



# On the Trapping and Potential Risks of the Invasive Rose-Ringed Parakeet (*Psittacula kramer* Scopoli, 1769) in the Gaza Strip – Palestine

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## ABSTRACT

The invasive Rose-ringed Parakeet (*Psittacula kramer* Scopoli, 1769) has become an integral part of the Palestine environment and ecology. Large numbers of the species are now being caught and sold at markets and shops selling pets in the Gaza Strip because of its attractive colors and ability to learn and imitate speech. Several dangers have been attributed to this bird in the local environment. As the first locally, the current modest study aims to focus on the trapping and potential risks of the Rose-ringed Parakeet in the Gaza Strip. The study, which lasted one year extended from September 2021 to August 2022, was based on field visits and direct observations, frequent meetings and discussions with stakeholders, follow-up of news and social media sites in addition to photography. The results showed that most of the bird hunters take bird trapping as a “profession” due to poverty, unemployment, scarcity of job opportunities and deteriorating economic conditions in light of the siege imposed by Israel on the Gaza Strip since 2005. Trapping of Rose-ringed Parakeets, which occur annually from early April to October, is concentrated near the eastern and northern borders of the Gaza Strip due to their unique ecological characteristics and proximity to the Gaza Envelope (a complex of Israeli settlements, located 7 km from the north and eastern borders of the Gaza Strip) which, with its orchards, farms and forest trees, constitutes fertile land for birds and the parakeet in question. Many Gazans have been killed, injured or arrested by the Israeli army for hunting birds near the border. Netting and glue-coated sticks associated with the use of parakeets of the same species or sound recordings are the two most important methods used locally for trapping the Rose-ringed Parakeet. The price of one pair of trapped parakeets ranges between 12 and 18 USD. Rose-ringed Parakeets pose many potential dangers locally because of their feeding on agricultural crops, especially fruits, their competition with some local wild birds, especially cavity-nesting ones, and their potential to cause health and noise risks to humans.

**KEYWORDS:** Rose-ringed Parakeet; *Psittacula kramer*; Bird hunters; Native birds; Trapping; Risks; Agricultural crops; Gaza Strip

## INTRODUCTION

Parrots, also known as psittacines are birds belonging to the order Psittaciformes and are found mostly in tropical and subtropical regions [1,2]. Many parrots have been chosen by humans as pets, with the Blue-and-yellow Macaw (*Ara ararauna*), African Gray Parrot (*Psittacus erithacus*), Cockatiel (*Nymphicus hollandicus*) and Red-lored Amazon (*Amazona autumnalis*) are just popular examples [3]. Parakeets (budgies); type of parrots, are generally more popular in pet stores due to their small size, playfulness, intelligence, and high affinity for training [2]. In general, the parakeet is a small parrot that has a long tail and

is sometimes kept as a caged bird. Parrots of all types, shapes, sizes and colors are among the most popular birds in pet stores. In a very recent study, Psittaciformes was the largest order of birds recorded in pet stores in the Gaza Strip, Palestine [3].

The Rose-ringed Parakeet or Ring-necked Parakeet or Indian Ringneck Parrot (*Psittacula kramer* Scopoli 1769) is a medium-sized parrot that is native to Africa and India [1,2,4]. It has been introduced to many parts of the world and is bred for the pet trade. Fleeing birds have colonized a number of cities around the world regardless of the prevailing climates. This parakeet has successfully

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adapted to living in several habitats, some of which are very close to urban areas. It is believed that global climate changes have caused many types of biological invasion globally. Biological invasion often drives ecological changes in the areas and ecosystems it infects [4,5]. Therefore, it is not surprising that climate change encourages the stability of the Rose-ringed Parakeet in different parts of the world [6]. In the wild, this is a noisy species with an unmistakable squawking call. They are herbivorous in the sense that they feed on plant materials such as grains, seeds, buds, fruits, vegetables, nuts and berries, and as a result they may cause damage and losses

in agricultural orchards [1]. Captive individuals can be taught to speak and imitate human speech. These alien invasive birds were known to affect biodiversity and the human economy [1,7]. The species is listed as of Least Concern by the International Union for Conservation of Nature (IUCN) because its population appears to be increasing [4]. The Rose-ringed Parakeet is widespread today in the Palestinian environment (Figure 1), although it is an alien or invasive to it, and it has become familiar and well-known to most Palestinians due to its beauty, its gorgeous colors, and its imitation of human voices.



**Figure 1:** Despite being an invasive bird, the Rose-ringed Parakeet (*Psittacula krameri*) has become an integral part of the Palestine environment: (A) male and (B) female.

Despite the multiplicity of studies that dealt with the spread, biology, ecology, risks and ways of managing the Rose-ringed Parakeet globally, the studies that dealt with or referred to this bird in Palestine and the surrounding area appear to be less. In Palestine, Abd Rabou [8] pointed out that the Rose-ringed Parakeet was among the bird fauna encountered at the main campus of the Islamic University of Gaza, Gaza Strip. It seems to be the only species representing the order Psittaciformes in the Gaza Strip. Handal et al. [9] indicated that the Rose-ringed Parakeet as well as three species of invasive birds; namely the Monk Parakeet (*Myiopsitta monachus*), the Indian Silverbill (*Euodice malabarica*) and Common Myna (*Acridotheres tristis*) are now traded in animal markets of the West Bank of Palestine. Recently, Al-Sweirki [3] showed that the Rose-ringed Parakeet is being hunted extensively and widely for commercial purposes with hundreds observed in pet stores in Gaza city, and that Gazans love the species because they are social, friendly, and excellent talker parrots.

Wittenberg [10] noted that the Rose-ringed Parakeet is found in Egypt, Jordan, Israel and Syria, and that this species has managed to survive in areas where there is little hunting pressure such as Cairo and many locations in Israel. The Rose-ringed Parakeet has been recorded among the bird fauna of Khartoum and Jabel El-Dayer National Park, Kordofan, Sudan [11-13]. In Israel, work on the Rose-ringed Parakeet and other introduced animals has been significant. Dvir [14]; Yom-Tov [15]; Roll et al. [16]; Justo-Hanani et al. [17] revealed that there is a possibility that the local population of the Rose-ringed Parakeet originated from runaway or released pets during the 1960s, and that the bird began breeding during the 1980s, and is now very common in many localities of Israel. Yosef et al. [18] indicated that the Rose-ringed Parakeet competed with the native Eurasian Hoopoe (*Upupa epops*) as a cavity-nesting bird species for nest sites in southern Israel.

In Jordan, Hays [19]; Khoury et al. [20] ensured that the feral populations of the Rose-ringed Parakeet have been established

in the Greater Amman City in the 1980s. Eid et al. [21] indicated that the Rose-ringed Parakeet was widely traded among the traded animals in the local market in Greater Amman City. Analogously, the species was found to be extensively traded in pet shops and animal markets of other countries such as Lebanon [22,23], Saudi Arabia [24] and the United Arab Emirates-UAE [25]. In Oman, the spread of the invasive Rose-ringed Parakeet is closely related to human activities, because of the increased availability of food in these areas, and is likely to constitute a serious pest that consumes cash crops, especially dates and grains [26].

Parrots are the most traded birds internationally, mainly to be used as companion pets. Parrots and parakeets imported or smuggled into the Gaza Strip are among the most important pets sold at pet stores and animal markets [3]. The Rose-ringed Parakeet that invaded Palestine in recent decades is considered one of the most important parrots that are trapped locally in large numbers and are also sold in animal stores and markets [3,8]. In fact, the Gaza Strip is crowded with dozens or hundreds of shops selling pets and sometimes wild animals that are trapped locally throughout the Gaza Strip, especially near the eastern areas adjacent to the armistice line or the Green Line; the de facto border separating the Gaza Strip from the rest of Palestine occupied by Israel in 1948 [3]. The information regarding the trapping and the dangers of the invasive Rose-ringed Parakeet in the Gaza Strip is scarce and needs to be enriched. This study aims to focus on the trapping and potential risks of the Rose-ringed Parakeet in the Gaza Strip. The importance of this study lies in the fact that it is the first of its kind that deals with this invasive bird in the Gaza Strip.

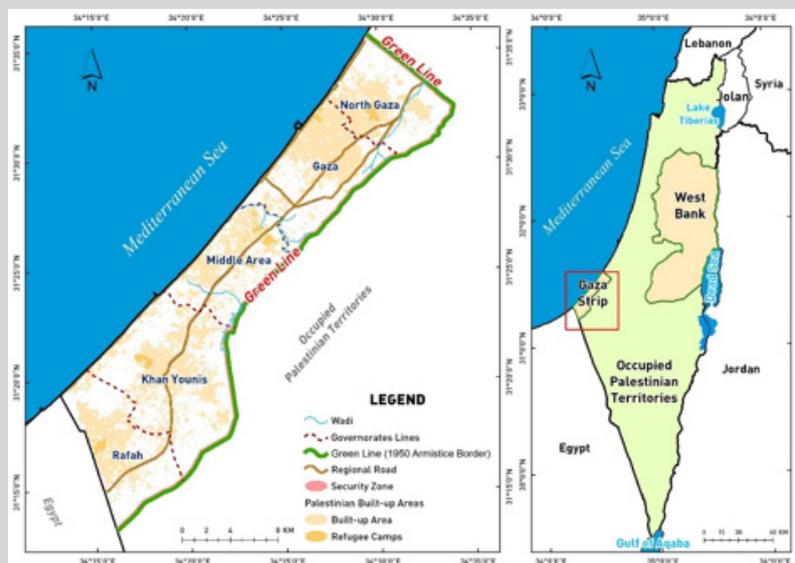
## MATERIALS AND METHODS

### Gaza Strip

The Gaza Strip (365 km<sup>2</sup>) is an arid to semi-arid coastal area located in the southern part of the Palestinian coast along the eastern shore of the Mediterranean Sea (Figure 2). It has five

governorates: North Gaza, Gaza, Middle, Khan Yunis, and Rafah. The local average rainfall is 300 mm. Sand dunes are the main feature of the western part of the Gaza Strip, while silt and clay lands predominate in the eastern part [27]. The population of the Gaza Strip is estimated to be more than 2.35 million people, and the population density reaches more than 6,000 people per square kilometer, making the Gaza Strip one of the most densely populated

areas in the world. Many Gazans, especially young men and boys, work in hunting birds throughout the Gaza Strip [3,8,28,29-35], and hunting birds is more concentrated near the northern and eastern borders. Hunters have been setting up hunting equipment, especially nets, in the area to hunt wild birds, especially the Rose-ringed Parakeet, which invaded Palestine since decades.



**Figure 2:** The map of the Gaza Strip shows the Green Line where most bird hunting takes place near it.

## Procedure

Since September 2021, multiple field visits have been carried out in the morning hours before noon to the places of installation of trapping equipment for birds in general and Rose-ringed Parakeet in particular, which are located along the eastern and northern borders of the Gaza Strip, which extends for about 60 km from Rafah in the south to Beit Lahia in the north. The aim of the visits was to get acquainted with the mechanisms of trapping birds and to learn more about the atmosphere of the Rose-ringed Parakeet trapping operations. These border areas are beset with great dangers to wildlife hunters because of the shooting at them

by Israeli soldiers stationed on the border separating the Gaza Strip from the territories of Palestine occupied by Israel since 1948. Many hunters were killed and injured as a result. Despite the risks, the field visits were not without the careful use of binoculars and close-up digital cameras for monitoring and documentation. Animal markets, pet stores, and zoos were also visited to study their content of the Rose-ringed Parakeet and the birds there. Many discussions were held with local residents, farmers, bird hunters and breeders in the markets and pet bird shops to obtain more information about the hunting and risks of Rose-ringed Parakeet in addition to its breeding and trade in the Gaza Strip.

## RESULTS

### Why do Gazans trap Parakeets?



**Figure 3:** The Rose-ringed Parakeet is widely spread in the shops selling pet birds in the Gaza Strip.

Most of the bird hunters indicate that their taking of bird trapping as a “profession” is due to many reasons including poverty, unemployment (more than 50%), the scarcity of job opportunities and the deteriorating economic conditions in the entire Gaza Strip, which has been besieged by Israel and the Arabs since 2005. Not only are these reasons, but some bird hunters also doing it as a hobby and as a kind of entertainment, even though they are personally not suffering from economic crises. After the hunt, the hunters sell their catch of parakeets and possibly other birds such as Goldfinches (*Carduelis carduelis*), Greenfinches (*Chloris chloris*), Linnet (*Linaria cannabina*), European Serin (*Serinus serinus*), etc. to pet shops or in markets to people who are fond of keeping birds (Figure 3). The price of one pair of Rose-ringed Parakeet ranges from 12 to 18 US dollars. In fact, the hobby of bird hunting is an old habit for many Gazans. It provides a modest source of income for those who do not have a job opportunity.

### How do Gazans trap parakeets?

Despite the many ways in which wild birds are hunted in the Gaza Strip, the most common methods of catching the Rose-ringed Parakeet are netting or sticks coated with glue as follows:

**Netting:** When the sun rises in the morning, bird hunters usually head to the border areas to catch parakeets through their nets. The tactic used in this method lies in attracting parrots to

trap them in the nets by placing and tying two or more parakeets; known locally as “*horeek*”, near the nets, where their feet are fixed with a rope that the hunter holds at the end. Mostly, hunters place the parakeets (bait) on or near the sunflowers, the favorite food of the Rose-ringed Parakeets, and sometimes on other objects. The hunter here moves the rope from time to time to force the two birds to move, which contributes to attracting parakeets and sometimes other bird species. As soon as one of the birds falls into the trap or the net, the hunter directly pulls another rope connected to the net to close the net on the bird and ensure that it is caught. The hunter puts the parakeets caught in a small cage and keeps repeating this action to catch more birds. Some bird hunters were able to bring audio recordings of the parakeet’s song as a way to lure it into the nets designated for trapping it.

**Glue-coated sticks:** This effective method requires less effort than netting, and is summarized by applying the glue as an adhesive to sticks attached to tree trunks (e.g. Date Palm trees) or other objects where parakeets are found in farmland and orchards. This method is similar to the netting method of using parakeets as bait to attract the birds of the same species that are hovering in the area to the glue-coated sticks to fall on. Once the birds fall on the sticks, they will not be able to escape and it will be easy for the bird hunter to collect the caught birds in special cages nearby.

### Where do Gazans trap Rose-ringed Parakeets?



**Figure 4:** Gazans used to trap Rose-ringed Parakeets near the eastern and northern borders of the Gaza Strip.

About a decade and a half ago, invasive parakeets have spread in the Gaza Strip, and Gazans are now watching them in a variety of ecosystems, especially among the trees and shrubs of the agricultural lands, gardens and parks. Most Gazans trap the parakeets among orchards and agricultural lands several hundred meters from the Green Line or the Armistice Line (Figure 4). This line includes the eastern and northern borders of the Gaza Strip, which are the de facto borders between the Gaza Strip and the rest of the Palestinian territories occupied by Israel in 1948. The Gaza Envelope is a complex of Israeli settlements, home to approximately

70,000 Israelis, located within 7 kilometers of the northern and eastern borders of the Gaza Strip. This region witnesses from time-to-time military tension due to the wars, incursions and operations carried out by Israel in the Gaza Strip, which makes it within the range of missiles and rockets launched by the Palestinian resistance from the Gaza Strip in response to Israel’s aggressive actions.

This area has wide agricultural, forestry and open areas that harbor many elements of Palestinian biodiversity, including the Rose-ringed Parakeet, the subject of this study. In fact, the Gaza

Envelope area is considered a reservoir for the Rose-ringed Parakeet and many other birds that bird hunters want to catch and set up nets and other hunting equipment for them. In the morning hours, the agricultural movement is active in the Gaza Envelope, which contributes to the displacement of large numbers of the birds in question towards the eastern and northern regions of the Gaza Strip. Such an attitude encourages them to be hunted in large numbers by the Gazans by luring them with chirping played on portable loudspeakers and catching them in nets and other trapping means. The Rose-ringed Parakeet is characterized by its attractive green color, attractive appearance, and ability to imitate speech after taming and indoctrination. Bird hunters begin to trap the Rose-ringed Parakeet annually from early April to October.

### Dangers of Trapping Rose-Ringed Parakeets near Gaza Borders

Israel has imposed a 300-meter buffer zone along the border fence that surrounds and besieges the Gaza Strip. For security reasons, as Israel claims, the Israeli army closely monitors the borders, using modern and advanced technologies and lethal weapons. Accordingly, Gazan farmers and wildlife hunters in the border area and those close to the border are exposed to many Israeli attacks, including pursuit, arrest, injury and killing. This border area, in addition to the sea waters of the Mediterranean Sea overlooking the Gaza Strip, is considered one of the most dangerous areas due to the constant Israeli military and security tensions and violations. They are indeed Israeli traps for Gazans who hunt birds from the land or catch fish from the sea. From time to time, the Israeli occupation forces target bird hunters who practice catching Rose-ringed Parakeets and other bird species by firing tear gas and live bullets. The result here is the injury and death of a number of bird hunters during the past years while practicing their profession or hobbies near the eastern and northern borders of the Gaza Strip. In 2021, several Gazan youths were killed by Israeli bullets while they were trapping near the eastern border of the Gaza Strip. Despite the risks posed by the profession of trapping birds in the border areas of the Gaza Strip, the demand for it continues, due to the scarcity of job opportunities, the deteriorating economic conditions and the high unemployment rate.

### Risks of Rose-Ringed Parakeets

The invasion of the Rose-ringed Parakeets to the environment of Palestine in general has raised problems in urban and rural areas as they are agricultural pests and competitors for some forms of native wildlife as well as it may pose health risks to humans.

**Damage to agriculture:** Rose-ringed Parakeets are considered by some Gazan farmers as agricultural pests that may cause obvious damage to some agricultural crops due to their generalist feeding behavior. Farmers, especially in the eastern and northern areas of the Gaza Strip, claim that Rose-ringed Parakeets cause damage to fruits such as guava, plums, pears, apples, mangoes, citrus, dates, figs, grapes in addition to corn, grains, seeds, ornamental flowers, etc. They added that the Parakeets often do more harm to the fruits of trees on the upper branches than on the lateral and lower branches. According to the farmers, sunflowers are among the most beloved crops for Rose-ringed Parakeets, as these birds come in the early morning and eat the seeds from the sunflower discs in an ingenious manner. As sometimes seen, defoliation by Rose-ringed Parakeets on some native and non-native (invasive) trees, shrubs, and ornamentals may reduce plant growth. Despite their harm, the Gazan farmers say that Rose-ringed Parakeets are considered an aesthetic asset, with their beautiful wings adorning farms and

agricultural areas. In urban environments, most Gazans find that Rose-ringed Parakeets bring bright green colors and they enjoy watching them fly and hover in the sky.

**Competition with native wildlife species:** Rose-ringed Parakeets, as secondary cavity nesters, compete directly with some native wildlife for food and habitat, and the nesting cavities of some locally breeding birds and possibly bats may be attacked and occupied as stated by some local farmers and bird hunters. The process is not clear in the Gaza Strip due to the lack of studies related to this, but there is some sort of dialogue made by citizens, farmers and hunters showing that the populations of some cavity-nesting birds such as the Great Tit (*Parus major*), House Sparrow (*Passer domesticus*), Eurasian hoopoe (*Upupa epops*), Syrian woodpecker (*Dendrocopos syriacus*), Little Owl (*Athene noctua*), Common Kestrel (*Falco tinnunculus*), etc. were negatively affected by Rose-ringed Parakeets. Cavities are commonly used by these bird species for nesting, roosting and sheltering purposes. Rose-ringed Parakeets begin breeding in earlier times before native birds begin breeding, giving them a competitive advantage over native birds. Again, the phenomenon is not thoroughly clear in the Gaza Strip, and it needs specific studies.

In some parks, gardens and orchards that witness a diversity of trees and shrubs, Rose-ringed Parakeets were sometimes observed disrupting the foraging behavior of some native bird species by causing reduced feeding or increased vigilance. The advertised feeding of Rose-ringed Parakeets on unripe fruits or fruits in the early ripening stages may prevent other birds from eating those fruits when they are ripe, thus promoting competition with native birds. In a related context, the Indian or Common Myna (*Acridotheres tristis*) is considered one of the most important and most dangerous and reproductive invasive birds in Palestine during the past two decades, and it is very possible that Rose-ringed Parakeets may affect the reproduction of this dangerous bird by increasing the number of suitable nesting cavities for it.

**Health and noise complaints:** Gazan farmers and bird hunters claim that Rose-ringed Parakeets are sometimes ferocious and that their powerful bites can cause deep wounds to people when they try to catch them while trapping, or even when these birds are brought in and out of their cages at markets, pet shops and homes. Some farmers also complain about the noise that Rose-ringed Parakeets make on farms when they are present in relatively large numbers due to their loud squawking and screeching. In the future, fears in the Gaza Strip lie that these birds will roost in greater numbers near human infrastructure, jeopardizing human health and safety in terms of disease transmission (avian influenza as an example), excreta accumulation and noise spread. On the other hand, Rose-ringed Parakeets kept in cages inside homes and shops are very messy and annoying. There are many complaints from Gazan breeders about the need to constantly clean the cages and the surrounding environment of these birds from feathers, food, seeds and droppings, because the birds get rid of their droppings quickly. Not only that, but it is also necessary to constantly check the water supply of Rose-ringed Parakeets, as they quickly pollute it.

## DISCUSSION

Palestine is rich in vertebrate biodiversity, especially birds, whose species number reaches 540 species or more, distributed between resident and migratory species [36]. There are also some invasive species that found in the Palestine environment a breeding ground for them. Among the most important of these birds are the Indian or Common Myna and the Rose-ringed Parakeet, two

birds considered among the most dangerous invasive birds across Palestine, the Middle East and the world [8,20,37,38,39]. Many of the birds of Palestine and the Middle East, either being resident, migratory or invasive (alien or exotic) are subjected to trapping for various purposes such as food, sports, captivity and trade [21,24,40,41-48].

The Gaza Strip is witnessing a remarkable increase in the number of wildlife hunters, who often support poor families who need daily food to feed them. Poverty, unemployment, blockade and lack of job opportunities contribute to the growth of this phenomenon that threatens the sustainability of wildlife. The Palestinian government interventions to regulate poaching and trapping of birds and wildlife are almost non-existent. In contrast, wildlife in Israel enjoys strict legal protection and this reduces poaching and hunting [49]. Frequent visits to animal markets and pet stores in the Gaza Strip may illustrate the scale of wildlife poaching and hunting. Many wild species of reptiles, birds and mammals have been seen in these places where they are bought and sold [3]. In other words, there are no red lines governing hunting wildlife in the Gaza Strip, as any animal or bird may be subject to pursuit and hunting by skillful hunters or even by children [8,28,31-34,50-52].

The Rose-ringed Parakeet prevails in various urban and suburban environments within the Gaza Strip (Personal Observations). For example, the species was recorded among the bird species residing or visiting the main campus of the Islamic University in Gaza City [8]. Such a record there is due to the fact that university campuses, parks, gardens and main roads of the Gaza Strip have a diversity of trees and shrubs that support wildlife, especially birds [53-56]. Along with other passerines, the Rose-ringed Parakeet is commonly trapped in several places including the border areas of the Gaza Strip. Such trapping near the northern and eastern border areas could be attributed as most Gazans said to lack of Gazan dwellings, spread of farms, trees and shrubs, as well as the proximity of these areas to the Gaza Envelope, which is inhabited by Israeli settlers who are mostly engaged in agriculture. Currently, Abd Rabou et al. [57] showed that Gaza Envelope enjoys abundance in agricultural production, abundance of forests and open areas that support mammalian biodiversity. As soon as the Israeli farmers come to their farms and carry out their agricultural and harvesting activities, significant numbers of bird species; particularly Rose-ringed Parakeets head towards the eastern and northern regions of the Gaza Strip, to find some of them confiscated through the Gaza trapping nets and other means. Some bird hunters may catch ten or more or less, depending on the trapping effort and the time spent in trapping, in addition to the weather factors, the abundance of birds and the Israeli measures at the borders. The area often witnesses Israeli military operations against Palestinians at these border areas. Live bullets, rubber-coated iron bullets, shells, tear gas grenades, sound and smoke grenades are commonly heard in border areas and may cause casualties. Injuries, killings and arrests among Palestinians as a result of the Israeli aggression undoubtedly contribute to the deterioration of the living conditions of the families of the victims.

The most common methods used for trapping Rose-ringed Parakeets were the nets (Figure 4) or the sticks coated with glue. These methods are very common in the Gaza Strip as pointed out by Abd Rabou [8,28-30]. A lot of bird species; especially perching birds (songbirds) belonging to the order of Passeriformes, are commonly trapped by professional and skillful Gazan hunters. One strike of the nets used may trap several Rose-ringed Parakeets and others (Personal Observations). In fact, different kinds and colors

of nets have been used locally to catch birds, mammals and reptiles [32,52]. The use of loudspeakers or birds as baits to lure birds to be trapped using nets or glue-coated sticks is common. After trapping, the harvest finds its way to the shops selling pet birds that spread throughout the Gaza Strip. It is worth noting that these pet shops are teeming with dozens of domesticated, pet or wild animal species as the local study of Al-Sweirki [3] pointed out. The price of one pair of the Rose-ringed Parakeet fluctuates from 12 to 18 US dollars. This amount provides a modest source of income for the bird hunters who do not have a job opportunity or are actually poor. Of course, hunters do not catch daily and on some days their harvest may be zero.

One of the most important reasons related to the Rose-ringed Parakeet, which makes it vulnerable to heavy hunting, is its remarkable occurrence in the Gaza Envelope and perhaps to a lesser extent in the Gaza Strip. The density of vegetation cover, especially the tall trees and shrubs in the Gaza Envelope, increases the chances of the occurrence, reproduction and spread of Rose-ringed Parakeets due to the number of nesting and roosting cavities that these woody plants may contain. Such nesting and roosting cavities or hollows are usually built by native birds and other wildlife species. In Pakistan, the breeding biology of the Rose-ringed Parakeet was promoted depending on tree species and sizes in addition to cultivation forms [58-60]. From another point of view, the bird's attractive green colors, which intersect with the blue color of some rectrices (tail quail feathers) in its long tail, the red color of its beak and the rose or pink collar around its neck, give it beauty above the beauty of its body and the way it flies in the sky of the Gaza Strip, and makes it a target for heavy trapping. The ability of the bird to learn and imitate human speech makes it very popular among Gazans to have in their shops and homes. In fact, these birds are among the best talking parrots worldwide [2].

The Gazan farmers consider the Rose-ringed Parakeet a limited pest that causes varying degrees of damage to many types of fruits and crops. Although the studies concerning the impacts of the Rose-ringed Parakeet and other pest birds are lacking in the Gaza Strip, the bird was found to have a high potential impact on agriculture in many world countries such as Pakistan [61] and South Africa [62,63]. In Bethlehem of the West Bank, the Rose-ringed Parakeet was said to attack almond and walnut trees [64]. Of course, the high impacts of the bird in question on agricultural crops could be attributed to its feeding habit as a generalist feeder. The bird occupies several places in the north and south of the world, and therefore it adapts to the crops found in its native as well as introduced locations [61,65-70]. Gazan farmers considered the Rose-ringed Parakeets as frugivores; feeding on fruits, and to a lesser extent as granivores; feeding on grains and seeds. In the Gaza Strip, the diet of the Rose-ringed Parakeets was said to consist mainly of ripe and unripe fleshy fruits. Similar studies also found that parakeets are mainly frugivores and granivores [61,68,71]. Sunflower was acknowledged by Gazan farmers to be one of the most preferred crops for Rose-ringed Parakeets. They claimed that the parakeets usually eat their seeds of sunflower in an ingenious manner. Such claim seems to be consistent with the study of Iqbal et al. [61] who described the feeding regimens of the bird on a sunflower field in an agro-ecosystem of Central Punjab, Pakistan.

The Gaza Strip harbors a remarkable diversity of breeding birds, some of which breed in nests made inside tree and building cavities. Examples are numerous, and since the Rose-ringed Parakeet is considered one of the secondary cavity-nesters, it will certainly intercept a group of these birds; expelling them and

occupying their nesting places. Gazan ecologists and biologists need in-depth studies to clarify this issue that invasive birds such as Rose-ringed Parakeets and Indian Mynas occupy the nests of birds and negatively impact the life and reproduction rate of these victim birds. According to the current results, many bird species were found in the menu of Rose-ringed Parakeets. In southern Israel, in an area not far from the Gaza Strip, there was a negative impact of invasive Rose-ringed Parakeets on the indigenous Eurasian Hoopoe (*Upupa epops*), mainly through the aggressive takeover of the Hoopoe's cavities by parakeets [18]. This corroborates what farmers and bird hunters in the Gaza Strip have said about Eurasian Hoopoe and other native birds being affected by Rose-ringed Parakeets [7,72,73]. Similar to Rose-ringed Parakeets, invasive Indian or Common Mynas (*Acridotheres tristis*) were reported to have a negative effect on the abundance of several cavity-nesters in Australia and Israel [38,74]. Mori et al. [75] suggested a possible competition between Rose-ringed Parakeets and Scops Owls (*Otus scops*) for suitable tree cavities. The small owl species; namely Scops Owls and Little Owls, which can be affected by the populations of the Rose-ringed Parakeets, have been recorded among the owls inhabiting the Gaza Strip [50]. Strubbe [76] revealed some sort of competition between Rose-ringed Parakeets and native Nuthatches (*Sitta europaea*) in Europe as well. The influence of competition between invasive and native birds on nesting cavities is not restricted to Rose-ringed Parakeets. In North America, Ingold [77] revealed that Red belled Woodpeckers (*Melanorpes carolinus*) lost up to half of their freshly dug cavities to the introduced European Starling (*Sturnus vulgaris*), which also negatively affected the Woodpecker's fecundity. Other native birds have been said to be negatively affected by European Starling as well [78].

During the current observations at different urban sites, Rose-ringed Parakeets were found chasing other birds regardless of their species identity reaching the same tree species they were feeding on. In some European countries, Rose-ringed Parakeets were found to be superior competitors against the Common Starlings (*Sturnus vulgaris*), European Robins (*Erithacus rubecula*) and Great Tits (*Parus major*) without killing or injuring any of them as revealed by Le Louarn et al. [79]. However, Covas et al. [80] indicated the killing of House Sparrows (*Passer domesticus*) by Rose-ringed Parakeets while feeding. Moreover, the Rose-ringed Parakeet was found to sometimes kill the Black Rat (*Rattus rattus*), some threatened bat populations and other native biodiversity components during competition [81-84]. Moreover, Le Louarn et al. [79] studied the abundance of bird species described as "urban exploiters" and "urban adapters", which included House Sparrows, European Starlings, Great Tits, Blue Tits, Common Chaffinch, Eurasian Collared Doves and European Robins at the feeders in some urban environments. Among all the species, the Rose-ringed Parakeet was the most abundant.

The open environment of the Gaza Strip is currently witnessing small flocks of Rose-ringed Parakeets. If flocks of birds become large in the future, roosts will produce noise complaints and unsanitary conditions from fecal deposits and buildup capable of increasing the risk of disease transmission to people. Parrots are negatively affected by various viral and bacterial diseases such as avian influenza (bird flu) and avian psittacosis (parrot fever). These two respiratory diseases are known to pose a high potential risk to human health and other birds [85,86]. It is noteworthy that the avian influenza crisis in the early 2000s severely affected the trade of domestic and exotic birds due to a global health warning [86,87,88]. Avian psittacosis, which refers to any infection or disease caused by *Chlamydia psittaci*, is most often transmitted to

humans through exposure to infected pet birds such as parrots and parakeets. Symptoms may include fever, headache, chills, muscle aches, cough, and sometimes difficulty breathing or pneumonia. If left untreated, the disease can be severe, and may lead to death, especially in the elderly [85].

## CONCLUSION

In conclusion, the Rose-ringed Parakeet (*Psittacula krameri Scopoli*, 1769), the subject of this modest study, is one of the birds that invaded Palestine and the Middle East countries and settled there for decades, but its intensive hunting activity began years ago throughout the Gaza Strip, specifically near the Green Line. The Gaza Envelope, with its thriving vegetation, is a reservoir for most of the locally caught Rose-ringed Parakeets. The populations of the Rose-ringed Parakeet do not appear to be large in the Gaza Strip, and accordingly, the risks posed by the birds appear to be limited till now. The study recommends conducting more scientific studies dealing with the ecology and risks of this invasive bird throughout Palestine. The study also recommends reducing hunting of wild birds and other wildlife species in order to preserve them in a sustainable fashion.

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