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Impact of Some Anthropogenic Activities on the Diversity of Resident Bird Species at Damietta Region, Egypt

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ABSTRACT

The present study aims to evaluate the impact of some anthropogenic activities on the resident bird community of northern area of Damietta coast, Egypt. Birds were surveyed by using point count and lines transect methods, in six different localities for 15 months (from July 2007 to September 2008). The localities represented the different human activities (cultivated; urbanized and three different fish farming sites) in addition to one control locality. The study investigated the effects of habitat type and climatic factors on resident bird community assemblage. Habitat characteristics included: vegetation cover, soil physical analysis and climatic factors. Habitat type and plant covers were clearly different among the localities and to less extent within them. Resident species diversity varied spatially and temporally among the different localities during the study period. The densely vegetated fish farm site had the highest species richness and abundance, while coastal site had the lowest one. In contrast deserted fish farm site had the highest resident species evenness, while agriculture site had the lowest one. Otherwise, control site had the highest resident species diversity while, coastal site had the lowest one (Simpson diversity index and Shanon-Wiener diversity index). House sparrow was recorded as the most abundant resident bird species among all study sites accumulatively. The different localities had distinct and characteristic groups of species responding to human activities. Hierarchical Cluster Analysis and Bray-Curtis ordination of the resident bird species community indicated that there were two bird groups: the first group included deserted fish farm site, densely vegetated fish farm site and control site near to the native habitat (semi-natural zone), while the second one consisted of coastal site, sparsely vegetated fish farm site and agriculture site (urbanization and highly modified habitat).

Key words: Biodiversity, human activity, Resident birds, species diversity, species abundance, species richness, species evenness, Damietta.

INTRODUCTION

The ability to determine how biodiversity is affected by habitat modification has become a major focus of ecology and biological conservation. Different species, even within a taxonomic group, may exhibit different responses to factors such as habitat destruction (Turner, 1996; Bender *et al*., 1998) and other forms of anthropogenic disturbance (Bengtsson *et al.,* 2000). The acceleration of human impacts on wild populations (Steidl and Anthony, 2000; Jackson *et al*., 2001) has led to a recent surge in studies on the disturbance effects of anthropogenic activity, especially on avian populations (Francl and Schnell, 2002).

Biodiversity might be affected by changes at various spatio-temporal scales, as well as biotic and abiotic conditions. A particular change in environmental conditions may increase the diversity of one subset of organisms within a community while decrease the diversity of a different group of organisms. There may be strong habitats heterogeneity and thus, different spatial locations may have quite different biodiversity. Anthropogenic activity comprises a collection of human created disturbance events that can have long- and short-term impacts on wildlife by inducing changes in behavior, physiology and reproduction (Gill *et al*., 1996; Frid and Dill, 2002).

Increases in anthropogenic activity are generally thought to decrease the persistence of local populations by compromising habitat suitability (Söderstrom *et al*., 2001;Francl and Schnell, 2002), restraining feeding and breeding opportunities and increasing regional extinctions of wildlife species (Thompson and Jones, 1999; Jackson *et al*., 2001; Fernandez-Juricic *et al*., 2004). In addition, disturbances have the ability to influence succession rates and trajectories, modifying vegetation associations and ecosystem biodiversity (Ratchford *et al*., 2005).

Wetlands play an important role in biodiversity because they are attractive to many species due to their large habitat diversity and their great productivity providing nutrients and other resources (Elmberg *et al*., 1994). Birds are among the most conspicuous wetland animal species that are extremely sensitive to large hydrological changes (Pyrovetsi and Papastergiadou, 1992). Water level fluctuations influence the physical structure of habitats, the availability and accessibility of food (Clausen, 2000) and the presence of safe roosting or breeding sites (Green and Robins, 1993; Guillemain

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et al., 2000). Factors affecting shorebirds, such as loss of habitats importance for breeding, staging, and non-breeding season foraging, and exposure to contaminants are important concerns for conservation and restoration of shorebird populations (McCrary and Pierson, 2000; Brown *et al*., 2001).

Birds are considered one of the most important and widely distributed species in the cultivated, non cultivated land and also in the desert habitat. Urban areas can sometimes be considered as a part of birds' habitats (Reynaud and Thioulouse, 2000).

Coastal habitats are being increasingly impacted by urbanization, both through direct loss and indirect effects of human activities within the habitats or the adjoining watershed (Kennish, 2002). In order to adequately assess the costs and benefits of developing or protecting coastal lands, the induced alternation should be understood. Many studies have investigated the impact of these alterations on the degradation of coastal habitats themselves and its effects on economically important fish and shellfish populations (Vanderklift and Jacoby, 2003), but fewer have focused on the effects on estuarine wildlife such as birds and mammals (West *et al.,* 2002; Le V Dit Durell *et al.,* 2005). The study of bird species diversity and environmental variables in relation to spatio-temporal change provides a clearer picture of the links of human spatial pattern to biotic process.

Damietta Governorate has witnessed major developmental activities during the last decade such as Industrial projects, fish cultures and landscape urbanization encroachment. Such activities in addition to agricultural practices have caused drastic changes in the nature of aquatic and terrestrial environment of this region. Therefore, the current study aims to explore the effect of these activities on the spatial and temporal variation in the diversity, richness, evenness and abundance of resident bird species in the study areas.

MATERIALS AND METHODS

The study was carried out in the northern area of Damietta Governorate over a period of 15 successive months between July 2007 and September 2008. Six localities were selected based on their nature to represent Damietta shore well and show to what extant resident bird species are affected by anthropogenic disturbance and whether these impacts affected the bird community diversity and abundance or not. Two different sites were sampled in each locality, chosen to represent as much as possible the local habitat heterogeneities as followed:

Place	Abbreviation	GIS Record
Agriculture land	(Agr.)	**N:** 31° 26' 147" **E:** 31° 46' 182"
Summer resort and landscape	(Coast)	**N:**31° 27' 762" **E:** 31° 41' 291"
Deserted fish farm	(Mahta)	**N:** 31° 26' 415" **E:** 31° 35' 242",
Densely vegetated fish farm	(Dvff)	**N:** 31° 26' 337" **E:**31° 35' 088"
Sparsely vegetated fish farm	(Svff)	**N :**31° 26' 316" **E:** 31° 34' 353"
Control Site "Kassara"	(Kas.)	**N:** 31° 29' 336" **E:** 31° 24' 253"

The geographical position of each site was recorded using a hand-held GIS receiver (Map 1).

Bird survey was carried out using Point counts (Hutto *et al.,* 1986; Ralph *et al.,* 1993; Ralph *et al.,* 1995) and line transects methods (Bibby *et al*., 2000). Birds were identified according to Bird guide book (Mullarney *et al.,* 1999; Svensson and Grant, 2001).

Data were analyzed by calculation of the following parameters: species abundance, richness, evenness and diversity by using the PC-ORD program for Windows version 1.14 (McCune and Mefford, 1999). Similarity (Jaccard index) was calculated using Full Stat program (Ludwig and Reynolds, 1988). Similarity indices between sites were measured by correlating the distances of similarity between groups and they were plotted using the Hierarchical cluster analysis by average linkage between groups on the SPSS 11.01 program for statistical analysis under windows Duferne and Legendre's (1997).

The climate of Damietta (The average seasonal temperature and R.H. %) was recorded over the study period from July 2007 until September 2008. For each locality, the following parameters were measured: Wind

Map1: The Northern area of Damietta showing the study sites.

speed and direction (by cupanemometer), % cloud cover, while Rainfall and atmospheric pressure data were taken from meteorological station of Damietta.

The collected plant samples in each site were identified in the herbaria of Botany department, faculty of Science, Damietta Branch-Mansoura University. Three soil samples were taken from each site for laboratory analysis of soil physical factors, soil texture and percentage of soil moisture. The soil analysis was carried according to Piper (1950) at Botany Department, faculty of Science, Damietta Branch-Mansoura University.

RESULTS

Habitat characteristics

A total of 85 plant species (Appendix 1) was recorded from the 6 sites of the study area, with the minimum number of plant species (6 species) recorded in Mahta-site, while the maximum number of plant species (54 species) was recorded in Agr-site (Fig. 1). The one-way ANOVA's showed a highly significant difference in species richness between study sites ($F_{(11,\ 1019)} = 2.39$, $P< 0.006$).

The climatic factors studied in Damietta area (air temperature, relative humidity, wind speed, wind direction, cloud cover, rainfall and relative humidity) throughout the study period are given in (Table 1). The climate of this area is semi-arid with hot long summer and short cool, windy, rainy winter. Soil grain size distribution (fine sand, medium sand, coarse sand, clay-silt and clay) for all samples and moisture percentage are shown in table 2.

Pattern of Resident Bird Diversity

A total of 86,475 individuals belonging to 40 bird species (10 orders and 24 families) were recorded throughout the study period from the study sites (Appendix 2).There were 15 species at Coast-site; 23 species at Mahta-site; 28 species at Dvff-site; 27 species at Svff-site; 24 species at Kas-site (control one) and 24 species at Agr-site (Fig.2).

1. Spatial and Temporal Pattern of Variation in Species Richness and Abundance of Resident Bird

The highest resident species richness (*S=28*) and abundance (Mean= 607.5$\pm$ 29.56) were recorded in Dvff-site while the Coast-site had the lowest richness (*S=15*) (Fig.2A) and species abundance (Mean=160.026 $\pm$ 22.58) (Fig. 3A). There was a highly significant difference between different study sites in both species richness ($F_{(5,89)} = 23.96$, $P< 0.00001$) and species abundance($F_{(5,89)} = 9.93$, $P< 0.00001$). On the other hand, May-2008 recorded the maximum resident species richness (S=29) during the study period at different study sites while March-2008 was the minimum one (S=21) (Fig.2B). The data show that there was no significant difference among different months at the study period in species richness ($F_{(14,89)} = 1.75$, $P \leq 0.1$). While, There was a highly significant difference among months of study periods in resident species abundance ($F_{(14,89)} = 3.43$, $P \leq 0.0001$). December-2007 recorded the maximum species abundance (Mean=211.395$\pm$12.99) during the study period

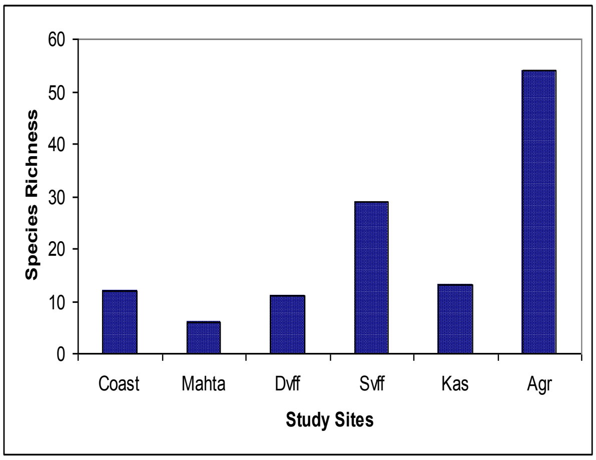
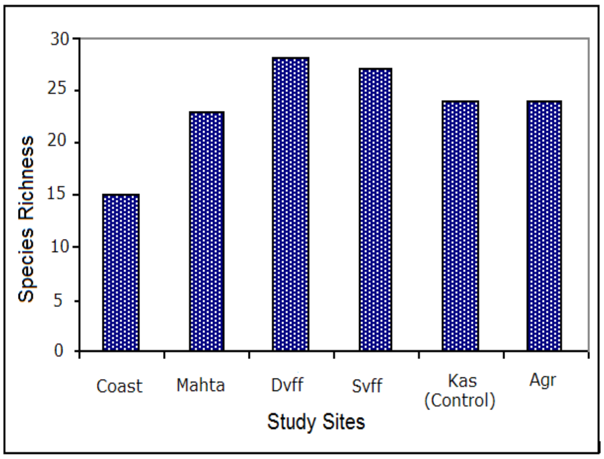


Figure (1): Plant species richness for study area.



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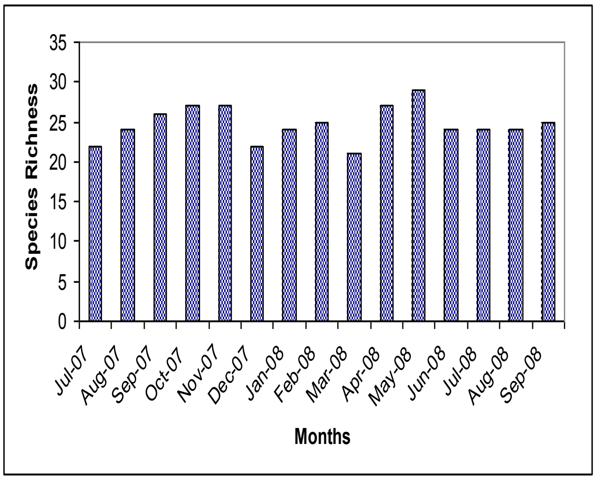


(B)

Figure (2): Resident bird species richness at different sites of the study area. (A): The spatial variation, and (B): The Temporal variation

Table (1): Climatic factor recorded in Damietta area from July 2007 to September 2008.

Months	Temperature (ºC)			Relative Humidity (RH) %	Wind speed	Wind direction	Cloud cover (%)	Rainfall (mm.)
	Max.	Min.	Mean					
July 2007	33.8	27.9	30.9	72%	11.4	SE	3	0
August 2007	34.2	30	31.8	61%	8.5	SE	3	0
September 2007	32.8	27	30.1	66%	9.4	SE	3	0
October 2007	23	21	21	77%	10.8	SW	5	0
November 2007	21.5	18	19.4	69%	7.1	S	5	13.7
December 2007	16	14	15	75%	7.5	S	7	15.1
January 2008	17.9	12.2	15	69%	11	SE	5	24.9
February 2008	14	12	13	71%	11	S	4	29.4
March 2008	29.5	21	23.7	48%	7.2	SE	3	0.6
April 2008	31.5	18.4	24	66%	6.2	SE	4	0
May 2008	29.9	22.3	25.8	59%	7	SE	3	0
June 2008	38.2	28.5	31.3	61%	9	S	3	0
July 2008	36.6	25.6	30.8	61%	8.6	SE	3	0
August 2008	36.7	26.2	32.5	61%	5	NE	3	0
September 2008	35	32	33	69%	7.4	SE	4	0

Table (2): Soil physical analysis for study area from July 2007 and September 2008.

	Coast	Mahta	Dvff	Svff	Kas	Agr
Fine sand	50.9	60	55	62	63	20
Medium sand	47.4	40	50	46	43.8	17
Coarse sand	1.4	1	1	1.5	1.3	0.9
Clay/silt	0.4	0.8	0.6	1	1.2	3.28
Clay	0	0	0	0	0	8.72
Moisture%	1.79	12.5	21.8	6	18.9	8.9

at different study sites while July-2007 was the minimum one (Mean=79.132 ±10.82) (Fig. 3B).

2. Spatial and Temporal Patterns of Variation in Species Evenness of Resident Bird

The highest resident species evenness was recorded in Mahta-site (E= 0.811) while Agr-site had the lowest one (E= 0.682) (Fig. 4A). There was a highly significant difference among different study sites in species evenness ($F_{(5, 89)} = 7.021$, $P< 0.0001$). The maximum resident species evenness was recorded on February, 2008 (E= 0.859) during the study period at different study sites while August-2008 had the minimum one (E= 0.704) (Fig. 4B). The data showed that there was no significant difference among months of study periods in species evenness ($F_{(14,89)} = 1.72$, $P\leq 0.07$).

3. Spatial and Temporal Pattern of Variation in Diversity of the Resident Bird

Figure (5A) illustrates the spatial variation in Simpson diversity index (D) and Shanon-Wiener diversity index (H) at different study sites. The highest values of resident species diversity by both Simpson diversity index and Shanon-Wiener diversity index were recorded in Kas-site (D = 0.9018 & H = 2.57), while the lowest one was recorded in Coast-site (D = 0.8224 & H = 2). There was a significant difference in Simpson diversity index ($F_{(5,89)}$ = 12.98, $P \leq 0.0001$) as well as for Shannon diversity index ($F_{(5,89)}$ = 15.6, $P \leq 0.0001$) among all studied sites.

There was no significant differences in the temporal variation in both Simpson diversity index ($F_{(14, 89)}$ = 0.95, $P \leq 0.5$) and Shannon diversity index ($F_{(14, 89)}$ = 1.09, $P \leq 0.3$) among months during the study period (Fig. 5B). However, February-2008 had the highest value of temporal variation in species diversity (D = 0.9261 & H = 2.766) with both Simpson and Shannon-Wienner diversity indices, August-2008 had the lowest (D =0.8494 & H = 2.239) one.

Species importance curve:

Figure (6) shows species importance curve of resident bird in all study sites accumulatively. Among the study sites, species B149 (*Passer domesticus niloticus*, Passeriformes: Passeridae) was the most important species while species B4 (*Ixobrychus minutus*, Ciconiiformes: Ciconiidae) and species B84 (*Columba livia gaddi*, Columbiformes: Columbidae) were the lowest ones, (see appendix 2).

Similarity (Jaccard index):

Table (3) shows the similarity between different studied sites, in resident bird species composition. The Dvff site was highly similar to Svff site (97.9%), while, the least similarity was between Coast-site to both Dvff site and Agr site (94.4%).

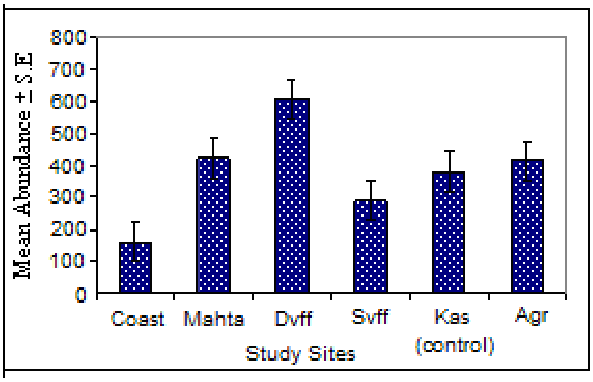
Hierarchical Cluster Analysis:

Figure (7) clarifies the groups of resident bird species resulting from the cluster analysis. The first level separated Kas-site, Mahta and Dvff sites from Coast, Svff and Agr-sites. In second level, Coast-site was separated from the other two study site Svff and Agr-sites and also Kas-site was separated from Mahta and Dvff-sites. The third level separated the two Svff and Agr-sites and Mahta-site from Dvff-site.

The Bray–Curtis ordination of the study sites was indicated in Figure (8), the six sites are plotted along axis 1 and axis 2. Axis 1 separated the most dissimilar sites (Agr. and Mahta),while axis 2 separated Coast and Svff as the most dissimilar sites while Kas and Dvff sites detected in between. The total variation was 95.30%, axis 1 extracted 76.17% of the original distance matrix and axis 2 extracted 19.13% of the original distance matrix.

DISCUSSION

Spatial distribution of organisms is determined by the accumulation of various factors being reflected on larger scales. These factors vary in nature from abiotic gradients (eg. type of soil, climatic conditions and vegetation cover) to clearly biotic features (eg. Predation,



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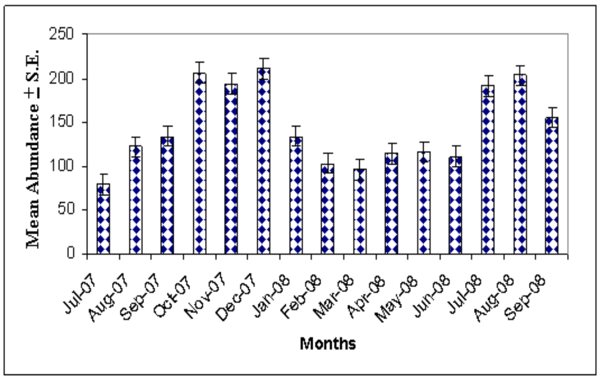
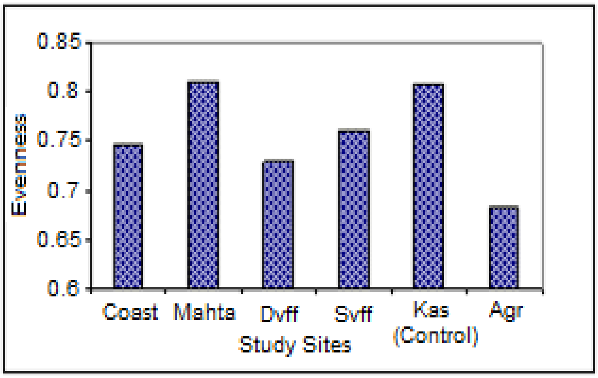
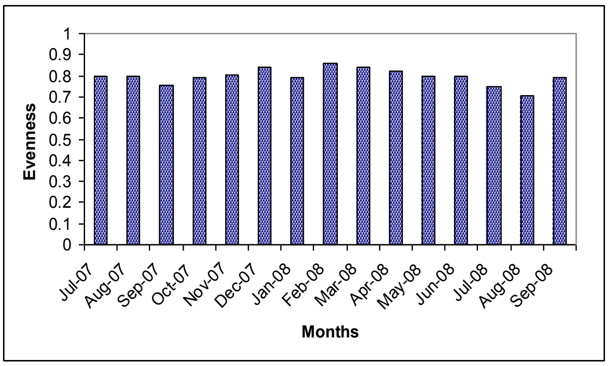


(B)

Figure (3): Resident bird species abundance at different sites of the study area: (A) The spatial variation, and (B) The temporal variation.



(A)



(B)

Figure (4): Resident bird species evenness at different sites of the study area: (A) The spatial variation, and (B) The temporal variation.

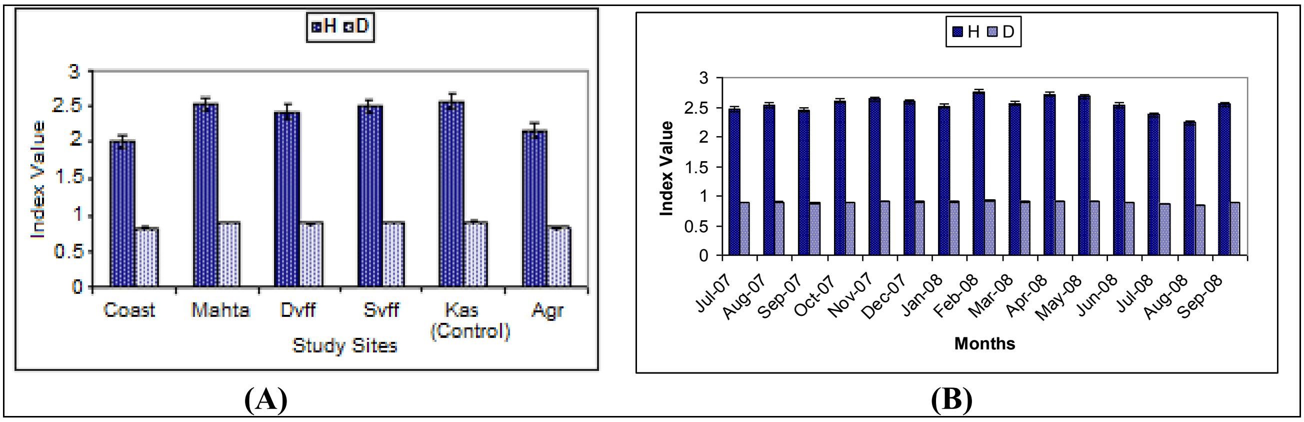


Figure (5): The Simpson diversity index (D) and Shannon Weiner diveristy index (H) of resident bird species at different sites of the study area: (A) The spatial variation, and (B) The temporal variation.

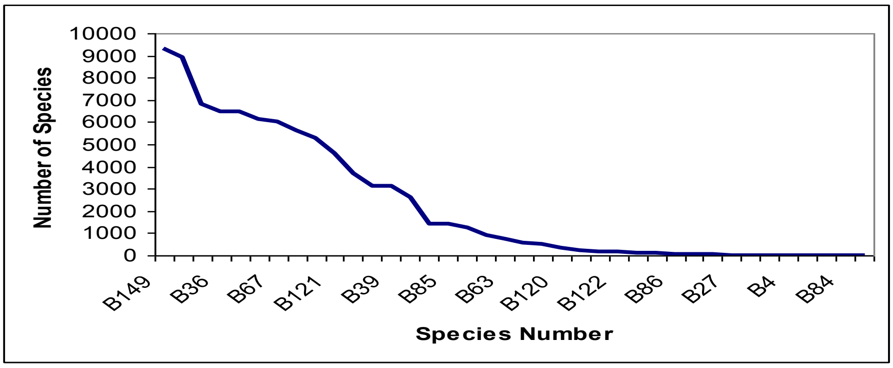


Figure (6): Species importance curve of resident bird at all studied sites together.

Table (3): The Jaccard similarity Index of resident bird species between different studied areas.

Sites	Coast	Mahta	Dvff	Svff	Kas	Agri
Coast	100%					
Mahta	95.3	100%				
Dvff	*94.4*	96.1	100%			
Svff	96.2	97.4	*97.9*	100%		
Kas	95.6	97.3	97.6	96.5	100%	
Agr	*94.4*	95.6	96.3	95.5	95.5	100%

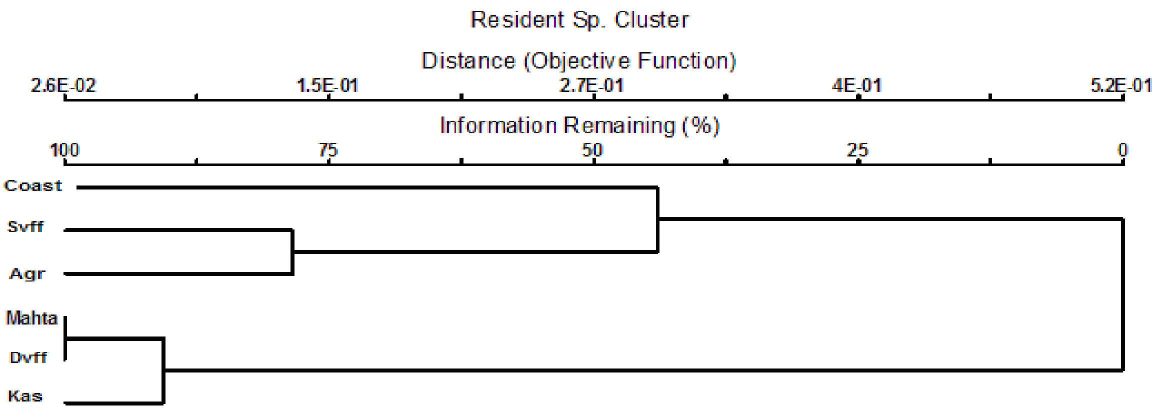


Figure (7): Dendrogram showing the 6 sites interpreted from the Hierarchical cluster Analysis Classification of the study sites according to resident bird in study site.

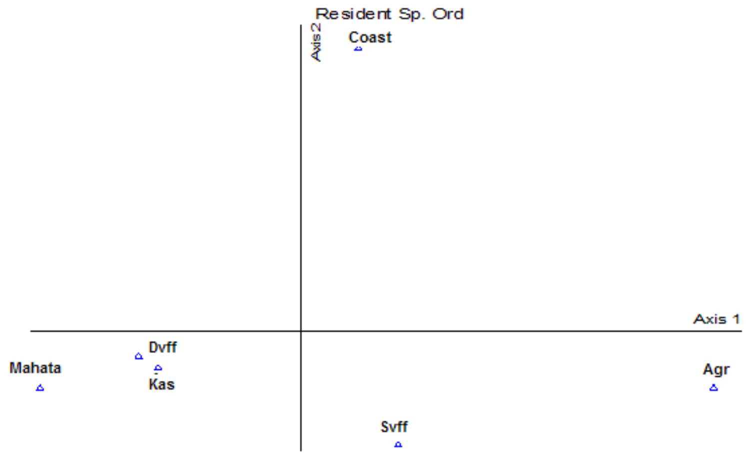


Figure 8: Bray-Curtis ordination of studied sites according to resident bird data.

competition, and heterogeneity of plant cover or state of succession). Also human activities often influence those factors affecting distribution (Lawton *et al.,* 1998). Studies of urban bird communities typically examine the influence of natural environmental factors, such as small-scale vegetation features (Daniels and Kirk-patrick, 2006 a, b), the size and spatial arrangement of natural habitat patches (Melles *et al.,* 2003; Camp-bell, 2009; Evans *et al.,* 2009).

The habitats within the control-site are more heterogeneous than the other sites, reflected its higher species richness while, Agriculture site has the lowest species richness. In contrast, Mahta and Dvff-sites have almost equivalent species diversity, significantly higher than other sites while Agriculture site was the lowest species diversity.

Cherkaoui *et al.* (2009) concluded that there is a growing need for understanding the ecological factors and processes affecting local community diversity in fragmented habitats for conservation purposes. Elimination of vegetation is one of the main ways of modifying animal habitats. Replacement of native vegetation by novel human-induced land cover is usually referred to as habitat replacement or loss because many novel land covers (e.g., farmland) are not suitable habitats for native species (Fischer and Lindenmayer, 2007; Yamaura *et al.,* 2009). Because habitat replacement has rapidly proceeded in recent decades, land-use change in general has become one of the biggest threats to biodiversity (Sala *et al.,* 2000; Foley *et al.,* 2005). As habitat replacement precedes, the area of native vegetation patches, species richness, and densities of many species in the patches all decline (Fischer and Lindenmayer, 2007).

The present data show that there is a significant difference among study sites in plant species richness. Agr-site records the highest plant richness and the lowest one is Mahta-site. Breeding passerine bird dominated mainly with reed and their abundance fluctuates with reed abundance. This is in consistent with local bird richness in forest patches generally depends on local vegetation structure, as plants directly determine the availability of food and nesting sites for bird species (Newton, 1998). So it is recommended to maintain larger green spaces with high structural diversity to maintain plant and bird diversity (Khera *et al.,* 2009; Campbell, 2009).

The climate of Damietta area is semi-arid with hot and long summer and short cool, windy, rainy winter. The results show that temperature increase toward Svff-site. According to Paclík and Weidinger (2007) bird species select the warmer roost sites than cold one. Mahta and Dvff-sites show marked increase in relative humidity (RH %). Mahta and Dvff-sites are highly vegetated, thus there is increase in evatranspiration, also contain a large water surface this entire factor lead to increase in humidity.

A great part of the birds' abundance variation among farming systems was found to be explained by the species specialization level related to organic and soil conservation management (Ondine et al., 2009). Accor-ding to soil physical analysis the soil texture and moisture varied, which reflect the variation in vegetation and birds community across the different sites. The fine and medium-textured soils are favorable for production, due to their high available retention of water and exchangeable nutrients. The coarse-textured soils permit rapid infiltration due to their large pores between particles. Soil texture affects the soil temperature. Fine-textured soils hold more water than coarse-textured soils, therefore, the fine-textured soil heats up slower than the coarse-textured soils.

Weather conditions, especially temperature, winds, and local topography have a substantial impact on bird flight and orientation (Akesson and Hedenstrom, 2007; Brattstrom *et al.,* 2008). Through the year, bird diversity varied among different months of the year between and within localities perhaps explained by climatic changes.

Resident and breeding bird species play an important role as a bioindicator of habitat change. Cottam *et al.*

(2009) detected that studies of breeding birds provide clear examples of the consequences of habitat fragmentation. O'Connell *et al.* (2007) found that breeding bird community are appropriate indicators of ecological condition. Because most of resident birds in Damietta region are gregarious birds, they have a significant effect on the habitat, especially when they are locally abundant. Recher *et al.* (1987) show that, because larger areas are required for greater numbers of individuals, gregarious animals are more likely to be affected by habitat loss than other guilds.

Human factors are important in managed of semi-natural habitats. The further loss or degradation of marginal vegetation as a result of land abandonment, under-management or intensification may have a serious impact on a number of bird species. Indeed, human settlement at some levels may limit avian productivity by diminishing resources, increasing nest predation, competition for resources, and brood parasitism (Marzluff *et al.*, 2001).

The abundance of reed specialists in coastal area was related to vegetation structure rather than to the extent of continuous early successional habitat at a study site or to surrounding land use patterns. The vegetation cover within the Dvff-site is dominated mainly with *Pharagmits australis* "reeds" than the other sites, reflected its higher bird species richness and abundance, while Coast-site has the lowest species richness and abundance. There is spatial significant difference among sites in species richness and abundance. In contrast, Mahta-site shows the highest resident species evenness and Agr-site the lowest one and sites varied significantly in evenness. On the other hand, Kas-site has almost equivalent species diversity in both Shannon-Wiener and Simpson diversity indexes, significantly higher than other sites while Coast-site was the lowest one. Previous work has demonstrated that changes in the composition of vegetation can alter avian community patterns in urban and suburban areas (Blair, 1996). Also the results are in consistent with other studies (Lee and Rotenberry, 2005; Nikolov, 2009; Lencinas, *et al*., 2009; Jayapal, *et al.*, 2009; McDermott and Wood, 2009) which all showed that differences in vegetation characteristics between disturbed and undisturbed sites were mirrored by differences in bird community composition and in which vegetation composition was identified as the key habitat feature in fashioning composition of avian assemblages especially breeding bird. On the other hand, Coast-site was recorded as lowest site in bird species richness, abundance and diversity and this can be explained by more urbanized area contains more invasive species than other. This is in agreement with that urban bird communities are usually characterized by the dominance of a few species (Beissinger and Osborne, 1982; Marzluff, 2001) and most of the species making up were introduced or alien species (Shwartz *et al.*, 2008). Localized extinctions may be a result of invasions by non-native species (Blair, 2004). Urban birds may be classified categorically as urban avoiders, suburban adaptable and urban exploiters (McKinney, 2002).

Temporal factors (stage of nesting cycle, seasonal effects, and annual variation) had the most effect on nesting success; landscape factors had little influence on nesting success (Cottam *et al*., 2009). Throughout the present study period, diversity did not vary significantly among different months, however, February 2008 recorded the highest value in Simpson and Shannon diversity index while August 2008 was the lowest one. Also May-2008 records the highest resident bird species richness and March-2008 was the lowest one with no significant difference between months. In contrast, there is significant difference among months in resident bird abundance; December-2007 had the highest abundance and July-2007 had the lowest one. For evenness Febraury-2008 had the most resident bird evenness and August-2008 had the lowest one. Variability in bird species richness, abundance and diversity especially resident bird can be explained by that in summer season (June-July-August/2008) fishermen cut all reeds to rearrange the shape of water pools banks in fishfarm and this affected bird community. This result is in agreement with Schmidt *et al.* (2005) who concluded that reed cutting significantly altered habitat structure, the overall arthropod community, as well as spiders and beetles at the species level, reducing two of the most important prey species for breeding passerines and the effects of reed cutting on habitat structure are similar to those reported from higher latitudes (Hawke and Jose, 1996; Ostendorp, 1999). Reed cutting reduced the availability of major prey species of birds. Also the uncut patches would also provide nesting opportunities to passerines (Baldi and Moskat, 1995). Several bird species are considered vulnerable in Damietta (e.g., little bittern and a lot of passerine), and many reed beds are part of their natural reserves.

Passer domesticus niloticus (house sparrow) was recorded as the most abundant resident bird species among all study sites especially in Coast-site. Goodman *et al.* (1989) found that house sparrows are abundant residents in Nile Delta. This may be due to the introduction or enhancement of foraging and nesting resources. Seed and sugar-water feeders and nest boxes were often present in residential areas. Not surprisingly, granivores were most strongly associated with development, and the incidence of granivores, like house sparrow, was strongly related to building density. Moreover, species that have been documented nesting in human structures (Kingery, 1998) were the dominant nesting group in developed sites. Child *et al.* (2009) found that raptors and scavengers displayed the most consistent losses with habitat loss and urbanization while nutrient dispersers and grazers tended to increase. In Mahta and Kas-sites little egret (*Egretta garzetta*) is the most abundant one while in Dvff-site yellow wagtail (*Motacilla flava*) and in Svff-site egyptian barn swallow (*Hirundo rustica savigmii*), while in Agr-site cattle egret

(*Bubulucus ibis*) is the most abundant one.

In the present work, high similarities were recorded between the Dvff-site and Svff-site. This can be explained by a lot of factor such as climatic factor, vegetation cover and soil physical structure similarities.

The results of Hierarchical Cluster Analysis and Bray-Curtis ordination of the resident bird species community indicate that there is no difference between the impacted sites and the control site, the separation principally takes place according to human settlement and vegetation cover. These make two different groups, the first one include Mahta, Dvff and Kas-sites (semi-natural zone), while the second group consists of Coast, Svff and Agr-sites (urbanization and highly modified zone). This results are in agreement with (van Rensburg *et al.*, 2009), who concluded that there is two distinctive bird habitat semi-natural habitat and urban habitat in South Africa.

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تأثير بعض النشاطات البشرية على التنوع الحيوي لأنواع الطيور المقيمة بمنطقة دمياط – مصر.

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الملخـــص العربــــي

إستهدفت الدراسة الحالية تقييم تأثيربعض الأنشطة البشرية على مجتمع الطيور في المنطقة الشمالية من ساحل محافظة دمياط - مصر. تم رصد أنواع الطيور من ستة مناطق مختلفة وذلك بإستخدام العد النقطي و العد في خط مستقيم لمده 15 شهر (من يوليو 2007م إلى سبتمبر 2008م). وأشتملت تلك المناطق على مواقع تمثل تأثير أنشطة بشرية مختلفة (الأنشطة الزراعية و المناطق الحضرية السكنية و ثلاث مزارع للأسماك مختلفة البيئات) بالإضافة إلى منطقة بدون أنشطة (تجربة ضابطة). كما تناول البحث دراسة تأثيرات نوع البيئة و العوامل المناخية على تجمعات مجتمعات الطيورالمقيمة. وتمثلت الخصائص البيئية المدروسة فى الغطاء الخضرى والعوامل الفيزيقية للتربة والعوامل المناخية المختلفة.

و قد أظهرت الدراسة إختلافاً للموائل والغطاء النباتي بإختلاف المناطق وبدرجة أقل داخل المواقع. خلال فترة الدراسة كان هناك إختلاف فى التنوع لأنواع الطيور المقيمة من حيث المكان والزمان فيما بين المناطق المختلفة. وكان موقع المزرعة السمكية ذات الغطاء النباتي الكثيف الأغني من حيث عدد الأنواع والأكثر وفرة من حيث عدد الأفراد، بينما كان الموقع الساحلي السكني اقلهم غني فى عدد الأنواع ووفرة الأفراد. و على العكس سجل موقع المزرعة السمكية المهجورة أعلى قيمة في عدد الأفراد النسبي للطيور المقيمة، بينما كان الموقع الزراعي أقلهم عدداً. ومن ناحية أخري، سجل الموقع الضابط أعلى قيمة في تنوع الطيورالمقيمة بينما سجل الموقع الساحلي السكني أقل القيم، وذلك بمقياسي سيمبسون و شانون - وينر للتنوع الحيوي. كما وجد أن العصفور النيلي أكثر أنواع الطيور المقيمة أهمية وأكثرهم وفرة فى جميع المواقع المدروسة تراكمياً. و يمكن القول أن المناطق المختلفة تميزت بمجموعات مميزة لأنواع من الطيور المقيمة إستجابة للأنشطة المختلفة للانسان.

كما أوضحت نتائج التحليل التسلسلي الهرمي العنقودي و تنظيم براي- كرتس لمجتمع أنواع الطيور المقيمة إمكانية فصل المواقع إلى مجموعتين ، المجموعة الأولي تتضمن المزرعة السمكية المهجورة ،المزرعة السمكية ذات الغطاء النباتي الكثيف والموقع الضابط (وهي مناطق شبه طبيعية). بينما المجموعة الثانية تحتوي على الموقع الساحلي السكنى، موقع المزرعة السمكية ذات الغطاء النباتي الخفيف والموقع الزراعي وهم أكثر تأثيراً بنشاط الإنسان الحضري و تحوراً عن البيئة الطبيعة.

Appendix (1): Plant species in study sites, during 2007-2008.

Scientific Name		Coast	Mahta	Dvff	Svff	Kas	Agr
Lycopersicon esculentum	P1	0	0	0	0	0	1
Capsicum species	P2	0	0	0	0	0	1
Oryza sativa	P3	0	0	0	0	0	1
Triticum aestivum	P4	0	0	0	0	0	1
Coriandum sativum	P5	0	0	0	0	0	1
Trifolium alexandrinum	P6	0	0	0	0	0	1
Melilotus ind	P7	0	0	0	1	0	1
Lolium tomenulantum	P8	0	0	0	0	0	1
Rumex dentatus	P9	0	0	0	1	0	1
Anthemis microsperma	P10	0	0	0	0	0	1
Conyza linifolia	P11	0	0	0	0	0	1
Imperata cylinderica	P12	0	0	0	0	0	1
Phragmites australis	P13	0	0	0	0	0	1
Shinus terenthiofolius	P14	0	0	0	0	0	1
Casuarina stritica	P15	0	0	1	0	0	1
Ricinus communis	P16	0	0	0	0	0	1
Olea europea	P17	0	0	0	0	0	1
Phoenix dactylifera	P18	1	0	1	1	0	1
Cucurbita pepo	P19	0	0	0	0	0	1
Psidum jugava	P20	1	0	0	0	0	1
Cynodon dactylon	P21	0	0	0	1	0	1
Chenopodium murale	P22	0	0	1	1	0	1
Uritica urens	P23	0	0	0	0	0	1
Salix sp.	P24	0	0	0	0	0	1
Musa nana	P25	0	0	0	1	0	1
Mangifera indica	P26	0	0	0	0	0	1
Zizphus sp.	P27	0	0	0	0	0	1
Morus alba	P28	0	0	0	0	0	1
Citrus Liman	P29	0	0	0	0	0	1
Arundo donax	P30	0	0	0	0	0	1
Citrus sinensis	P31	0	0	0	0	0	1
Eucalyptus citroidora	P32	0	0	0	1	0	1
Citrus aurantifolia	P33	0	0	0	0	0	1
Juncus acutus	P34	0	0	0	1	0	1
Sonculus oleraceae	P35	0	0	0	0	0	1
Lemna sp	P36	0	0	0	0	0	1
Lotus corniculatus	P37	0	0	0	0	0	1
Urospermum picroides	P38	0	0	0	0	0	1
Solanum nigra	P39	0	0	0	0	0	1
Folium Mori	P40	0	0	0	0	0	1
Pistia stratiotes	P41	0	0	0	0	0	1
Cybrus articulatus	P42	0	0	0	1	0	1
Polypogen monspliensis	P43	0	0	0	1	0	1
Citrus reticulata	P44	0	0	0	0	0	1
Ludwigia stolonifena	P45	0	0	0	0	0	1
Echinochloa stagnina	P46	0	0	0	0	0	1
Asteriscus graveolens	P47	1	1	1	1	1	1
Pluchea dioscoridis	P48	0	0	0	0	0	1
Cyperus alopecuroides	P49	0	0	0	0	0	1
Tamarix nilotica	P50	0	0	0	1	0	1
Cynodon dactylon	P51	0	0	0	0	0	1
Typha domingensis	P52	0	0	0	0	0	1
Eichhornia crassipes	P53	0	0	0	0	0	1

Musa sapientum	P54	0	0	0	0	0	1
Zygophyllum aegyptium	P55	1	1	1	1	1	0
Salsola kali	P56	1	1	1	1	1	0
cakile maritum	P57	1	0	0	1	0	0
Polygonum equisetiforme	P58	1	0	0	0	1	0
Ficus elastica	P59	1	0	0	0	0	0
Hibiscus rosa sinensis	P60	1	0	0	0	0	0
Ornimental	P61	1	0	0	0	0	0
Cynanchum acutum	P62	1	0	0	0	1	0
Arundo donax	P63	0	1	0	0	0	0
Saeuda sp.	P64	0	1	1	1	0	0
Passia indica	P65	0	0	0	1	1	0
Allium cepa	P66	0	0	0	1	0	0
Senecio desfentaineii	P67	0	0	1	0	1	0
Cistanche sp.	P68	0	1	0	1	0	0
Anchusa aegyptiaca	P69	0	0	0	1	0	0
Daucus carota	P70	0	0	0	1	0	0
Brassica oleracea	P71	0	0	0	1	0	0
Eruca sativa	P72	0	0	0	1	0	0
Lactuca sativa	P73	0	0	0	1	0	0
Ficus psendosycomorus	P74	0	0	0	1	0	0
Echinochola colonum	P75	0	0	0	1	0	0
Allium Sp.	P76	0	0	0	1	0	0
Cichorium pumilum	P77	0	0	0	1	0	0
Mescmbryanthemum crystallinum	P78	0	0	0	1	1	0
Cuscuta sp.	P79	0	0	0	0	1	0
Ifloga spicata	P80	0	0	0	0	1	0
Inula crithmoides	P81	0	0	0	0	1	0
Mescmbryanthemum nodeftora	P82	0	0	0	0	1	0
Stipagrostis lanata	P83	0	0	0	0	1	0
Launaea nudicaulis	P84	0	0	0	0	1	0
Heleocharis sp.	P85	0	0	0	0	1	0

Appendix (2): Resident Bird Checklist record in study sites, their code and relative abundance, during 2007-2008.
R: Resident, Sh: Shorebird, Mr: birds of marshes and ©: first record breeding in Egypt.

Classification					*Sp.*	*Status*		
Order	**Family**	**Scientific Name**	**English Name**	**Arabic Name**	***Code***	**R**	**Sh**	**Mr**
Ciconiiformes	**Ardeidae**	***Ixobrychus minutus***	**Little bittern**	**واق صغير**	**B4**	*		*
		Egretta garzetta	**Little egret**	**بلشون أبيض**	**B6**	*	*	*
		Ardeola ralloides	**Squacco heron**	**واق أبيض**	**B7**	*	*	*
		Bubulucus ibis	**Cattle egret**	**أبو قردان**	**B8**	*	*	*
Accipitriformes	**Accipitridae**	***Elanus caeruleus***	**Black winged kite**	**حدايه**	**B27**	*	*	*
Falconifoemes	**Falconidae**	***Falco tinnunculus***	**Kestrel**	**عوسق**	**B30**	*	*	*
Gruiformes	**Rallidae**	***Gallinula chloropus***	**Common moorhen**	**دجاج الماء**	**B34**	*	*	*
Charadriiformes	**Charadriidae**	***Hoplopterus spinosus***	**Spur-winged plover**	**زقزاق**	**B36**	*	*	*
		Charadrius alexandrinus	**Kentish plover**	**قطقاط أبو الرؤوس**	**B39**	*	*	
	Recurvirostridae	***Himantopus himantopus***	**Black winged stilt ©**	**أبو المغازل ©**	**B62**	*		*
		Burhinus oedicnemis	**Stone curlew**	**كروان**	**B63**	*	*	*
	Laridae	***Larus genei***	**Slender billed gull**	**نورس قرقطي**	**B67**	*	*	*
		Larus cachinnans	**Yellow legged gull**	**نورس أصفر القدم**	**B68**	*	*	*
Columbiformes	**Columbidae**	***Columba livia***	**Rock dove**	**حمام جبلى**	**B84**	*	*	
		Columba livia domestica	**Pigeon**	**حمام منزلي**	**B85**	*	*	*
		Streptopelia decaocto	**Collared dove**	**يمام مطوق**	**B86**	*		*
		Streptopelia senegalensis	**Laughing dove**	**يمام بلدي**	**B87**	*	*	*
Cuculiformes	**Cuculidae**	***Centropus senegalensis***	**Senegal coucal**	**كوكو/مك**	**B89**	*	*	
Strigiformes	**Tytonidae**	***Tyto alba***	**Barn owl**	**بومه ماصة**	**B90**	*	*	
	Strigidae	***Athene noctua***	**Little owl**	**أم قويق**	**B92**	*	*	
Coraciiformes	**Meropidae**	***Merops orientalis***	**Little green bee eater**	**وروار/خضير**	**B96**	*		*
	Upupidae	***Upupa epops***	**Hoopoe**	**هدهد**	**B98**	*	*	*
	Alcedinidae	***Ceryle rudis***	**Pied kingfisher**	**صياد السمك الأبقع**	**B99**	*	*	*
		Halcyon smyrnensis	**White breasted kingfish.**	**قاوند**	**B100**	*	*	*
Passeriformes	**Alaudidae**	***Galerida cristata***	**Crested lark**	**قنبرة متوجة**	**B102**	*		*
	Hirundinidae	***Hirundo rustica savigmii***	**Barn swallow**	**عصفور الجنة**	**B107**	*	*	*
	Motacillidae	***Anthus novaeseelandiae***	**Richard's pipit**	**أبو فصية**	**B108**	*		*
		Motacilla cinerea	**grey wagtail**	**أبو فصاده رمادي**	**B109**	*	*	*
		Motacilla alba	**Pied wagtail**	**أبو فصاد أبقع**	**B110**	*	*	*
		Motacilla flava	**Yellow wagtail**	**أبو فصاد أصفر**	**B111**	*	*	*

	Laniidae	***Lanius excubitor***	**Great grey shrike**	دقناش الباديه	**B116**	*		*
	Corvidae	***Corvus corone cornix***	**Hooded crow**	غراب بلدي	**B119**	*	*	*
	Sylviidae	***Cisticola juncidis***	**Fan tailed warbler**	فصيه مروحيه الذنب	**B120**	*	*	*
		Prinia gracilis	**Graceful prinia**	هازجه	**B121**	*	*	*
		Acrocephalus stentoreus	**Clamorous reed warbler**	هازجـــه القصـــب الصياحة	**B122**	*		*
	Turdidae	***Oenanthe deserti***	**Desert wheatear**	أبلق الصحراء	**B138**	*		*
		Phoenicurus ochruros	**Black redstart**	حميراء سوداء	**B142**	*	*	*
	Pycnonotidae	***Pycnonotus barbatus***	**Common bulbul**	بلبل عربي	**B148**	*	*	*
	Passeridae	***Passer domesticus niloticus***	**House sparrow**	عصفور الغيط	**B149**	*	*	*
	Ploceidae	***Ploceus manyar***	**Streaked weaver**	عصفور نساج مخطط	**B154**	*		*