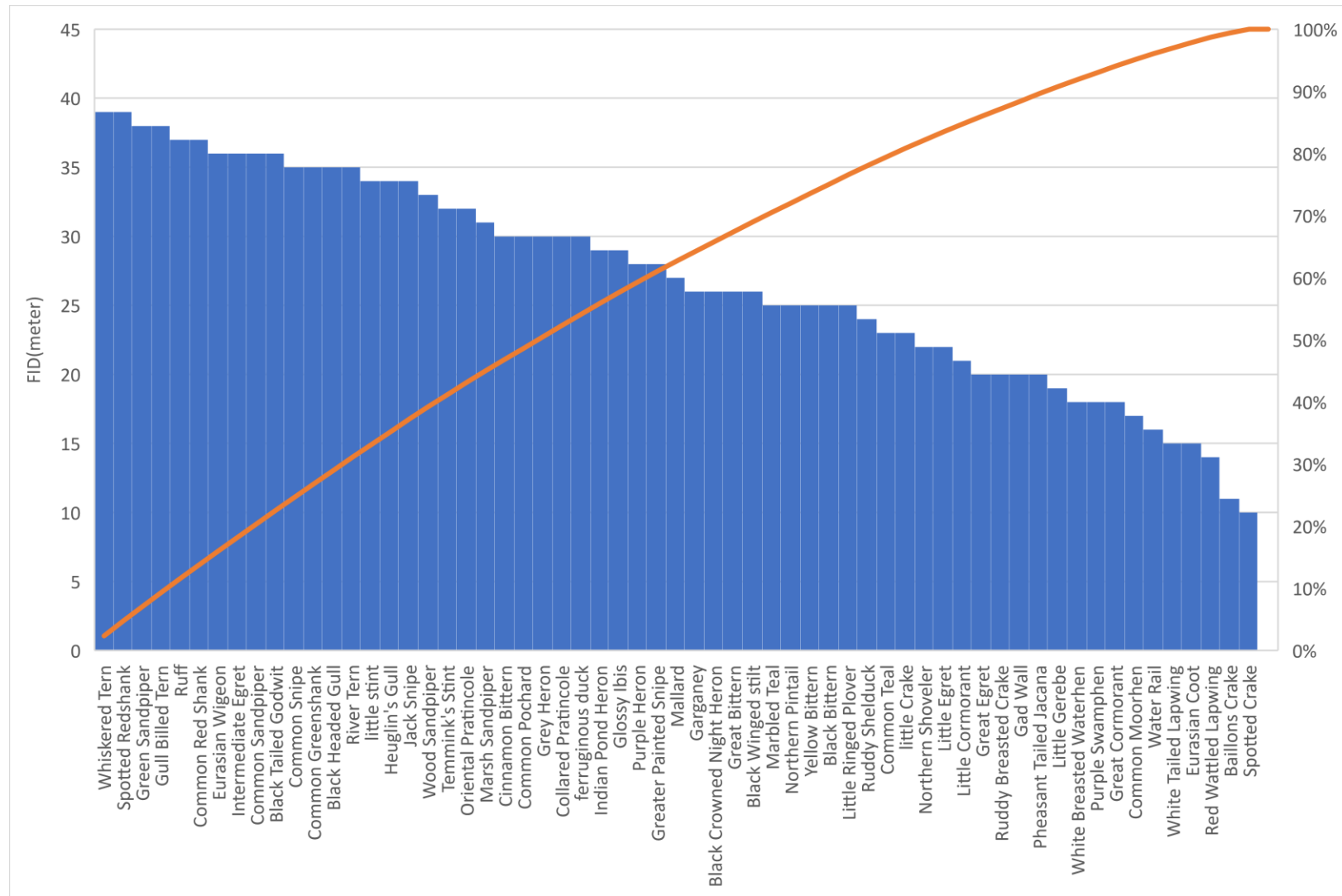


Figure 5: Level of FID of different water birds

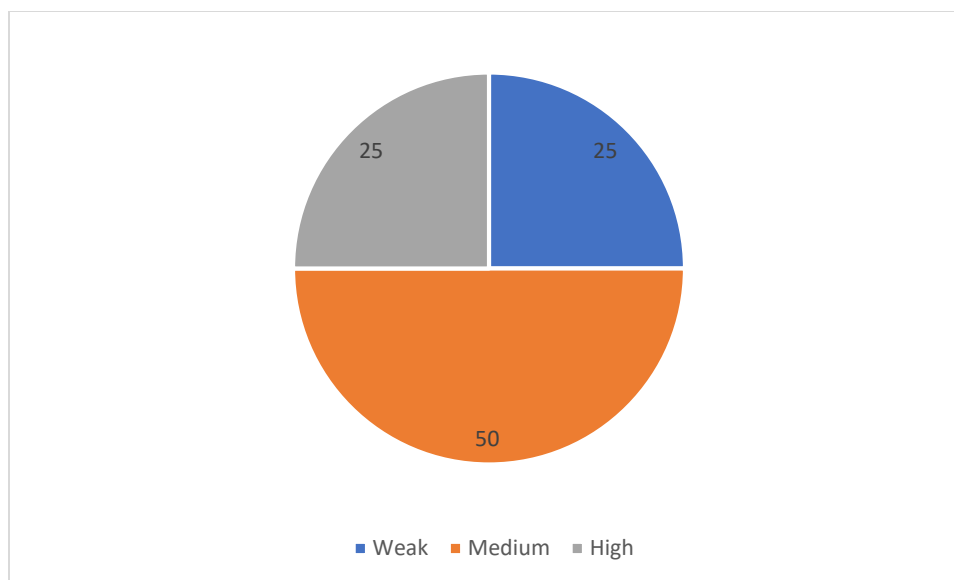


Figure 6: Percentage of Response type in species of Order Passeriformes

Rate of response of passerine birds was also recorded during current study, according to which, 50% of passerine birds showed medium response. This indicated that they remain in the site upon disturbance, 25% showed high and 25% showed weak response (Figure 6).

Seventy percent of passerines recorded lay in the 12 m to 32 m range. Pale martin showed maximum (39) FID among passerines and Jungle babbler showed the minimum FID of 9 meter. (Table 3), (Figure 7)

Table 3. Flight initiation distance of passerines at Langh lake

S. No	Common Name	Scientific Name	FID (meter)
1	Pale Martin	<i>Riparia diluta</i>	32
2	Wire Tailed Swallow	<i>Hirundo smithii</i>	27
3	Barn Swallow	<i>Hirundo rustica</i>	26
4	Common Whitethroat	<i>Sylvia communis</i>	20
5	White Tailed Stonechat	<i>Saxicola leucurus</i>	15
6	Red Throated Flycatcher	<i>Ficedula parva</i>	16
7	Common Stonechat	<i>Saxicola rubicola</i>	17
8	Pied Bushchat	<i>Saxicola caprata</i>	10
9	Rufous tailed Scrub Robin	<i>Cercotrichas galactotes</i>	19
10	Spotted Flycatcher	<i>Muscicapa striata</i>	10
11	Asian Desert Warbler	<i>Sylvia nana</i>	12
12	Rufous Vented Prinia	<i>Prinia burnesii</i>	14
13	Bay-Backed Shrike	<i>Lanius vittatus</i>	15
14	Isabelline Shrike	<i>Lanius isabellinus</i>	17
15	Long Tailed Shrike	<i>Lanius schach</i>	16
16	Turkestan Shrike	<i>Lanius phoenicuroides</i>	18
17	Baya Weaver	<i>Ploceus philippinus</i>	20

18	Streaked Weaver	<i>Ploceus manyar</i>	22
19	Chestnut Shuoldered Petronia	<i>Petronia xanthocollis</i>	20
20	Spanish Sparrow	<i>Passer hispaniolensis</i>	15
21	Commn Redstart	<i>Phoenicurus phoenicurus</i>	14
22	House Sparrow	<i>Passer domesticus</i>	10
23	Paddy Field Warbler	<i>Acrocephalus agricola</i>	11
24	Clamorous Reed Warbler	<i>Acrocephalus stentoreus</i>	12
25	Oriental Sky Lark	<i>Alauda gulgula</i>	14
26	Crested Lark	<i>Galerida cristata</i>	10
27	Common Chiff Chaff	<i>Phylloscopus collybita</i>	14
28	Bluethroat	<i>Luscinia svecica</i>	14
29	Striated Babbler	<i>Turdoides earlei</i>	10
30	Jungle Babbler	<i>Turdoides striata</i>	9
31	Common Babbler	<i>Turdoides caudata</i>	9
32	Graceful Prinia	<i>Prinia gracilis</i>	14
33	Rufous Fronted Prinia	<i>Prinia buchanani</i>	11
34	Yellow Bellied Prinia	<i>Prinia flaviventris</i>	13
35	Plain Prinia	<i>Prinia inornata</i>	12
36	Zitting Cicsticola	<i>Cisticola juncidis</i>	14
37	Paddy Field Pipit	<i>Anthus rufulus</i>	15
38	Citrine Wagtail	<i>Motacilla citreola</i>	13
39	Yellow Wagtail	<i>Motacilla flava</i>	13
40	White Wagtail	<i>Motacilla alba</i>	15
41	White Cheeked Bulbul	<i>Pycnonotus leucotis</i>	10
42	Red Vented Bulbul	<i>Pycnonotus cafer</i>	10
43	Blyth's Reed Warbler	<i>Acrocephalus dumetorum</i>	12
44	Purple Sun Bird	<i>Dreptes thomensis</i>	10
45	Common Myna	<i>Acridotheres tristis</i>	11
46	Blue Cheeked Bee Eater	<i>Merops persicus</i>	14
47	Green Bee Eater	<i>Merops orientalis</i>	13
48	Black Drongo	<i>Dicrurus macrocercus</i>	15

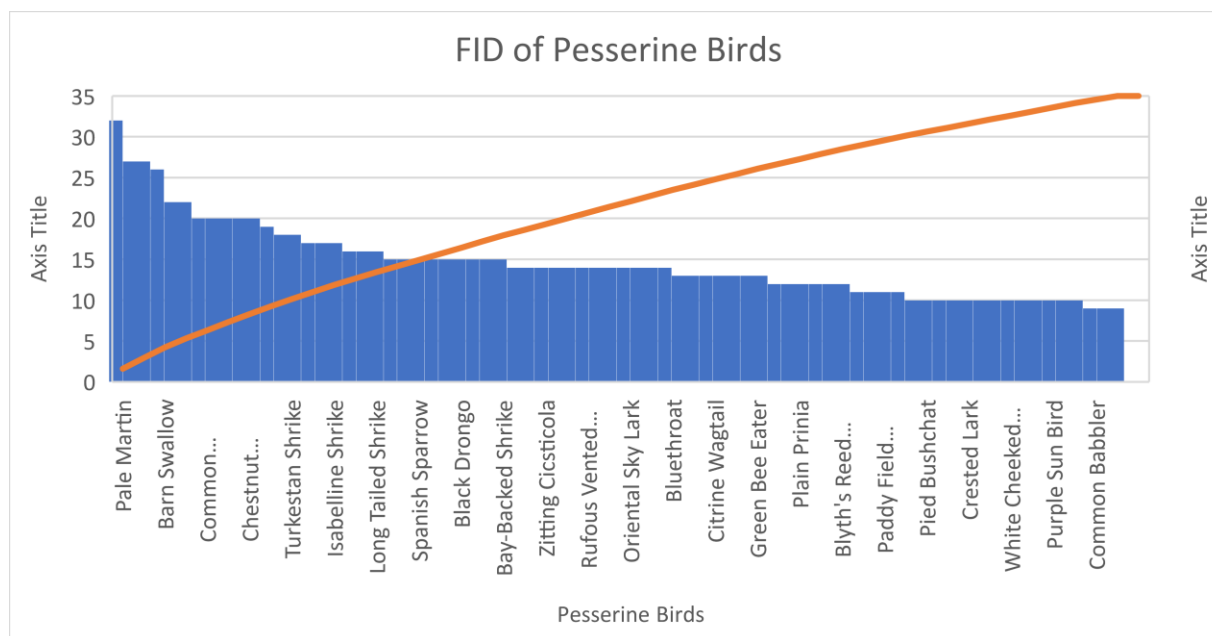


Figure 7: Level of FID of different Passerine birds

RESULT AND DISCUSSION

Species Richness and Species Abundance

During current study 131 species of birds belong to different families were recorded at Langh lake which indicates that this site is a perfect habitat of different bird species. This could be due to various factors like abundant typha, juncus and tamarix grown on edges of lake and different trees. From recorded birds, water birds were among highest in variety of different species. From total recorded birds, 51% were resident, 35% were in winter migrant, 9 % passage migrant were recorded and only 5% were summer migrant. Among water birds the greatest number of species recorded were from order Charadriiforms.

Marbled Teal (*Marmaronetta angustirostris*) was recorded with percentage relative abundance of 1.4. This species is Vulnerable in IUCN red list. Population of this species is declining due to habitat destruction and illegal hunting (BirdLife International, 2017). Ferruginous duck (*Aythya nyroca*) was recorded with relative abundance of 0.85%. This species is Near

threatened internationally. Distribution range of this species is declining (Wetlands International, 2016). Changes to the vegetation community, disruption of water regimes, siltation, and increased water turbidity contribute to its dwindling numbers.

Greater Spotted Eagle (*Clanga clanga*) is facing serious threats throughout its distribution range. Its conservation status is vulnerable internationally. This species was recorded from study area with relative abundance of 0.17%. Key threats to this species are habitat destruction, disturbance, poaching and habitat degradation due to afforestation and wetland drainage. In eastern Europe, agricultural intensification and the abandonment of traditional floodplain management have reduced habitat quality (Lohmus and Vali, 1998).

River Tern (*Sterna aurantia*) is near threatened internationally. This was recorded during survey with 0.25% relative abundance. The global population is estimated at between 50,000 and 100,000 individuals (Delany and Helmink, 2006). Threats to this species are currently not clear but flow regime, flooding of nest-sites and

construction of dams could be major causes of its decline (Birdlife International, 2016). Population of Black-tailed Godwit (*Limosa limosa*) is declining globally, making its conservation status Near threatened. This was recorded from current study area with 0.34% relative abundance. Most significant to this species is loss of habitat for its nesting sites due to intensive agriculture.

Flight Initiation Distance and Response

FID is important for planning and developing policies for conservation of birds. Presence of humans in habitat of wildlife results in their disturbance. Hence, buffers are required between the wildlife and its observers to reduce wildlife disturbance. Yet, no proper research has previously been conducted to find the FID for birds of Pakistan. The current study recorded FID for 109 birds belonging to different avian families. Spotted Redshank (*Tringa erythropu*) and Whiskered tern (*Chidonias hybrida*) showed maximum flight initiation distance among water birds and Pale martin (*Riparia diluta*) among passerine birds. Due to aesthetic value of Langh lake a lot of visitors move towards this area and perform different kinds activities such as boating, playing loud music and eating, causing pollution which causes disturbance to the bird population. There is no defined boundary that would cordon off area between visitors and birds. All these factors create hurdles for conservation policies.

Past studies insinuate that birds take humans as a predator when approached, which produces different biological changes that are negative in most cases. An experiment was conducted on Royal Penguins (*Eudyptes schlegeli*) on Macquarie Island, Antarctica which revealed a 1.23-fold increase in heart rate from resting rate and a six-fold increase in vigilance as man approached; the study found that this response was significantly greater than that

produced for its natural aerial predator (Nick et.al, 2005). During current studies 50% species of Passerines showed a weak response. As many birds are not negatively affected by human presence which is quite similar with the study performed in Europe (Mayer-Gross, 1997) in which nests of 11 passerine birds were visited frequently in breeding season for two years, but they showed no negative effect. But from different studies it was proven that real predation attempts and human disturbance results in redirecting the target bird's time and energy expenditure away from other important activities, such as reproduction and feeding (Frid and Dill, 2002). Human outdoor recreation and intensive agriculture along wetlands has been linked to lower abundance and reduced species richness.

CONCLUSION

Langh lake is a wildlife sanctuary and habitat of many birds but this area needs long term management policies to maintain ecological integrity of this habitat. Current study recorded FID, birds' response toward disturbance and diversity of birds in this habitat. This information will help stakeholders to develop policies to control the human intervention in birds' habitat be it in the form of agricultural activities or recreational activities. This data will also help in conservation of birds and in reducing their conflict with humans.

REFERENCES

- BirdLife International (2004). State of the world's birds 2004: indicators for our changing world. BirdLife International, Cambridge, pp 7.
- BirdLife International (2016). *Sterna aurantia*. The IUCN Red List of Threatened Species.
- BirdLife International (2017). *Marmaronetta angustirostris*. The IUCN Red List of Threatened Species.

- BirdLife International (2019). Country profile: Pakistan.
- Blumstein DT (2006). Developing an evolutionary ecology of fear: how life history and natural history traits affect disturbance tolerance in birds. *Anim Behav.*, 71: 389–399.
- Dandenong Valley Authority (1979). Edithvale Wetlands buffer area analysis. Environmental report 2, Dandenong Valley Authority, Melbourne.
- Frid A, Dill LM (2002). Human-caused disturbance stimuli as a form of predation risk. *Conserv Eco.*, 6: 11–26.
- Ghalib S, Kanwal R, Zahra A (2018). Review of the distribution, status and conservation of wildlife of Sindh. *Can J Pure Appl Sci.*, 12: 4519-4533.
- Grimmett R, Roberts T, Inskipp T (2009). *Birds of Pakistan*. Yale University Press.
- Hediger H (1934). *Zur Biologie und Psychologie der Flucht bei Tieren*. *Biol. Zentralbl.* 54: 21-40.
- Holmes N, Giese M, Kriwoken LK (2005). Testing the minimum approach distance guidelines for incubating Royal penguins *Eudyptes schlegeli*. *Biolog. Conserv.*, 126: 339–350.
- Hossain MD, Baki A (2015). Present status of preliminary survey on avifauna diversity and distribution in the most polluted river Buriganga, Dhaka, Bangladesh. *Int J Pure Appl Zool.*, 3(1): 59-69.
- Lohmus A, Vali U, 1998. Numbers of the Greater Spotted Eagle and the Lesser Spotted Eagle in Estonia. *Hirundo. Acta ornithoecol*, 11: 24-34.
- Mayer-Gross H, Crick HQP, Greenwodd JJD (1997). The effect of observers visiting the nests of passerines: an experimental study. *Bird Study*, 44: 53–65.
- Roberts TJ (1992). In: *The Birds of Pakistan*. 1st ed 2, Oxford University Press, New York.
- Simon D, Scott D, Helmink ATF, (2006). *Waterbird Population Estimates*. 4th ed.
- Sutherland WJ (2000). *The conservation, research, management and policy handbook*. Blackwell Science Ltd., Oxford, pp 14.

Mosvi et al. (2019). Avian Diversity of Langh Lake
J Biores Manag. 6 (1): 9-26