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Full Length Research Paper

Study on birds communities occurring at habitats adjacent to sewage water in Jeddah province during autumn and spring seasons

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A study was conducted to monitor and record bird communities in the sewage water discharging sites dominated by water lakes in the eastern section of Jeddah during autumn and spring seasons of the year 2003. Birds species were monitored in regular visits 2 days every week, recording their presence, their individual numbers, and observing any other biological features e.g. presence of nests and the like. A total of 63 bird species were recorded in the site during autumn months and 62 bird species were recorded during spring season. Twenty six species were resident in the site during both season's winter and summer, while 36 species migrate away from the site during summer months. On the other hand only 8 bird species left the site and migrated away during winter season. The bird recorded with the highest number during winter were Rappels Weaver with 333 birds, Black Winged Stilt with 236 birds, House Sparrow with 180 birds, Olivaceous Warbler with 119 birds and Pallid Swift with 101 birds. Winter season dominated summer season by the presence of significantly higher number of bird species, and this is probably due to the rise in temperature during summer months. It seems that some species are affected by high temperature so they migrate away from the site during summer.

Keywords: Birds communities, Sewage water, Seasons, Jeddah

INTRODUCTION

The history of the science of birds in the Arabian Peninsula extends to the beginning of the nineteenth century, where a number of scientists appeared, like (Philby, 1933) who is considered one of the prominent persons that cares about collection of bird samples during the thirties of the twentieth century. Then comes (Bates, 1940) who registered his observations and those of the others before him, and he was characterized by the best knowledge about birds in the Arabian Peninsula, and their relations and distribution in the different habitats, and made a complete survey to some areas like the Arabian Bay. The Arabian Peninsula receives great numbers of migrating birds, and some of them over fly the Peninsula without stopping during their migration from Europe and western Asia in their way to Africa (Meinertzhagen, 1954). The book "Birds of Saudi Arabia " contains a list of many of the resident and migrating species of birds in the Kingdom of Saudi Arabia recorded by (Jennings, 1981a). The birds of Yanbu Industrial City and the area around it during the period from April 1984 and May 1987 were listed and registered in a book by (Baldwin and Meadows, 1988). Many other studies were carried out on the birds of the Eastern Region of the Kingdom and different other areas by (Bundy, et al.,

1989), and the birds of Tabuk region by (Stagg and Walker, 1982), in addition to the studies of the birds of the southern western region by (Felemban, 1986) More than 200 species of birds were registered in the middle region in the studies of carried out by (Stagg, 1987).

Jeddah sewage water is discharged into the Red Sea coastal area throughout a large channel that forms some sort of lakes in some parts. This sewage water encouraged the growth of many species of plants shrubs, trees and water reeds. And thickets of bushes and trees repeat itself along this water channel, with an increase in the covered area by these thickets in the lake site. One of the prominent plant cover are the Acacia tree species particularly *Acacia humulosa, Tamarix macrocarpa, Leptadenia pyrotechnica.* This site attracted many species of birds, indigenous, exotic, visitors and migrated birds to come to the area. And with the vast increase in urbanization, and the increase in the sewage water discharge and the expansion of the area covered by vegetation and the availability of the feeding sources of the birds like insects, worms, plant and tree fruits, etc., the numbers of birds species coming to the site are increasing. It is known that birds can fly long distances in a process called “Bird Migration” to reach sites with available food, and where it can reproduce.

A study was conducted to monitor and record the species of birds that are commonly present in the sewage water lakes site during autumn and spring months of the year 2003. And at the same time to carry out biological studies on the bird Ruppels Weaver, its body weight, the relation of its body weight with its wing length, its moulting 2ehaviour and its reproduction throughout the months of the year.

MATERIALS AND METHODS

This study on the monitoring and registration of the bird species resident and visiting Jeddah discharging site, was carried out during winter and summer season of the year 2003. The work was conducted with two days visits every week, and each visit continued for 8 hours work. The work starts at 6 ocelots in the morning. Binocular was used to record the different bird species and their numbers, and the places of their presence whether sitting on a tree branch, or on the ground or in the water. Also mist nets were used to catch samples of birds for biological studies, and visual observations were carried out for detection of bird nests, eggs and breeding 2ehaviour.

The biological studies included measurement of the body weight, the wing length and the relation between them of the bird Rappel Weaver, together with its breeding season and its moulting 2ehaviour.

The Field Guide of, Birds of the Middle East and North Africa (Hollom, et al., 1988), The Birds of Britain and Europe with North Africa and the Middle East (Heinzel, et al.,1979) and the Field Guide to the Birds of the Middle East (Porter, et al.,1996) were used as field guides to differentiate between bird species, and as a reference to bird names.

Statistical Analysis

Standard deviation and range mean were used, together with the regression test for determination of the relation between the bird body weight and the wing length, with the help of the reference of (Chalmers and Parker, 1986).

RESULTS AND DICUSSION

Sixty three species of birds were found residing the area during autumn months (table 1), against 62 species during spring months (table 2). And a total of 40 species out of this range were found residing in this area during both seasons. With 23 species of birds migrating away from the site during spring season and come back again during autumn season (table 3), and 22 species migrating away from the site during autumn and come back again during spring (table 4).

Bird species present during autumn season

The total number of bird species recorded in the site during autumn months (September, October, and November) was 63 species (table 1). The number of the resident species was 31 species (49.2%) and the emigrant species was 32 (51.8%) of the total. And according to the specific density of the species during autumn season, 39 different species were recorded in the month of September with an average of 61.9%, and 41 species during October giving an average of 65% of the total recorded species. And during November the total number of recorded species was 49 with a percentage of 77.7% of the total number. The total number of birds recorded during autumn reached 1750 birds, and the highest number was during September, giving a total of 620 with a percentage of 35.4% of the total numeric density. October was comparatively the month with the lowest number of birds recording 535 birds with a percentage of 30.5% of the total (Figure 1). It could be seen that the bird Ruppels Weaver was the one with the highest number dominating all the others throughout the three months of autumn, giving a total of 248 birds, seconded by House Sparrow (138 birds), then the Black-Winged Stilt (116 birds), then the Balled Swift with a total of 102 birds, and the Great grey Shrike with a total of 96 birds.

Table 1. Species and number of Birds recorded in the experimental site during autumn season of 2003.

N	Bird Species		Septmber	October	November
1	Little Grebe	resident	24	18	11
2	Long Billed Pipit	″	-	-	4
3	Western Reef Heron	″	2	5	1
4	Black-Capped Bulbul	″	18	8	11
5	Black Bush Robin	″	9	11	8
6	Desert Partridge	″	-	1	-
7	Black Kite	″	5	1	2
8	Egyptian Vulture	″	3	1	1
9	Griffon Vulture	″	3	1	1
10	Black Start	″	-	2	-
11	African Collard Dove	″	3	-	-
12	Kestrel	″	2	2	1
13	Moorhen	″	14	8	11
14	Palm Dove	″	9	23	25
15	Little Green Bee Eater	″	42	8	-
16	Black Winged Stilt	″	40	40	36
17	Hoopoe Lark	″	11	-	-
18	Crested Lark	″	9	9	-
19	Crab Plover	″	-	-	2
20	Kentish Plover	″	8	3	3
21	Arabian Babbler	″	11	8	8
22	Nile Valley Sunbird	″	12	9	-
23	Graceful Warbler	″	12	11	12
24	Indian House Crow	″	5	7	4
25	Brown-necked Raven	″	-	2	1
26	House Sparrow	″	54	44	40
27	Rappels Weaver	″	72	92	84
28	African Silver Bird	″	21	12	-
29	Rock Dove	″	3	6	14
30	Arabian Warbler	″	6	8	10
31	House Bunting	″	2	-	2
32	Little Egret	emigrant	-	-	1
33	Glossy Ibis	″	15	-	-
34	Gadwall	″	-	-	11
35	Pintail	″	-	-	2
36	Garganey	″	23	-	-
37	Shoveler	″	18	-	-
38	Mallard	″	-	-	11
39	Coot	″	24	-	-
40	Tufted Duck	″	-	-	13
41	Pallid Swift	″	-	49	53

Table 1. Continue

42	Spotted Crake	″	-	-	1
43	Common Red Start	″	8	-	-
44	Swallow	″	-	-	28
45	Palm Dove	″	9	23	25
46	Avocet	″	-	-	1
47	Common Snipe	″	-	2	4
48	Red backed Shrike	″	18	13	14
49	Olivaceous Warbler	″	-	18	44
50	Arabian Warbler	″	6	8	10
51	Lesser Whitethroat	″	-	-	5
52	Spotted Flycatcher	″	4	4	2
53	Collared Flycatcher	″	-	2	2
54	Collared Pratincole	″	-	-	14
55	Little Ringed Plover	″	13	9	7
56	Ringed Plover	″	-	8	5
57	European Bee-Eater	″	42	8	-
58	Spur-Winged Plover	″	9	3	1
59	Pallid Swift	″	-	49	53
60	Short-toed Lark	″	12	5	12
61	Swallow	″	-	-	28
62	Wheatear	″	-	-	2
63	Masked Shrike	″	-	-	2
	TOTAL		535	575	620

Spring season Birds

The total number of species monitored and recorded during this season reached 62 of both the resident and migrated species, with a total of 30 resident species (48.4%), and 32 migrated species (51.6%). The highest number of species was recorded during April reaching 60 species compared to May with only 49 species. The total numeric density of the birds reached 1338 birds, and the highest number of birds was registered during April (826 birds) with a percentage of 61.7% of the total specific density, compared to the number of birds recorded during May with a total of 512 birds (38.3%) as regard to the total recorded spring birds. The bird Pallid Swift recorded the highest number of presence (135 birds) with a percentage of 10.1% of the total number of birds, seconded by the Ruppels Weaver with a number of 100 birds (7.5%), then comes the bird House Sparrow with a total number of 80 birds (5.97%), and Swallow with 79 birds and 5.9%, and Black Winged Stilt with 75 birds and 5.6%. On the other hand the species with the lowest number of birds are Hoopoe with only one bird, Wigeon, Namagque Dove and Golden Oriole with only 2 birds, Desert Partridge, Lichtenstein´s Sandgrous, Isabelline Whearear, Griffon Vulture, Egyptian Vulture and Griffon Vulture with total number of birds ranging between

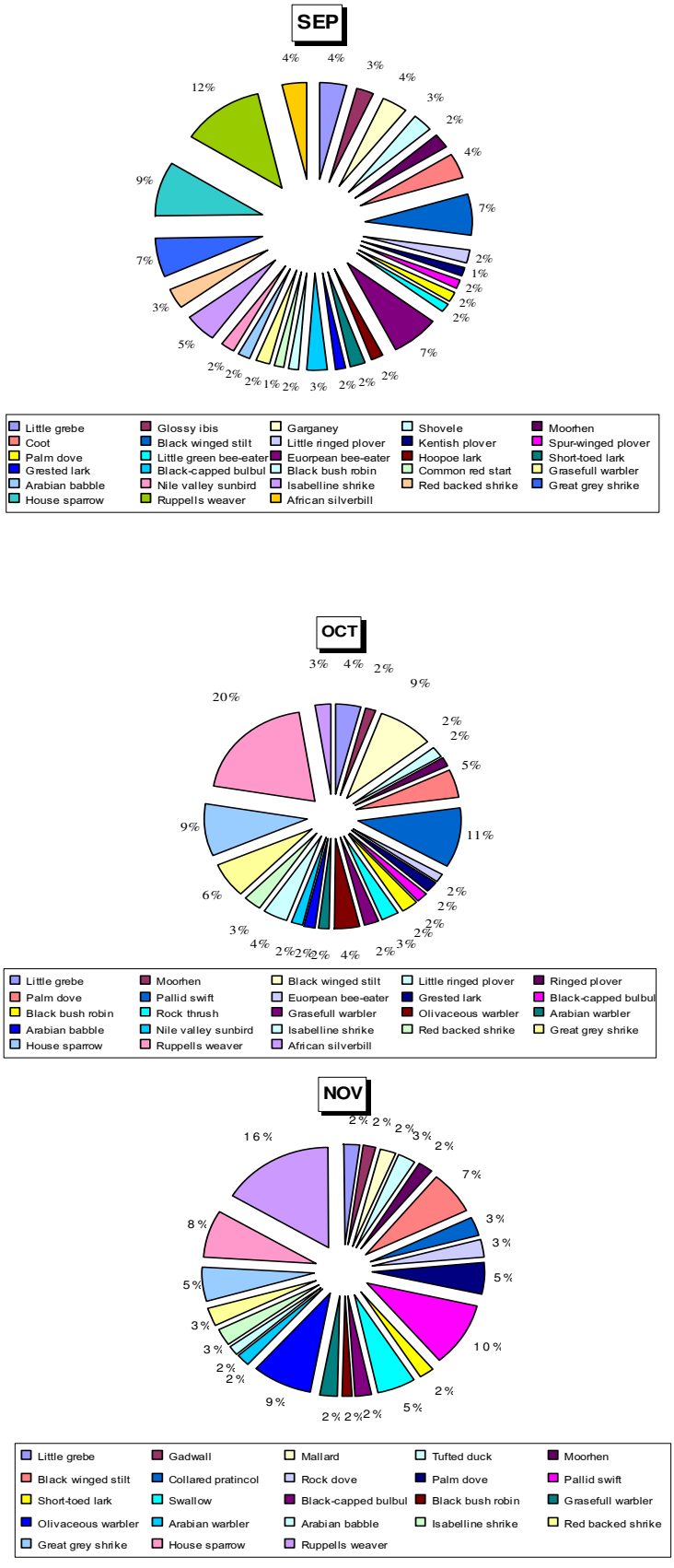


Figure 1. The total number of bird species recorded in the site during autumn months.

Table 2. Species and number of Birds recorded in the experimental site during spring season of 2003

N0.	Species		April	May	N0.	Species		April	May
1	Little Grebe	resident	17	10	31	Little Bittern	emigrant	8	6
2	Western Reef Heron	″	8	-	32	Bittern	″	12	-
3	Black-Capped Bulbul	″	12	9	33	Squacco Heron	″	18	14
4	Black Bush Robin	″	8	15	34	Wigeon	″	1	1
5	Desert Partridge	″	2	1	35	Tauny Eagle	″	3	5
6	Black Kite	″	4	5	36	Shoveler	″	14	6
7	Egyptian Vulture	″	3	1	37	Mallard	″	12	8
8	Griffon Vulture	″	3	1	38	Coot	″	12	9
9	Black Start	″	4	-	39	Quail	″	11	-
10	Kestrel	″	4	2	40	Pallid Swift	″	87	48
11	Moorhen	″	10	10	41	Cream colored Courser	″	9	5
12	Palm Dove	″	24	14	42	Common Red Start	″	11	9
13	Little Green Bee Eater	″	6	-	43	Swallow	″	46	33
14	Black Winged Stilt	″	44	31	44	Palm Dove	″	24	14
15	Hoopoe Lark	″	-	1	45	Spur-Winged Plover	″	5	2
16	Crested Lark	″	12	5	46	Turtle Dove	″	11	-
17	Kentish Plover	″	9	2	47	Common Swift	″	14	9
18	Arabian Babbler	″	6	12	48	Olivaceous Warbler	″	23	-
19	Graceful Warbler	″	14	7	49	Spotted Flycatcher	″	9	8
20	Indian House Crow	″	8	12	50	Blue-cheeked Bee-Eater	″	21	9
21	Brown-necked Raven	″	3	2	51	Yellow Wagtail	″	36	27
22	House Sparrow	″	38	42	52	Collared Flycatcher	″	5	3
23	Rappels Weaver	″	51	49	53	White Wagtail	″	29	18
24	African Silver Bird	″	12	14	54	Isabellin Wheatear	″	4	-
25	Rock Dove	″	15	9	55	Sedge Warbler	″	4	2
26	Arabian Warbler	″	8	5	56	European Bee-Eater	″	14	-
27	House Bunting	″	4	2	57	Red Warbler	″	10	-
28	Lichtenstein´s Sandgrous	″	2	1	58	Cretzschmar´s Bunting	″	9	9
29	Chestnut Sandgrous	″	6	3	59	Short-toed Lark	″	16	-
30	African Rock Martin	″	9	-	60	Golden Oriole	″	1	1
					61	Blackcap	″	20	-
					62	Woodchat Shrike	″	5	2
						Total		826	512

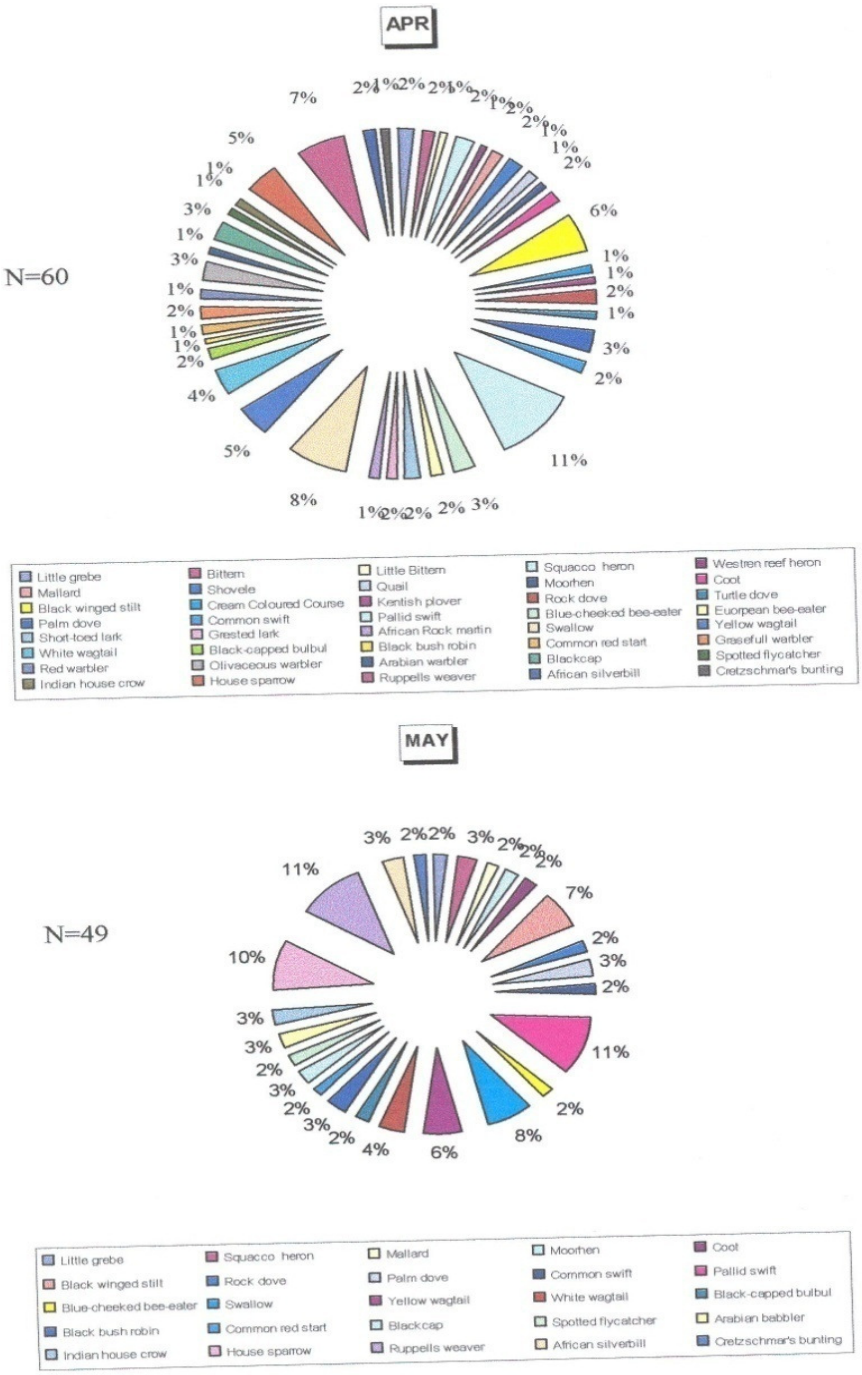


Figure 2. The total number of species monitored and recorded during spring season.

3 – 4. (Figure 2)

Birds that is commonly present in the area during both autumn and spring seasons

There were 40 species of birds recorded in the area during both autumn and spring seasons (table 3), and all of these are from the resident species. From these species, the most dominating are:

Ruppels Weaver is one of the indigenous birds and was recorded in large numbers particularly in autumn with a total of 248 birds, and in spring it reached 100 birds. It was seen that this bird starts reproduction in March and that it starts shedding off its feather after the end of the reproduction period, and extended for about 5

Table 3. Body weight of Ruppels Weaver throughout the year

Month	No.	Mean(gm)	S.D.	Range
January	7	16.57	1.71	15-19
February	5	15.8	0.447	15-16
March	3	16	0.000	16
April	5	17.4	0.894	16-18
May	4	16	1.15	15-17
June	5	15	1.22	14-17
July	3	14.6	0.577	14-15
August	4	14.5	0.577	14-15
September	9	15.7	1.093	15-18
October	14	15.57	1.82	14-19
November	6	15.83	1.16	15-18
December	5	15.80	0.447	15-16
Total	**70**	**16.2**	**1.39**	**14-19**

months from June to October. It was also seen that it starts building nets with different sizes. (Mackworth-Praced and Grant, 1960) reported the reproduction period of this bird between March and May in the eastern coast of the Red Sea and during January and February in the southern western region of the Kingdom of Saudi Arabia.

House Sparrow, is one of the indigenous birds, and was recorded in large numbers in both seasons, with autumn dominating recording a total of 138 birds, and spring with 80 birds. Baldwin and Meadows, 1988 considered House Sparrow as an indigenous bird and present in large numbers in Yunbou City. It was observed that the reproduction period of this bird starts in February as was seen through the building up of nests, and (Summers-Smith, 1988) has mentioned that the beginning of the reproduction season of this bird, in both the northern and southern half of the universe starts in March.

Black winged Stilt, it is a resident bird in this area, and ranks the third dominator in autumn with a total of 116 birds, and the fifth dominator during spring with a total number of 75 birds, it presents in all autumn and spring months. (Felemban and Al-Banna, 1993) considered it as a resident bird in the sewage discharge area of Makkah, while (Baldwin and Meadows, 1988) consider it as an emigrant visitor during winter in Yunbou City area.

Pallid Swift is an emigrant bird in the area, (Baldwin and Meadows, 1988) mentioned that it is an emigrant bird, and a winter visitor, and (Porter, et al., 1996) said it reproduces during November particularly in the Arabian Bay.

Little Grebe is one of the commonly resident birds, shown throughout the months of autumn and spring, and it was shown with six nets containing from 2 to 4 eggs. (Felemban, 1996) mentioned that this bird is present in great numbers in Jeddah province particularly in areas covered with sewage water, and the same result was reached by Ajarem 1991) and (Stagg, 1987).

Great Grey Shrike, it is an emigrant bird appears during autumn in reasonably greater numbers compared to others, and some were seen resting on tree branches, others on the ground and others in the fields. It is a bird with a grey color on its head and its back, and its wings are black in color. It is also characterized by a darkish black line extending from the end of the beak to the back of the head.

Olivaceous Warbler is an emigrant bird as said by (Baldwin and Meadows, 1988). It is mostly present in the areas covered by thick Acacia trees. Black Kite, was seen in small numbers between (8-9) in the experimental area during autumn and spring seasons, and is considered one of the resident birds in this sewage water site south of Jeddah City.

Egyptian Vulture and Griffon Culture are resistant birds in this site seen during autumn and spring but in small numbers. (Felemban and Al-Banna, 1993). Recorded this bird in Makkah sewage water discharge area, (Baldwin and Meadows, 1988) in Yanbu City area.

Moorhen, is one of the resident birds in this sewage water area, and was seen in comparatively greater numbers in both autumn (33 birds) and spring (20 birds) .It is a resident bird in most of Saudi Arabian areas (Ajarem, 1991; Porter, et al., 1996).

Isabelline Skrike was seen between the tree branches specially Acacia trees as single birds and inside the fields. It was present in autumn in large numbers compared to spring season.

Coot, this bird was seen in both seasons, and it is an emigrant bird. (Baldwin and Meadows, 1988) described this bird as a winter visitor to fresh water areas, and have a group of 25 birds in Yanbu City.

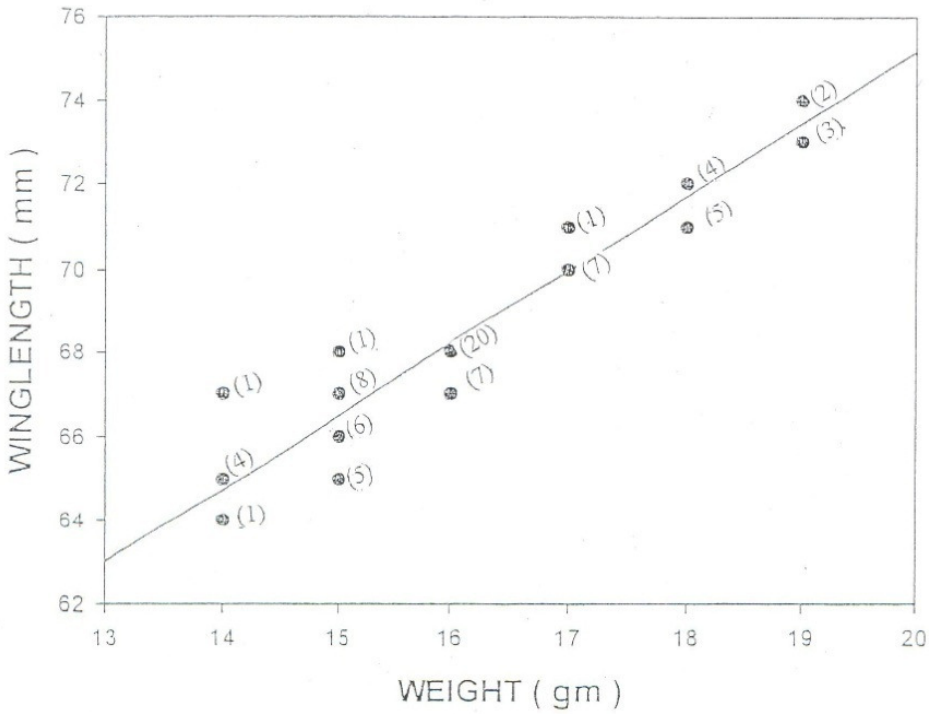
Table 4. Average weight of males and females of Ruppels Weaver during the seasons of the year

Season		Male mean wt. (gm)		Female mean wt. (gm)
Autumn	7	18	22	14.9
Winter	2	19	18	15.8
Spring	6	17.5	3	15.3
Summer	1	17	11	14.5
Total	16	18.25	54	15.57

Table 5. The relation between body weight and wing length of Ruppels Weaver using the regression line equation

	No.	(a)	(b)	Y=a + bx
Autumn	29	40.3	1.75	Y=40.3 + 1.75 X
Winter	20	38.8	1.82	Y=38.8 + 1.82 X
Spring	9	36.0	2.00	Y=36.0 + 2.00 X
Summer	12	46.3	1.33	Y=46.3 + 1.33 X

(a) = point where Y crosses the line
(b) = the slope
Y = equation of the striate line



(*) Numbers in grapgh represents number of birds

Figure 3. The slope between body weight and wing length showing significant differences in a way that wing length increases linearly with increase in body weight.

Ruppels Weaver

From all of the birds investigated Ruppels Weaver is the mostly present and distributed bird in the studied area. So it was subjected to detailed biological study including the body weight of the male and female, the relation between the body weight and the length of the wing, moulting, the breeding period and building of nests.

Table 6. Moulting points of Ruppels Weaver from January to October, 2003

Month	J	F	M	A	M	J	J	A	S	O	N	D	Total
No. of birds	7	5	3	5	4	5	3	4	9	10	6	5	70
No. of moulting points	-	-	-	-	-	5	3	4	9	10	-	-	35
Level of moult (points)	-	-	-	-	-	10-16	17-27	22-30	35-47	35-42	-	-	35

Body weight of Ruppels Weaver

Table (3) illustrates differences in the body in the body weight of the birds during the months of the year. It was clear that the rates of body weight increase during the cold winter months compared to the other hot months which witnessed reduction in body weight. It can be said that the body needs much energy to combat the cold weather during winter season, and this hypothesis is in agreement with what was said by many researchers in Europe, that the weight of resident birds increases in winter for the bird needs enough energy to warm itself against the cold weather, then starts reducing during reproduction and moulting period due of the high energy used in taking care of the young babies and the physiological processes (Newton, 1972; Newton and Evan, 1966).

On the other hand table (4) illustrates the body weight of the male and female during the different seasons. It showed that the male body weight is significantly greater than that of the female body weight during the four seasons of the year. The average body weight of the male was 18, 19, 17.5 and 17 gm, and that of the female were 14.9, 15.8, 15.3 and 14.5 gm respectively during autumn, winter, spring and summer. The male and female weights reached their minimum during summer season, and the highest weights were reached during winter, compared to the other seasons.

Body weight and wing length

The Regression Analysis using the Sigma Plot was used to determine the significant relation between the body weight and wing length of both the male and female of Rappel Weaver. The slope in Figure 3 and the analysis of that slope (table 5), are showing significant differences in a way that wing length increases linearly with increase in body weight.

Moulting of the bird Ruppels Weaver

Moulting condition of the bird was investigated monthly from January to December, 2003. Using (Ginn and Melville, 1983) method to calculate the wing moulting points from zero to five depending of the feather growth, and accordingly calculation of moulting starts from zero to fifty points. Seventy birds were investigated and moulting starts from June and reached its highest level in September and October, with no moulting from January to May, table (6).

Reproduction of Ruppels Weaver

The male of Ruppels Weaver was seen building its nets during January, and a number of 1 to 7 nests in one tree were seen. Eggs were found in some nests during February, and the weight of the eggs reached 2.2-2.3 gm. The female lies on the eggs. After one week small chicks were found in the nest. In 15 March the chicks were seen fully covered with feather.

CONCLUSION

Sixty three bird species were recorded residing Jeddah sewage water discharging area during autumn season (September, October November), and 31 (49.2%) species are resident and 32 (51.8%) are emigrant species. While during spring season the total number of bird species were 62, 30 (48.4%) resident and 32 (51.8%) emigrant species. The birds with the highest presence were Ruppels Weaver, House Sparrow, Pallid Swift, Black Winged Stilt and Swallow. The length of the wing of the bird Ruppels Weaver increases linearly with increase in its body weight. Ruppels Weaver moulting period starts from June and reaches its highest level in September and October.

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