

# Occurrence and Some Ecological Aspects of the Golden Jackal (*Canis aureus* Linnaeus, 1758) in the Gaza Strip, Palestine

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## Abstract

The Golden Jackal (*Canis aureus* Linnaeus, 1758), which belongs to the Canidae family, is an opportunist carnivore in the Gaza Strip (365 square kilometers). The current study aims at giving notes on the occurrence and some ecological aspects of the species in the Gaza Strip, Palestine. The study, which lasted 14 years (2007-2020), is descriptive and cumulative in its style. It was based on frequent field visits, direct observations and meetings and discussions with wildlife hunters, farmers and other stakeholders. The findings of the study show that Gazans are familiar with the Golden Jackal to the extent that a Gazan family holds the Arabic name of the animal, which is “*Wawi*”. The Golden Jackal was sometimes encountered and hunted in the eastern parts of the Gaza Strip, which are characterized by the presence of wilderness areas, intensive agriculture, poultry pens and solid waste landfills. Like other a few mammalian faunas, the adult Golden Jackals enter the Gaza Strip through gaps in or burrows beneath the metal borders separating the Gaza Strip from the rest of the Palestinian Territories and Egypt. Gaza zoos were found to harbor tens of Golden Jackals trapped or hunted by clever wildlife hunters using different means such as wire cages known locally as “*maltash*”



and foothold traps with metal jaws that may cause lesions to the trapped animals. Poisoning and shooting were also common methods used to control the jackals and other carnivores causing harm to agriculture and livestock. The animal was known among the Gazans as an omnivore, feeding on wild and domestic animals in addition to plant materials, garbage and carrions. In conclusion, the study recommends the need to raise ecological awareness to preserve the Golden jackal and to adopt safe control measures for jackals and other carnivores, including the construction of protective fences for agricultural fields and animal pens.

## Keywords

Carnivores, Golden Jackals, Trapping, Foothold Traps, Wildlife Hunters, Zoos, Gaza Strip

## 1. Introduction

Palestine (27,000 square kilometers) is a biodiversity rich country because of its strategic geographic position at the meeting point of Asia, Africa and Europe and the three zoogeographical areas: Palaearctic, Afrotropical, and Oriental. The variation of landscapes, ecosystems, habitats and niches promotes species diversity of plants and animals of different categories [1]. In fact, Palestine is home to more than a dozen carnivore species representing the families of Canidae, Felidae, Mustelidae, Herpestidae and Hyaenidae [1] [2]. The Golden Jackal (*Canis aureus* Linnaeus, 1758), which belongs to the Canidae family, is one of the commonest carnivores worldwide [3] [4] [5] and in the Middle East countries [6]-[15] including Palestine [1] [16]. It was responsible for losses in both agricultural and livestock production in the region [17] [18] [19] [20]. Although the Golden Jackal is a common breeder in the West Bank which has relatively vast wild areas compared to the Gaza Strip, it seems to be not a breeder carnivore to do so in the Gaza Strip. Sightings and hunting of the Golden Jackal in the Gaza Strip were confirmed by both wildlife hunters and local people as many as tens of the species were caged at Gaza zoos [16].

Work on Golden Jackals seems to be very extensive and intensive worldwide, especially in the Middle East region. A lot of studies dealing with the biology and ecology of Golden Jackal were surveyed [12] [16] [17] [20] [21] [22]-[61]. As far as the Palestinian Territories are concerned, no specific studies targeting Golden Jackals have been surveyed. All that is present in this regard is represented by surveys of vertebrate diversity in the occupied Palestinian Territories (West Bank and Gaza Strip) dealing with the occurrence of mammalian fauna including the carnivores [1] [2] [16] [62] [63] [64]-[77]. Hence, the absence of particular studies promoted the conduction of the current study which comes to give notes on the occurrence and ecology of the Golden Jackal (*Canis aureus* Linnaeus, 1758) in the Gaza Strip. The importance of the current work comes from

the fact that it is the first of its kind dealing with one of the largest carnivores occurring in the totally fenced, small area of the Gaza Strip, which represents only 1.5% of the total area of Palestine.

## 2. Materials and Methods

### 2.1. The Gaza Strip

The Gaza Strip (365 square kilometers) is a coastal zone lying in the southern part of the Palestinian coast along the eastern shore of the Mediterranean basin (**Figure 1**). It is surrounded by occupied Palestinian Territories from the east and north, Egypt to the south and the Mediterranean to the west. It is composed of five governorates: North Gaza, Gaza, Middle, Khan Younis, and Rafah. The Gaza Strip has a population of about 2.2 million, mostly refugees from the 1948 Nakba. The population density is about 5500 inhabitants per square kilometer, making the Gaza Strip one of the most densely populated areas in the world [78]. The Gaza Strip is characterized by its semi-dry Mediterranean climate, which is hot in summer and cold in winter. The average temperatures in the Gaza Strip range from 25 degrees Celsius in summer to 13 degrees Celsius in winter. The average annual rainfall is 300 mm. The daily relative humidity fluctuates between 65% and 85% in summer and between 60% and 80% in winter. 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 [78].



**Figure 1.** A map showing the position of the Gaza Strip in Palestine.

## 2.2. Procedure

The current study, which lasted 14 years (2007-2020), is descriptive and cumulative in its style. It was a part of a large study dealing with vertebrate fauna. It was based on frequent visits and direct observations of wildlife, with particular emphasis on Golden Jackals. Many ecosystems within the limits of the Gaza Strip have been surveyed. These ecosystems included the three wadis or valleys of the Gaza Strip (Wadi Gaza, Wadi Beit Hanoun and Wadi Salqa), agricultural orchards, and Al-Mawasi ecosystem and sand dunes lying in the western belt of the Gaza Strip. Particular emphasis was paid to the eastern belt of the Gaza Strip near the political borders with Israel because of its specialty in harboring opportunist mammals that cross the borders through gaps and/or burrows and enter the Gaza Strip such as gazelles, Grey Wolf, Red Fox and the Golden Jackal; the core of the current study. It is worth mentioning that the eastern belt of the Gaza Strip which is characterized by its richness in cereal, vegetable and fruit production, animal husbandries and poultries, and the presence of the three major solid waste landfills. The zoological gardens (zoos), which prevail in the whole governorates of the Gaza Strip, were surveyed for their animal and Golden Jackal contents. Furthermore, the biology exhibitions and animal collections of the local universities were visited and monitored. Meetings and discussions with wildlife hunters, local inhabitants, farmers and owners of poultry pens and zoos were continuously carried out in order to get more info and to close the gaps regarding the occurrence, ecology and risks of the Golden Jackal in the Gaza Strip. Finally, the use of professional binoculars and digital cameras was of an utmost priority throughout the succeeding stages of the current study for documentary and confirmatory purposes.

## 3. Results

### 3.1. Description of the Palestinian Golden Jackal

According to specimens encountered in the field (**Figure 2**), hunted by some wildlife hunters and caged at Gaza zoos (**Figure 3**) or found dead on a few occasions in the Palestine environment, the adult Golden Jackal is a medium-sized carnivore belonging to the Canidae family, which includes wolves, dogs and foxes. It has a yellow color mixed with gray; a color that may change depending on the age, season and region. The animal is nocturnal in the sense that it is active at night, especially in areas inhabited by humans, to feed on a different variety of food items. Gazans (the people of the Gaza Strip) are familiar with this carnivore species to the extent that a Gazan family holds the Arabic name of the animal; “*Waw*”. Gazans said that the animal often tries to rob villages and farms at night to steal chickens and young animals. The Golden Jackal does not howl except at night and spends its day in bushes and burrows or in water when the temperature is very high.

### 3.2. Occurrence of the Golden Jackal in the Gaza Strip

Adult Golden Jackals are seldom seen around villages and in the vicinity of the



**Figure 2.** The Golden Jackal (*Canis aureus* Linnaeus, 1758) is a common carnivore in Palestine [photos taken by Mr. Ahmad K. Jbareen].



**Figure 3.** Golden Jackals (*Canis aureus*) were caged in tents at Gaza zoos.

three valleys or wadis that cut the Gaza Strip in several directions. Gazans confirmed the presence of adult Golden Jackals in the eastern parts of the Gaza Strip, though the animal was seen and captured in the sandy belt characterizing the western parts of the Gaza Strip. It prefers to live in dry open areas and dry grasslands. Hunting of Golden Jackals along with other mammals; particularly carnivores, artiodactyls and lagomorphs (**Table 1**), was and is still a common phenomenon in the Gaza Strip. The fate of carnivores captured is killing or selling at cheap prices to the local private zoos prevailing nearly in the whole governorates of the Gaza Strip. Tens of Golden Jackals were encountered by the authors at Gaza zoos throughout the study period (**Figure 3**). The zoo cages harboring the animal were found to contain from two to five individuals for each.

In fact, all the specimens of Golden Jackals seen, captured or caged at Gaza zoos within the limits of the Gaza Strip were adults. The pups or juveniles of the animal have never been seen or hunted in the Gaza Strip. According to wildlife hunters and farmers, the Golden Jackal is not a breeder animal in the Gaza Strip. Its occurrence in the local environment is restricted to adults because the animal, which prevails in Palestine, comes to the Gaza Strip through earth burrows or gaps found in the politically wired borders isolating the Gaza Strip from the rest of Palestine. In spite of that, breeding of the Golden Jackal was proved by many zoo owners. Unfortunately, none of the pups survived for long due to poor care and parents devour their young. Zoo owners claimed that they have no experience dealing with jackal pups, and at the same time, jackals need vast areas that were not present within zoos, in order to succeed in their breeding biology.

From another point of view, a few carcasses of the Golden Jackal were encountered by the authors and their colleagues throughout the study period. Some of these Jackals were shot by hunting guns, while others were found dead without showing signs of gunfire. Some farmers claimed that many carnivores, including

**Table 1.** Mammalian fauna captured for different purposes in the Gaza Strip.

Family	Common Name	Scientific Name
<b>Order Carnivora</b>		
	Golden Jackal	<i>Canis aureus</i> Linnaeus, 1758
Canidae	Grey Wolf	<i>Canis lupus</i> Linnaeus, 1758
	Red Fox	<i>Vulpes vulpes</i> Linnaeus, 1758
Herpestidae	Egyptian Mongoose	<i>Herpestes ichneumon</i> Linnaeus, 1758
Mustelidae	Marbled Polecat	<i>Vormela peregusna</i> Gldenstdt, 1770
Felidae	Jungle Cat	<i>Felis chaus</i> Schreber 1777
<b>Order Artiodactyla</b>		
	Palestine Mountain Gazelle	<i>Gazella gazelle</i> Pallas 1766
Bovidae	Dorcas Gazelle	<i>Gazella dorcas</i> Linnaeus, 1758
<b>Order Carnivora</b>		
Leporidae	Cape Hare	<i>Lepus capensis</i> Linnaeus, 1758

the Golden Jackal, Red Fox (*Vulpes vulpes*) and Egyptian Mongoose (*Herpestes ichneumon*), that attack their domestic animals, crops and property, were commonly poisoned using various pesticides and poisons because of their pest behavior. On one occasion only, a dead specimen was brought to the Biology Department of the Islamic University in 2007 for the purpose of embalming and preserving it inside the department, but due to the weakness of the capabilities, the specimen was not embalmed and was subsequently discarded. As was claimed by the person who brought the specimen, the Golden Jackal was caught by hand in North Gaza and kept in a special place inside his house. The person did not know how to take care of it until the animal passed away.

### 3.3. Feeding Habits of Golden Jackals in the Gaza Strip

In spite of its classification in the order Carnivora (mammals that have specialized in primarily eating flesh), the Golden Jackal is an omnivore in the sense that it feeds upon both animal and plant materials; particularly fruits. The eastern part of the Gaza Strip is mostly an agricultural territory of cereals, vegetables and fruits (melon, watermelon, citrus, date palm, almonds, peaches, etc.). The animal was known among the Palestinians, and hence the Gazans, in its predation on domestic ungulates, hares and rabbits, rodents, lizards, snakes, frogs, birds, insects and fruits. Moreover, the animal is a scavenger in the sense that it feeds on garbage, carrions and carcasses of sheep and goats and other animals reared in the Gaza Strip.

### 3.4. Why Do Some Gazans Combat Golden Jackals?

Meetings with some farmers living in the eastern parts of the Gaza Strip demonstrated that the damages of the Golden Jackal to farmers were restricted to:

- 1) The Golden Jackal is an opportunist that attacks poultry farms and pens of domestic animals; stealing and feeding on them.
- 2) The Golden Jackal is known among all Palestinians for its attacks on farms and agricultural crops such as watermelon, melons, corn and sugarcane. For this reason, Gazan farmers claimed that they resort to tightening the fence of their farms to avoid the attack of the animal.
- 3) Golden Jackals like many members of the Canidae family; were supposed to play a role in the epidemiology and transmission of rabies to humans, although the main source of rabies in Palestine is stray and feral dogs.
- 4) Although it did not happen at all in the Gaza Strip, some farmers claimed that some jackals may attack children and kill them. Those farmers told that they have heard some stories occurring in some countries having large populations of Golden Jackals.
- 5) Some farmers claimed that the killing of Golden Jackals may be carried out by some Gazans because they believed that they might be wolves or stray and mad dogs that might attack them or their property and domestic animals. It is worth noting that some jackals at Gaza zoos have the inscription “wolf” on them

due to the lack of clear distinction between wolves and jackals and even some races of dogs.

### 3.5. Are There Benefits for Jackals in the Gaza Strip?

In spite of the previously mentioned damages of Golden Jackals on people, livestock and farms, some farmers and local people have argued for the presence of Golden Jackals in the Gaza environment, citing some of their ecological and economic benefits as follows:

1) The Golden Jackal is beneficial to humans in the sense that it is considered one of the cleaners of the environment, because the animal is a scavenger as it feeds on garbage and carcasses of dead animals. As a result, the animal eliminates the health problems that may result from the accumulation of dead animals in streets and farms and plays an important ecological role in the initial decomposition of animal carcasses.

2) The Golden Jackal also benefits farmers by feeding on rodents and other harmful animals including insects that are considered agricultural pests, thus preventing the increase of their populations and reducing the application of dangerous pesticides to combat such pests.

### 3.6. Local Methods of Golden Jackal Trapping, Hunting and Control

Although it has a limited occurrence in the Gaza Strip, many trapping and control strategies have been adopted by Gazans to deal with the attacks of the Golden Jackal on their livestock and properties. These included:

1) The application of wire cage traps of different sizes known locally as “*mal-tash*” to catch Golden Jackals and other wild animals. Cage traps are designed to catch live animals in a cage. They are usually baited, sometimes with food bait and sometimes with a live “lure” animal. Cage traps usually have a trigger located in the back of the cage that causes a door to shut. The closure of the trap door prevents the animal from escaping.

2) Foothold or leghold traps with metal jaws, known locally as “*fakh*”, have been used to catch jackals (**Figure 4**). These traps are commonly used by Gazans to trap Cape or Brown Hares (*Lepus capensis*) for feeding purposes. This method was experienced to cause harm and painful lesions to both jackals and other non-target species. In 2008, a live specimen of the Red Fox (*Vulpes vulpes*) missing a limb was found in the zoo of Rafah city, due to being caught by a foothold trap with metal jaws in eastern Gaza Strip (**Figure 5**).

3) Poisoning or the use of poisons by the application of poisoned baits. Dead lambs, chicken and ducks were stated to be used as poisoned baits by a few Gazan farmers.

4) Shooting using guns was and is still a common tool in the hunting process of wild animals including the relatively larger carnivores entering the Gaza Strip from Israel or living and roaming in it such as mongooses, wolves, foxes and jackals (**Figure 6**).



**Figure 4.** A foothold traps with metal jaws missing some of its parts was encountered in eastern Gaza Strip to catch hares and other wildlife species.



**Figure 5.** A Red Fox (*Vulpes vulpes*) missing one of its limbs was encountered at the Rafah zoo in 2008 because of the use of the indiscriminate foothold traps with metal jaws in eastern Gaza Strip.



**Figure 6.** Shooting is a common phenomenon in the Palestinian territories to kill pest carnivores including the Golden Jackal.

5) Poaching and hand-holding were recorded in rare cases for the catch of the Golden Jackal in the Gaza Strip, as a person pursued a Jackal until it entered a place where he could hold it.

#### 4. Discussion

Palestine is home to more than 100 mammalian species, with carnivores constituting a significant part of these mammals [1]. The Gaza Strip, which lies at the southern part of the Palestinian coast along the eastern shore of the Mediterranean basin, is home to eight carnivore species [16], of which the Egyptian Mongoose (*Herpestes ichneumon*) is the commonest [16] [62] [63] [64] [65] [66]. Limited numbers of the Golden Jackal (*Canis aureus*) and the Red Fox (*Vulpes vulpes*) occur nowadays in the various ecosystems of the Gaza Strip. The latter was known to have recent local breeding success (Personal Communications). Prior to 2000, large and medium-sized mammals seemed not to occur in the Gaza Strip because of political borders constructed by the Israeli occupation to isolate the Gaza Strip from the rest of the occupied Palestine. In addition, the Gaza Strip experienced during the occupation era internal borders constructed by the Israeli settlements to completely isolate themselves from the Palestinian cities and refugee camps for security reasons. All these borders within and around the Gaza Strip contributed much to the prevention of ecological flow of large and medium-sized mammals between the Palestinian land masses represented here by the West Bank, Gaza Strip and the other occupied Palestinian lands currently known as Israel [65]. In the same context, the construction of the cement Israeli Apartheid and Segregation Wall in the West Bank since the beginning of 2000s had disastrous impacts on wildlife ecology and biodiversity flow as pointed out by Abdallah and Swaileh [79].

It was well known that Golden Jackals were present in the Gaza Strip 6 - 7 decades ago, but due to the presence of the separation fence and barbed wire, agricultural development, space constraints, population increase, and the lack of natural spaces, they have declined. Their numbers have reached zero. After the witnessed Israeli withdrawal from the Gaza Strip in 2005, and the dismantling of the internal borders of the Israeli settlements, the Gaza Strip witnessed from time to time limited influxes of some wild mammals such as gazelles and carnivores, including the Golden Jackal; the main focus of the current study. Immediately after the Israeli withdrawal, the Gaza Strip witnessed a boom in the opening of many private zoos in all its governorates. Such zoos encouraged the hunting and trapping of wildlife [16] [63] [64] [80]; especially wild mammals, to be sold later to these zoos. The Golden Jackal was and is still considered one of the largest carnivore mammals, which was encountered in dozens in the zoos of the Gaza Strip [16]. Such a presence in relatively big numbers inside zoos made the single zoo cage to harbor from two to five individuals of the animal as the findings of the current study pointed out.

Most hunting and trapping activities of wildlife took place in the eastern parts of the Gaza Strip. This, of course, could be attributed to many logic reasons.

1) Large and medium-sized mammals including the Golden Jackal enter the Gaza Strip through gaps in the political fence separating the Gaza Strip from both Israel and Egypt. Underground burrows constitute another way for carnivore entrance to the Gaza Strip.

2) The concentration of most poultries and animal husbandries in the eastern part of the Gaza Strip attracts such carnivore flow. This may interpret the tendency of local inhabitants and farmers to kill and poison such carnivore species threatening their livestock. Abd Rabou [66] pointed out the killing and poisoning of the Egyptian Mongoose by Gazans because of its attack on poultries. In Libya, Bsissa *et al.* [81] ensured the occurrence of the Golden Jackal in and around villages rich in domestic animal pens.

3) The eastern belt of the Gaza Strip does not enjoy a crowded population, but it is very rich in agricultural fields and wilderness areas, which attract a large variety of mammals, birds and reptiles, which in turn constitute a source of food for predators and mammalian carnivores, including jackals [16] [66].

4) The solid waste landfills, which prevail in the eastern belt of the Gaza Strip, may play a role in attracting some animals such as Red Foxes, Golden Jackals and Grey Wolves because these landfills are very attractive to a variety of wildlife species such as birds, reptiles and small mammals, which in turn constitute good food items to such carnivores.

5) The nocturnal behavior of most carnivores facilitates their predation on both wild and domestic animals and even fruits at times the eastern regions of the Gaza Strip are enjoying complete calm due to the departure of farmers to their relatively remote homes, and because of the military and security measures and risks imposed by Israel in the border areas. These areas were subject to Israeli military incursions and shootings especially during wars and instability times. It should be noted here that a number of wildlife hunters have been killed while practicing their hobbies in these relatively pristine areas [62].

6) It is well known that large mammals have bigger home ranges. Hence, the entrance of foxes, wolves, jackals and even gazelles into the Gaza Strip could be attributed to the bigger home ranges they have [82] [83] compared to smaller mammals, which usually have smaller home ranges [84]. In the Negev Desert, which is proximate to the Gaza Strip, Afik and Alkon [83] estimated a minimum home range of a pair of the Grey Wolf (*Canis lupus pallipes*) to be 60.3 km<sup>2</sup>.

The Golden Jackal is an opportunistic omnivore; feeding on both animal and plant materials; particularly fruits. It has a great similarity in food composition with other canids and carnivores [35] [36] [85] [86]. The eastern regions of the Gaza Strip are full of agricultural fields with a variety of crops, including watermelon, melon, corn, wheat, onion, barley, potato, carrot and many other vegetables and fruits. The entry of Golden Jackals and other wild animals across the nearby borders causes agricultural problems for farmers as they feed on agricultural crops and destroy them. Such attacks often force farmers to adopt various means to combat and control these animals. According to Mendelsohn [17], Franck and Farid [86] and Amr *et al.* [87], the consumption of leaves, vegetables

and fruits and other fibrous plant tissues is widespread among carnivores; with the Golden Jackal is just an example. In Israel, Mendelsohn [17] reported Golden Jackals as a menace to agriculture and the associated complications of control efforts. In Bangladesh, the Golden Jackal was known to attack agricultural crops and feed upon sugarcane, corn, melon and vegetables. Many of the jackals were trapped in sugarcane fields. The sugar content of the sugarcane attracts jackals that bite some joints of the stalk of the plant and chew them [88]. Plant materials such as leaves of grass species, barley and vegetables mainly carrot were also identified in feces of Golden Jackals in Ethiopia [61].

The Golden Jackal was and is still known among the Palestinians for its predation on a variety of wildlife species such as hares, rodents, lizards, snakes, frogs, birds and insects, thus controlling their population. The predation of the animal on domestic animals such as sheep, goats, lambs, turkey, geese, ducks, hens, pigeons and many others, form a challenge for Gazans on the ways they should adopt to lower the damage caused by jackals to livestock and domestic life. A lot of studies dealt with analyzing the food contents of the Golden Jackal showed proximate results. In Israel, evidence for food consumption by jackals was primarily derived from studies on scats or gastrointestinal tracts. The main food category of jackals was ungulates, 80% of which were domestic animals. Other common food types included fruit, birds, small mammals, invertebrates and garbage [53]. According to Yom-Tov *et al.* [32], 1.5% - 1.9% of calves born in the Golan Heights, northern Israel, die due to predation, mainly by Golden Jackals. The high predation rate was attributed to the artificially large jackal population, which was caused by the food provided by humans at illegal landfills. In Israel, one of the important conservation problems caused by increased jackal density is the decreasing density of the northern subspecies of Mountain Gazelle (*Gazella gazella gazella*) as pointed out by Dolev and Perevolotsky [89]. In Greece, stray dogs and jackals are the only animals that could prey on small, hoofed livestock in areas where there are no wolves [45]. According to local people in Nepal, cattle, pheasants, rodents and lagomorphs were commonly preyed upon by Golden Jackals [90]. The Gazans' perception on the role of the Golden Jackal and other carnivores as environmental cleaners was appreciated and documented in different studies worldwide [57] [91] [92].

The Golden Jackal tends not to attack adult people in the Gaza Strip, but it may attack and harm a young child if it had the opportunity as claimed by some Gazans. Such claims were documented in various countries worldwide. In 1979, two young children were attacked and killed by Golden Jackals near the edge of a village in southern Bangladesh [88]. Also, more than likely the animal plays an important role in the epidemiology of rabies, although the main source of rabies is feral dogs [17] [32] [88] [93] [94]. In fact, rabies is a viral disease that occurs in more than 150 countries and territories worldwide. It was estimated that more than 55,000 people die from rabies every year, mostly in Africa and Asia [95]. From an economic point of view, jackals have been hunted sometimes in some countries to obtain their fur or meat, and they may be raised in homes such as

domesticated dogs for the purpose of protection. Such practices have never been found in the Palestinian Territories. In Israel, a great number of wildlife species, including carnivores, was known to be poached for meat purposes by guest Thai workers who were introduced to Israel from Thailand as pointed out by Yom-Tov [96].

The use of poisons, toxins and pesticides to control jackals and other vertebrates as well as invertebrate pests in the Gaza Strip carries negative impacts. The use of poisoned baits was stated by many farmers against jackals, though the phenomenon was not very common. In Israel, the attempts to control jackal populations achieved moderate success by application of poisoned baits, mainly strychnine. The use of strychnine resulted in the decrease of the numbers of Griffon Vultures (*Gyps fulvus*) as well [17]. These poison baits were extremely disastrous as many non-target species such as Egyptian Mongooses, Wild Cats, and Red Foxes were poisoned and negatively impacted. The population of the Palestine Viper (*Daboia palaestinae*) was said to increase considerably after the conduction of jackal extermination campaign [17]. This was probably connected with the concomitant disappearance of the Egyptian Mongoose (*Herpestes ichneumon*), which preyed to a large extent on reptiles, including vipers [66]. The situation of poisoning method applied on jackals and other carnivores is not clearly understood in the Gaza Strip. Some Gazans used dead animals like lambs, turkey, chickens and ducks or geese as poisoned baits as the findings showed. As an approach to control Golden Jackals in Israel, Yom-Tov *et al.* [32] suggested that poisoning should be applied during evening times in carcasses recently predated by jackals, and the remnant poisoned carcasses should be removed in early morning in order to prevent its consumption by vultures and other carrion-feeding animals. In Greece, declines of jackals were partly attributed to the fact that all wild canid species (namely jackals, foxes and wolves) were considered pests during the 1970s and 1980s, and consequently legally persecuted by every possible means, including poisoning [45].

Snaring seems to be of little or no use in the Gaza Strip. Snares, which are described as the silent killers of the forest, are one of the simplest but most effective hunting techniques practiced in the tropics and home-made wire or cable snares are the predominant form of hunting across large areas of Southeast Asia [97]. Instead, shooting by guns was and is still used in the Gaza Strip, with the birds and mammals were the most common victims of shooting [16] [65] [66] [98]. More recently, a Red Fox was shot by wildlife hunters in the Gaza Strip and the photos were posted in the Facebook (Personal Observations). Denning jackal pups could be removed from dens in order to reduce predation on livestock, because the food requirements of adult jackals are less when they do not have pups to tend to [99]. This approach is sometimes applied in countries having great densities of jackals. In the case of the Gaza Strip, there are no signs of jackal breeding, and as such, this method is losing its local significance.

Hunting and trapping of wildlife species is a common phenomenon in the Gaza Strip. Poverty, unemployment, low socioeconomic standards and the Israe-

li blockade imposed on about 2.2 million people living in the Gaza Strip are strong factors enhancing wildlife hunting for different purposes including meat, rearing at homes, fun, game and trade [16] [62] [63] [64] [67] [68] [69] [80] [98] [100] [101] [102] [103]. The use of live traps such as wire cages and foothold traps was documented in the Gaza Strip. The kind of foothold traps applied in the Gaza Strip is disastrous to wildlife because they are made of pure iron. Such metal foothold traps were known to cause harmful and painful lesions to the mammalian species hunted. Many wild carnivores including jackals, wolves, foxes, hares and even hedgehogs were actual victims. Domestic Cats (*Felis catus*) and Domestic Dogs (*Canis familiaris*) were not far away from this tragedy. As shown in **Figure 5**, a caged Red Fox in Rafah zoo was found missing one of its limbs as a result of the use of the indiscriminate foothold traps with metal jaws. In the USA, standard foothold traps equipped with rubber padded jaws were commonly used as a depredation management tool to control Coyote (*Canis latrans*) populations [104]. In fact, leghold traps, which have been banned in some countries of the world, pose a threat to the health and life of hunted animals. These traps break and crush the animal's limb, immobilize the animal and make it vulnerable to predation and without shelter from the harsh weather conditions. Hunting these animals prevents them from returning to their dens, and therefore their young are left alone with no food and care, so they die.

## 5. Conclusion

In conclusion, the Golden Jackal, in spite of its limited occurrence, represents a large carnivore species that plays an important ecological role in the Gaza Strip. In the light of this fact, the current study recommends the need to raise ecological awareness among Gazans to protect the Golden jackal and to adopt safe control measures for jackals and other carnivores, including the construction of protective fences for agricultural fields and animal pens.

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## Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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