

On the Owls (Order Strigiformes) Inhabiting the Gaza Strip – Palestine



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Submission: October 5, 2020; **Published:** October 28, 2020

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Abstract

Birds are among the best-known vertebrate fauna of Palestine. Owls (order Strigiformes) comprise 10 extant species of the 540 bird species occurring in Palestine. The current study comes to give considerable notes on the Palestinian owls encountered in the Gaza Strip. Since 2002, frequent field visits and observations and discussions with local people have been used to determine the bird fauna including owls prevailing in the Gaza Strip. Animal markets, pet shops and zoos were visited as well to study their owl content. Binoculars, guidebooks and digital cameras were vital tools to satisfy the purpose of the study. At least, five species of owls belonging to two families (Tytonidae and Strigidae) were encountered throughout the current study. They were the Barn Owl (*Tyto alba*), Little Owl (*Athene noctua*), Long-eared Owl (*Asio otus*), European Scops Owl (*Otus scops*) and Eurasian Eagle Owl (*Bubo bubo*). This number may increase in the future, as new numbers of birds are added to the Gaza birds list annually. The Barn Owl was and is still the commonest owl species prevailing in all environments of the Gaza Strip, especially those close to dwellings and human activities. However, it was the most captive owl species in zoos, animal markets and pet shops. In terms of size, the Eurasian Eagle Owl is the biggest, while the European Scops Owl is the smallest. The threats facing owls in the Gaza Strip include habitat loss and destruction, poaching and trapping, myths and superstitions, secondary poisoning, road kills and fences of agricultural lands. Finally, the study recommends the raise of ecological awareness among Gazans and application of protection measures including nesting boxes in order to sustainably conserve the owl species and their significant ecological role in the Gaza Strip.

Keywords: Bird fauna; Strigiformes; Owls; Barn Owl; Threats; Gaza Strip

Introduction

Birds are among the best-known biodiversity components of the Earth [1,2]. Palestine, which has an area of 27,000 km², is home to more than 540 bird species inhabiting all types of terrestrial and aquatic habitats [3]. They are encountering a capital deterioration which is tipping the majority of their populations and species closer to extinction [2]. Among others, urbanization is a major threat facing birds and other wildlife in Palestine because it depletes natural and semi-natural habitats, decreases faunal biodiversity and sometimes creates new ecological habitats for some species [4]. The Gaza Strip, which covers an area of 365 km² (about 1.5% of the total area of Palestine) has a population composing of two million Palestinians [5]. It has been considered as an environmentally and ecologically hot spot because of its overcrowding, population density, political instability, environmental deterioration and injustice in addition to the escalating depletion of its natural resources [6]. The diversity of landscapes, ecosystems, habitats, niches and climates of the Gaza Strip introduces mating, nesting, resting,

roosting, mimicry, protection and food values to birds, of which the owls (order Strigiformes) are a considerable part [7-14].

Owls are a group of kind and very beautiful birds belonging to order Strigiformes which is commonly divided into two families; the true or typical owl family, which is known as Strigidae, and the barn-owl family, which is known as Tytonidae [14]. More than 200 species of mostly solitary and nocturnal birds of prey form the Strigiformes order. Despite being a very small set of bird species, owls inhabiting Palestine (hereafter Palestinian owls) have received considerable attention from naturalists and biologists because of their direct relationship to agriculture. Owls are usually distinguished by their upright posture, large and broad heads, binocular or two-eyed vision, binaural hearing using both ears, sharp claws or talons and feathers adapted to silent flight [15]. Owls hunt mostly small mammals, insects, and other birds, although a few species specialize in hunting fish. Owls play an important role in the maintenance of a natural balance since they are at the apex of trophic levels in terrestrial and aquatic

ecosystems [16]. The historical Palestine is home to ten species of owls comprising the Tytonidae and Strigidae families; Barn Owl (*Tyto alba*), Little Owl (*Athene noctua*), Long-eared Owl (*Asio otus*), Shot-eared Owl (*Asio flammeus*), European Scops Owl (*Otus scops*), Pallid Scops Owl (*Otus brucei*), Eurasian Eagle Owl (*Bubo bubo*), Pharaoh Eagle Owl (*Bubo ascalaphus*), Tawny Owl (*Strix aluco*) and Desert Owl (*Strix hadorami*). Added to that, the Brown Fish Owl (*Ketupa zeylonensis*), which is an extinct owl species in the country [3,17].

In spite of this owl diversity, a few studies targeting owls were carried out in the Palestinian territories. Amr et al. [18] investigated the diet of Eurasian Eagle Owl (*Bubo bubo*) in Wadi Al-Makhrou, Bethlehem Governorate of Palestine. Glausiusz [19]. pointed out that the Barn Owl (*Tyto alba*) was used in a cross-border collaboration program of Middle East, including Palestine instead of pesticides to control pests. In Jordan and Israel, a lot of studies were carried out on certain owl species, discussing their feeding ecology, breeding biology and their importance in pest control [18,19 & 20-27]. In the Palestinian territories, many owl species were mentioned in bird-related studies concerning the occurrence and incidence of birds in particular ecosystems such as Wadi Gaza Nature Reserve and Al-Mawasi ecosystem and

their analogous environments [7-13]. During recent decades, the Palestinians have been increasingly aware of the importance of owls for different aspects including public health, role in ecosystems, educational value, and the necessity of protect them. Taking into account that biological conservation of organisms is, in part, based on how much the Palestinians know about them, the principal aim of the current work is to report an emphasis on the occurrence of and the threats facing the Palestinian owls of the Gaza Strip.

Materials and Methods

Gaza Strip

The Gaza Strip (365 km²) is an arid to semi-arid coastal zone lying in the southern part of the Palestinian coast along the eastern shore of the Mediterranean Sea (Figure 1). It has five governorates: North Gaza, Gaza, Middle, Khan Younis, and Rafah. The local average annual rainfall is 300 mm. Sand dunes are the main feature of the western part of the Gaza Strip, while the clay and clayey lands predominate in the eastern part [6,28]. Nowadays, the Gaza Strip has a population of about 2 million, with the population density reaching 5,500 inhabitants per square kilometer, making the Gaza Strip one of the most densely populated areas in the world [11].



Figure 1: A map showing the geographic position of the Gaza Strip.

Procedure

Since 2002, frequent field visits and observations and discussions with local people have been used to determine the bird fauna prevailing in the various ecosystems of the Gaza Strip. During the field visits, binoculars and digital cameras were commonly used for observations and documentation. More focus was paid on the occurrence of and the threats facing the owl species of the Gaza Strip. Animal markets, pet shops and zoological gardens (zoos) were commonly visited to study their owl content. All local literature concerning bird fauna in the Gaza Strip were reviewed as well. Many available local, regional and international guidebooks in addition to many internet sites have been referred

to in order to identify bird species [29-34].

Results

Owl species of the Gaza strip

The findings of the current study revealed at least five species of owls occurring in the various environments within the limits of the Gaza Strip (Table 1 & Figure 2). Most of them seem to be locally resident and breeding. The most widespread species of all is the Barn Owl (*Tyto alba*) which belongs to Tytonidae family. The four other species belong to Strigidae family. The following paragraphs display a description of each Owl species occurring in the wild and sometimes in captivity in the Gaza Strip.



Figure 2: The owl species of the Gaza Strip: (A and B) Eurasian Eagle Owl *Bubo bubo*, (C and D) Long-eared Owl *Asio otus*, (E) Little Owl *Athene noctua*, (F and G) European Scops Owl *Otus scops* and (H) Barn Owl *Tyto alba*.

Table 1: Owls (order Strigiformes) of the Gaza Strip.

Family	Scientific Name	Common Name
Strigiformes		
Tytonide	<i>Tyto alba</i>	Barn Owl
Strigidae	<i>Otus scops</i>	European Scops Owl
	<i>Athene noctua</i>	Little Owl
	<i>Asio otus</i>	Long-eared Owl
	<i>Bubo bubo</i>	Eurasian Eagle Owl

Barn Owl (*Tyto alba* Scopoli 1769)

The Barn Owl is not only one of the most widely distributed of owls, but of all land birds. It is the commonest owl species prevailing in all environments of the Gaza Strip, especially those close to dwellings and human activities. As its name indicates, the Barn Owl is often found in rural areas nesting within barns. The presence of the species may be identified by the male's distinctive call at night. It is characterized by its heart-shaped face and its white and gold colors. Males are usually whiter in color

and smaller in size than females. Like other owl species, the Barn Owl is nocturnal in the sense that it is active at night; attacking and hunting small mammals, small wild and domestic birds and reptiles. Accordingly, some Gazans consider the Barn Owl as an undesirable pest because of its intermittent attacks to domestic poultries. As commonly seen at night, Barn Owls are deadly and effective hunters, who use their excellent eyesight and hearing to locate their prey in the dark. They will fly and ambush their prey and be able to close silently due to their flight feathers, grabbing it with their claws.

Preys are commonly swallowed whole. As all owls do, the fur, feather and bones of preys are regurgitated in small, compact masses known as “pellets”. Some biologists or ecologists collect these pellets and use them to learn or to know more about owl diets. The nests are built in cavities of tree holes, barns and old buildings. Out of pessimism, most Gazans acknowledge the role of Barn Owls along with other owls in rodent control especially the House Mouse (*Mus musculus*), Black Rat (*Rattus rattus*) and even the Palestine Mole-rat (*Spalax ehrenbergi*) which is a common subterranean rodent threatening the roots and tubers of agricultural crops grown in the Gaza Strip. With regard to reproduction, the Barn Owl often uses existing cavities constructed in trees, cliffs, caves, and buildings. Once the eggs hatch, the female will spend all of her time in the nest caring for the young. Many individuals of the species were captured during the daytime while hiding themselves at caves or barns or buildings in the Gaza Strip. The Barn Owl is actually the commonest stuffed owl species at the Palestinian universities’ laboratories or caged at zoos prevailing in the Gaza Strip.

In fact, the adults, chicks and nests of the different owl species inhabiting the Gaza Strip have been chased by local people, especially children, for no clear reasons. In two occasions, the chicks or juveniles of the Barn Owl were collected in baskets or cartoon boxes and brought to local zoos for sale. Like other bird and owl species, many Barn Owls were sometimes seen in some animal and pet shops and in Al-Yarmouk Market, lying in the middle of the Gaza City, to be sold cheaply to the public. Over the past few years, nest boxes were provided under the eaves of buildings and in other locations in the West Bank of Palestine for two reasons. The first implies the necessity to increase the local population of Barn Owls (population management) in the wild. The second implies the biocontrol of rodents as well as other vertebrate and invertebrate pests threatening the agricultural crops and other human properties. Media news pointed out that Barn Owls accepted the provided nest boxes and sometimes preferred them to natural sites. Such nest boxes have never been used in the Gaza Strip.

Eurasian Eagle Owl (*Bubo bubo* Linnaeus, 1758)

Eurasian Eagle Owls (European Eagle Owls or Eagle Owls) are among the world’s largest owls. The species is often found in mountainous areas and cliffs characterizing the West Bank of

Palestine; hence it is rare in the Gaza Strip of Palestine. This species has distinct ear tufts, with its upper parts mottled dark black and brown. The face has distinctive orange eyes. Thus, the orange pumpkin eyes, and feathered ear tufts make them one of the most eye-catching owls in the world. The name of the species may come as a reflection of the bird in displaying a type of flight similar to that of soaring hawks. The large, powerful feet and strong flight make the bird an effective hunter. It is mostly a nocturnal (dusk to dawn) and top predator, looking for a range of different types of prey, mostly small mammals but also birds of different sizes, reptiles, amphibians, fish and diverse invertebrates. In the Gaza Strip as a coastal area, the Eurasian Eagle Owls have been known to feed mainly on seabirds and sometimes waterfowls, waders and herons prevailing in water bodies and wetlands as the highly deteriorated wetland ecosystem of Wadi Gaza in the middle of the Gaza Strip. These owls usually hunt at night from a perch or while flying low over the ground or treetops. They are silent hunters that use their keen eyesight and hearing to locate and capture prey. Ecologically, top predators play an important role in ecosystems by helping to control populations of prey animals and maintain an ecological balance in the ecosystems where they live.

European Scops Owl (*Otus scops* Linnaeus, 1758)

The European Scops Owl (Eurasian Scops Owl or Scops Owl), which is small in size, often perches upright and shows small ear tufts that are raised when alert. The eyes are yellow. It is found in a variety of habitats including open woodlands, orchards, parks and cultivated areas. This nocturnal owl is insectivorous in the sense that it feeds on insects and other invertebrates such as grasshoppers, beetles, butterflies and moths, spiders, caterpillars and even earthworms. In addition, small mammals, small birds, reptiles and frogs are consumed. Because of its cryptic and heavily streaked plumage, the species may become invisible when resting in trees by day. The bird was sometimes recorded near human dwellings, where the lights of cities and towns attract insects which constitute its main food. Among other owl species, the European Scops Owl is the rarest in the Gaza Strip.

Little Owl *Athene Noctua Scopoli, 1769*

The Little Owl is a small and common owl species inhabiting a range of habitats in the arid to semi-arid Gaza Strip including agricultural lands, woodlands, orchards, ruins, parks, gardens, wadis (valleys) and sand dunes characterizing the western belt of the Gaza Strip. Little owls are plump grey-brown owls, much streaked and spotted with white. The Scops Owl is considerably lighter than the Little Owl. Being a cavity nester and a perching bird, the species was seen in the daylight standing at the gate of holes characterizing the cliffs or perching on branches of many tree species. Little Owls often hunt from a perch; typically fence post, telephone poles, or mounds of earth or rocks, having diets containing insects, earthworms, and other invertebrates in addition to small vertebrates like rodents and small birds and reptiles.

Long-eared Owl (*Asio otus* Linnaeus, 1758)

Similar to Barn Owls, the Long-eared Owl is one of the most widely distributed and most numerous owl species in the world. It is called so because it has erected blackish ear-tufts that are positioned in the center of the head like exclamation marks. The face of this medium-sized owl has two vertical white lines between the eyes, and the eyes are yellow. Gazans considered the Long-eared Owl as the most attractive owl species. Although it is seldom seen within the Gaza Strip, the Long-eared Owl is commonly found in areas with a mix of dense cover for roosting and open spaces for hunting. Like the Little Owl, this species can be easily seen perching on a tree twig of dense foliage or standing on the front of a cliff burrow in its daytime roost with their plumage provides excellent camouflage. Like other owls, the Long-eared owl has a body adapted for silent flight and precision hunting. It hunts rodents, bats, small mammals, small birds, lizards, snakes and other small creatures over open country by night.

Threats Facing the Owls of the Gaza Strip

Owls are powerful raptors and strong predators, and because they are often nocturnal, they are rarely seen and the risks they face are not as well known. Owls face a wide range of threats as they go about their daily activities. The most dangerous threats to owls include:

Habitat Loss

Nowadays, most wildlife species including birds are vulnerable

to habitat loss, modification and destruction worldwide. Logging and tree cutting often destroy the habitats preferred by birds including owls for nesting, resting and sheltering purposes. Development measures that destroy the prey populations of mice, voles, rats, rabbits, reptiles, amphibians and even arthropods also threaten owls by eliminating critical food items from their habitats. It is worth mentioning that old, hollow trees and old buildings are suitable nesting sites for owls. Removal of such structures means that the owls will have no safe place to raise owlets and their breeding success declines dramatically. The Gaza Strip (365 km²) is an overcrowded area, having a population of about 2.0 million (5,500 people per square meter). The removal of old buildings and barns including many antiquities is a continuous process of development. Such removals eliminate the breeding and nesting sites for Barn Owls as an example.

Poaching and Trapping

Owls may be poached or trapped by some Gazans (Figure 3) and brought into illegal captivity and private zoological gardens (zoos) prevailing in the Gaza Strip (Figures 4 & 5). In fact, poaching is a serious threat facing a great deal of birds including all owl species occurring in the Gaza Strip. Adults and juveniles are both poached and sometimes sold. Visits to zoological gardens, pet shops and Al-Yarmouk Market in the middle of Gaza City ensure such a fact. Some of the Barn Owls poached and trapped in the Gaza Strip found their way to biology laboratories of local universities for stuffing and preservation purposes (Figure 6).



Figure 3: A photo showing three species of owls poached, trapped and kept at a Palestinian home at the Gaza Strip: Long-eared Owl (left), Little Owl (middle) and Barn Owl (right).



Figure 4: Caged Barn Owls (*Tyto alba*) in Gaza zoos.



Figure 5: A clay pot housed six Barn Owls (*Tyto alba*) at a zoo in the Gaza Strip.



Figure 6: Preserved specimens of the Barn Owl (*Tyto alba*) were commonly encountered at the biology laboratories and exhibitions of local universities of the Gaza Strip, Palestine.



Figure 7: A dead Barn Owl (*Tyto alba*) after being subject to secondary poisoning in Al-Mawasi ecosystem in southern Gaza Strip.

Myths and Superstitions

Many Arab cultures including that of some Palestinians of the Gaza Strip have myths about owls and crows as harbingers of death or evil, and due to these misconceptions, the birds may be discriminated against and deliberately harmed.

Roadkills

Although it is rare in the Gaza Strip, many wildlife species including owls may be vulnerable to being hit by passing cars and other transporting vehicles. Owls are nocturnal animals that used to hunt at night. As a result, motorists may not see the bird in time to safely avoid a collision. It is well known that owls often hunt alongside roads where litter tossed from vehicles attracts the rodents they like to eat to the side of the road.

Secondary Poisoning

Poisons and chemical pesticides are commonly and heavily used in the Gaza Strip to combat vertebrate and invertebrate pests causing harm to agriculture and other human properties. These dangerous materials remain in the pest's bodies and can poison owls that may prey on those pests after they are contaminated. (Figure 7) The toxins can accumulate in owls' bodies to lethal levels, resulting in lengthy debilitation and death. It's a terrible irony that these rodent poisons kill the very predators that control rodent populations.

Fences of Farms and Orchards

While flying over fields for hunting, owls can easily collide with fences bordering agricultural areas and orchards of the Gaza Strip and become entangled in wire or net, causing injuries, feather damage, suffocation, or starvation.

Discussion

The diversity of bird fauna in Palestine is highly attributed to the strategic position of Palestine at the meeting point of the three continents: Asia, Africa and Europe, in addition to climate, ecosystem and habitat diversities. In addition, Palestine plays as a stopover point for migratory bird fauna prior to continuing their annual migration from Eurasia to Africa and vice versa [6]. Strigiformes (owls) forms an important part of bird diversity in Palestine, and hence the Gaza Strip [8,10 &11,35]. In fact, the owl species of Palestine were more or less similar to those recoded in Jordan as an adjacent country [36,37]. The small area of the Gaza Strip, which is 365 km², seems not to harbor the whole species of owls occurring in Palestine. The five species recoded in the Gaza Strip equals 50% of the ten owl species of Palestine regardless to the Brown Fish Owl (*Ketupa zeylonensis*), which is extinct. The current figure may increase in the coming years in the Gaza Strip because the number of recorded bird species is escalating day by day [11]. The flight adaptation of owls and their expansion of food niche may increase their number in the Gaza Strip.

Of the five species of owls recorded in the Gaza Strip, the Barn Owl is the commonest. In fact, the Barn Owl is one of the most recorded owls in the studies held in the Gaza Strip [33,7-13] and it is one of the most studied species of owls in the world; especially in terms of its feeding ecology and behavior [38-45]. It feeds mostly on small mammals, small birds and reptiles inhabiting the various ecosystems of the Gaza Strip. Mice, gerbils, rats in addition to the Palestine Mole-rat, a common subterranean rodent in the Gaza Strip, were said and acknowledged by Gazans to be among the preys of Barn Owls. Such findings were found to coincide with other studies concerning the diet of the Barn Owl in Lebanon as a neighboring country to Palestine. Abi-said et al. [45]. analyzed

the pellets of Barn Owls in Lebanon and pointed out that the small mammals (rodents and insectivores) constituted 96.4% of the diet of the species, while birds constituted 3.6%.

Although it is rare in the Gaza Strip, the scarce predation of owls on Palestine Mole-rats was documented in Lebanon as well [45,46,37]. The low presence of Palestine Mole-rats in the diet of such owl species could be attributed to its subterranean lifestyle which protects it from predation. The feeding nature of Barn Owls makes them one of the best control agents of rodents and other vertebrates as well as invertebrate pests of Palestine agriculture. Although nest boxes for Barn Owls have been used as a conservation tool to increase populations in areas where natural nest sites are limited, such uses of these boxes have never been used in the Gaza Strip. In contrast, the use of such boxes in the West Bank of Palestine has given good results regarding rodent pest control [19]. Nowadays, Barn Owls are widely used in biological control projects of rodents in the world [47-50,35].

Neither the Barn Owl nor the other four owl species recorded in the current study have been separately studied in the Palestinian Territories (West Bank and Gaza Strip). Generally speaking, the majority of bird species occurring in the Palestinian Territories have never been autecologically or zoologically studied. This is simply could be autecologically to the scarcity of ornithologists and ecologists in the Palestinian universities. In spite of this painful fact, the number of people who are amateur observing and watching birds and other wildlife forms is increasing locally. This was and is still evident through the Facebook posts related to the birds of Palestine, which boast of their numbers and beauty. The study of [18] seems to be the first in this regard, which investigated the diet of Eurasian Eagle Owl (*Bubo bubo*) in Wadi Al-Makhrou, Bethlehem Governorate of Palestine. In contrast, the studies concerning the biology and ecology of owl species in Israel (the occupied Palestinian lands in 1948) is escalating day by day [51,52,22-27,19]. In fact, attention to Palestinian environmental issues, especially ecological and biodiversity issues, appeared new after the arrival of the Palestinian National Authority (PNA) to the Palestinian Territories after the Oslo Treaty in 1994. Several neighboring countries had come a long way in studies relating to ecology and the environment before that date.

As far as the threats facing owls and their populations in the Gaza Strip are concerned, they are many. Habitat loss, destruction, fragmentation and homogenization are considered among the most significant impacts of urbanization. In fact, urbanization, which is a continuing process in the Gaza Strip, can impose itself by an increase of noise intensity, artificial lighting at night, pollution, roadkills and disturbance by predators, which significantly alter ecological processes within urbanized areas and their surroundings. Such threats affecting wildlife; particularly owls, were pointed out in many owl studies [53-56] revealed that the number of owl species was negatively correlated with nocturnal noise emissions. In North America, three subspecies of Spotted Owls (*Strix occidentalis*) have experienced population declines

over the past century due to habitat loss and fragmentation from logging. Moreover, the emerging influences of climate change, high-severity fire, and bio-invasions appeared to be synergistically and differentially affecting population trends of the Spotted Owl subspecies as pointed out by Wan et al [57].

Poaching and trapping of wildlife is exerted in an alarming fashion in the Gaza Strip. Pigeons, doves, waterfowls, waders, raptors, chukar partridges, quails, sparrows and other wildlife items were and are still commonly hunted for different purposes using different means [5-10,28] Owls are not exceptional. They were poached and hunted to be finally posted in zoos, pet shops, animal markets, biology exhibitions at local universities, or even reared at homes. Wildlife poaching was known to be practiced worldwide; particularly in developing countries [58-67].

Pesticides are chemical material used to kill and control different sorts of pests. They were extensively and intensively used and applied in the Gaza Strip, where agriculture is a backbone of the Palestinian economy [68,69]. Secondary poisoning occurs when a predator like an owl eats an animal or prey, such as a mouse, rat, or insect, which has previously been poisoned by a commercial pesticide. The Barn Owl, the commonest in the Gaza Strip, was seen dead, in many times, in both the wild and the agricultural fields. The effect of pesticides on wildlife, domestic life and experimental animals is hazardous as pointed out by Rabou [70]. Secondary poisoning in different species of owls and raptors was documented in several wildlife studies [71-74]. From a cultural point of view, some Palestinians, like other Arabs, disrespect owls and some may kill them using different means. Such a phenomenon has no scientific justification. It can be explained only by the pessimism. According to local people, pessimism of owls appears to be due to their distinctive shape among the birds, their presumed ugliness (in spite of the truth that they are beautiful birds), their frightening voice or sound that is connected to myths by the death of people, and perhaps their supposed love for ruins. In the Malawi of Africa, the situation is not better. According to Enriquez and Mikkola [74], more than 90 percent of respondents of the country connected owls with bad luck, witchcraft, and death.

Wire fences are a common feature characterizing the borders of agricultural areas, farms and orchards of the Gaza Strip. This is simply because those individual properties of the Palestinians are gradually diminishing due to the Islamic inheritance system. Each owner creates fences to preserve his private property to avoid attacks. Accordingly, the number of fences is increasing in the Gaza Strip, where agriculture is considered a backbone. Such a situation represents a threat to raptors and other avian species. Owls are a very active nocturnal predator in the Gaza Strip, they are susceptible to different lesions and injuries and even death when they hit such fences; especially the barbed-wire ones. Injuries and deaths among birds and other wildlife categories were well documented [75-77]. Although road kills form a threat to wildlife worldwide, it seems to be of low consideration in the

Gaza Strip, particularly for avian wildlife. In the West Bank of Palestine, most road kills were counted for mammals and reptiles [78]. In conclusion, the study recommends the need to raise ecological awareness among the Gazans in order to preserve wildlife, especially raptors including owls, which have a high biological importance that is summarized in preserving the ecological balance and combating environmental pests. It may be necessary to use nesting boxes for owl species in order to increase their numbers to ensure biological control of rodents and other vertebrate pests in a sustainable fashion [79-82].

Acknowledgement

My thanks are due to Dr. Walid S. Basha, Ms. Eqbal S. Radwan, Mr. Ismail S. Radwan, Mr. Bashar S. Jarayseh, Mr. Mohammed Hamdan, and Mr. Ramadan Hamad for their continuous help with photos and technical support throughout the succeeding stages of this modest study.

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