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# Notes on Some Palestinian Bird Fauna Existing in the Zoological Gardens of the Gaza Strip

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**Abstract:** The geography, topography and climatic variations of Palestine form a suitable environment for the occurrence of wildlife; particularly bird fauna. After the Israeli evacuation from the Gaza Strip in late 2005, many zoological gardens have been established. Birds acquired by the zoological gardens in the Gaza Strip were surveyed using special bird guidebooks throughout frequent visits between October, 2007 and September, 2010. A total number of 56 bird species belonging to 26 families and 16 orders was determined and listed. Aquatic birds comprised 16 (28.6%) of the species encountered, while terrestrial birds comprised 40 (71.4%) species. Although local hunting of birds using different means was the main supplier for Gaza zoological gardens, the import of many large bird species through the earth tunnels joining the Gaza Strip with the Egyptian Territories was also present. The Ostrich *Struthio camelus,* which is extinct in Palestine since the beginning of the 20$^{th}$ century, was encountered in most Gaza zoological gardens. The Great White Pelican *Pelecanus onocrotalus*, Greater Flamingo *Phoenicopterus roseus* and the White Stroke *Ciconia ciconia*, which are considered as the largest occurring Palestine bird fauna, were encountered as well. Many raptor species including the worldwide vulnerable Lesser Kestrel *Falco tinnunculus* were found to be hunted and caged in all zoological gardens. In conclusion, zoological gardens are good tools contributing to the knowledge of the Palestinians about their bird fauna resources. Accordingly, it is recommended to improve the current status of Gaza zoological gardens and to regulate bird and wildlife hunting through the implementation of environmental laws and legislations and the enhancement of ecological awareness.

**Key words:** Bird Fauna · Raptors · Wildlife Hunting · Zoological Gardens · Gaza Strip

## INTRODUCTION

The geographic location of Palestine at the terrestrial meeting point between the three continents; Asia, Europe and Africa gives the country a strategic major migration route in the Palearctic region. Every year, millions of migratory birds pass through the area following three main migratory routes; the coast and coastal plain, the mountains and the Jordan Valley [1]. More than 500 bird species were known to inhabit Palestine [1-3], of which over 200 species breed there, either resident or summer visitors [4]. Birds occupy all terrestrial and aquatic habitats of Palestine including the remote areas, mountains and the Negev Desert.

The Gaza Strip, which is located at the southern portion of the Palestine coast along the Mediterranean Sea, is blessed with a considerable number of bird fauna including terrestrial and aquatic forms. Dense concentration of birds occurs over the Gaza Strip during spring and autumn migration seasons [5, 6]. It is worth mentioning that wetlands, including the wetland ecosystem of Wadi Gaza, are considered as very productive ecosystems, having rich bird fauna. They provide bird fauna with all necessary requirements such as shelter, protection, food and breeding, resting and roosting places …etc [7-13]. In autumn, scores of fine nets are erected each year along the Gaza coastline to illegally catch migratory birds such as the Common Quail *Coturnix coturnix* [1, 9, 10]. In addition to poaching and hunting, urbanization and residential creeping, ecosystem alteration and destruction, environmental pollution and the extensive and intensive use of pesticides impose real threats on birdlife in the Gaza Strip.

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Bird hunting was and is still a common practice, whereas tens of bird species; particularly raptors (falcons, eagles, owls, ...etc), pheasants, waterfowls, doves and passerines are subject to poaching and hunting activities in key ecosystems of the Gaza Strip, e.g. Wadi Gaza [11, 12, 14], Al-Mawassi area, the western grapevine-cultivated sand dunes and the agricultural orchards prevailing in the eastern parts of the Gaza Strip. Such bird hunting activities could be risky, whereas tens of Gazans, especially youngsters, have been killed or injured by the Israeli gunfire or troops while trying to hunt birds near the Israeli border fence (Personal Communications and Local Media Reports). Birds are sold for meat or as pets and Gaza youngsters often hunt them for pocket money.

**Zoological Gardens in the Gaza Strip:** Zoological gardens are institutions aiming at offering great opportunities for entertainment and education and contributing to wildlife conservation. They often promote scientific research, especially for environmental and biological parties [15]. Prior to the Israeli evacuation from the Gaza Strip in late 2005, no zoological gardens have been established, with the exception of the Rafah private zoological garden which was established in 1999 and was by far considered as the first zoological garden in the Gaza Strip. Eight private zoological gardens have been established since 2006 in the five governorates of the Gaza Strip (North Gaza, Gaza, Middle, Khan Younis and Rafah) though many of them have been closed in the last two years due to intrinsic factors. The area of these zoological gardens ranges from 1.5 to 8 dunums (dunum = 1000 square meters). These zoological gardens were found to provide revenues to their owners and to be a good contributor to the knowledge of the Palestinians about their biodiversity items; especially bird fauna. Hence, the establishment of zoological gardens in the Gaza Strip encouraged wildlife hunting and trading. Particular emphasis was paid on bird fauna which are commonly hunted or trapped locally using different means. It is worth mentioning that two of the Gaza zoological gardens were demolished following their attacks by Israeli soldiers and tanks in 2004 and 2009. According to local media reports, the majority of animal component of these zoological gardens were killed or lost during that attacks.

**Literature Review:** Worldwide, birds have been extensively studied and surveyed in various ecosystems for different reasons including population assessment and conservation [16]. This was apparent from the magnitude of the literature surveyed. Wetlands have been considered the best areas to survey birds due to their open nature and water domination [17]. Wetlands support wide range of bird fauna species of which waterfowls are the most abundant [18]. For example, Ashkenazi and Dimentman [8] recorded 180 bird species including herons, dabbling ducks, kingfishers and waders in different habitats in a newly created Agmon wetland and surrounding cultivated peat land in the Hula Valley, Israel. National parks and nature reserves are rich places for biodiversity and they were found to be continually surveyed for bird fauna in different localities throughout the world [19-21]. In Jordan which is very close to Palestine, Evans *et al.* [22] recorded 142 bird species of which more than 34 species were actually breeders in the proposed Rum Wildlife Reserve.

Work on bird fauna in the Gaza Strip seemed to be growing and promising. Yassin *et al.* [23] and Abd Rabou [24] recorded tens of bird species prevailing in North Gaza; particularly the Beit Lahia wastewater treatment plant (BLWWTP) which often attracts aquatic birds (waders and waterfowls). Besides, studies conducted by MedWetCoast [6, 25], Abd Rabou [9, 10] and Abd Rabou *et al.* [11] in Wadi Gaza Nature Reserve revealed the presence of more than 100 terrestrial and aquatic bird species; some of them were local breeders. Abu Taleb [26] investigated the vertebrate fauna of the Gaza Strip and he listed as many as 234 bird species.

A substantial interest was paid to terrestrial and aquatic bird fauna caged in Gaza zoological gardens. Hence, the current study comes to document the Palestinian bird fauna existing in the zoological gardens of the Gaza Strip. Such a documentation is expected to enhance the Palestinians knowledge towards their bird fauna. Zoological gardens are promising in promoting the local biologists and ecologists to conduct works on bird biology, behavior and ecology in the Gaza Strip.

**The Study Area:** The Gaza Strip (31°25'N, 34°20'E) is a 365 $km^2$ arid strip of the Palestinian land along the southeastern Mediterranean. It represents the northern link between the Sinai and the Negev deserts. About 1.7 million residents, of whom the majority are United Nations-registered refugees, are living in the five governorates of the Gaza Strip (North Gaza, Gaza, Middle, Khan Younis and Rafah). The annual rainfall ranges from 200 mm in the south to 400 mm in the north. Three dry to semi-dry wadis (valleys) dissect the Gaza Strip. They are, from north to south, Wadi Beit Hanoun, Wadi Gaza and Wadi Al-Salqa.

## MATERIALS AND MEHTODS

Frequent visits were carried out to the eight local zoological gardens of the Gaza Strip during a three-year study (October, 2007 - September, 2010) in order to record and determine the caged Palestinian bird fauna species, which are mostly hunted by skilled people using different means. Observations and interviews with bird hunters and zoo owners were conducted as well. Photos were taken to document the caged bird species in Gaza zoological gardens using digital cameras. Identification of bird species follows published keys and guidebooks [27-33].

## RESULTS

A total number of 56 Palestinian bird species belonging to 26 families and 16 orders was recorded in the zoological gardens of the Gaza Strip (Table 1). The species in Table 1 were taxonomically arranged according to the available guides and textbooks. Aquatic birds comprised 16 (28.6%) of the species encountered, while terrestrial birds comprised 40 (71.4%) species (Figure 1). The order Passeriformes was the biggest order and comprised 15 (26.8%) of the encountered bird species (Figure 2), followed by the order Columbiformes which comprised

Table 1: Palestinian bird fauna existing in the zoological gardens of the Gaza Strip

| Family | Scientific Name | Common Name |
|---|---|---|
| | **Order Struthioniformes** | |
| Struthionidae | *Struthio camelus* | Ostrich |
| | **Order Pelecaniformes** | |
| Pelecanidae | *Pelecanus onocrotalus* | Great White Pelican |
| | **Order Ciconiiformes** | |
| Ardeidae | *Bubulcus ibis* | Cattle Egret |
| | *Egretta garzetta* | Little White Egret |
| Ciconiidae | *Ciconia ciconia* | White Stork |
| | **Order Phoenicopteriformes** | |
| Phoenicopteridae | *Phoenicopterus roseus* | Greater Flamingo |
| | **Order Anseriformes** | |
| Anatidae | *Alopochen aegyptiacus* | Egyptian Goose |
| | *Anas strepera* | Gadwall |
| | *Anas platyrhynchos* | Mallard |
| | *Anas clypeata* | Shoveler |
| | **Order Accipitriformes** | |
| Accipitridae | *Milvus migrans* | Black Kite |
| | *Buteo buteo* | Common Buzzard |
| | *Circus aeruginosus* | Marsh Harrier |
| | *Aquila heliaca* | Imperial Eagle |
| | **Order Falconiformes** | |
| Falconidae | *Falco naumnani* | Lesser Kestrel |
| | *Falco tinnunculus* | Common Kestrel |
| | *Falco subbuteo* | Eurasian Hobby |
| | *Falco peregrinus* | Peregrine Falcon |
| | **Order Galliformes** | |
| Phasianidae | *Alectoris chukar* | Chukar |
| | *Coturnix coturnix* | Common Quail |
| | *Numida meleagris* | Helmeted Guineafowl |
| | **Order Gruiformes** | |
| Rallidae | *Gallinula chloropus* | Common Moorhen |
| | *Fulica atra* | Eurasian Coot |
| | *Grus grus* | Common Crane |
| | **Order Charadriiformes** | |
| Burhinidae | *Burhinus oedicnemus* | Stone Curlew |
| Charadriidae | *Vanellus spinosus* | Spur-winged Plover |
| Laridae | *Larus fuscus* | Lesser black-backed Gull |
| | *Larus ridibundus* | Black-headed Gull |
| | *Larus melanocephalus* | Mediterranean Gull |
| | **Order Columbiformes** | |
| Columbidae | *Columba livia* | Rock Dove |
| | *Streptopelia decaocto* | Collared Dove |
| | *Streptopelia turtur* | Turtle Dove |
| | *Streptopelia senegalensis* | Laughing Dove |

Table 1: Continued

| | | |
|---|---|---|
| | **Order Cuculiformes** | |
| Cuculidae | *Clamator glandarius* | Great Spotted Cuckoo |
| | **Order Strigiformes** | |
| Strigidae | *Asio otus* | Long-eared Owl |
| | *Athene noctua* | Little Owl |
| | *Tyto alba* | Barn Owl |
| | Order Caprimulgiformes | |
| Caprimulgidae | *Caprimulgus europaeus* | Eurasian Nightjar |
| | **Order Coraciiformes** | |
| Alcedinidae | *Halycon smyrnensis* | White-breasted Kingfisher |
| Meropidae | *Merops apiaster* | European Bee-eater |
| Upupidae | *Upupa epops* | Hoopoe |
| | **Passeriformes** | |
| Pycnonotidae | *Pycnonotus xanthopygos* | Yellow-vented Bulbul |
| Turdidae | *Turdus merula* | Common Blackbird |
| | *Turdus philomelos* | Song Thrush |
| | *Saxicola torquata* | Stonechat |
| Corvidae | *Corvus corone* | Hooded Crow |
| Sturnidae | *Sturnus vulgaris* | European Starling |
| Passeridae | *Passer domesticus* | House Sparrow |
| Fringillidae | *Fringilla coelebs* | Chaffinch |
| | *Serinus serinus* | European Serin |
| | *Serinus syriacus* | Syrian Serin |
| | *Rhodospiza obsoleta* | Desert Finch |
| | *Carduelis spinus* | Siskin |
| | *Carduelis cannabina* | Linnet |
| | *Carduelis chloris* | Green Finch |
| | *Carduelis carduelis* | Goldfinch |

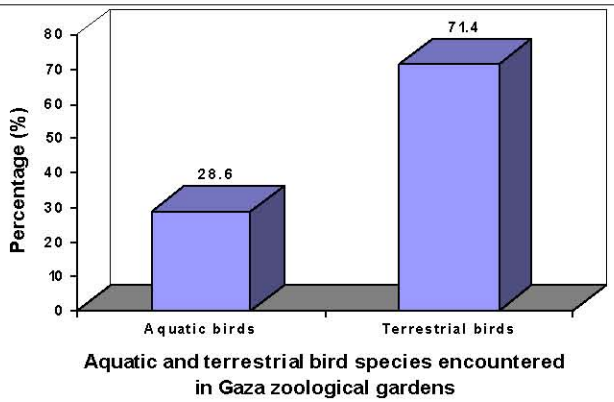


Fig. 1: A diagram showing the percentages of aquatic and terrestrial birds encountered in the zoological gardens of the Gaza Strip

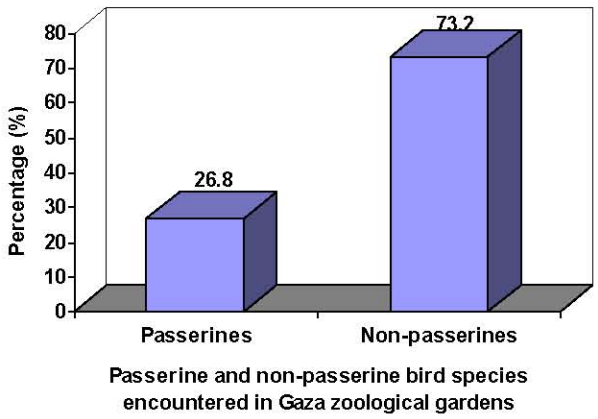


Fig. 2: A diagram showing the percentages of passerine and non-passerine bird species encountered in the zoological gardens of the Gaza Strip

8 (14.3%) species. Non-passerines comprised 41 (73.2%) of the whole encountered species (Figure 2). With the exception of the large Palestinian bird species (Ostrich, Great White Pelican, White Stork and Greater Flamingo) which were commonly introduced from Egypt using the earth tunnels joining the Gaza Strip with the Egyptian Territories, all the other encountered bird species were hunted within the limits of the Gaza Strip. There is a continuous provision and renewal of the bird species in Gaza zoological gardens as many birds were found to pass away due to food shortage or unavailability, poor veterinary care and poor caging conditions. The data on the most common and important Palestinian bird species encountered in Gaza zoological gardens are provided here.

**Ostrich *Struthio camelus* (Linnaeus, 1758):** The world's largest and tallest bird species. It stands at an average height of 2.5 meters. Wild populations of the Ostrich were recoded since a century in Palestine and the Sinai Peninsula [34], but the species is now extinct [4, 29]. As many as 14 individuals (males and females) of the species were encountered in Gaza zoological gardens during the study period. Sometimes, the species was found to be caged together with the Australian Emu *Dromaius novaehollandiae,* which is by far considered as the second-largest extant bird in the world by height after the Ostrich.

**Great White Pelican *Pelecanus onocrotalus* (Linnaeus, 1758):** The Great White Pelican is one of the largest Palestinian birds exceeding 10 kg in weight. It is well adapted for aquatic life, as it feeds mainly on fish. Flocks of the species usually reach Palestine in autumn seasons and fly in the sky of the Hula Lake and the Gaza Strip. As many as 22 individuals were encountered in Gaza zoological gardens during the study period (Figure 3). The species is introduced to the Gaza Strip from Egypt via the tunnel trade.

**Cattle Egret *Bubulcus ibis* (Linnaeus, 1758):** The Cattle Egret is a cosmopolitan species of heron inhabiting wetlands, agricultural lands, landfills and dump places of the Gaza Strip. It is well known by the Palestinians to accompany cattle and other large mammals, feeding on insects and other invertebrates that may harm agricultural crops and for this reason the bird was known as a farmer's friend. It is common to see the bird flying in small groups to and from roost sites in the sky of the Gaza Strip.

Fig. 3: Great White Pelican *Pelecanus onocrotalus*

Fig. 4: Cattle Egret *Bubulcus ibis*

Fig. 5: White Stork Ciconia ciconia

The species is commonly seen in large groups mixed with other aquatic bird species in the wetland ecosystem of wadi Gaza and the BLWWTP. As many as 12 individuals were encountered in Gaza zoological gardens during the study period (Figure 4).

**White Stork *Ciconia ciconia* (Linnaeus, 1758):** The White Stork is one of the largest Palestinian birds. Its plumage is mainly white with black flight feathers and

wing coverts. Adults are known for their long red legs and long pointed red beaks (Figure 5). The species is carnivorous in the sense that it feeds on a wide range of animal prey, including insects, fish, amphibians, reptiles and small mammals and birds. The White Stork inhabits meadows, farmland and wetlands in Palestine. Although the species have never been seen on the ground of the wetland ecosystem of Wadi Gaza by the author, some Gazans claimed that the species occurs in solid waste landfills lying in the eastern parts of the Gaza Strip, which are inaccessible for most Palestinians due to their proximity to the political borders with Israel. The author recorded plenty numbers of the species inhabiting wetlands (known as *Mayas*) during an ecological visit to the Dinder National Park, Sudan in January 2006. Most Gaza zoological gardens harbor few numbers of the species; most of them have been imported from Egypt via the tunnel trade.

**Greater Flamingo *Phoenicopterus roseus* (Pallas, 1811):** The Greater Flamingo is the largest of the six different Flamingo species, reaching about 1.5 meter high. Worldwide, Flamingos inhabit wetlands, coastal lagoons, mud flats and inland shallow lakes. They are omnivorous filter feeders in the sense that they use their pills to filter algae and tiny animals such as shrimps, molluscs and insect larvae which live in the mud at the bottom of shallow pools. Perlman and Meyrav [4] stated that the Greater Flamingo is common in the saltpans of Eilat and Atlit, southern Israel, mainly in winter and on migration. As many as 17 individuals of the Greater Flamingo were recorded in Gaza zoological gardens during the study period. They are imported from Egypt via tunnel trade.

**Egyptian Goose *Alopochen aegyptiacus* (Linnaeus, 1766):** The Egyptian Goose is a waterfowl species inhabiting a variety of water bodies including marshes and sewage lagoons. In the Gaza Strip, the species was rarely seen by the author in the BLWWTP, Wadi Gaza Nature Reserve and the sewage lagoons of Khan Younis city. It feeds mostly on seeds, grasses and other plant materials. As many as four individuals of the species were recorded in Gaza zoological gardens (Figure 6). Although they occur in the Gaza Strip, the recorded individuals were mostly imported from Egypt via tunnel trade as stated by zoo keepers.

**Mallard (Wild Duck) *Anas platyrhynchos* (Linnaeus, 1758):** The Mallard is considered as the ancestor of all domestic ducks. The breeding male is unmistakable, having a green head followed by a white collar which demarcates its head from the breast. Like most female dabbling ducks, the female Mallard has a mottled light brown color. The species was sometimes seen in flocks and with other species of the genus *Anas* swimming in the effluent lake of the BLWWTP and the other sewage lagoons in the Gaza Strip. In spite of their living habit in wastewater ponds and lagoons, some Palestinians were found to hunt ducks for their meat. Different Goose and Duck species including the species in question were encountered together in many of the Gaza zoological gardens. In the Rafah zoological garden, a small pond containing the Mallard was noted.

Fig. 6: Egyptian Goose *Alopochen aegyptiacus*

Fig. 7: The Black Kite *Milvus migrans* after being hunted in the vicinity of Wadi Gaza Nature Reserve

**Black Kite *Milvus migrans* (Boddaert, 1783):** The historic Palestine is home to more than 45 species belonging to order Falconiformes which contains Vultures, Eagles, Kites, Harriers and Falcons [4, 35]. The Black Kite, as an example, seems to occur year round in the Gaza Strip. Along with other raptor species, t he Black Kite was found to be hunted or trapped locally using different means for trade and rearing purposes (Figure 7). It is worth mentioning that many Palestinians have been shot and killed by

the Israeli Army while doing such hunting activities near the political borders separating the Gaza Strip from Israel. Secondary poisoning and hunting activities constitute a major threat to raptor life in the Gaza Strip. All Gaza zoological gardens were found to possess wire cages containing different raptor species. Such a species could be sold at U.S.$ 30-40.

**Lesser Kestrel *Falco naummani* (Fleischer, 1818):** The Lesser Kestrel is a small bird of prey recorded in different localities of the Palestinian Territories as a common summer visitor. In different ecological visits, the species was seen flying in flocks searching the ground of agricultural fields and other vegetated areas in the Gaza Strip. The Lesser Kestrel feeds on agricultural pests such as insects, small birds, reptiles and mice. From this point of view, local media reports pointed out that the Lesser Kestrel has been used as biological pest controller in the West Bank of Palestine and it gave good results. The Lesser Kestrel is categorized globally as a vulnerable species; meaning that the species seems to be undergoing a possibly accelerating decline. The indiscriminate use of insecticides and the extensive hunting practices seem to pose major threats on the falcon species of Palestine. The species was commonly seen caged in considerable numbers along with other falcon species (Common Kestrel *Falco tinnunculus* and Eurasian Hobby *Falco subbuteo*) in most Gaza zoological gardens. These falcons were sometimes seen hunted by children and the bird is sold at U.S.$ 5-15 depending on the species.

**Chukar *Alectoris chukar* (Gray, 1830):** The Chukar or Chukar Partridge is one of the commonest gamebird species in Palestine. It occurs throughout the year in different ecological habitats of the Palestinian environment including the barren mountainsides, grassy slopes and arid valleys. The species feeds mostly on seeds and insects. The bird is a local breeder and it builds its nest on the ground [11, 36]. Nearly all Palestinians are familiar with the species as it has well marked black and white bars on the flanks and a black band running from the forehead across the eye and running down the head to form a necklace that encloses a white throat (Figure 8). In the Gaza Strip, flocks of 7-15 individuals of the species are usually recorded in various agricultural and natural habitats including the grapevine and olive fields. Due to its delicious meat, the Chukar is threatened by intensive hunting using different means. Most Gaza zoological gardens were found to harbor from 5 to 20 individuals of the Chukar (Figure 8) including juveniles. Many zoo keepers claimed that the species faces an accelerating death in their cages due to unknown causes.

**Common Quail *Coturnix coturnix* (Linnaeus, 1758):** The Common Quail is one of the smaller gamebirds of the world. Quails usually prefer low-growing crops and rough grasslands in the Palestinian environment to live in. Like the Chukar, the species feeds on seeds and insects on the ground. Scattered flocks of the Common Quail usually come to the Gaza Strip coast through the Mediterranean Sea during their migration path from Europe to Africa at the beginning of autumn season. Hundreds of Quail (known as *Fir, Salwa* or *Semman*) are known to be captured daily along the Gaza Sea coast by illegal erection of scores of fine nets in the autumn season. Hunters usually benefit from the captured birds as a source of food or money. The pair of the Common Quail is usually sold at U.S.$ 3-4. Similar to other areas in the world, the species is also bred and kept as poultry both for eggs and delicious meat. The species was mentioned in many statements of the Holly Quran which indicated how the migrating Israelites relied on migrating Quails (*Salwas*) for food. More than 45 individuals of the Common Quail were encountered in Gaza zoological gardens during the study period; most of which came from poultry and market sources.

**Common Moorhen *Gallinula chloropus* (Linnaeus, 1758):** The Common Moorhen or Common Gallinule is a bird having an almost worldwide distribution. It lives around well-vegetated marshes, swamps, ponds, canals and other wetlands in Palestine. In the Gaza Strip, this breeding rail species is usually seen, sometimes along with the Eurasian Coot *Fulica atra* (Linnaeus, 1758), in aquatic and semi-aquatic habitats such as Wadi Gaza Nature Reserve, Al-Mawasi area and the BLWWTP. Its presence may be known by its characteristic loud voice. The mature Common Moorhen is a distinctive species having a dark plumage with white undertail, yellow legs and a red facial shield (Figure 9). The species feeds on insects and small water creatures, aquatic weeds and seeds. Despite poaching and loss and pollution of its habitats in the Gaza Strip, the Common Moorhen remains plentiful and widespread and is commonly found to invade the neighboring agro-ecosystems, causing nuisance to local farmers and residents. The Common Moorhen is a common bird species in most Gaza

Fig. 8: Chukar *Alectoris chukar*

Fig. 9: Moorhen *Gallinula chloropus*

zoological gardens. A total number of 50 individuals were encountered during the study period. This may reflect the wide distribution of the species in the Gaza Strip. Ground mist nets are commonly used to hunt the species in its aquatic habitats.

**Stone Curlew *Burhinus oedicnemus* (Linnaeus, 1758):** Despite being classed as a wader, the Stone Curlew prefers dry open habitats with some bare ground. It is seen year around resting in many natural and agricultural ecosystems in the Gaza Strip, e.g. grapevine and olive fields, Wadi Gaza, Al-Mawasi area and shrubby sand dunes. The species is characterized by having a strong yellow and black beak and large yellow eyes. It feeds upon insects and small invertebrates. The bird is considered as a local breeder in the Palestinian environment and its nests are built on ground, each containing two eggs with stones usually around as observed by the author. The eggs and nests of the species are usually threatened and destroyed by both children and shepherds. The Stone Curlew is uncommonly seen in Gaza zoological gardens, with only three individuals encountered.

**Spur-winged Plover *Vanellus spinosus* (Linnaeus, 1758):** The Spur-winged Plover or the Spur-winged Lapwing is conspicuous and unmistakable wader occurring besides wetlands, marshes, wastewater lagoons and even agricultural fields in the Palestinian environment. In all eco-trips carried out by the author and his ecology students to Wadi Gaza Nature Reserve, Al-Mawasi area and the BLWWTP, the species was encountered in tens. Sometimes, ground nests of the species containing 4 eggs have been encountered. In the Gaza Strip, these nests are commonly threatened by local people, farmers, children and shepherds [9-11]. More or less threats were also recorded in the Sunt Forest Bird Sanctuary, Khartoum State, Sudan [37]. The food of the Spur-winged Plover consists of insects and other invertebrates. The bird is considered locally as a noisy species in the sense that it releases loud calls in an attempt to defend its breeding territory. The bird was encountered in a few numbers in many Gaza zoological gardens.

**Laughing Dove *Streptopelia senegalensis* (Linnaeus, 1766):** The Laughing or Senegal or Palm Dove is a resident terrestrial and breeding bird in the Palestinian environment. It belongs to the bird family Columbidae, which includes the Doves and Pigeons. All known Palestinian Dove species of the genus *Streptopelia* are known locally as *Jamam*. These include the species in question along with the Turtle Dove *Streptopelia turtur* (Linnaeus, 1758) and the Collared Dove *Streptopelia decaocto* (Frivaldszky, 1838). The Laughing Dove occurs in cultivations, villages and buildings, rocky and flat areas in the Gaza Strip. It feeds on grass, seeds, grains and small insects. The nest is built on a diversity of tree and shrub species and it usually contains two eggs. Eggs, fledgling and the adults of all Dove and Pigeon species in the Gaza Strip are really under real threat due to egg collection, nest destruction and over-hunting of adults for meat purposes. In most Gaza zoological gardens, the Laughing Dove is usually present in considerable numbers (Figure 10) and it was sometimes found caged with other Dove and Pigeon species.

**Great Spotted Cuckoo *Clamator glandarius* (Linnaeus, 1758):** The Great Spotted Cuckoo is an uncommon bird species in the Gaza Strip. During the last six years, the author recorded as many as 5 juveniles of the species in cultivated areas rich in trees and shrubs (Figure 11). These juveniles have blackish upperparts and cap.

Fig. 10: Laughing Dove *Streptopelia senegalensis*

Fig. 11: A juvenile Great Spotted Cuckoo *Clamator glandarius* displayed by the author

Fig. 12: Barn Owl *Tyto alba* (Note the heart-shaped face)

Fig. 13: European Starling *Sturnus vulgaris*

Fig. 14: The Goldfinch *Carduelis carduelis* is a commonly hunted bird in the Gaza Strip

Fig. 15: The Goldfinch *Carduelis carduelis* caged in a zoological garden

The species feeds mainly on insects. Only two individuals were encountered in Gaza zoological gardens and this finding may reflect the ecological status of the species in the Gaza Strip as a summer visitor.

**Barn Owl *Tyto alba* (Scopoli, 1769):** The Barn Owl is the most widely distributed species of owl worldwide and in Palestine. This is a bird of open country such as farmland or grassland with some interspersed woodland. This nocturnal bird can be recognized by its heart-shaped face which is usually bright white (Figure 12) and by its silent flight during the hunting activities. The presence of the species may be identified by the male's distinctive call at night. The Barn Owl feeds primarily on small vertebrates, particularly rodents. In spite of the ecological benefits provided by the species in Palestine, the Barn Owl, along with other Owl species, is often persecuted by farmers and local people. Local threats facing the species usually include secondary poisoning and poaching and hunting by fearful locals. Local media reports pointed out that the

Barn Owl was used as biological pest controllers in the West Bank of Palestine and the species provided good results. All Gaza zoological gardens were found to have from 4 to 10 individuals of the species (Figure 12). In many occasions, the author noted children bringing the whole nest of the Barn Owl which contains from 3 to 4 juveniles. It is worth mentioning that the nests of the species are built in cavities of tree holes, barns and old buildings.

**Common Blackbird *Turdus merula* (Linnaeus, 1758):** The Common Blackbird is a common breeding species known for most Palestinians. It is known locally as "*Doj* or *Shahrour*". It is found year round, inhabiting gardens, parks, dense agricultural fields and fruit orchards. Although the male is all black except for a yellow eye-ring and bill, the female has mainly dark brown plumage. The species is omnivorous in the sense that it feeds on animal and plant material like insects, earthworms, other invertebrates and fruits. The Common Blackbird is commonly seen spending much of its time searching food on the ground. As many as 5 individuals of the species were encountered in Gaza zoological gardens throughout the study period.

**European Starling *Sturnus vulgaris* (Linnaeus, 1758):** The European Starling is a small bird native to Europe but now it is one of the world's most abundant birds. In Palestine, the species is well known and easily identified due to its shiny black plumage that is spangled with white (Figure 13). Locally, the European Starling is known as *Zarzour*. It prefers different habitats including grassy areas, farms, pastures and other similar environments. It feeds on a variety of animal and plant materials including insects and other invertebrates, grains, seeds and fruits. About 15 individuals of the European Starling were only encountered in the main zoological garden of the Gaza City (Figure 13). They were found to be caged with other passerines such as the Green Finch *Carduelis chloris* (Linnaeus, 1758) and European Serin *Serinus syriacus* (Linnaeus, 1766).

**Goldfinch *Carduelis carduelis* (Linnaeus, 1758):** Worldwide, Goldfinches are commonly kept and bred in captivity because of their distinctive appearance and pleasant song. The species occurs naturally in shrubby areas, gardens, parks and fruit orchards. In the Gaza Strip, the Goldfinch is easily identified by adults and children due to its striking and beautiful colors. The species is currently considered as uncommon bird due to habitat destruction and its intensive poaching and hunting (Figure 14). The species is loved by all Gazans and every Gazan would like to have the opportunity to cage the bird at home to enjoy listening to its distinctive songs. A single Goldfinch was found to be sold at U.S.$ 40-50. As far as the presence of the Goldfinch in Gaza zoological gardens is concerned, the species was a common zoo bird (Figure 15). In most occasions, the species was found to be caged together with other passerines, especially Finches.

## DISCUSSION

The current study revealed the occurrence of 56 bird species in Gaza zoological gardens, most of them were described in earlier works conducted in the Gaza Strip [9, 11, 23, 26]. The diversity of terrestrial and aquatic bird species in Gaza zoological gardens comes as a reflection of what is existing in the Gaza Strip. The strategic geographical position of the Gaza Strip, which is located at the southern portion of the Palestine coast along the Mediterranean Sea, along with climatic variations facilitates the occurrence of both floristic and faunistic species of the three continents (Asia, Africa and Europe), with birds are the most conspicuous of all vertebrate fauna [10]. Different natural and agricultural ecosystems in the Gaza Strip are home to terrestrial and aquatic bird species. They provide bird fauna with all needs; shelter, fuel, food and nesting and resting sites. For example, Wadi Gaza Nature Reserve with its wetland ecosystem provides habitats and multi-purpose niches for a variety of bird fauna as pointed out by Abd Rabou *et al.* [11]. Many migratory bird species use the coastal and wetland habitats of the Gaza Strip as a stopover point before continuing their annual migration [6]. This could be attributed to the fact that the Gaza Strip plays as a bottleneck for migratory birds coming from Eurasia to Africa and vice versa.

Agriculture is the backbone of economics of the Gaza Strip and agricultural fields cover most of the land there. Hence, terrestrial birds are the most common and the mostly hunted bird species there, as they comprise 71.4% of the species encountered in Gaza zoological gardens. The occurrence of 16 aquatic birds among the recorded species in the Gaza zoological gardens could be attributed to the diversity of aquatic bodies in the Gaza Strip, e.g. the wetland ecosystem of Wadi Gaza, sewage treatment

plants and lagoons which are found in most Gaza governorates, Al-Mawasi ecosystem which is unique to the Palestine coast and the Mediterranean Sea which harbors a diversity of coastal and marine bird species such as Cormorants, Terns and Gulls [11].

Bird hunting is a common practice among the Palestinians. However, the establishment of many zoological gardens in the Gaza Strip in the last few years was found to further promote wildlife hunting. From a recreational point of view, the local supply of zoological gardens with bird species hunted in the Gaza Strip can not satisfy the desire of the Palestinians to know more about bird fauna. Hence, the tunnels joining the Gaza Strip with the Egyptian Territories were found to be necessary in closing the gap through importing key bird species from outside. Most of the imported bird species were known to pass through the Gaza Strip during the migration seasons such as the White Stork and the White Pelican [11] or to occur elsewhere in the Palestinian Territories [4]. Such an import through earth tunnels could be considered by many parties as an illegal action and this is true if the crossing points of the Gaza Strip with Israel and Egypt were open. Unfortunately, the tight closure of these crossing points in the face of the Palestinians as a response to the Israeli blockade imposed on the Gaza Strip since 2006 necessitates such a tunnel trade for all principal goods including zoo animals [38].

Illegal hunting and non-rationale poaching of birds and other wildlife species using different means are common practices and could harm bird fauna in the Gaza Strip. This scene could be attributed to the fact that most Gazans are lying under the poverty line and most youths are suffering from the unemployment crisis especially in the running years where the Israeli blockade or siege on the Gaza Strip is still functioning and most needs of the Gazans come from the earth tunnels joining the Gaza Strip with the Egyptian territories. Most bird species that are recorded in the current study were found to be hunted locally. Hunting of the Common Quail *Coturnix coturnix* seems to be the most visible along the Mediterranean coast of the Gaza Strip in autumn seasons [1, 5, 11]. It is acceptable to local scientific parties that illegal hunting or over-hunting activities have resulted in that many wildlife species are threatened. In Turkey, the populations of the Common Quail and the Chukar *Alectoris chukar* have shown a large decrease due to widespread illegal hunting [20]. Raptors have been illegally hunted in the Gaza Strip, with the Lesser Kestrel, which is categorized globally as a vulnerable species, is a clear example of this tragedy. The negative impacts of pesticides could not be excluded as well; they impose real threats to raptor species in the area [35, 39]. Such dilemma could be considered as a sign to the Palestinian authorities to take effective steps towards protecting wildlife through imposing environmental laws and legislations in times all parties saying that nature is a scarce resource in Gaza Strip. In Israel, the illegal hunting practices adopted by Thai workers were found to impose negative impacts on wildlife [40] in spite of the fact that all wildlife species have legal protection there and hunting is allowed only for animals that are either classified as agricultural pests or are common [41].

The current over-population, which is estimated at 1.7 million in the very limited area the Gaza Strip owes (365 $km^2$), is also expected to have adverse impacts on bird ecology. This is nurtured by other threatening factors such as the intensive and extensive application of infrastructural and developmental projects. Residential expansion at the expense of natural ecosystems is a common phenomenon in the Gaza Strip. Hence, the escalating uprooting of vast areas whether natural or cultivated by both the Israeli Army and the Palestinians themselves had its major impact on birdlife in the area. This is primarily attributed the characteristic sensitivity of bird fauna to any changes and alterations in such ecosystems [42].

Better zoo management means that zoo animals including birds need to be caged or housed and fed according to the species requirements and this in turn will be in part reflected by the good general conditions of the caged animals. Wickins-Drazilova [43] pointed out that the continuing existence of zoological gardens and their good purposes such as conservation, science, education and recreation can be ethically justified only if zoological gardens guarantee the welfare of their animals. From these points of view, the frequent visits to Gaza zoological gardens showed that the veterinary treatment, housing, stocking, feeding and sanitation concerning zoo birds seemed to be poorly dealt with. This was apparent from the magnitude of birds passing away during the last four years as told by zoo keepers. De Haas van Dorsser *et al.* [44] stated that animals of the Sana'a and Tai'zz zoological gardens in the Republic of Yemen had reasonable diets and housing, but overstocking, poor handing and lack of preventive medicine were found to compromise the welfare of zoo animals.

Modern zoological gardens have five primary interconnected goals: Animal welfare, conservation, education of the public, research and entertainment [15]. In the Gaza Strip, the majority of zoo visitors come, at least

in part, for entertainment, while the first goals of zoological gardens are usually unquestionably placed. It is the role of the lower and higher education institutions in the Gaza Strip to emphasize on the five goals as a one package. This could be internalized through advanced educational and research programs concerning the biology, ecology, behavior and better management of zoo animals. Finally, the author recommends improving the current status of Gaza zoological gardens in order to be both entertaining and educational and regulating bird and wildlife hunting in the Gaza Strip through the implementation of environmental laws and legislations and the enhancement of ecological awareness campaigns.

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## REFERENCES

1. UNEP, 2003. Desk study on the environment in the Occupied Palestinian Territories. United Nations Environment Program (UNEP), Nairobi, Kenya, pp: 188.
2. PIALES - Palestinian Institute for Arid Land and Environmental Studies, 1996. A preliminary investigation of biodiversity in Palestine: Problems and prospects, West Bank, Palestine, pp: 41.
3. Ali-Shtayeh, M.S. and A.K. Hamad, 1997. Biodiversity in Palestine: West Bank and Gaza Strip. In the Proceedings of the Arab experts meeting on biodiversity in the Arab world. The Arab Center for the Studies of Arid Zones and Dry Lands - ACSAD. (Damascus) and the Technical Secretary of the League of the Arab States (Cairo). 1-5 October 1995, Cairo, Egypt. ACSAD/AS/P171/1997. Damascus, pp: 469-529
4. Perlman, Y. and J. Meyrav, 2009. Checklist of the birds of Israel. Israel Ornithological Center, Society for the Protection of Nature in Israel (SPNI), Israel, pp: 30.
5. Euroconsult and IWACO, 1994. Gaza environmental profile (Part I): Inventory of resources. Palestinian Environmental Protection Authority, Gaza Strip, Palestine, pp: 60.
6. MedWetCoast, 2003. Management plan: Wadi Gaza. Project for the Conservation of Wetland and Coastal Ecosystems in the Mediterranean Region - MedWetCoast, pp: 171.
7. Skinner, J. and S. Zalewski, 1995. Functions and values of Mediterranean wetlands. MedWet - Conservation of Med. Wetlands, Tour du Valat, France, pp: 78.
8. Ashkenazi, S and C. Dimentman, 1998. Foraging, roosting and nesting habitats of the avian fauna of the Agmon wetland, northern Israel. Wetland Ecology and Management, 6(2/3): 169-187.
9. Abd Rabou, A.N., 2005. An ecological survey and assessment of Wadi Gaza Nature Reserve, Gaza Strip – Palestine, with particular emphasis on wildlife, Ph.D. thesis, Department of Environmental Studies, Faculty of Science and Technology, School of Life Sciences, Al-Neelain University, Sudan.
10. Abd Rabou, A.N., 2011. On the ecology of Wadi Gaza, Gaza Strip: Survey and assessment (Wildlife is focused). LAP Lambert Academic Publishing, Germany, pp: 304.
11. Abd Rabou, A.N., M.M. Yassin, M.R. Al-Agha, D.M. Hamad and A.S. Ali, 2007. The avifauna of Wadi Gaza Nature Reserve, Gaza Strip - Palestine. The Islamic University Journal (Series of Natural Studies and Engineering), 15(1): 39-85.
12. Abd Rabou, A.N., M.M. Yassin, M.R. Al-Agha, N.A. Fayyad, B.F. Al-Zain, A.S. Ali and D.M. Hamad, 2007. On the benefits provided by the wetland ecosystem of Wadi Gaza - Gaza Strip. In the Proceedings of the 2nd International Engineering Conference on Construction and Development (IECCD-II), Theme XII: Environmental Design Trends and Pollution Control, September 3-4, 2007, Faculty of Engineering, Islamic University of Gaza, pp: 44-58.
13. Saygili, F., N. Yigit and S. Bulut, 2011. The spatial and temporal distributions of waterbirds in Lakes Aksehir-Eber and Lake K?oycegiz in western Anatolia, Turkey: A comparative analysis. Turkish Journal of Zoology, 35(4): 467-480.

14. Abd Rabou, A.N. and K.S. Abu Daher, 2009. The environmental tragedy of Wadi Gaza after 60 years on the Palestine Nakba. In the Proceedings of Palestine… 61 years after Nakba, May 16-17, 2009, Faculty of Arts, Islamic University of Gaza, pp: 935-954.
15. Fernandez, E.J., M.A. Tamborski, S.R. Pickens and W. Timberlake, 2009. Animal-visitor interactions in the modern zoo: Conflicts and interventions. Applied Animal Behavior Sci., 120: 1-8.
16. Bibby, C., M. Jones and S. Marsden, 1998. Expedition field techniques: Bird surveys. Expedition Advisory Center, Royal Geographical Society (with the Institute of British Geographers), London, pp: 134.
17. Forshaw, J., S. Howell, T. Lindsey and R. Stallcup, 1999. Birding: The Nature Company Guides. Time Life Books, USA., pp: 288.
18. Kirby, J.S., 1995. Winter population estimates for selected waterfowl species in Britain. Biological Conservation, 73: 189-198.
19. Hamad, D.M., 1998. Bird fauna in Dinder National Park. Sudan Notes & Records (SNR), 2: 187-203.
20. Sert, H. and A. Erdogan, 2004. The avifauna of Termessos National Park (Antalya - Turkey). Turkish J. Zool., 28: 134-145.
21. Perktas, U. and Z. Ayas, 2005. Birds of Nallihan Bird Paradise (Central Anatolia, Turkey). Turkish J. Zool., 29: 45-59.
22. Evans, M., Z. Amr and R.M. Al-Oran, 2005. The status of birds in the Proposed Rum Wildlife Reserve, Southern Jordan. Turkish J. Zool., 29: 17-25.
23. Yassin, M.M., A.N. Abd Rabou and M.R. Al-Agha, 2006. Preliminary survey of terrestrial vertebrate fauna and people's awareness towards wildlife in the Northern Governorate of the Gaza Strip. Al-Azhar Bulletin of Science: Zoology & Botany, 17(1): 17-41.
24. Abd Rabou, A.N., 2011. Environmental impacts associated with the Beit Lahia wastewater treatment plant, North Gaza Strip, Palestine. Middle-East J. Scientific Research (MEJSR), 7(5): 746-757.
25. MedWetCoast, 2002. Fauna site diagnosis - Wadi Gaza. Project for the Conservation of Wetland and Coastal Ecosystems in the Mediterranean Region - MedWetCoast, pp: 48.
26. Abu Taleb, M.H., 2008. Studies on some vertebrates of Gaza Strip - Palestine. Ph.D. thesis, Ain Shams University - Egypt / Al-Aqsa University – Palestine (The Joint Program for Higher Studies).
27. Porter, R.F., S. Christensen and P. Schiermacker-Hansen, 1996. Field guide to the birds of the Middle East. T and AD Poyser, London, pp: 460.
28. Cottridge, D.M. and R. Porter, 2000. A photographic guide to birds of Israel and the Middle East. Steimatzky Ltd., pp: 144.
29. Shirihai, H., 1996. The birds of Israel. Academic Press, pp: 876.
30. Jonsson, L., 1999. Birds of Europe with North Africa and the Middle East. Christopher Helm (Publishers) Ltd., pp: 559.
31. Harrison, C. and A. Greensmith, 1993. Birds of the world. 1st American ed., DK Publishing. Inc., pp: 416.
32. Vere Benson, S., 1984. Birds of Lebanon, Syria and Jordan and for use in the neighboring Arab States. International Council for Bird Preservation. England, pp: 200.
33. Abu Shammalah, M. and M. Baha El-Din, 1999. Birds of Gaza. Darwish Consulting Engineers Ltd., pp: 44.
34. Phillips, J. C., 1915. Some birds from Sinai and Palestine. The Auk: A Quarterly J. Ornithol., XXXII(3): 273-289.
35. Brett, J., 1988. Birds of prey in Palestine. In the Proceedings of the 1st Palestinian Ecology Conference, 1988, Department of Life Sciences, Bethlehem University, pp: 109-112.
36. Alkon, P.U., 1983. Nesting and brood reproduction in an Israeli population of chukars, *Alectoris chukar* (Aves: Phasianidae). Israel J. Zool., 32: 185-193.
37. Hassan, M.A., 2001. Breeding habits of the Spur-winged Plover *Vanellus spinosus* in Sunt Forest Bird Sanctuary. M.Sc. thesis, Department of Zoology, University of Khartoum - Sudan.
38. Abd Rabou, A.N., 2009. The Zionist siege and its environmental consequences in the Gaza Strip. In the Proceedings of Palestine… 61 years after Nakba, May 16-17, 2009, Faculty of Arts, Islamic University of Gaza, pp: 911-933.
39. Liven-Schulman, I., Y. Leshem, D. Alon and Y. Yom-Tov, 2004. Causes of population declines of the lesser kestrel *Falco naummani* in Israel. Ibis, 146(1): 145-152.
40. Yom-Tov, Y., 2003. Poaching of Israeli wildlife by guest workers. Biological Conservation, 110: 11-20.

41. Mendelssohn, H. and Y. Yom-Tov, 1988. Changes of the distribution and abundance of vertebrates during the 20th Century in Israel. In: Y. Yom-Tov and E. Tchernov, (Eds.), The Zoogeography of Israel. Dr. W. Junk Publishers, Dordrecht, pp: 515-548.
42. Pomeroy, D., 1992. Counting birds. AWF technical handbook series 6, African Wildlife Foundation (AWF), Nairobi, Kenya, pp: 48.
43. Wickins-Drazilova, D., 2006. Zoo animal welfare. J. Agricultural and Environmental Ethics, 19: 27-36.
44. De Haas Van Dorsser, F.J., N.S. Thowabeh and A.A. Al-Midfa, 2003. Health status of zoo animals in Sana'a and Tai'zz, Republic of Yemen. In the Proceedings of the World Association of Wildlife Veterinarians (WAWV) wildlife sessions at the 27th World Veterinary Congress in Tunisia, 2002, pp: 66-69.