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## Concerns associated with the sporadic occurrence of the Arabian wolf (*Canis lupus* Linnaeus, 1758) in the eastern Gaza Strip – Palestine

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### Abstract

The Arabian Wolf (*Canis lupus* Linnaeus, 1758) is a keystone carnivore in Palestine (27,000 km<sup>2</sup>). During the last 15 years, dozens of the Arabian Wolf managed to cross the Green Line or the de-facto borders that isolate the Gaza Strip from the rest of Palestinian Territories occupied by Israel since 1948 and infiltrate the Gaza Strip (365 km<sup>2</sup>). The current study investigates the concerns associated with the sporadic occurrence of the Arabian Wolf in the eastern Gaza Strip - Palestine. The current study, which lasted 10 years (2013-2022), was based on various procedures including field observations, frequent visits to local zoos, meetings and discussions with local farmers, breeders of domestic animals and wildlife hunters, constant follow-up of news and social media and photography. According to old Gazans, the Arabian Wolf was present in the Gaza Strip 7-8 decades ago, and after that its numbers decreased to zero. After the Israeli withdrawal from the Gaza Strip and the uprooting of its settlements in late 2005, dozens of Arabian Wolf and other carnivores crept intermittently through gaps in the border to the east of the Gaza Strip. The Arabian Wolf often arrives at night, looking for food, and it returns again in the morning hours to the Gaza Envelope. Many individuals have been captured or killed by Gazans at night using live traps "Maltash", leghold traps "Fakh", or even rifles and cartridges. Some healthy specimens have been sold and kept in cages at local zoos. Many plausible factors encouraged the infiltration of Arabian Wolves and other canids into the eastern Gaza Strip, such as the abundance of wildlife prey attracted by solid waste dumps, sewage treatment plants, and agricultural production activities of various crops, in addition to the abundance of animal pens and poultry farms. The concern of Gazans living in the eastern regions of the Gaza Strip stems from the attack of Arabian Wolves and other predators on animal pens and poultry farms, the probable spread of rabies, and the possibility of Arabian Wolves attacking humans, especially children. To avoid the damage of Arabian Wolves and predators sneaking across the border, some Gazans built protective fences, and to avoid being attacked by these animals, some Gazans, especially the young, refrained from going out at night. In conclusion, Arabian Wolves and other carnivores are an important and vital part of the Palestinian ecosystems that must be protected sustainably.

**Keywords:** Arabian wolf, *Canis lupus*, carnivores, wildlife infiltration, green line, concerns, Gazans, eastern Gaza strip

### Introduction

Palestine (27,000 km<sup>2</sup>) is home to a huge diversity of vertebrate fauna because of its geographical location, climate, topography, diversity of vegetation, and the multiplicity of its ecosystems and habitats. Wild mammals represent an important part of this diversity. According to Meiri *et al.* (2019) [80], Palestine is home to approximately 130 species of wild mammals. Carnivores are considered one of the most important taxonomic groups or taxa within the mammalian fauna in Palestine and are spread throughout all ecosystems from east to west and from north to south. There are 15 species of carnivores that occur in Palestine (Qumsiyeh, 1996 and Meiri *et al.*, 2019) [91, 80] of which five belong to the Canidae family, namely the Golden Jackal (*Canis aureus*), Arabian Wolf (*Canis lupus*), Blanford's Fox (*Vulpes cana*), Rüppell's Fox (*Vulpes rueppelli*) and Red Fox (*Vulpes vulpes*). According to the global state of conservation, these canids are considered as Least Concern (LC), but locally the Blanford's Fox and Rüppell's Fox are Endangered (EN), while the Arabian Wolf is Vulnerable (VU) (Meiri *et al.*, 2019) [80]. The Gaza Strip (365 km<sup>2</sup>), which represents about 1.5% of the total area of Palestine, has tens of mammalian species, some of which are carnivores. Abd Rabou (2009) [7] documented seven species of carnivores in the Gaza Strip, including the very rare Sand Cat (*Felis margarita*), which was seen only once in the area of the destroyed Gaza International Airport in the far south of the Gaza Strip, which indicates its possible infiltration from the Sinai Peninsula into the Gaza Strip.

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Arabian or Gray or Desert Wolves are keystone predators of the Class Mammalia, Order Carnivora, and Family Canidae. They are highly adaptable social carnivores with the ability to live in a variety of ecosystems around the world (Boitani and Bartoli, 1983<sup>[31]</sup> and Harrison and Bates, 1991<sup>[63]</sup>). They are opportunistic feeders that show great flexibility in food sources including plants and fruits (Qumsiyeh, 1996)<sup>[91]</sup>. Even human food sources such as garbage are not avoided and are a staple food source in some areas (Gräßer *et al.*, 2019)<sup>[61]</sup>. Studies examining the ecology, biology, behavior, attacks and management of the Arabian Wolf in the Middle East and the Arab region are escalating day by day. In Jordan and Saudi Arabia, several studies have investigated carnivores in different environments where the Arabian wolf is a keystone species (Nader and Büttiker, 1980; Qumsiyeh *et al.*, 1993; Amr *et al.*, 1996; Bunaian *et al.*, 2001; Wronski and Macasero, 2008; Cunningham and Wronski, 2010a and b; Al-Haza and Wronski, 2012; Bray *et al.*, 2014; Aloufi and Amr, 2018; Zafar-ul Islam *et al.*, 2019; Eid *et al.*, 2020 and Hamidan *et al.*, 2020)<sup>[85, 92, 22, 37, 21, 35, 20, 109, 49, 62]</sup>. In Turkey and Iran, many important and original studies dealing with the Arabian Wolf have been surveyed (Özkurt *et al.*, 1998; Hasanzadeh *et al.*, 2012; Ahmadi *et al.*, 2013; Khosravi *et al.*, 2013; İlemin, 2014; Tourani *et al.*, 2014; Behdarvand and Kaboli, 2015; Süel *et al.*, 2018; Mengüllüoğlu *et al.*, 2019; Mohammadi *et al.*, 2019 and Arslan *et al.*, 2021)<sup>[88, 64, 17, 74, 69, 99, 30, 97, 82, 83, 24]</sup>. Ibis *et al.* (2016)<sup>[68]</sup> investigated the genetic analysis of the Turkish Arabian Wolf based on partial mitochondrial DNA sequences. The studies related to the Arabian Wolf in Israel were diverse, as most of them focused on the occurrence and ecology of the animal in the arid environments prevailing in the south, particularly the Negev Desert (Afik and Alkon, 1983; Shalmon, 1986; Dayan *et al.*, 1992; Hefner and Geffen, 1999; Reuven and Geffen, 1999; Geffen *et al.*, 2004; Borkowski *et al.*, 2011; Cohen *et al.*, 2013; Bensen and Khalilieh, 2021 and Bensen *et al.*, 2022)<sup>[16, 95, 46, 65, 93, 55, 34, 40, 33, 32]</sup>. Nemtsov and King (2001) looked at

the management of wild canids in Israel, including the Arabian Wolf, particularly with regard to their risks to agriculture and opportunities for the spread of rabies.

The Arabian Wolf (*Canis lupus* Linnaeus, 1758) is the largest among the Palestinian carnivores (Qumsiyeh, 1996)<sup>[91]</sup> (Figure 1). It lives in various ecosystems throughout Palestine, including the Negev Desert in southern Palestine, and also in the area bordering the Gaza Strip, called the Gaza Envelope, from which it can sneak through borders to the eastern regions of the Gaza Strip. According to Meiri *et al.* (2019)<sup>[80]</sup>, there is good morphological evidence that Arabian Wolves breed heavily with dogs (*Canis familiaris* or *Canis lupus familiaris*). Mostly, there are no specific studies on the Arabian Wolf in the Palestinian territories. In the West Bank, Albaba (2016)<sup>[18]</sup> documented the presence of the Arabian Wolf in many governorates of the West Bank with no further details. In the Gaza Strip, the studies of Abd Rabou and his colleagues indicated that the Arabian Wolf, as an opportunistic feeder, enters the eastern parts of the Gaza Strip through gaps or openings in the wire border that separates the Gaza Strip from the rest of the Palestinian territories occupied by Israel since 1948 (Abd Rabou, 2005; 2009; 2011a and b and Abd Rabou *et al.*, 2007 and 2022)<sup>[2-4, 15]</sup>. Al-Jamal, 2018<sup>[19]</sup> and Khalaf (2019)<sup>[72]</sup> referred to the presence of the Arabian Wolf (*Canis lupus arabs*) in Khan Yunis Governorate, in the southern Gaza Strip as a result of its infiltration from the occupied Palestinian territories in 1948 through the border fence. The presence of the Arabian Wolf has never been recorded in the western belt of the Gaza Strip (Abd Rabou, 2019)<sup>[7]</sup>, and there are no mummified specimens of it in the biological museums of Palestinian universities in the Gaza Strip (Abd Rabou 2020a and Abd Rabou *et al.*, 2020)<sup>[8, 11]</sup>. Based on the foregoing, the current modest study aims to shed light on the incidence and risks of the Arabian Wolf in the Gaza Strip. The importance of this study is that it is the first in the Palestinian Territories to talk about this animal in some detail.



**Fig 1:** A photograph showing the Arabian Wolf (*Canis lupus*) in the desert of Jerusalem (Al-Quds), Palestine [Photo: Mohammad Al-Shoaiibi, May 9, 2022]

## Materials and Methods

### Gaza Strip

The Gaza Strip (365 km<sup>2</sup>) is a coastal area located in the southern part of the Palestinian coast along the eastern shore of the Mediterranean basin (Figure 2). It is bordered to the north and east by the Palestinian territories occupied by Israel

in 1948, by Egypt to the south, and the Mediterranean Sea to the west. The Gaza Strip consists of five governorates: North Gaza, Gaza, Middle, Khan Yunis and Rafah. The population of the Gaza Strip is about 2.3 million people, most of whom are refugees from the Nakba in 1948. The population density is about 6,000 people per square kilometer, which makes the Gaza Strip one of the most densely populated areas in the

world. The eastern areas close to the Green Line (the de facto border between the Gaza Strip and the rest of the Palestinian areas occupied by Israel in 1948) are characterized by a relatively dense presence of forms of wildlife, including some species of mammals (and carnivores) that infiltrate across the border into the Gaza Strip (Abd Rabou *et al.*, 2022a) [13]. The Gaza Strip is characterized by its semi-Mediterranean climate. Dry, hot summers and cold winters. Average temperatures in the Gaza Strip range between 25 °C in summer and 13°C in winter. The average annual precipitation is 300 mm. Sand dunes are the main feature of the western part of the Gaza Strip, while silt and muddy lands prevail in the eastern part (UNEP 2003) [103].

## Procedure

The current study, which lasted 10 years (2013-2022), was based on various procedures including field observations of the eastern regions of the Gaza Strip and monitoring of wildlife, frequent visits to local zoos to study their content of carnivores, especially the Arabian wolf, contacts, meetings and discussions with local farmers, breeders of domestic animals and wildlife hunters, constant follow-up of news and social media, review of all local scientific publications targeting carnivores, and finally photography for documentary purposes.

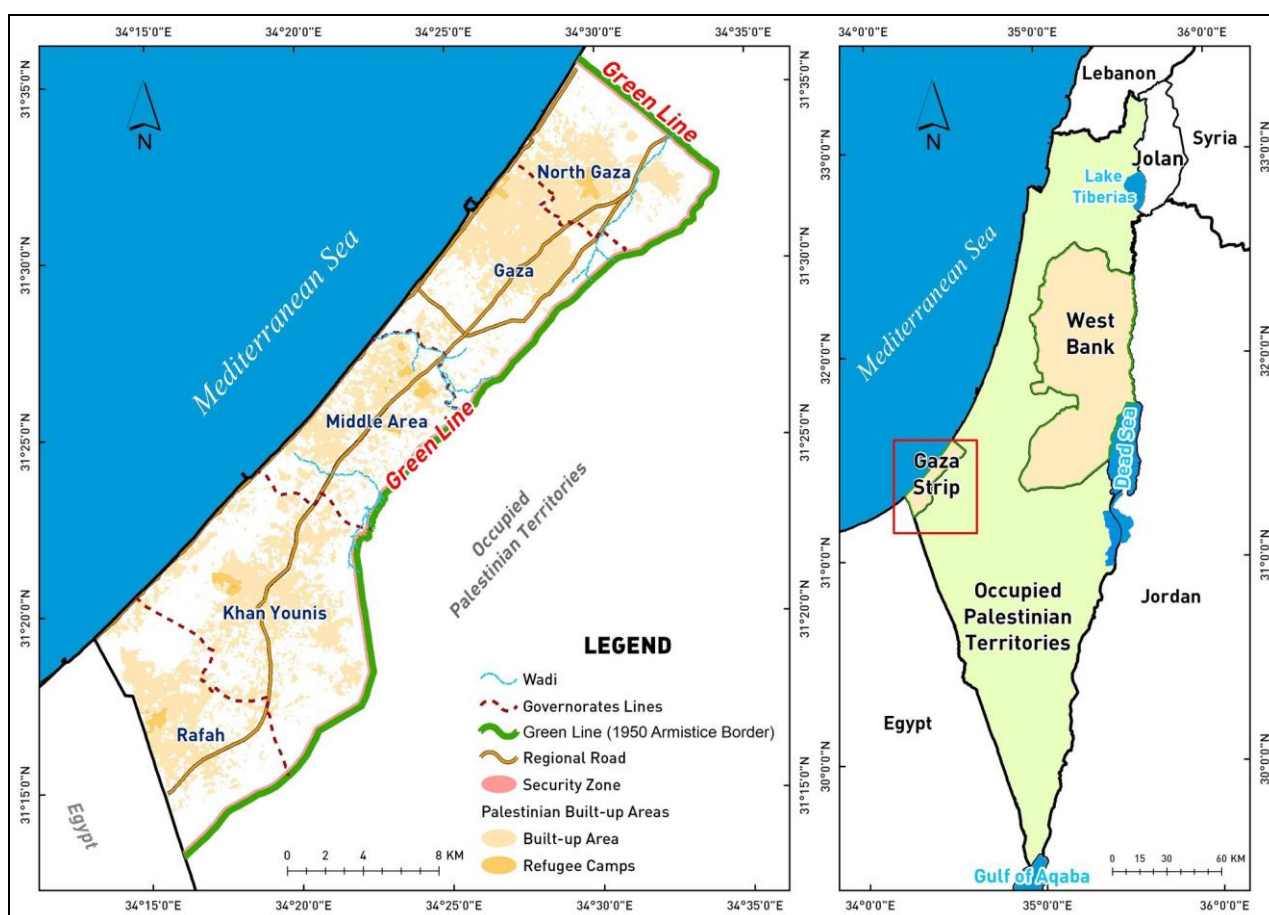


Fig 2: Map of the Gaza Strip – Palestine

## Results

### Description of the Arabian Wolf

Ocular observations of Arabian Wolves in captivity (Figure 3) or in zoos scattered in the Gaza Strip (Figure 4) show that the animal is a medium-sized predator, but it is the largest among the canids (wolves, jackals, dogs and foxes) that live in Palestine and the Gaza Strip. Most Arabian Wolves tend to be spotted gray as their names indicate. It may be difficult for the general population of the Gaza Strip to differentiate between the Arabian Wolf, the Golden Jackal, and the Dog, to the extent that it is easy to find a Arabian Wolf in a zoo, but the tag attached to the cage says that it is a Golden Jackal, and this has been observed repeatedly in the zoos spread in the Gaza Strip. The telltale signs of a wolf are its ears, which are often erect, and the tail hanging straight down. The Arabian Wolf that infiltrates the Gaza Strip is adapted to the desert environment, as it mostly comes from the dry environments that characterize the Negev desert in southern Palestine. The Arabian Wolf usually lives in small groups, although cases of

infiltration across the border into the Gaza Strip involve only solitary and adult specimens. As previously stated, Arabian Wolves are carnivores and feed on a variety of small to medium sized prey. The Arabian Wolf is nocturnal in the sense that it is active at night, especially in areas that are not far from human habitation. The Wolf is a well-known predator among the Gazans (residents of the Gaza Strip), to the extent that individuals or families from the Gaza Strip bear the Arabic name for the animal "Deeb".

### Was the Arabian Wolf present in the Gaza Strip?

Frequent discussions with older Gazans, particularly farmers living in the eastern parts of the Gaza Strip, suggested that Arabian Wolves (*Canis lupus*), Golden Jackals (*Canis aureus*), Red Foxes (*Vulpes vulpes*), Striped Hyenas (*Hyaena hyaena*) and other medium-sized mammals existed in the Gaza Strip 7-8 decades ago, but only because of the separation fence and the barbed wires that Israel built as an occupying power in 1967, agricultural development, space



constraints, increased population density, and a lack of natural spaces, those wild mammals have retreated and their numbers have decreased to zero.

### The current sporadic occurrence of the Arabian Wolf in the Gaza Strip

Some Gazans who live in the eastern parts of the Gaza Strip have witnessed a small number of Arabian Wolves over the past years, coming through burrows, openings or gaps in the separation wall, especially after the Israeli withdrawal from the Gaza Strip in late 2005. It is worth noting that the separation wall is known as the Green Line (the de facto borders separating the Gaza Strip from the rest of the Palestinian territories occupied by Israel since 1948). Some Gazans believe that very few mammals may infiltrate the Gaza Strip coming through the border fence between the Gaza Strip and the Sinai Peninsula (the Arab Republic of Egypt), because the Sinai Peninsula is a sandy desert, while the Gaza cover area, from which most mammals come, enjoys the presence of forests, bushes, and agricultural lands that it would provide shelter, shelter, food, camouflage, hiding and mating for these creatures. During the past 15 years, Gazans have been able to sight, hunt, and possibly kill many wild as well as stray mammals coming into the Gaza Strip across the border. These included, in addition to the Arabian Wolf (*Canis lupus*), the Golden Jackal (*Canis aureus*), the Red Fox (*Vulpes vulpes*), the Stray or Free-ranging Dog (*Canis lupus familiaris* or *Canis familiaris*), the Jungle Cat (Jungle cat

(*Felis Chaus*), the Wild or Feral Cat (*Felis silvestris*), the Egyptian Mongoose or ichneumon (*Herpestes ichneumon*), the Marbled Polecat (*Vormela peregusna*), and the Common Badger (*Meles meles*) as carnivores.

Some mammals such as Indian Crested Porcupines (*Hystrix indica*) as rodents and Gazelles, especially the Palestine Mountain Gazelle (*Gazella gazella*) and Dorcas Gazelle (*Gazella dorcas*) as Artiodactylans or even-toed ungulates were able to come to the Gaza Strip, but also in small numbers. It is worth mentioning that the Arabian Wolf is the largest of the carnivores, and its arrival to the Gaza Strip from the Palestinian Territories occupied by Israel in 1948 is still small and rare, and it occurs at intervals compared to other mammals. About 15 years ago, some Gazans, especially farmers in the eastern Gaza Strip, began listening at night to the howling of the Arabian Wolf and complaining about the infiltration of predators belonging to the order Carnivora (flesh-eating mammals). Because most of carnivores are nocturnal, these creatures often arrive at night to the eastern border areas of the Gaza Strip, sneaking through the openings or gaps of the separating fence, looking for food, and these creatures return again from where they came in the morning hours to the Gaza Envelope area. In one of the famous incidents, a young man from Khan Yunis governorate, south of the Gaza Strip, managed to catch a Arabian Wolf alive, after setting a trap for it in his sheep farm, east of the governorate, in early December 2018 (Figure 4).



**Fig 3:** An Arabian Wolf caught alive after setting a trap in a sheep farm, east of Khan Yunis Governorate, southern Gaza Strip, in early December 2018

### Trapping means of Arabian Wolves

Although the Arabian Wolf has a sporadic occurrence in the Gaza Strip, many trapping means have been applied by Gazans to deal with the animal:

1. Wire cage traps known locally as "*Maltash*" of different sizes and shapes are used to catch Arabian Wolves as well as other carnivores. Cage traps are designed to catch live animals in the presence of bait. Cage traps usually have a trigger located at the back of the cage that causes the door to close. Closing the trap door prevents the animal from escaping.
2. Foothold or leghold traps with metal jaws, known locally as "*Fakh*" are used to catch Arabian Wolves and other animals including Hares (*Lepus capensis*). This method often causes injuries to caught animals, including some non-target species.
3. Shooting with rifles and cartridges to kill is a common

tool in the process of hunting wild animals, including wild birds and carnivores that infiltrate across the border into the Gaza Strip, such as Arabian Wolves, Red Foxes, Golden Jackals, Stray Dogs, Egyptian Mongooses, and others.

### Fate of Arabian Wolves trapped in the Gaza Strip

Although they are less exposed to poaching and trapping by Gazans due to their intermittent entry into the Gaza Strip, what is trapped is sometimes killed or sold to zoos scattered throughout the Gaza Strip, just like the many mammals, birds and reptiles that are hunted locally and is also sold cheaply to Gaza zoos. After the Israeli withdrawal from the Gaza Strip and the uprooting of Israeli settlements in late 2005, the opening of private zoos in the governorates of the Gaza Strip became popular. Although most Gaza zoo animals, including Arabian Wolves, were smuggled from Egypt to the Gaza Strip

through underground tunnels constructed by Gazans in the face of the blockade imposed by Israel and some Arab and international regimes on the Gaza Strip since 2006, many zoo animals are caught locally using different types of traps. In fact, most of the Arabian Wolves that are in the dozens in Gaza zoos (Figure 5) were smuggled from Egypt into the Gaza Strip, and some of them are caught locally. This is

evidenced by the fact that a few individuals of Arabian Wolves, Golden Jackals, and Red Foxes have lost a limb due to being caught using iron leg traps, often resulting in leg injuries or death if the animal remains in the trap without the hunter reaching it. It should be noted here that some of these canids die due to being shot by Gazan hunters who carry guns and cartridges.



**Fig 4:** The Arabian Wolves of Gaza zoos are either smuggled from Egypt through underground tunnels or hunted locally using different trapping means

#### **Factors encouraging canids to infiltrate the eastern regions of the Gaza Strip**

The eastern regions of the Gaza Strip, adjacent to the borders between the Gaza Strip and the Palestinian territories occupied by Israel in 1948, differ from the rest of the Gaza regions. There is an open and bare area called the "buffer zone" that is not inhabited or approached by any of the residents of Gaza. Israel established this area for security reasons, as it claims. The eastern areas of the Gaza Strip are exposed almost daily to Israeli invasions accompanied by pursuits of Gazans and shootings. Wild and agricultural vegetation is exposed, intermittently, to herbicides and other pesticides sprayed by aggressive Israeli planes. Because of the security and military conditions, the Palestinian population in those areas decreases, especially at night. These areas are mainly agricultural areas in which orchards, vegetable farms, animal and poultry farms, beekeeping and other animal and plant production processes prevail. In light of this, Arabian Wolves, canids, felines, and other predators resort to infiltrating across the border to reach the eastern regions of the Gaza Strip in the hope of obtaining food to satisfy their needs, and this is helped by a group of factors:

1. The main solid waste landfills and some random solid waste dumps cover large areas along the eastern borders of the Gaza Strip. These dumps attract huge numbers of

wildlife from mammals, birds and mammals that provide a palatable morsel for the intrusive carnivores.

2. The three main wastewater treatment plants are also located in the north, middle and south of the Gaza Strip, covering large areas. These facilities attract a good number of wildlife, especially waterfowl and waders, which may provide a palatable morsel for the intrusive carnivores.
3. Because of its vegetation and agricultural nature, the lack of the Gazan population, and the prevailing calm, most of the wildlife in the Gaza Strip resides in those areas to the extent that most of wildlife hunting, especially for birds, takes place in those areas. These areas provide an opportunity for sneaky predators to find food. Vegetation also provides camouflage and detection mechanisms for these organisms.
4. The eastern regions of the Gaza Strip generally enjoy a large number of farms for animals and livestock such as cows, goats, sheep and rabbits (Figure 6), in addition to poultry farms such as chickens, ducks, geese, turkeys, quails and pigeons. The various elements of animal production provide a fertile ground for predators to infiltrate and seize some of them. The owners of animal farms have suffered from repeated loss of some of the animals they raise.



**Fig 5:** The abundance of sheep and goat breeding and grazing in the eastern regions of the Gaza Strip encourages the infiltration of Arabian Wolves and other predators across the border

### What worries the Gazans about the infiltration of Arabian Wolves?

Discussions with Gazans, especially farmers who live in the eastern regions of the Gaza Strip, showed that the dangers of the Arabian Wolf are numerous and can be summarized in the following points:

1. Arabian Wolves, in addition to some other predators, are opportunistic carnivores that can attack poultry farms and animal pens that are widely spread in the eastern regions of the Gaza Strip, stealing from them and feeding on them. Some animal breeders have suffered losses in their animals due to carnivores attacking them. For this reason, animal breeders claimed that they resort to tightening the fence of their animal farms to avoid such predator attacks.
2. Arabian Wolves, like the rest of the Canidae family, may play a role in the epidemiology and transmission of rabies to humans, although the main source of rabies in Palestine and neighboring countries is Stray and Feral Dogs (*Canis lupus familiaris*). It is worth noting that rabies is a preventable viral disease that is transmitted most often through the bite of an animal infected with rabies. The rabies virus infects the central nervous system of mammals, eventually causing brain disease and death.
3. Arabian Wolves are animals that do not tend to attack adults, but they may attack and harm a young child if they get the chance. Although this has never happened in the Gaza Strip, some Gazans claim that some Arabian Wolves may attack and kill children and that is why they do not let their children out at night, especially in marginal areas where predators are expected to enter at night. Those Gazans told that they had heard some stories of children being attacked in some countries with large canine populations such as Arabian Wolves and Golden Jackals. Some Gazans mention Verse 17 from Surat Yusuf (Joseph) in the Holy Quran, which talks about the claim of the brothers of our master Yusuf (Joseph), peace be upon him, that the Arabian Wolf attacked Yusuf (Joseph) when he was still a child. God Almighty said in verse 17 of Surat Yusuf (Joseph): [They cried, "Our father! We went racing and left Joseph with our

belongings, and a Wolf devoured him! But you will not believe us, no matter how truthful we are"]].

### Benefits of Arabian Wolves in the Palestine environment

Arabian Wolves exist naturally in most of the ecosystems in Palestine. The entry of these animals into the environment of the Gaza Strip takes place intermittently during the night hours, and they do not stay long, as they leave in the morning hours. Despite the previously possible harms of Arabian Wolves to people, livestock and public health, there are some benefits of Arabian Wolves in the Palestine environment as a whole as follows:

1. The Arabian Wolf, despite its generally low numbers in Palestine compared to other carnivores, is considered part of the biodiversity that must be protected because it represents one of the "keystone species" and its presence is necessary for biological balance, and its loss represents a threat to the ecological environment. The Arabian Wolf can feed on rodents and pests that harm humans and their property and thus prevent an increase in their numbers.
2. Residents of the West Bank in Palestine suffer from the problem of Wild or Feral Boars (*Sus scrofa*), some of which may be released by Israeli settlers to harm the Palestinian people, animals, farms and property in a blatant manner. The low numbers of Arabian Wolves in the West Bank, as a direct enemy of Wild and Feral Boars, contributes to the Boars' large numbers and increased dangers.
3. Arabian Wolves are opportunists in that they look for easy meals. Although they hunt many Palestinian wild animals such as Palestine Mountain Gazelle (*Gazella gazella*), Dorcas Gazelle (*Gazella dorcas*), Wild Boar (*Sus scrofa*), and other mammals and animals, hunting excursions are not always successful and Arabian Wolves will scavenge old carcasses and scavenge for trash if they live in areas where humans and wolves overlap. As a result, the animal eliminates the health and environmental problems that may result from the accumulation of dead animals in their places and plays an important environmental role in the primary decomposition of animal carcasses.



4. The carcasses of Arabian Wolves' prey help redistribute nutrients in the soil and provide food for other Palestinian wildlife species that cannot kill larger prey or are considered scavenger or environmental cleaners by nature such as eagles, vultures, herons, crows, and other birds and mammals.

#### Gazans' actions against the dangers of Arabian Wolves and predators

Gazans in the eastern regions of the Gaza Strip seek to reduce the risk of infiltration by the Arabian Wolf and other predators as follows:

1. Securing barns for livestock, domestic animals and bird farms by strengthening them with metal nets and barbed wire to prevent predators from entering and capturing their animals.
2. Avoid the movement of Gazans, especially children, during the night hours in the agricultural and marginal areas near the borders, which may be exposed to the infiltration of predators, so as not to be harmed by Arabian Wolves and Golden Jackals. Stray Dogs, which spread abundantly throughout the Gaza Strip, constitute a danger that may be more than the Arabian Wolves, because these dogs in their flocks may attack some Gazans, and cases of their harm have been recorded.
3. Some Gazans in the eastern regions of the Gaza Strip claimed that young men, from time to time, fire their weapons at predators that harm them and attack their farms and barns with the aim of killing or displacing them. Some Gazans confirmed that they saw some stray dogs and other predators dying because of this act. Other Gazans did not rule out poisoning some dead domestic animals in order to kill intruding predators that might feed on them.

#### Discussion

Palestine is home to about 130 species of mammals (Meiri, 2019) <sup>[80]</sup>, and carnivores constitute a capital part of these creatures (Qumsiyeh, 1996) <sup>[91]</sup>. According to Abd Rabou (2009) <sup>[7]</sup>, the Gaza Strip is home to eight species of carnivores, of which the Egyptian mongoose (*Herpestes ichneumon*) is the most common (Abd Rabou, 2005, 2009, 2011a and b and 2019a and b) <sup>[2, 3, 4, 6]</sup>. Although Golden Jackals (*Canis aureus*) and Red Foxes (*Vulpes vulpes*) have been recorded in different ecosystems in the whole Gaza Strip (Abd Rabou, 2009; 2011b; 2019a and Abd Rabou *et al.*, 2021) <sup>[3, 5, 6, 10]</sup>, Arabian Wolves have been recorded sporadically and sparsely in the eastern parts of the Gaza Strip. Residents of the eastern regions mentioned that they hear the Arabian Wolf howling at night, which raises their fear of going out at night. The howling behavior of Wolves can be influenced by environmental and social factors as revealed by Husband *et al.* (2020) <sup>[110]</sup>. Prior to 2005, the security fences that Israel built around and inside the Gaza Strip played into the rarity of medium-sized mammals that could exist in the Gaza Strip. This situation contributed to the lack of ecological communication between the Gaza Strip and the other geographical components of Palestine. Similarly, the construction of the Israeli Apartheid Concrete Wall in the West Bank since the beginning of the first decade of the current century had disastrous effects on the ecology of wildlife and the flow of biodiversity (Abdullah and Swaileh, 2011) <sup>[1]</sup>. Similar findings were revealed by Trouwborst *et al.*

(2016) <sup>[101]</sup> as well. After the remarkable Israeli withdrawal from the Gaza Strip in late 2005, and the dismantling of the internal borders of the defunct Israeli settlements, the Gaza Strip witnessed from time to time limited influxes of some wild mammals such as gazelles and carnivores, including the Arabian Wolf; the main target in the current study (Abd Rabou 2009 and Abd Rabou *et al.*, 2022) <sup>[3, 14]</sup>.

Unlike some carnivores that are hunted locally and are present in reasonable numbers in zoos scattered throughout the Gaza Strip, Arab Wolves are also present in limited numbers, but most of them were smuggled through the underground tunnels linking the Gaza Strip and the Sinai Peninsula (the Arab Republic of Egypt). These tunnels were built after Israel tightened its blockade on the Gaza Strip since 2006, affecting most of the goods needed by the residents of the Gaza Strip. A very small percentage of the Arab Wolves that crossed the eastern borders of the Gaza Strip and were hunted locally were deposited at limited prices in zoos. Similar to some species of animals and birds present in Gaza zoos, which are labeled on the preambles of their cages without their real names, the cages of Arabian Wolves, Golden Jackals, and sometimes Red Foxes may bear the preambles of each other's names (Abd Rabou, 2009; 2019a and Abd Rabou *et al.*, 2021) <sup>[3, 6, 10]</sup> because these zoos are private and there is no scientific supervision of their animal content. It is easy not to classify the captured or smuggled animals in a clear scientific way.

Most of the infiltration of carnivores into the Gaza Strip occurred in the eastern parts due to the factors previously mentioned in the results of the study. The concentration of most poultry and animal husbandry in the eastern part of the Gaza Strip is a major factor in promoting the influx of carnivores. This may explain the propensity of locals and farmers to kill and poison such carnivorous species such as Egyptian Mongooses and Golden Jackal which threaten their livestock (Abd Rabou, 2019a and b and Abd Rabou *et al.*, 2021) <sup>[6, 10]</sup>. In Libya, Bsisia *et al.* (2019) <sup>[36]</sup> ensured the emergence of Golden Jackals in and around villages rich in animal pens. In Germany and Bulgaria, the Gray Wolf and Golden Jackals are serious pests threatening and killing thousands of both domestic and wild animals (Genov and Vassilev, 1991; Ansorge *et al.*, 2006 and Genov and Dzhindzhieva, 2010) <sup>[58, 23, 57]</sup>. The nocturnal behavior of most carnivores facilitates their predation on both wild and domestic animals and even fruits in the eastern areas of the Gaza Strip in times the area enjoys complete calm due to the departure of farmers to their relatively remote homes (Abd Rabou, 2019a and b and Abd Rabou *et al.*, 2021) <sup>[6, 10]</sup>. The Cape Hare (*Lepus capensis*) is a lagomorph that lives in the Gaza Strip and may be a good prey for such dogs (Abd Rabou, 2021) <sup>[10]</sup>. Ecologically, large mammals are known to have larger home ranges. Hence, the entry of Arabian Wolves in addition to Red Foxes, Golden Jackals and even gazelles into the Gaza Strip can be also attributed to the larger home ranges they have (Afik and Alkon, 1983 and Reuven and Geffen, 1999) <sup>[16, 93]</sup> compared to smaller mammals, which usually have smaller home ranges. In the Negev Desert, which is very close to the Gaza Strip, Afik and Alkon (1983) <sup>[16]</sup> estimated that the minimum home range for a pair of Arabian Wolf (*Canis lupus pallipes*) is 60.3 square kilometers.

The Arabian Wolf can feed on both animal and plant matter; especially the fruits that are abundant in eastern Gaza Strip. In this, the animal is similar to canids and other carnivores in



food composition (Yom-Tov *et al.*, 1995; Basuony, 1998; Basuony *et al.*, 2005; Giannatos *et al.*, 2010 and Frank and Farid, 2020) <sup>[108, 27, 59, 51]</sup>. Entry of carnivores across the nearby border into the Gaza Strip may cause underestimated losses and destructions to agricultural crops. Such attacks often force farmers to adopt various means to combat and control the animals. According to Franck and Farid (2020) <sup>[51]</sup>, plant-based consumption is widespread among carnivores. In Bangladesh and Ethiopia, Golden Jackals have been known to attack agricultural crops and feed on fruits and vegetables (Poche *et al.*, 1987 and Gashe and Yihune, 2020) <sup>[90, 52]</sup>.

The Arabian Wolf was, and still is, known and heard in anecdotes among Gazans for preying on a variety of domestic as well as wild animals, and this is true (Meriggi and Lovari, 1996; Tiralla *et al.*, 2021 and Myslajek *et al.*, 2022) <sup>[81, 98, 84]</sup>. The results of the current study showed that Gazans living in the eastern regions of the Gaza Strip used to lose many of their domestic animals due to the infiltration of predators such as Arabian wolves, jackals, red foxes, and others across the borders. Studies conducted in Israel showed that the main food category of Golden Jackals as cousins to Arabian Wolves were ungulates, 80% of which are domestic. Other common food types include fruit, birds, small mammals and invertebrates (Borkowski *et al.*, 2011) <sup>[34]</sup>. In Greece, Stray Dogs and Golden Jackals are the only animals that can prey on livestock in areas where Wolves are not found (Giannatos *et al.*, 2005) <sup>[60]</sup>. Scat analysis of the Arabian Wolves (*Canis anthus*) and African Golden Wolf (*Canis anthus*) shows that a great percentage was animal remains while plant remains constituted a lower percentage (Ciucci *et al.*, 1996 and Eddine *et al.*, 2017) <sup>[38, 47]</sup>. Although they are cousins, Grey Wolves were found to attack Domestic Dogs and feed on them (Kojola *et al.*, 2022) <sup>[5]</sup>. In Michigan, Wolves were found to prey on livestock and Domestic Dogs (Sidorovich *et al.*, 2003 and Edge *et al.*, 2011) <sup>[96, 48]</sup>. In Canada, swimming Wolves (*Canis lupus*) were found to attack a swimming Moose (*Alces alces*) (Jordan *et al.*, 2010) <sup>[71]</sup>. In central Greece and Iran, residents usually suffer from the predation of the Grey Wolf on wild ungulates and livestock (Iliopoulos *et al.*, 2009 and Hosseini-Zavarei *et al.*, 2013) <sup>[70, 67]</sup>.

Wildlife attacks on humans are an example of serious human-wildlife conflict (Treves *et al.*, 2004; Hindrikson *et al.*, 2017 and Naderi, 2017) <sup>[100, 66, 86]</sup>. As previously stated, the Arabian Wolf tends not to attack adult Gazans, but it may attack and harm a young child if it had the opportunity as claimed by some Gazans. Such claims of canids attacking humans have been documented in various countries around the world and examples are numerous and growing. Linnell and Alleau (2016) <sup>[77]</sup> and Linnell *et al.* (2003 and 2021) <sup>[78-79]</sup> have investigated many Wolf attacks on humans in many locations and in different ways. Coyotes (*Canis latrans*) caused extreme attacks on humans in North America and Canada (White and Gehrt, 2009 and Gehrt *et al.*, 2022) <sup>[105, 56]</sup>. In southern Bangladesh, two young children were attacked and killed by Golden Jackals in 1979 (Poche *et al.*, 1987) <sup>[90]</sup>. In Hamedan province of west Iran, 53 Wolf attacks were recorded on humans with the majority of victims were children and most incidents took place during the Wolf's pup-rearing season (Behdarvand and Kaboli, 2015) <sup>[30]</sup>. Khan (2017) <sup>[73]</sup> pointed out that a Himalayan Wolf (*Canis himalayensis*) attack of a twelve-year-old case at high altitude. In Turkey, Wolf attacks on human resulted in rabies and death (Türkmen *et al.*, 2012) <sup>[102]</sup>.

The fears among Gazans on the possible role of the Arabian Wolf in transmitting rabies can be considered though the main source of rabies is Stray and Feral Dogs (Seimenis, 2008; David *et al.*, 2009; David and Yakobson, 2011; Cohen-Manheim *et al.*, 2018 and Fayyad *et al.*, 2019) <sup>[94, 44, 45, 39, 50]</sup>. Such fears of rabies from canids crossing borders such as the case in the eastern Gaza Strip cannot be ruled out (Awerbuch-Friedlander, 2005) <sup>[26]</sup>. Despite Israel's successes in managing rabies (Linhart *et al.*, 1997 and Yakobson *et al.*, 2006) <sup>[76, 107]</sup>, a case occurred in 1996 due to being bitten by a small animal, possibly a mouse or rat. The patient's condition deteriorated until he died. The immunofluorescence examination of the skin biopsy was positive for rabies (Gdalevich *et al.*, 2000) <sup>[54]</sup>. Also in Israel, the transmission of rabies virus via livestock has been recorded and thus poses a threat to public health (David *et al.*, 2015) <sup>[43]</sup>. It was estimated that more than 55,000 people die from viral disease every year, mostly in Africa and Asia (Vodopija *et al.*, 2016) <sup>[104]</sup>. Fayyad *et al.* (2019) <sup>[50]</sup> proposed a new strategy to enable wider vaccination coverage of Stray Dogs combined with control of the breeding activities of these dogs in order to reduce the risk of rabies transmission to Palestinians.

The use of live traps such as wire cages and foothold traps to hunt carnivores and other mammalian fauna was documented in the Gaza Strip. The kind of foothold traps applied in the Gaza Strip is disastrous because they are made of pure iron. Such metal foothold traps were known to cause harmful and painful lesions to the mammalian species hunted including Domestic Cats (*Felis catus*) and Domestic Dogs (*Canis familiaris*) (Abd Rabou, 2009 and Abd Rabou *et al.*, 2021) <sup>[3, 10]</sup>. In USA, standard foothold traps equipped with rubber padded jaws were commonly used as a depredation management tool to control Coyote (*Canis latrans*) populations (Phillip *et al.* 1996) <sup>[89]</sup>. The foothold traps used locally were stated to break and crush the animal's limb, immobilize the animal and make it vulnerable to predation and without shelter from the harsh weather conditions. In conclusion, the current study recommends the need to raise ecological awareness among Gazans to protect the Arabian Wolf and other wildlife categories in a sustainable manner and to adopt safe control measures for carnivores, including the construction of protective fences for agricultural fields and animal pens.

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