

Biotic Relationships between Plants and Birds at Damietta Coastal Area, Egypt

G.A. Abd-Allah^a, M.S. Serag^b, N.E.R. El Bakary^a, S.G. Habib^{a*}

^a Zoology Department, Faculty of Science, Damietta University, Egypt

^b Botany Department, Faculty of Science, Damietta University, Egypt

*Corresponding author (email: sayedgabr2010@yahoo.com)

Abstract

The present study aimed to explain the relationships between plants and birds in the different habitats at Damietta coastal area. Field study indicated that one hundred and one plant species were recorded, belonging to 49 families, of these 51 species were wild and 43 species were cultivated. On the other hand, sixty six species of birds were censused belonged to 12 orders and 28 families. Results showed that birds are an essential part of the plant-animal association as they play an essential role in keeping our environment clean and disease-free. Many biotic relationships were found in the present study that conserve ecological balance as birds provide plants with many benefits such as 1) Seed dispersal which play an essential role for the propagation of many plants. 2) Protection as cattle egret, Egyptian barn swallow, black-winged kite, hooded crow, red breasted flycatcher and hoopoe protect plants from insects and earth worm. 3) Pollination as many species of plants, most commonly with red flowers, are pollinated by birds. Furthermore plants provide birds with a number of resources, including food, shelter and protection, nesting material and nest sites. Plants provide food for birds both directly and indirectly. Directly as many species of plant provide a nectar, fruit, seeds and grains to birds for example house sparrow mostly feeds on the seeds of weeds and grasses. It prefers oats and wheat. Indirectly as plants provide habitat for insects which in turn are eaten by birds (e.g. Egyptian barn swallow, Red breasted flycatcher, European barn swallow and European bee-eater). The study showed that vegetation was often densest in the shrub layer, and so thickets of understorey vegetation e.g. *Eucalyptus citroidora* and *Casurina stritica* were important habitat elements for many bird species e.g. house sparrow, cattle egret.

Keywords: Biotic Relationship, Birds, Damietta Coastal Area, Plants

Introduction

Avifauna is an important component of Egypt's biological resources. It is the most diverse and prominent of all the country's non aquatic vertebrate fauna. More than 470 bird species are known from Egypt [1]. Egypt enjoys a considerable diversity of habitat, despite its predominantly hyper-arid environment. Lying at

the junction of four biogeographically regions, Saharo-sindian, Irano-turanian, Mediterranean and Afrotropical. Egypt has a unique mixture of vegetation types, which support a corresponding diversity of faunal elements [2].

Before construction a facility, a vegetation survey is valuable to document species composition, abundance, and usefulness to birds. Vegetation survey was conducted at the site to 1)

characterize the abundance and structure of vegetation; 2) identify plants with utility as food, nesting material, or tools; 3) determine the abundance and distribution of useful vegetation; and 4) identify and possibly hazardous vegetation. The first major work on the ornithology of Egypt since Shelly [3] was that of Meinertzhagen [4] which included considerable information not only on the distribution of birds in Egypt, but also on their habitats. Another work in Egyptian avian fauna was at the book "birds known to occur in Egypt" by Tharwat [5]. Publications dealing with the ornithology of the Red Sea and Eastern Desert [6,7].

Survey was done at Damietta governorate by Support for Environmental Assessment and Management (SEAM) [8]; this study recorded 32 resident breeding birds inhabiting the governorate. Recently, the first scientific study has been taken at Damietta Governorate to survey all resident, migratory and passage birds by El-Arabany *et al.* [9], they reported 26 resident breeding birds, 15 species passage migrants, and 25 species winter visitors were censused.

When examining avian populations, it is often helpful to relate bird measures to vegetation characteristics of the different habitats. MacArthur & MckArthur [10] found that bird species diversity was positively related to vegetation diversity. In general, vegetation vertical diversity, canopy height and cover, and/or total vegetation volume can help explain avian richness and diversity [11,12].

The coastal area of Damietta is exceptionally important for the habitats and the ecosystems that

they encompass and for the survival of species dependent upon them. The protection of such area is one way of approaching biodiversity conservation. The proper utilization of the coasts plays a define roles in the development of the region so countries of arid and semi-arid regions direct their efforts towards the renewable resources of coasts ecosystem to produce more food for people and animals, such efforts should be based on previous knowledge of climate, site, vegetation and wild life as well as human activities [13-15].

The present study aimed to evaluate the biotic relationships between growing plants and common birds at different habitat types in the coastal area of Damietta. The obtained results will be useful for credible conservation and management of biodiversity of the study area.

Study Area

This study was conducted in the coastal area of Damietta. This region extends from Port-Said at east to Dakahleya at west by coast of about 61 Km. It is characterized by villages and summer resorts such as Ezbit El-Burg, Gamasah, New Damietta and Ras El-Bar [14]. The study area was divided into three sites as follow: Site I was located at the western section of Damietta coastal area (El-Kasara), Site II was located between east of new Damietta up to west of Damietta harbour sea-port where interference by man is substantial and Site III was located in the eastern section of the study area at triangle zone of Manzala Lake (Fig. 1).

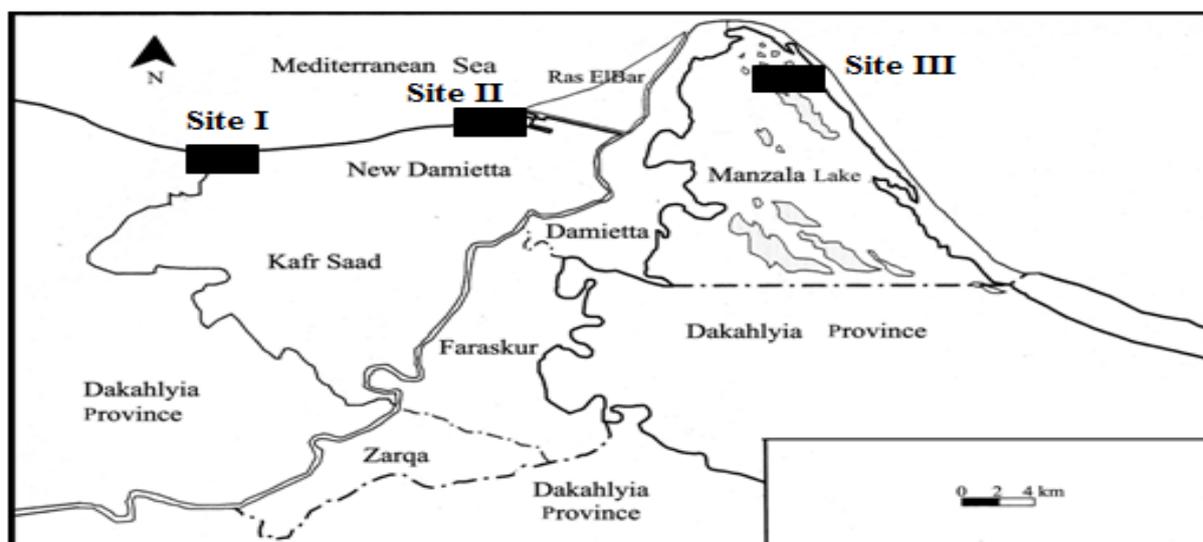


Fig. 1 Location map showing the three sites of the Damietta coastal area. (I) Western section of New Damietta, (II) Distance between east New Damietta up to west of Damietta Harbor, and (III) Triangle zone of Lake Manzala (wetland).

Materials and methods

Plant Survey

Fourty stands were selected to represent variation in the habitats. These habitats were sandy habitat (sheets & dunes) and salt marsh. Locations of the stands were selected after the primary reconnaissance of the area. The distribution of these stands was 20 stands of sand habitat and 20 stands of the salt marsh. The number and distribution of wild plants in each habitats type depended mainly on the presence of a reasonable degree of visual physiographic and physiognomic homogeneity and when a minimum degree of disturbance was ensured. List of plant species, their occurrence are expressed based on frequency, density and dominance. The combined estimation of cover abundance scale is used together with sociability value Braun-Blanquet [16]. Species richness of each species is calculated as the mean number of species per stand according to Pielou [17]. Nomenclature and identification of the plant species followed Täckholm [18]; Boulous [19].

Bird Survey

Surveys of 20 minutes were conducted from sunrise until 4 hours after sunrise. Each location was visited two times monthly. Over a period of 6 minutes, we slowly walked the 100-m transect, recording each bird seen and heard within 30 minutes on either side of the transect line. At the end of the transect, we stopped and recorded birds for an additional 8 min, then walked back along the transect for 6 min to the starting point [20]. Birds were identified according to Tharwat [5].

Biotic relation between plants and birds

Biotic relation between plants and birds based on field observations e.g. bird activities such as tracks, burrowing, feeding, nesting and defection were made regularly on the study area.

Results

Plant Survey

Field study showed 101 species of plants were recorded. The recorded species were belonged to

49 families, of these 51 species were wild and 43 species were cultivated (Table 1 and Fig. 2).

The most common plants are namely *Zygophyllum aegyptium*, *Phragmites australis*, *Bassia indica*, *Halocnemum strobilaceum* and *Arthrocnemum macrostachyum*, *Oryza sativa*, *Triticum aestivum*, *Phoenix dactylifera*, *Shinus terebinthifolius*, *Schinus molle*, *Zea mays l.*, *Lycopersicon esculentum* and *Tamarix nilotica*.

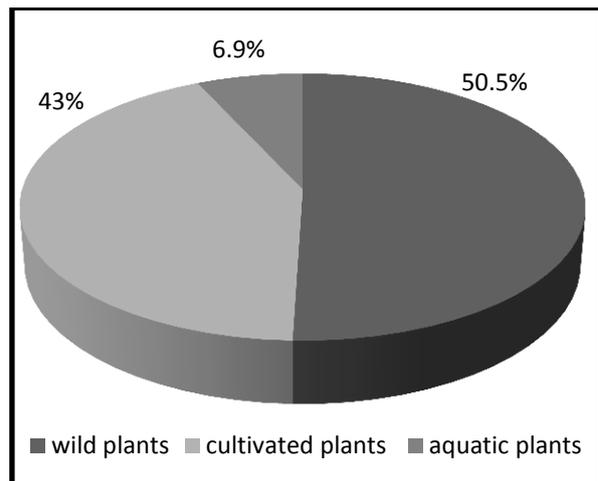


Fig. 2 The percent between wild, cultivated and aquatic plants in the coastal area of Damietta (September, 2009 to March, 2011).

Bird Survey

The avian community of Damietta coastal area may be classified into four types according to type of feeding: twenty of carnivores species, twenty one of insectivorous species, twenty one of omnivores species and four species of herbivores in a percent of 30.30%, 31.82%, 31.82% and 6.06% respectively (Fig. 3).

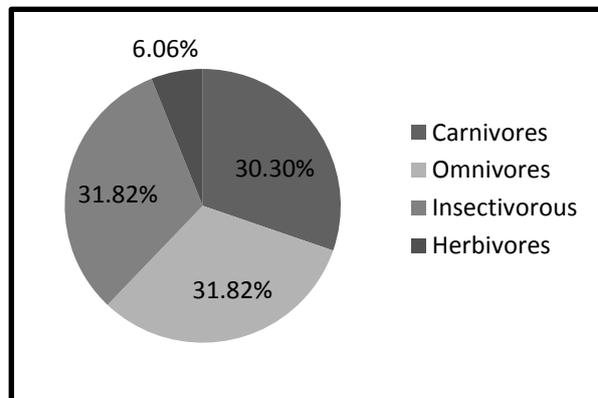


Figure 3: The percent between carnivores, insectivorous, omnivores and herbivores of 66 bird species censused in Damietta coastal area (September, 2009 to March, 2011).

Table 1 List of plant species recorded in the different habitats of the study area. SB: Sand Bar, SM: Salt March, H: Hummock, DSM: Dry Salt March, WSM: Wet Salt March, RS: Reed Swamp, FF: Fish Farm, FCu: Fertile Cultivated land, WsL: Waste Land, AQ: Aquatic Habitats, G: Grandness, D: dominant, A: Abundant, F: Frequent, O: Occasional, R: Rare (>5).

a) Terrestrial plants

1. Wild plants recorded in the different habitats of the study area

Family	Scientific name	Arabic name	Use and value	SB	H	DS M	WS M	RS	FF	WsL	G
Aizoaceae	<i>Mesembryanthemum nodiflorum</i>	الغاسول الرفيع	Medicinal	A	D						
Aizoaceae	<i>Mesembryanthemum crystallinum</i>	الغاسول / الثلج	Medicinal	A	D						
Amaranthaceae	<i>Amaranthus ascendens</i>	عرف الديك	Weed							A	
Apiaceae	<i>Ammi majus</i>	الخلّة	Medicinal								
Asclepiada	<i>Cynanchum acutum</i>	المديد	Medicinal, Wood			A		A			
Asteraceae	<i>Inula crithmoides</i>	الانويلا	Medicinal			D	D				
Asteraceae	<i>Sonchus oleraceus</i>	الجعضيض	Edible							A	
Asteraceae	<i>Cichorium pumilum</i>	السريس	Medicinal, weed								
Asteraceae	<i>Pluchea dioscoridis</i>	البرنوف									
Asteraceae	<i>Urospermum picroides</i>	السليس	Medicinal							A	
Asteraceae	<i>Senecio desfontainii</i>	المرار	Medicinal	A	A						
Asteraceae	<i>Aster squamatus</i>	الاستر	Weed							A	
Brassicaceae	<i>Sisymbrium irio</i>	فجل الجمل	Weed								
Brassicaceae	<i>Cakile maritima</i>	صاروخ البحر	Weed	D	D						
Brassicaceae	<i>Lepidium sativum</i>	حب الرشاد	Medicinal								A
Caryophyllaceae	<i>Spergularia marina</i>	أبو غلام	Weed			A					
Chenopodiaceae	<i>Halocnemum strobilaceum</i>	الخريزة	Medicinal, halophytes		D	D					
Chenopodiaceae	<i>Beta vulgaris</i>	السلق	Edible								
Chenopodiaceae	<i>Salsola kali</i>	السالسولا	Medicinal	A	A						
Chenopodiaceae	<i>Chenopodium murale</i>	الزربيع	Medicinal							A	
Chenopodiaceae	<i>Bassia indica</i>	الكوخيا	Feeder for animals			A			A		
Convolvaceae	<i>Convolvulus arevensis</i>	العليق	Medicinal, Wood							O	
Cyperaceae	<i>Cyperus rotundus</i>	السعد	Medicinal								
Euphorbiaceae	<i>Euphorbia peplus</i>	اللبينة	Medicinal								D
Fabaceae	<i>Alhagi graecorum</i>	العاقول	Medicinal, halophytes	D	D						
Fabaceae	<i>Lotus glaber</i>	رجل العصفور	Weed								D
Fabaceae	<i>Medicago sativa</i>	النفل	Weed								D
Fabaceae	<i>Melilotus indicus</i>	الحنذوق	Weed								
Juncaceae	<i>Juncus acutus</i>	السمار الحلو	Industry cages, mats				A				
Labiatae	<i>Mentha microphylla</i>	حبق البحر	Seeds are eaten by birds							O	
Malvaceae	<i>Malva parviflora</i>	الخبيزة	Edible							D	

Table 1 continued

Onagraceae	<i>Ludwigia stolonifera</i>	جوسيا	Weed										
Plantagonaceae	<i>Plantago major</i>	لسان الحمل	Medicinal									D	
Poaceae	<i>Imperata lastical</i>	الحلفا	Paper production				A						
Poaceae	<i>Arundo donax</i>	الغاب البلدي	Industry cages									A	
Poaceae	<i>Lolium temulentum</i>	دهنورة	Medicinal										
Poaceae	<i>Polypogon monspeliensis</i>	ديل القط	Weed									D	
Poaceae	<i>Setaria viridis</i>	ديل الفار	Weed										
Poaceae	<i>Avena fatua</i>	الزيمير	Feeder for livestock										
Polygonaceae	<i>Persicaria salicifolia</i>	أبو زلف	Seeds are eaten by birds										
Polygonaceae	<i>Polygonum equisetiforme</i>	قرضاب	Weed						O				
Polygonaceae	<i>Rumex dentatus</i>	الحميض	Food, Edible										
Portulacaceae	<i>Portulaca oleracea</i>	الرجلة	Medicinal, Edible										
Primulaceae	<i>Anagallis arvensis</i>	عين القط	Weed									A	
Solanaceae	<i>Solanum nigrum</i>	عنب الديب	Medicinal									D	
Solanaceae	<i>Datura stramonium</i>	الداتورا	Medicinal									O	
Typhaceae	<i>Typha domingensis</i>	البردي	Mats										
Uriticaceae	<i>Urtica urens</i>	الحريق	Medicinal									A	
Verbenaceae	<i>Phylla nadiiflora</i>	الليبيا	Medicinal									R	O
Zygophyllaceae	<i>Zygophyllum album</i>	الرطريط	Medicinal, halophyte	D	D	D							
Tamarixaceae	<i>Tamarix nilotica</i>	الطرفة	Ornamental		D	D							

2. Cultivated plants recorded in the different habitats of the study area

Family	Scientific name	Arabic name	Use and value	H	DSM	WSM	RS	FF	FCu	WsL	G
Anacardiaceae	<i>Shinus terebinthifolius</i>	القلقل العريض	Ornamental, hedge, Medicinal						D		D
Anacardiaceae	<i>Schinus molle</i>	القلقل الرفيع	Ornamental, hedge						F		F
Anacardiaceae	<i>Mangifera indica</i>	مانجو	Food								O
Apiaceae	<i>Apium graveolens</i>	الكرفس	Medicinal						A		A
Apiceae	<i>Anethum graveolens</i>	الشبث	Medicinal								
Apocynaceae	<i>Thevetia peruviana</i>	الثيفيتا	Ornamental, poisonous								A
Asteraceae	<i>Helianthus annus</i>	عباد الشمس	Oil, Food								
Bignoniaceae	<i>Jacaranda acutifolia</i>	الجاكاراندا	Medicinal								R
Brassicaceae	<i>Brassica oleraceae</i>	الكرنب	Food								
Casuarinaceae	<i>Casuarina stricta</i>	الكازورينا	Wind break, wood						D		
Cesalpiniaceae	<i>Delonix regia</i>	البوانسيانا	Ornamental								A
Cucurbitaceae	<i>Cucurbita pepo</i>	كوسة	Food						A		
Cupressaceae	<i>Cupressus sempervirens</i>	السرو	Ornamental, Wood								O

Euphorbiaceae	<i>Ricinus communis</i>	خروع	Ornamental, Medicinal							O		O
Fabaceae	<i>Bauhinia variegata</i>	خف الجمل	Ornamental									O
Fabaceae	<i>Erythrina lysistemon</i>	ارثيرنا	Ornamental									O
Fabaceae	<i>Acacia saligna</i>	الأكاشيا	Ornamental, Sand fixation	A						R		A
Fabaceae	<i>Cassia fistula</i>	الكاسيا الصفراء	Ornamental									A
Fabaceae	<i>Cassia nodosa</i>	الكاسيا	Ornamental									R
Fabaceae	<i>Trifolium alexandrinum</i>	برسيم	Feeder for animals								D	D
lificioeae	<i>Allium cepa</i>	بصل	Food, Medicinal									
Malvaceae	<i>Dalbergia sissoo</i>	السرسوع	Ornamental									O
Malvaceae	<i>Hibiscus rosa sinensis</i>	ورد الصين	Ornamental									O
malvaceae	<i>Gossopium barbadense</i>	القطن	Fiber									
Meliaceae	<i>Melia azedarach</i>	الزنبق	Anti insecticide							O		
Moraceae	<i>Ficus elastica</i>	التين المطاطي	Ornamental, Wood									
Moraceae	<i>Ficus nitida</i>	فيكس نندا	Ornamental									D
Moraceae	<i>Morus alba</i>	توت	Edible							A		
Musaceae	<i>Musa mansa</i>	موز	Fruits are eaten by birds							A		
Myrtaceae	<i>Psidium Jugave</i>	الجوافة	Fruits are eaten by birds							A		D
Myrtaceae	<i>Eucalyptus lastica</i>	الكافور العادي	Medicinal, Wood, wind break							A		
Nyctaginaceae	<i>Bougainvella glabra</i>	الجهنمية	Ornamental									O
Oleaceae	<i>Olea europea</i>	الزيتون	Oil, Food							A		A
Palmae	<i>Phoenix dactylifera</i>	نخيل البلخ	Food, weed, edible,fruits							D		
Pinaceae	<i>Bombax malabaricum</i>	البومباكس	Ornamental									R
Poaceae	<i>Cynodon dactylon</i>	نجيل	Ornamental							D		
Poaceae	<i>Oryza sativa</i>	أرز	Food							D		
Poaceae	<i>Triticum aestivum</i>	قمح	Food							D		
Poaceae	<i>Zea mays l.</i>	الذرة	Food									
Rutaceae	<i>Citrus aurantifolia</i>	الليمون	Medicinal, Food							O		
Rutaceae	<i>Citrus aurantium</i>	الارنج	Medicinal							A		A
Solanaceae	<i>Lycopersicon esculentum</i>	طماطم	Food							D		
Salicaceae	<i>Salix subserrata</i>	صفصاف								A		

b) Aquatic Plants

Family	Scientific name	Arabic name	Use and value	SB	H	DS M	WS M	RS	FF	WsL	AQ
Araceae	<i>Pistia stratiotes</i>	الزقيم	Free floating								D
Araceae	<i>Lemna gibba</i>	عدس الماء	Duckweed								D
Onagraceae	<i>Ludwigia stolonifera</i>	جوسيا									A
Poaceae	<i>Phragmites australis</i>	البوص	Sand fixation, water treatment	F	D	F	A	D	D	D	D
Poaceae	<i>Echinochloa stagnina</i>	أمثوط	Feeder, forage					D			D

Potederiaceae	<i>Eichhornia crassipes</i>	ورد النيل	Free floating								D
Ranunculaceae	<i>Ranunculus sceleratus</i>	أقحوان الماء	Weed								D

Table 2 Survey, classifications, feeding of birds distributed in different habitats in the coastal area of Damietta at August, 2009 to February, 2011. M: Marine habitat, Co: Coastal habitat, W: Wetland habitat, Cu: Cultivated land, U: Urban habitat, C: Common, A: Abundant, R: Rare, SC: Scarc

Order	Family	Scientific name	Common name	الاسم باللغة العربية	Feeding	Habitats				
						Ma	Co	W	Cu	U
Ciconiiformes	Ardidae	<i>Egretta garzetta</i>	Little egret	البشون الأبيض	Carnivores			A	R	
		<i>Ardeolar alloides</i>	Squacco heron	الواق الأبيض	Carnivores			R	R	
		<i>Bubulcus ibis</i>	Cattle egret	أبو قردان	Carnivores			R	A	R
		<i>Ardea cinerea</i>	Grey heron	البشون الرمادي	Carnivores			SC		
Columbiformes	Columbidae	<i>Columba livia</i>	Rock dove	الحمام الجبلي	Herbivores		R	R	R	R
		<i>Columba l. domestica</i>	Feral pigeon	الحمام المنزلي	Herbivores		A	A	A	A
		<i>Streptopelia decaocto</i>	Collared dove	اليمام المطوق	Herbivores			A	A	A
		<i>Columba aegyptiaca</i>	Palm Dove	اليمام البلدي	Herbivores		A	A	A	A
Gruiformes	Rallidae	<i>Rallus aquaticus</i>	Water rail	مرعة الماء	Omnivores			R	R	
		<i>Gallinula chloropus</i>	Moorhen	دجاج الماء	Omnivores			R	R	
		<i>Crex crex</i>	Corncrake	مرعة الغلة	Omnivores			SC		
		<i>Arenaria interpres</i>	Turnstone	قنبرة الماء	Omnivores		C	C	C	
		<i>Fulica atra</i>	Coot	الغر	Omnivores			C		
Acciptiformes	Acciptridae	<i>Elanus caeruleus</i>	Black-winged kite	الحدأة ذات الجناح الأسود	Carnivores				R	
		<i>Circus rufinus</i>	Marsh harrier	الدرع	Carnivores		SC			
Falconiformes	Falconidae	<i>Falco tinnunculus</i>	Kestrel	العوسق	Carnivores		R	R	R	R
Cuculiformes	Cuculidae	<i>Cuculus aegypticus</i>	Sengal Coucal	الكوكو	Insectivorous			SC	SC	
Strigiformes	Strigidae	<i>Athene noctua</i>	Little Owl	أم قويق	Carnivores				R	R
Galliformes	Phasianidae	<i>Coturnix coturnix</i>	Migratory quail	السمان	Omnivores		C			
Caprimulgiformes	Caprimulgidae	<i>Caprimulgus europaeus</i>	Nightjar	البخاخ	Insectivorous		SC			
Passeriformes	Corvidae	<i>Corvus corone cornix</i>	Hooded crow	الغراب البلدي	Omnivores		C	C	C	C
	Alaudidae	<i>Galerida cristata</i>	Crested lark	قنبرة متوجة	Omnivores			R	R	
	Passeridae	<i>Passer domesticus</i>	House sparrow	العصفور الدوري	Omnivores			C	C	C
	Hirundinidae	<i>Hirundo r. savignii</i>	Egyptian barn swallow	عصفور الجنة المصري	Insectivorous		C	C	C	C
		<i>Riparia riparia</i>	Sand martin	سنونو	Insectivorous		R	R	R	
		<i>Lanius excubitor</i>	Great grey shrike	دقناش البادية	Carnivores				SC	
		<i>Hirundo rustica rustica</i>	European barn swallow	عصفور الجنة الأوروبي	Insectivorous		R			R
	Pycnonotidae	<i>Pycnonotus barbatus</i>	Common bulbul	بلبل شاع	Omnivores			SC	SC	SC
	Motacillidae	<i>Anthusno vaeseelandiae</i>	Richard's pipit	أبو فصية	Insectivorous		SC			
	Laniidae	<i>Lanius collurio</i>	Red-backed shrike	دقناش أكحل	Carnivores		SC			

	Turdidae	<i>Oenanthe oenanthe</i>	Wheatear	أبلق أبو بليق	Insectivorous		R			
		<i>Oenanthe isabellina</i>	Isabelline wheatear	أبلق أشهب	Insectivorous		R			
		<i>Oenanthe hispanica</i>	Black-eared wheatear	أبلق أسود الأذن	Insectivorous		R			
		<i>Ficedula prava</i>	Red breasted flycatcher	خاطف الذباب أحمر البطن	Insectivorous		SC	SC	SC	
Charadriiformes	Charadriidae	<i>Hoplopterus spinosus</i>	Spur-winged plover	الزقراق	Carnivores		C	C	C	C
		<i>Charadrius dubius</i>	Little-ringed plover	قطايط متوج صغير	Carnivores			SC		
		<i>Charadrius alexandrinus</i>	Kentish plover	قطايط أبو رؤوس	Carnivores			SC		
	Laridae	<i>Larus argentatus</i>	Herring gull	نورس اصفر القدم	Omnivores	A				
		<i>Larus marinus</i>	Great black-backed gull	نورس السمك	Omnivores	C				
		<i>Larus fuscus</i>	Lesser black-backed gull	نورس دغية	Omnivores	A				
		<i>Larus audouinii</i>	Audouin's gull	نورس أدوين	Omnivores	C				
		<i>Larus canus</i>	Common gull	نورس شاع	Omnivores	R				
		<i>Larus melanocephalus</i>	Mediterranean gull	نورس البحر المتوسط	Omnivores	C				
		<i>Larus ridibundus</i>	Black-headed gull	نورس أسود الرأس	Omnivores	C				
		<i>Larus minutes</i>	Little gull	نورس صغير	Omnivores	R				
	Scolopacidae	<i>Calidris alba</i>	Sanderling	المدروان	Carnivores		C	C	R	
		<i>Tringa erythropus</i>	Spotted red shank	طيوطي أحمر الساق أرقط	Carnivores		R			
	Burhinidae	<i>Burhinus oedicnemus</i>	Stone curlew	الكروان	Carnivores			SC	R	
	Sternidae	<i>Sterna sandvicensis</i>	Sandwich tern	خرشنة	Carnivores	C	C			
	Coraciiformes	Alcedinidae	<i>Ceryle rudis</i>	Pied Kingfisher	صياد السمك الأيقع	Carnivores			A	A
<i>Halcyon smyrnensis</i>			White-breasted Kingfisher	القاوند	Carnivores			A	A	
<i>Alced aatthis</i>			European kingfisher	صياد السمك الأوروبي	Carnivores			R		
<i>European Upupasp</i>			European hoopoe	الهدهد الأوروبي	Omnivores		SC	SC	R	SC
Meropidae		<i>Upupa sp</i>	Hoopoe	الهدهد	Omnivores		R	R	R	R
		<i>Merops apiaster</i>	European bee-eater	الوروار الأوروبي	Insectivorous		R			
Motacillidae		<i>Motacilla flava</i>	Yellow wagtail	أبو فصادة اصفر البطن	Insectivorous			C	C	C
		<i>Motacilla alba</i>	White wagtail	أبو فصادة أبيض البطن	Insectivorous			A	A	A
Sylviidae		<i>Hippolais icterina</i>	Icterine warbler	خنشع ليموني	Insectivorous		SC	SC	SC	
Turdidae		<i>Saxicola ruberta</i>	Whinchat	قلبي أحمر	Insectivorous			SC	SC	SC
		<i>Saxicola torquata</i>	Stonechat	قلبي مطوق	Insectivorous			SC	SC	SC
		<i>Phoenicurus phoenicurus</i>	Redstart	الحميراء	Insectivorous					SC
		<i>Phoenicurus ochruros</i>	Black redstart	الحميراء السوداء	Insectivorous					SC
		<i>Erithacus rubecula</i>	Robin	أبو الحناء	Insectivorous					SC
		<i>Luscinia megarhynchos</i>	Nightingale	المغناء	Insectivorous					SC
		<i>Luscinia luscinia</i>	Thrush Nightingale	عندليب الشجر	Insectivorous		SC			SC
Passeridae		<i>Passer hispaniolensis</i>	Spanish sparrow	العصفور الأسباني	Omnivores			SC	SC	SC

Bird survey of selected sites were 68 birds species, they were belonged to 12 orders and 28 families. These species and their classification and distribution in different habitats were listed in Table (2) and figure (4).

Field study indicated that the major habitat types were recognized in the study area could be divided into aquatic and terrestrial habitats. The

aquatic habitats were namely: irrigation canals, drains, ditches and fish farms, however the terrestrial habitats are beach zone, sand bar, mounds, hummocks, hillocks, sand flats, salt marshes (wet & dry), reed swamps, fertile cultivated lands, highway road side and reclaimed lands.



Little egret



Squacco heron



Cattle egret



Rock dove



Feral pigeon



Collared dove



Palm Dove



Water rail



Moorhen



Turnstone



Black-winged kite



Kestrel

Fig. 4 The most common birds observed during the field study in the coastal area of Damietta. Photos by Habib, S.G.



Senegal Coucal



Little Owl



Migratory quail



Nightjar



Hooded crow



Crested lark



House sparrow



Egyptian barn swallow



Red-backed shrike



Isabelline wheatear



Black-eared wheatear



Spur-winged plover



Kentish plover



Great black-backed gull



Mediterranean gull

Fig. 4 Continued



Stone curlew



Pied Kingfisher



White-breasted Kingfisher



European kingfisher



European hoopoe



Hoopoe



European bee-eater



Yellow wagtail



White wagtail

Fig. 4 Continued

Biotic Relations between Plants and Birds

Based on field observations the relationship between plants and birds was as following:

Feeding

Plants provide food for birds both directly and indirectly. Directly as birds can eat many parts of plants, including buds, berries, fruit, nuts and seeds. there were 13 bird species that feed directly (Table 3) or indirectly as plants provide habitat for insects which inturn are eaten by birds and they were 15 bird species showed in (Table 4).

Shelter and protection

Field observations showed that plants provided a natural shelter in the study area to attract birds to a safe and secure setting. There were 26 birds used plants as shelter (Table 5).

Nesting material

Field observation showed that there were three important elements of the design of most nests, including robust, provide good insulation and were well camouflaged. Sticks, bark and grass commonly provide the support structure, and these items were usually abundant. Most eggs that were produced by birds were eaten by predators so there was a high demand for concealed nest sites. Many small birds nest in the understorey where the vegetation was often thickest. Some species also show a preference for nesting in spiky shrubs.

Seed dispersal

Some species of bird e.g. Common bulbul and Hoopoe are known to include some fruit in their diet. Even primarily insectivorous species such as Egyptian barn swallow, house sparrow will occasionally take small fruits. This is, perhaps, a

result of the broad individual niches of the species in our relatively depauperate avifauna.

Pollination

Humming birds adapted by going to a flowers and taking the pollen like bees do with insects. Most bees when go to flower get flower pollen on thier legs, then fly to another flower and drop the pollen there thus, dispersing the pollen by visiting different plants.

Table 3 Bird species that feed directly on plants

Bird name	Direct feeding
House sparrow	Seeds of some grasses and weeds. It preferred oats and wheat and also eaten berries and fruits.
Feral pigeon	Grass seeds and berries.
Collared dove	Grain and shoots.
Palm doves	Grass, seeds and grains.
Rock dove	Grains of rice, maize, millet and other cereals. Banyan figs and other berry-like fruits.
Water rail	Buds, seeds, flowers, shoots and seeds of water plants, berries and fruit.
Moorhen, Corncrake	Plant material including grass seed and cereal.
Turnstone	Coconut.
Crested lark	Seeds of weeds.
Common bulbul	Fruit, nectar
Herring gull	Vegetable matter such as roots, tubers, seeds, grains, nuts and fruit
Lesser black-back gull	Seeds and berries
Hoopoe	Plant matter such as seeds and berries

Discussion

A strong correlation between bird community and habitat diversity indices suggests that birds are dependent on the compositional complexity of trees, shrubs, and herbs. These observations suggest that birds community is significantly associated with plant species diversity, confirming the findings of James & Wamer [21]. To study the biotic relationships between plants and birds in the different habitats at the coastal area of Damietta, it is necessary first to identify the major type habitats and make a survey of both plants and birds.

In the present work the major habitat types being recognized in the study area and were

divided into aquatic and terrestrial habitats. The aquatic habitats were namely: irrigation canals, drains, ditches and fish farms, however the terrestrial habitats were beach zone, sand bar, mounds, hummocks, hillocks, sand flats, salt marshes (wet & dry), reed swamps, fertile cultivated lands, highway road side and reclaimed lands.

Table 4 Bird species that feed indirectly on plants

Bird name	Indirect feeding
Nightjar	moths and other large flying insects
Egyptian barn swallow	flying insects Mongooses and bugs
European barn swallow	flying insects
Isabelline wheatear	flying insects
Black-eared wheatear	flying insects
Red breasted flycatcher	flying insects
European bee-eater	bees, wasps and hornets
Icterine warbler	flying insects
Whinchat	Terrestrial and flying insects
Stonechat	flying insects
Redstart	flying insects
Black redstart	flies
Robin	flying insects
Nightingale	flying insects
Thrush	flying insects
Nightingale	flying insects

Plants survey indicated that there were one hundred and one plant species, belonging to 49 families, of these 51 species were wild and 43 species were cultivated. On the other hand, sixty six species of birds were censused belonged to 12 orders and 28 families. Changes in plant species composition and structure can negatively affect habitat quality [22] and reduce individual fitness [23]. Fragmentation of natural habitats may lead to the local extinction of some species, particularly those that occur at low densities, due to low recolonization rates, increased predation by natural predators and competitors, and other environmental factors [22,23]. The present study showed that plants provide food at different times of the year to birds directly or indirectly. Directly in the form of seeds, fruit, buds, seeds, flowers, shoot, berries and nuts, indirectly as plants provide habitat for insects which in turn are eaten by birds. e.g. Egyptian barn swallow, Red breasted flycatcher, European barn swallow and

European bee-eater. Plants also provide safe nesting sites and cover that protect birds from inclement weather and predation. The most popular natural shelters in the study area included:

Table 5 Birds that used plants as shelter

Bird name	Bird nest
Little egret, Squacco heron, Cattle egret and Grey heron	On platforms of sticks in trees or shrubs. The colonies were found in woodlands near lakes or rivers, in swamps, or on small inland or coastal islands.
Collared dove, Palm Dove	trees
Water rail, Moorhen	building its nest a little above the water level from whatever plants (Herbs and jungle) are available nearby
Corncrake and Coot	in grassland, sometimes in safer sites along a hedge, or near an isolated tree or bush, or in overgrown vegetation.
Black-winged kite	a loose platform of twigs
Stone curlew	was off the ground in vegetation
Senegal coucal	on the branches of trees
Little owl	in holes in trees.
Hooded crow	a tall tree
House sparrow	in the open, on the branches of trees, especially evergreens and hawthorns
Great grey shrike	on side branches near the trunk
Common bulbul	inside the leafy foliage of a small tree or shrub
Hoopoe and European hoopoe	in a hole in a tree or wall, with a narrow entrance
Spur winged plover	In a hole in cultivated land
Yellow wagtail	It nests in tussocks
Icterine warbler	in a tree or a bush
Whinchat	It nests in dense low vegetation
Nightingale	on the ground within or next to dense bushes
Thrush Nightingale	It nests low in dense bushes.

Trees: field study showed that all types of trees (e.g. *Eucalyptus lastic*, *Morus alba* and *Phoenix dactylifera*) were beneficial to birds.

Shrubs: shrubs and bushes were also suitable bird shelters, particularly for smaller birds or ground-dwelling species such as doves and quail.

Grass: field observations showed that long,

ornamental grasses were ideal for small birds and ground-feeding species

Tree Cavities: the study showed that healthy, living trees were good shelter, but dead, hollow trees were also essential for many cavity-nesting birds. These cavities were also useful for roosting owls and winter bird shelters.

Birds and wildlife have adapted to utilize native plants that provide food (directly and indirectly), cover, nesting sites, shelter and protection, nesting material or a combination of resources, also birds provide plants with a number of benefits as birds help plants in seed dispersal, pollination and protection.

The avian community of Damietta coastal area may be classified into four types according to type of feeding: twenty of carnivores species, twenty one of insectivorous species, twenty one of omnivores species and four species of herbivores in a percent of 30.30%, 31.82%, 31.82% and 6.06% respectively

Field study showed that plants rely on birds to disperse their seeds. Some species of bird are known to include some fruit in their diet. Even primarily insectivorous species such as Egyptian barn swallow and House sparrow will occasionally take small fruits. This is perhaps a result of the broad individual niches of the species in our relatively depauperate avifauna. Among the birds which eat fruits were Common bulbul and Hoopoe, these species chew and crack larger seeds with their relatively powerful bills and so must be regarded primarily as seed predators. Seeds of most fruits are indigestible and are eaten by animals and birds who deposit those seeds in their fecal matter. Since these creatures do not stay in the same place, the seeds are dispersed over a large area usually similar to that of where the mother plant thrived. They also have the benefit of being fertilized.

The relationships differed at the spatial and temporal scales, which made interpretation difficult, but the variations were possibly due to seasonality in migrants and phenological events of plant species [24]. However, previous species-level analysis showed that some habitat specific species are more prevalent only in the specific habitats [25]. Of the some 10,000 living bird species on earth [26], one in eight is threatened with global extinction [27]. Agricultural expansion and land use changes are leading drivers in the global decline of biodiversity [28,29] and in the decline of about 60% of the birds listed on the IUCN (International Union for Conservation of Nature) Red List [28].

Human activities can alter the biota of ecosystems via extinctions and invasions [30,31]. It can greatly influence the structure of bird and plant communities. As areas are cleared due to agriculture, industry, urbanization and uprooting of *Phoenix dactylifera*. The vegetative structure of the habitat often undergoes major change, typically increasing in patchiness and decreasing in plant-species diversity [32]. Also, replacing native vegetation with introduced species decreases the foliage-height diversity and biomass of plants. As usable vegetative areas diminish, food availability to birds and the number of suitable breeding areas are reduced. Avian-species diversity typically drops with increasing disturbance, partly for these reasons [33].

On the basis of the present study we may conclude that birds are excellent measure of the health of the environment and of the sustainability of human progress. They occur in many habitats, can reflect changes in other animals and plants, and can be sensitive to environmental changes. A great deal of high quality data already exists, and new data are realistic and relatively inexpensive to collect. In addition, birds have meaning, resonance and symbolic value for many audiences, and are extremely popular with the public. The obtained information about the biotic relations between plants and birds may be useful for credible conservation, management of biodiversity and establishment of a nature reserve.

References

- [1] S.M. Goodman, P.L. Meininger, The birds of Egypt. Oxford, UK, Oxford University Press. (1989)
- [2] S.E. El-Kassas, Effect of some growth regulators on the yield fruit quality of Zaghoul date palm. Third Symposium on date palm. Date palm Research Center, King Faisal Univ., Saudi Arabia, 1 (1993) 179-186
- [3] G. Shelly, A handbook on the birds of Egypt. John Van Voorst, London (1872)
- [4] R. Meinertzhagen, Nicolls Birds of Egypt. Hugh Ress, London (1930)
- [5] M.E. Tharwat, Birds known to occur in Egypt. Arabic Republic of Egypt, Cabinet of Ministers, Egyptian Environmental Affairs agency (EEAA), Department of Nature Protection, Publication of National Biodiversity Unit No. 8 (1997)
- [6] A. El-Negumi, H. Zain El-Din, M. El-Momeiry, M. Fayed, Birds of Egypt. Dar El-Fikr El-Araby, Cairo. (In arabic) (1950)
- [7] S. Goodman, Report on two small bird collections from Gabel Elbaregion, Southern Egypt. Bonn. Zool. Beitr. 35 (1984) 39-56
- [8] Support for Environmental Assessment and Management (SEAM) Programme, Damietta Governorate, Environmental Profile, Ministry of State for Environmental Affairs, Egyptian Environmental Affairs Agency, Entec. Uk. Ltd., Erm, Uk, Department for International Development (2004)
- [9] N.F. El-Arabany, S.E. Mansy, G.A. Abd-allah, S.E. Hassab El-Naby Comparisons between genetic and morphometric differentiation among populations of sparrows in Egypt. M. Sc. Thesis, Faculty of Science, Mansoura University, Egypt. (2007)
- [10] R. MacArthur, J. MkcArthur, On bird species diversity. Ecology (1961) 594-598
- [11] J. Finch, Family Obligations and Social Change. Cambridge, UK, Polity Press (1989)
- [12] G.S. Mills, J.B. Dunning, J.M. Bates, The relationship between breeding bird density and vegetation volume. Wilson Bull 103 (1991) 468-479
- [13] M.S. Serag, Ecology of four succulent halophytes in the Mediterranean coast of Damietta, Egypt. Estuarina Coastal Shelf Sciences 49 (1999) 29-36.
- [14] M.A. Zahran, A.J. Willis, The vegetation of Egypt, 2nd edn. Springer Science and Business Media B.V. (2009)
- [15] M.S. Serag, An Ecological study on two geophytes: *Asparagus Stipularis* Forssk. and *Asphoclelus aestivus* Brot. In the Mediterranean coast of Egypt. Catrina 6 (2011) 47-58
- [16] J. Braun-Blanquet, Pflanzensoziologie. Grundzüge der Vegetationskunde. Springer-Verlag, Wien and New York. (1964)
- [17] E.C. Pielou, Ecological Diversity. New York: Wiley. [A general book on ecological diversity. Entropy-based diversity measures. Models (for the distribution of species) (1975)
- [18] V. Täckholm, Students' Flora of Egypt, 2nd edn. Cairo Univ. Publ., Cooperative Printing Company, Beirut, (1974) p. 888
- [19] L. Boulos, Flora of Egypt Chicklist. Al-Hadara Publishing, Cairo, Egypt. (2009)
- [20] E. Karen, E. Francl, D. Gary, relationships of human disturbance, bird communities, and plant communities along the land-water interface of a large reservoir. Environmental Monitoring and Assessment 73 (2002) 67-93
- [21] F.C. James, N.O. Wamer, Relation between temporal forest bird communities and vegetation structure. Ecology 63 (1982) 159-171
- [22] M.L. Morrison, T.A. Scott, Laying the foundation for a comprehensive program of restoration for wildlife habitat in a riparian floodplain. Environmental Management. 18 (1994) 939-955

- [23] D.T. Bolger, A.C. Alberts, M.E. Soule, Occurrence patterns of bird species in habitat fragment: sampling, extinction, and nested species subsets. *American Naturalist* 137 (1991) 155-166
- [24] T.R. Shankar Raman, Effect of slash-and-burn shifting cultivation on rainforest birds in Mizoram, North-east India. *Conservation Biology* 15 (2001) 685-698
- [25] N. Chettri, E. Sharma, D.C. Deb, Bird community structure along a trekking corridor of Sikkim Himalaya: A conservation perspective. *Biological Conservation* 12 (2001) 1-16
- [26] F. Gill, D. Donsker, (eds) IOC World Bird Names (version 2.6). <http://www.worldbirdnames.org/>. Accessed Nov., 2010
- [27] J.E.M. Baillie, C. Hilton-Taylor, S.N. Stuart (eds) IUCN Red List of threatened species: A global species assessment. World Conservation Union (2004)
- [28] K. Norris, Agriculture and biodiversity conservation: Opportunity knocks. *Conserv Lett.* 1 (2008) 2-11
- [29] J.P.W. Scharlemann, R.E. Green, A. Balmford, Land-use trends in endemic bird areas: global expansion of agriculture in areas of high conservation value. *Glob. Change Biol.* 10 (2004) 2046-2051
- [30] D.U. Hooper, F.S. Chapin, J.J. Ewel, A. Hector, P. Inchausti, S. Lavorel, J.H. Lawton, D.M. Lodge, M. Loreau, S. Naeem, B. Schmid, H. Setälä, A.J. Symstad, J. Vandermeer, D.A. Wardle Effects of biodiversity on ecosystem functioning: A consensus of current knowledge. *Ecological Monographs* 75 (2005) 3-35
- [31] M.A. Gray, S.L. Baldauf, P.J. Mayhew, J.K. Hill, The response of avian feeding guilds to tropical forest disturbance. *Conservation Biology* 21 (2007) 133-141
- [32] D.A. Norton, R.J. Hobbs, L. Atkins, Fragmentation, disturbance, and plant distributions: Mistletoes in woodland remnants in the western Australian wheatbelt. *Conserv. Biol.* 9 (1995) 426-438.
- [33] S.R. Beissinger, D.R. Osborne, Effects of urbanization on avian community organization. *Condor* 84 (1982) 75-83

الملخص العربي

العلاقات الحيوية بين النباتات والطيور بالمنطقة الساحلية لدمياط

جمال عبد الرحيم عبد الله¹، ممدوح سالم سراج²، نيفين السيد رضا البقري¹، السيد جبر حبيب¹
¹ قسم علم الحيوان - كلية العلوم - جامعة دمياط
² قسم علم النبات - كلية العلوم - جامعة دمياط

تهدف الدراسة إلى إيجاد العلاقات الحيوية بين النباتات النامية بالمنطقة الساحلية لمحافظة دمياط والطيور بها. فقد تم تسجيل 101 نوع من النباتات تنتمي إلى 49 فصيلة. و66 نوع من الطيور. ومعظم التنوع الحيوي للنباتات والطيور في المنطقة معرض للخطر نتيجة للنشاط البشري من الصيد الجائر للطيور وتدمير الموائل الطبيعية للطيور مثل اقتلاع النباتات وعلي رأسها نبات النخيل. وقد أكدت الدراسة أن الشريط الساحلي الممتد من مدينة الدبية (بورسعيد) شرقاً وحتى جمصة غرباً ممراً هاماً للطيور المهاجرة العابرة ومونلاً للكثير من الطيور المهاجرة الزائرة الشتوية. وعليه فإن التدهور الحادث في هذه المنطقة نظراً للأنشطة البشرية المفرطة سوف يدمر هذا الممر مما يعرض الطيور المهاجرة للخطر. وقد أظهرت النتائج أن هناك العديد من العلاقات الحيوية بين النباتات والطيور حيث تقدم النباتات الغذاء للطيور إما بشكل مباشر حيث تتغذى الطيور علي الحبوب والبذور والثمار والبراعم أو بشكل غير مباشر حيث توفر النباتات البيئة المناسبة للحشرات والتي تتغذى عليها الطيور كذلك تقدم النباتات للطيور المأوي والحماية من الكائنات المفترسة الأخرى حيث تقوم الطيور بصنع أعشاشها داخل النباتات أما الطيور فتساعد النباتات في عمليتي التلقيح ونثر البذور وحمايتها من العديد من الحشرات والديدان. والنتائج المتحصل عليها سوف تفيد في عمل قاعدة بيانات عن التنوع البيولوجي (نباتات وطيور) وإظهار العلاقات الحيوية من حيث إدخال نباتات غازية جديدة وكذلك برامج صون وإدارة التنوع الحيوي بالمنطقة الساحلية. وتوصي الدراسة بالحفاظ علي هذا التنوع الحيوي من التدهور بحماية هذه المنطقة الساحلية من التلوث وإنشاء محمية طبيعية لصون الأنواع النادرة والمهددة بالانقراض علي مستوي النباتات وكذلك الطيور.