

# On the Palestinian Reptilian Fauna Caged and/or Kept Stuffed at Zoos of the Gaza Strip

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## Abstract

The strategic geographical location of Palestine, along with its topography, diversity of ecosystems and climatic changes, create a suitable environment for the presence of reptiles. Zoos in the Gaza Strip have a variety of zoo animals including terrestrial, freshwater and marine reptiles. The present study aims to document the Palestinian reptiles held in captivity and/or kept stuffed at zoos in the Gaza Strip. Repeated visits to Gaza zoos were conducted over a ten-year period from 2010 to 2019 to achieve the purpose of the study. Digital cameras and guidebooks were used to document and identify Palestinian reptiles. In addition, interviews were carried out with zoo owners and workers and some reptile hunters who provide live and even dead specimens to Gaza zoos and had their specimens identified and photographed. A total of 29 Palestinian reptile species (one crocodile, four turtles, six lizards and 18 snake species), belonging to 3 orders and 15 families, were recorded as live or preserved specimens at Gaza zoos. The Nile Crocodile (*Crocodylus niloticus*), which went extinct in Palestine since the beginning of the 20<sup>th</sup> century, is the biggest reptilian encountered in the current study. Nearly all these reptiles were trapped using different means in the marine, freshwater and terrestrial environments of the Gaza Strip. Two of the highly threatened global sea turtle species were encountered: the Loggerhead Sea Turtle (*Caretta caretta*) and the Green Sea Turtle (*Chelonia mydas*). The Spur-thighed Tortoise (*Testudo graeca*), which is classified as vulnerable by the IUCN, is kept in relatively large numbers in cages at Gaza zoos. The Desert Monitor (*Varanus griseus*), Palestine Viper (*Daboia palaestinae*), and Syrian Black Snake (*Coluber jugularis asianus*) were the most occurring lizard and snake species at Gaza zoos. In conclusion, zoos are good tools that contribute to Palestinians' knowledge of their wildlife resources. The ecological role of reptiles in their ecosystems requires Palestinians to protect and conserve them as well as all forms of wildlife in a sustainable manner.

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## Keywords

Reptilian Fauna, Marine Turtles, Snakes, Hunting, Zoos, Gaza Strip, Palestine

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## 1. Introduction

Reptiles are considered a common component of biodiversity in the various landscapes, ecosystems and habitats of Palestine and its neighboring countries, as the nature of the arid and semi-arid region is favorable for the presence of animals [1]-[5]. The nature of the dry and thick skin of this group of animals is suitable for such climates and habitats and protects the animals from shocks and the risks of dehydration [6]. Reptiles, being Poikilotherms or cold-blooded organisms, can become inactive in conditions where food and/or water are scarce [3]. Worldwide, reptilian fauna is mostly threatened by habitat loss and degradation, unsustainable use, invasive species, environmental pollution, disease and global climate change [7].

Reptiles have been extensively studied and surveyed in Middle Eastern countries such as Egypt, the closest country to the Gaza Strip [8]-[14]. For example, Ibrahim [11] studied the reptiles of the Suez Canal University which is located in the Suez Canal zone. He revealed the presence of 19 reptiles comprising 14 lizards and 5 snakes. In Jordan, also very close to Palestine, work on reptiles has also been extensive and intensive [2] [15]-[18]. Other regional countries having considerable reptilian studies included Türkiye [19]-[21], Israel [22]-[24], Saudi Arabia [25]-[27], Lebanon [28] [29], etc. The reptile fauna of Palestine, which exceeds 100 species, includes major groups such as lizards, snakes, and turtles (tortoises, terrapins and sea turtles) [5] [30]. In the West Bank of Palestine, few researchers have focused their work on reptiles and a considerable number of species have been found in every site surveyed or studied [31]-[36]. In the Gaza Strip, work on reptiles is increasing day by day, as a relatively large number of reptiles have been recorded during the past two decades in many ecosystems [1] [37]-[43].

Zoos or zoological gardens, which are institutions that aim to provide ample opportunities for entertainment and education and contribute to the conservation of wildlife, often promote scientific research, especially for environmental and biological parties [44]-[49]. Eight private zoos have been established since 2006 in the five governorates of the Gaza Strip (North, Gaza, Middle, Khan Younis and Rafah), although several have closed in recent years due to intrinsic factors. Zoos in the Gaza Strip have been found to provide income to their owners and contribute well to the knowledge of Gazans about their biodiversity elements [50]-[52]. Particular emphasis has been placed on reptiles held by Gaza zoos. Terrestrial reptiles are usually captured or caught locally using various means, while endangered sea turtles are accidentally caught or killed by longline, gillnet and trawl fisheries [53] [54]. It is worth noting that most species of lizards and snakes cannot survive

for a long time at Gaza zoos due to poor handling and care, and therefore the majority of these species were found preserved (kept stuffed) at zoos. Despite the many studies that have addressed the diversity, care and preservation of reptiles at zoos in many countries of the world [55]-[63], it seems that no scientific studies have been published documenting and studying reptiles in zoos in either the West Bank or the Gaza Strip-Palestine. This study aims to identify the terrestrial, marine and freshwater reptiles caged and/or preserved at Gaza zoos. This study also aims to fill the gap in the Palestinian vertebrates acquired by Gaza zoos, where Abd Rabou [50]-[52] documented the Palestinian mammals and birds present there. In fact, this study is the first of its kind to address the reptiles at Gaza zoos.

## 2. Methodology

### 2.1. Gaza Strip

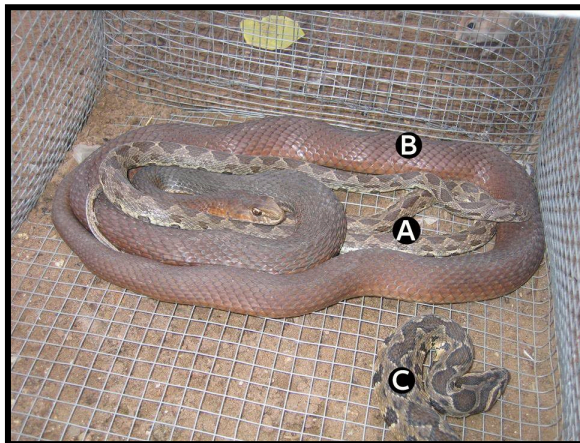
The Gaza Strip (365 km<sup>2</sup>) is an arid to semi-arid coastal zone lying in the southern part of the Palestinian coast along the eastern shore of the Mediterranean Sea (**Figure 1**). It has five governorates: North Gaza, Gaza, Middle, Khan Younis, and Rafah. The local average annual rainfall is 300 mm. Sand dunes are the main feature of the western part of the Gaza Strip, while the clay and clayey lands predominate in the eastern part [64]. Nowadays, the Gaza Strip has a population of about 2.4 million, with the population density reaching 5,500 inhabitants per square kilometer, making the Gaza Strip one of the most densely populated areas in the world. A lot of Gazans (people inhabiting the Gaza Strip) have been engaged in the hunting of various wildlife species including reptiles, in order to rear, preserve or sell them to local zoos and/or pet shops.



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

## 2.2. Procedure

Frequent visits were carried out to the zoos of the Gaza Strip during a ten-year study, extending from 2010 to 2019, in order to record the caged and/or preserved Palestinian reptilian fauna species. It is worth mentioning that all Gaza zoos were host to both live and preserved reptilian specimens (Figure 2 and Figure 3). Wet and dry preservations were present. Formalin preserved specimens were found put in bottles varying in shape, color and size. Most of the preservation vessels were cola bottles. With the exception of Nile Crocodiles, all caged and preserved reptilian species were poorly dealt with at Gaza zoos (Figure 4). Observations and interviews with zoo keepers and wildlife hunters were conducted as well. Wildlife hunters were very supportive in the sense that they provided the author with specimens and photos that enriched the current work. During zoo visits, digital cameras were commonly used for observations and documentation. Identification of reptilian species was made easy using published keys and guidebooks [2]-[5] [65]-[67].



**Figure 2.** A wire cage containing three live snake species was encountered at a zoo in north Gaza: (A) Coin-marked Snake *Hemorrhhis nummifer*, (B) Montpellier Snake *Malpolon monspessulanus* and (C) Palestine Viper *Daboia palaestinae*.



**Figure 3.** Store rooms, having dry and wet preserved reptilian specimens including turtles, lizards and snakes, were common at Gaza zoos.



**Figure 4.** All caged reptilian species were poorly dealt with at Gaza zoos (For example, live specimens of the Spur-thighed Tortoise *Testudo graeca* were poorly caged in the same cages containing birds such as pigeons, doves and others).

### 3. Results

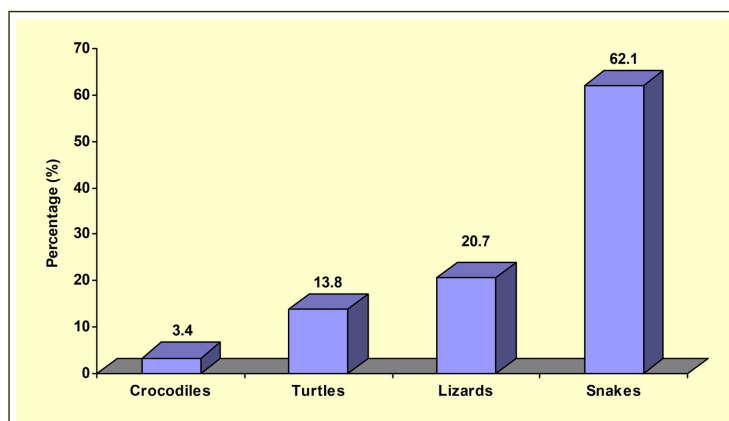
A total number of 29 Palestinian reptilian species (1 crocodile, 4 turtles, 6 lizards, and 18 snakes) belonging to 15 different families and three orders was recorded to be caged and/or preserved (kept stuffed) at the zoos of the Gaza Strip; they are listed in **Table 1** and illustrated in **Figure 5**. The order Squamata, which includes lizards and snakes, was the biggest of the reptilian orders comprising 24 species (82.8%), followed by order Testudines comprising 4 turtle species (13.8%) and order Crocodylia comprising one species (3.4%). The four turtle species represented marine, freshwater and terrestrial habitats of the Gaza Strip. With the exception of the Nile Crocodile (*Crocodylus niloticus*), which is totally extinct in whole Palestine, all the reptilian species were resident and mostly found throughout the year. Some reptiles may cause harm to local people.

**Table 1.** Reptiles recorded in the zoological gardens of the Gaza Strip.

Family	Scientific Name	Common Name	Arabic Name
<b>Order Crocodylia</b>			
Crocodylidae	<i>Crocodylus niloticus</i>	Nile Crocodile	التمساح النيلي
<b>Order Testudines</b>			
Cheloniidae	<i>Caretta caretta</i>	Loggerhead Sea Turtle	السلحفاة البحرية ضخمة الرأس
	<i>Chelonia mydas</i>	Green Sea Turtle	السلحفاة البحرية الخضراء
Geoemydidae	<i>Mauremys caspica</i>	Caspian or Striped-neck Terrapin	السلحفاة القزوينية مخططة الرقبة
Testudinidae	<i>Testudo graeca</i>	Spur-thighed or Greek Tortoise	السلحفاة اليونانية مهمازية الورك
<b>Order Squamata</b>			
Varanidae	<i>Varanus griseus</i>	Desert Monitor	الورل الصحراوي
Agamidae	<i>Stellagama stellio</i> ( <i>Laudakia stellio</i> )	Starred or Roughtail Rock Agama	الحرردون النجمي
Lacertidae	<i>Acanthodactylus boskianus</i>	Bosc's Fringe-toed Lizard	سحلية بوسك هديبية الأصابع
Chamaeleonidae	<i>Chamaeleo chamaeleon</i>	Mediterranean or Common Chameleon	حرباة البحر المتوسط

## Continued

Scincidae	<i>Eumeces schneiderii</i>	Schneider's or Berber Skink	السقنقور البربري (أم الحيات)
	<i>Chalcides ocellatus</i>	Ocellated or Eyed Skink	الدفان (السقنقور العيني - سقنقور الحدائق)
Typhlopidae	<i>Xerotyphlops vermicularis</i>	European Worm or Blind Snake	الثعبان الدودي الأعمى الأوروبي
Boidae	<i>Eryx jaculus</i>	Sand Boa	الذساس أو الدفان (البوا الرملية العاصرة)
Colubridae	<i>Dolichophis jugularis</i>	Syrian Black Snake	الثعبان الأسود السوري (الحنش الأسود - العرييد - الهام الأسود)
	<i>Dolichophis schmidtii</i>	Schmidt's Whip Snake (Red-bellied Racer)	ثعبان شميدت (الثعبان أحمر البطن)
	<i>Hemorrhhois nummifer</i>	Coin-marked Snake	الثعبان النقدي أو البقلاوي العادي
	<i>Platyceps collaris</i>	Red Whip Snake or Collared Dwarf Racer	الأفعى النشابية (رأس النحاس - الثعبان أحمر السوط)
	<i>Spalerosophis diadema</i>	Blotched Diadem or Clifford's Royal Snake	الثعبان الملكي أو الأرقم (الأفعى البقلاوية الصحراوية)
	<i>Eirenis rothii</i>	Roth's Dwarf Racer	الثعبان القزمي المقدسي
	<i>Rhynchocalamus melanocephalus</i>	Black-headed Ground Snake or Palestine Kukri Snake	ثعبان الأرض ذو الرأس الأسود (ثعبان كوكري فلسطين)
	<i>Natrix tessellata</i>	Dice or Water Snake	ثعبان النرد (الثعبان المائي)
	<i>Lytorhynchus diadema</i>	Diademed Sand or Crowned Leaf-nose Snake	الثعبان التاجي ورقي الأنف أو ثعبان الرمال المتوج
	<i>Telescopus nigriceps</i>	Black Headed or Black Cat Snake	ثعبان القط أسود الرأس
<i>Macroprotodon cucullatus</i>	False Smooth Snake	الحية الملساء الكاذبة (البسباس أسود الرأس)	
Psammophiidae	<i>Malpolon monspessulanus</i>	Montpellier Snake	الثعبان الخضاري خلفي الأنياب (أفعى الفران)
	<i>Psammodphis schokari</i>	Schokari Sand Racer	ثعبان أبو السيور (الزاروق)
Micrelapidae	<i>Micrelaps muelleri</i>	Müller's Ground Viper or Müller's Black-headed Snake	الأفعى المولرية (أفعى المسبحة)
Viperidae	<i>Echis coloratus</i>	Palestine Saw-scaled Viper or Painted Carpet Viper	الأفعى منشارية الحراشف الفلسطينية (أفعى السجادة)
	<i>Daboia palaestinae</i>	Palestine Viper	الأفعى الفلسطينية



**Figure 5.** A graphic model showing the percentages of reptilian group (crocodiles, turtles, lizards and snakes) recorded at Gaza zoos.

### 3.1. Order Crocodylia

This order was represented by one species only as follows:

**Nile Crocodile *Crocodylus niloticus* (Laurenti, 1768)**

Although the Nile Crocodile is a reptile that lives in the Nile River and some African rivers, it is a Palestinian reptile that became extinct in the early twentieth century. In Gaza zoos, the Nile Crocodile is exceptional in that it is smuggled into the Gaza Strip from Egypt through underground tunnels that connect the Gaza Strip to Egyptian territory. All other zoo reptiles are hunted or trapped locally. Up to 22 Nile crocodiles were found at Gaza zoos during the succeeding stages of the current study. The specimens were found to be between 70 and 170 cm long. All the zoo crocodiles were found inhabiting small artificial freshwater pools of varying sizes inside tightly closed wire cages (**Figure 6**).



**Figure 6.** Nile Crocodiles *Crocodylus niloticus* are commonly caged at Gaza zoos.

### 3.2. Order Testudines

This order was represented by four turtle species living in the various aquatic and terrestrial habitats of the Gaza Strip as follows:

**Loggerhead Sea Turtle *Caretta caretta* (Linnaeus, 1758):**

The Loggerhead Sea Turtle is one of seven or eight sea turtles known worldwide. It is commonly known as its shell is typically reddish brown. There were doubts about having the females of Loggerheads coming ashore to lay eggs. The local threats to all sea turtles included loss of nesting habitat due to coastal developments and human disturbances (such as coastal lighting and construction developments). In addition, young and adult Loggerheads and other sea turtles such as the Green Sea Turtle (*Chelonia mydas*) and the Leatherback Sea Turtle (*Dermochelys coriacea*) were known to be incidentally caught in local fishing trawls. Although the release of caught specimens to seawater has been recorded in the Gaza

Strip, the slaughtering of other specimens for feeding purposes was recorded as well. As many as eight live and mummified specimens were encountered at Gaza zoos. Sea turtles were commonly seen put in small freshwater ponds in some zoos, while they were put in water fountains existing in other zoos. These inappropriate refuges for sea turtles in zoos make it difficult for them to survive long. The inevitable death of these sea turtles means throwing them or embalming them to stay tilted for periods in front of zoo visitors. On one occasion, the Loggerhead Sea Turtle and the Green Sea Turtle were seen together in a very small pond in a zoo lying in Gaza City (**Figure 7(B)**).

#### **Green Sea Turtle *Chelonia mydas* (Linnaeus, 1758)**

The Green Sea Turtle is the only species in the genus *Chelonia*. The color of the carapace of this species is olive to black. The common name comes as a reflection of the usually green fat found beneath its carapace. The Green Sea Turtle is mostly herbivorous in the sense that it feeds mostly on different species of seagrasses. Slaughtering of the species for feeding purposes was recorded locally. As many as four live and mummified specimens were encountered at Gaza zoos. On one occasion, the Green Sea Turtle and the Loggerhead Sea Turtle were seen together in a very small pond in a zoo lying in Gaza City (**Figure 7(A)**).

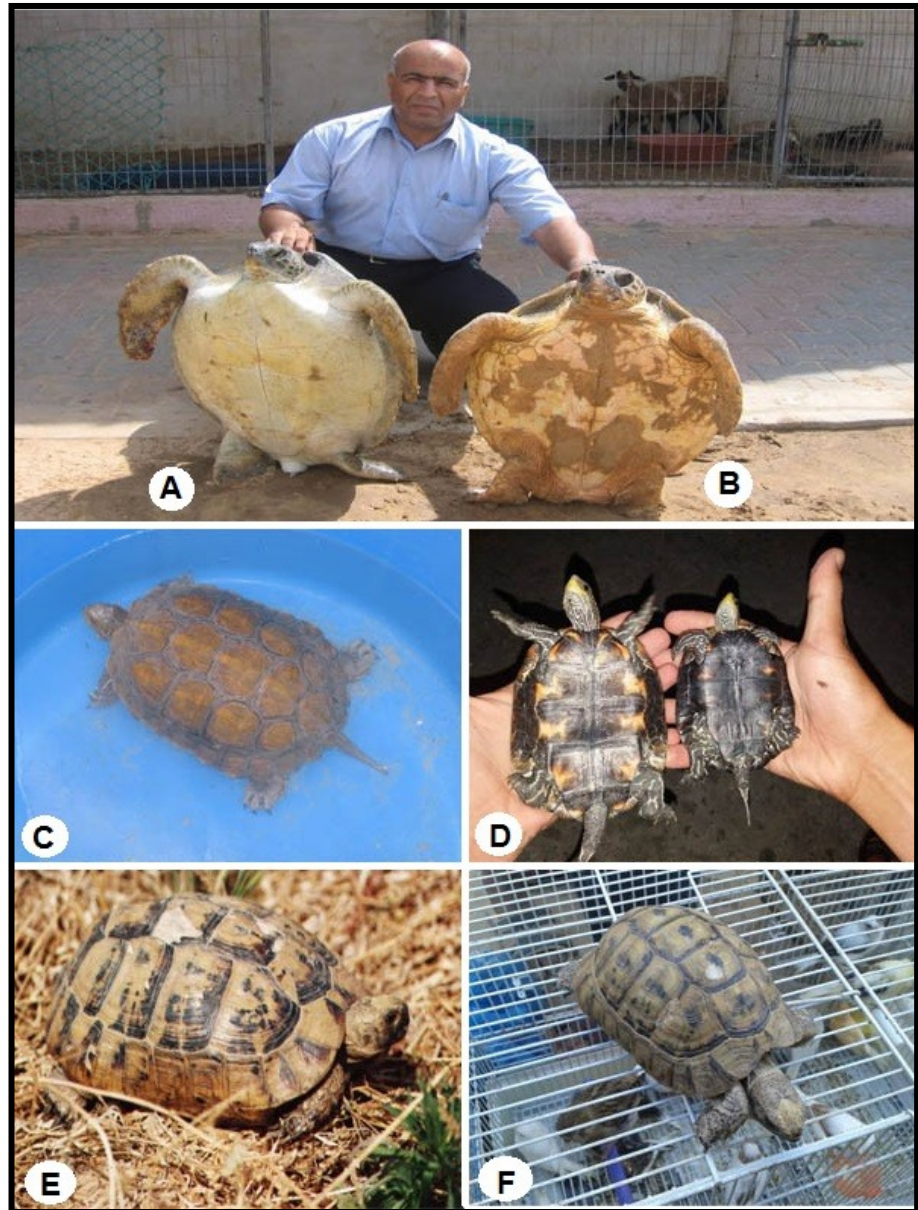
#### **Caspian Terrapin *Mauremys caspica* (Valenciennes, 1833)**

The Caspian Turtle or Terrapin inhabits all types of fresh to brackish perennial water bodies of Palestine; Wadi Gaza and its wetlands are keystone resources of the species in the Gaza Strip. The species thrives in the shallow and highly polluted standing and slow-flowing sewage lagoons and canals in Wadi Gaza. During the study period, five live specimens and another four mummified ones were found at Gaza zoos. The live specimens were found to be put within very small freshwater ponds or sometimes in plastic containers filled with water (**Figure 7(C)** & **Figure 7(D)**).

#### **Spur-thighed Tortoise *Testudo graeca* (Linnaeus, 1758)**

The Spur-thighed Tortoise (Greece or Greek Turtle) inhabits all types of terrestrial and agricultural habitats of the Gaza Strip. This turtle species is commonly hunted and traded as a pet animal in the Gaza Strip. Local welfare concerns exist with this trade, as the juvenile and adult turtles are not properly housed at the Palestinian homes or even caged at Gaza zoos when being sold, leading to a high rate of mortality in captivity. The turtle is herbivorous in the sense that it loves plant materials to feed upon. The findings of the current study show that the Spur-thighed Tortoise is the most common among the Testudines order in being caged at zoos. At least 35 live and mummified specimens were encountered at Gaza zoos (**Figure 4** and **Figure 7(E)** & **Figure 7(F)**). They were commonly caged with other animals including pigeons and doves such as the Rock Pigeon (*Columba livia*), Laughing Dove (*Spilopelia senegalensis*), Turtle Dove (*Streptopelia turtur*), Ringneck or Barbary Dove (*Streptopelia risoria*) in addition to the Indian Crested Porcupines (*Hystrix indica*) and the African Spurred or Sulcata Tortoises (*Centrochelys sulcata*), which were smuggled from Egypt through the earth tunnels joining the

Gaza Strip with the Egyptian Territories. It is worth mentioning that this tortoise is listed as a vulnerable species according to the International Union for Conservation of Nature (IUCN) categories.



**Figure 7.** Marine, freshwater and terrestrial turtle species recorded at Gaza zoos: (A) Green Sea Turtle *Chelonia mydas*, (B) Loggerhead Sea Turtle *Caretta caretta*, (C & D) Caspian or Striped-neck Terrapin *Mauremys caspica*, and (E & F) Spur-thighed or Greek Tortoise *Testudo graeca*.

### 3.3. Order Squamata

Squamata is the largest order of class Reptilia, consisting locally of lizards and snakes, which are collectively known as scaled reptiles or squamates. A total number of 24 species (6 lizards and 18 snakes) was encountered at Gaza zoos as follows:

### 3.3.1. Lizards

#### **Desert Monitor *Varanus griseus* (Daudin, 1768)**

The Desert Monitor is the biggest lizard species living in the Gaza Strip. It is called locally as “*Warra*”. It inhabits different wild and agricultural habitats including the sand dune lying in the western belt of the Gaza Strip. It conceals itself among various vegetation types. The animal seems to feed on toads, lizards, snakes, birds and mammals in addition to the eggs of many wild and domesticated animals as claimed by local farmers. The Desert Monitor falls under an actual threat because of habitat destruction, hunting and intentional killing by farmers and local people. Some Gazans claimed that they usually kill the species because of its fearful size and expected predation on poultries and avian eggs. Nearly all Gaza zoos have multiple live as well as mummified specimens of the Desert Monitor (**Figure 8(A)**). Thus, it was considered as the commonest lizard species caged or preserved at Gaza zoos. On one occasion, two neighboring cages were found to harbor separate specimens of the Desert Monitor and the Nile Monitor (*Varanus niloticus* Linnaeus, 1758), which was smuggled from Egypt to the Gaza Strip through the earth tunnel trade.

#### **Starred or Roughtail Rock Agama *Stellagama stellio* (Linnaeus, 1758)**

The Starred Agama or Roughtail Rock Agama or Sling-tailed Agama (locally known as *Hardon*) is a lizard that is found everywhere in the Gaza Strip, especially agricultural areas, uninhabited buildings and archaeological areas, which are studied with insects; the main food item of the animal. It was one of the most common lizards in the Gaza Strip. Adults may reach a total length of 30-35 cm. This quite shy animal is normally found basking in rocky and stony habitats. It is often seen to dive into cracks in order to hide from potential predators. As many as eight live specimens were found in various bottles and wire cages with narrow openings at Gaza Zoos. Additional three specimens were found preserved in formalin in rooms or stores inside zoos. Aside from live or preserved specimens, dozens of species were often seen basking on the walls of the zoos themselves (**Figure 8(B)**).

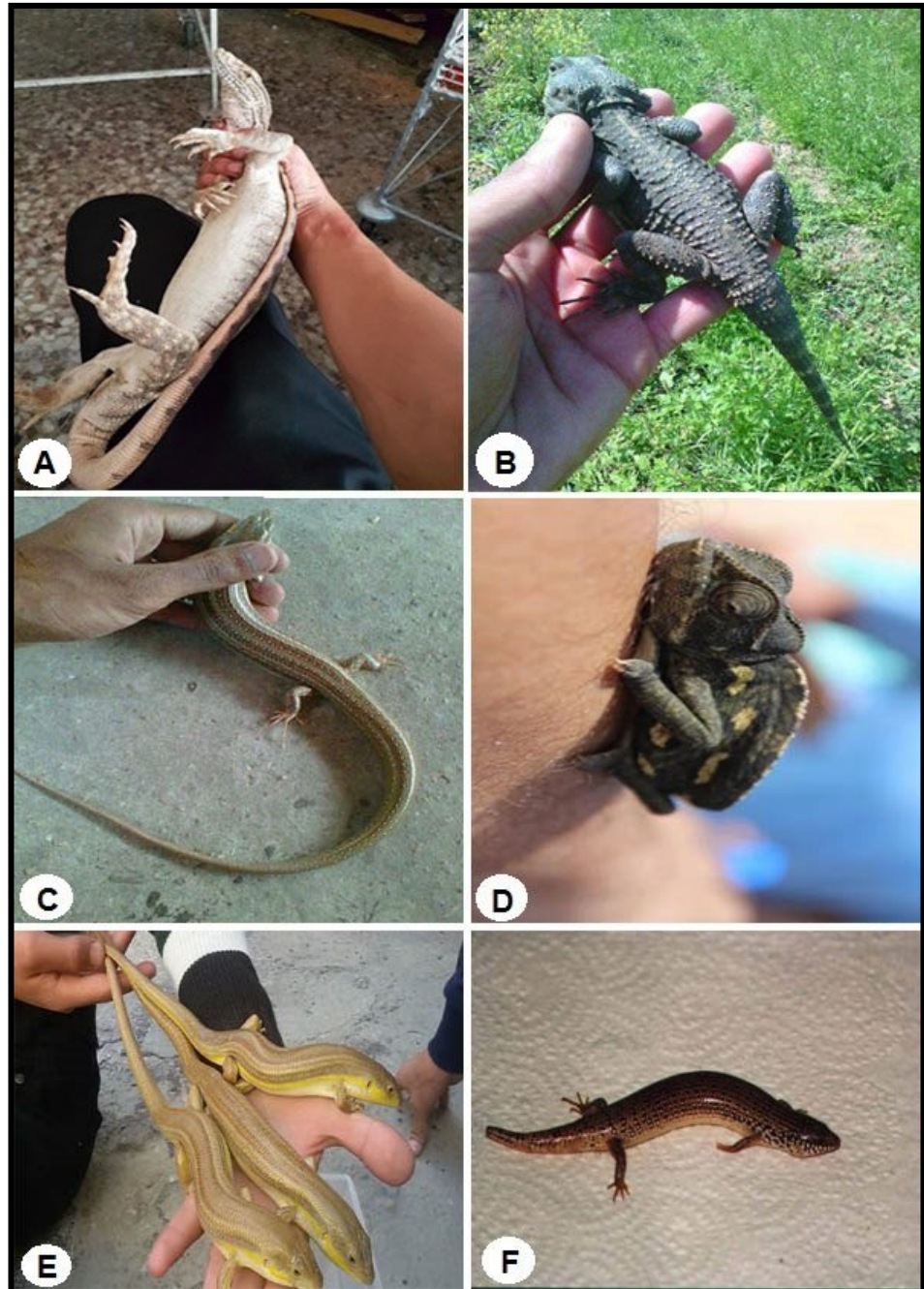
#### **Bosc’s Fringe-toed Lizard *Acanthodactylus boskianus* (Daudin, 1802)**

Like the Starred Agama, the Bosc’s Fringe-toed Lizard is one of the commonest diurnal lizards in the Gaza Strip (**Figure 8(C)**). The dorsal surface has five longitudinal dark stripes. It prevails in a diversity of habitats including coastal and cultivated areas, wadis (valleys) in addition to the sand dune ecosystem dominating the western belt of the Gaza Strip. Similar to most lizards, the species is insectivorous. Only two separate specimens were found preserved in formalin at Gaza zoos.

#### **Mediterranean Chameleon *Chamaeleo chamaeleon* (Linnaeus, 1758)**

The Mediterranean or Common Chameleon is insectivorous in the sense that it captures insects by rapid extension of its long tongue. The species is threatened locally by habitat loss due to urban expansion, intentional killing by children for no clear reasons, and illegal collection as a pet animal in the sense that it can be handled and reared indoors. It is a well-known phenomenon among the Gazans that the Chameleon has a variable color depending on the background in addition

to temperature and light stimuli. Three live specimens were found climbing natural or artificial plants in small cages inside Gaza zoos. On one occasion, a child was found holding a chameleon and resting it on his leg in front of a crowd of visitors (**Figure 8(D)**). In addition, a formalin-preserved specimen was encountered in a room housing mummified reptiles at a zoo in Gaza City.



**Figure 8.** Lizard species recorded at Gaza zoos: (A) Desert Monitor *Varanus griseus*, (B) Starred Agama *Stellagama stellio*, (C) Bosc's Fringe-toed Lizard *Acanthodactylus boskianus*, (D) Mediterranean Chameleon *Chameleo chameleo* (E) Schneider's or Berber Skink *Eumeces schneiderii* and (F) Ocellated Skink *Chalcides ocellatus*.

### Schneider's or Berber Skink *Eumeces schneiderii* (Daudin, 1802)

The Schneider's or Berber Skink, which has a short snout, is a medium-sized lizard reaching a total length of about 40 cm. The lizard is the most beautiful in the Gaza Strip. This animal has a white belly and a beautiful olive-brown back with irregular golden-yellow spots or longitudinal stripes along its scales, which is why it is often hunted locally for the pet trade. Like other lizard species, when this species is threatened, it may drop its tail and grow a new one over time. Although the new tail will work, it will never be the same shape as the original. The Schneider's Skink is a desert to semi-desert-dwelling animal that feeds mainly on arthropods (insects) and sometimes on small vertebrates such as mice. More than 12 live and preserved specimens were encountered at Gaza zoos. Once, a child was found carrying 3 live specimens of Schneider's Skink, and was trying to sell them to a zoo owner at very low prices (Figure 8(E)).

### Ocellated Skink *Chalcides ocellatus* (Forsskål, 1775)

The Ocellated or Eyed Skink (locally known as *Dafan*) is a famous lizard that prevails in farmlands and wadis within the Gaza Strip. The researcher encountered dozens of this skink under stones and wooden crusts located near the wastewater treatment plant in Beit Lahia-North Gaza Strip. It is characterized by having a small head, a cylindrical body and a length exceeding 20 cm. It is a typical skink that has smooth, glossy overlapping dorsal scales and relatively small limbs. It feeds on insects, arachnids and small lizards. Five specimens preserved in formalin were found in rooms housing mummified reptiles and birds within Gaza zoos. Some of these preserved specimens were found missing their tails because these lizards have been known to sever their tails if exposed to danger or threat (Figure 8(F)).

## 3.3.2. Snakes

### European Worm or Blind Snake *Xerotyphlops vermicularis* (Merrem, 1820)

The European Worm or Blind Snake is found year-round in the Gaza Strip. It has a small head, indistinct eyes and a rounded snout. It is a fossorial creature that feeds on insects such as ants in addition to other invertebrates. The specific name *vermicularis* means worm, because most people think that this snake is a worm. Gazans obtained specimens by searching cracked soils and under stones in agricultural fields and vegetated sandy areas. This species is non-venomous, harmless and incapable of biting. The small size (20 - 30 cm), slender shape and burrowing behavior of this species discourage its presence in Gaza zoos, where only two specimens have been found alive (Figure 9(A)) and one mummified.

### Sand Boa *Eryx jaculus* (Linnaeus, 1758)

Generally speaking, boids (family Boidae) have thick bodies that help them suffocate their prey. The Sand Boa has a head that is not distinct from the neck. It can reach a length of 50 cm or more. It is usually found in soft, loose soil by the Gazans. Lizards, rodents, birds, and invertebrates such as insects form the basis of the snake's diet. This species hunts its prey by squeezing it and is neither poisonous nor harmful to humans, but it will try to escape or bite if restrained. Locally, the Sand Boa is a pet that is sometimes traded in pet shops. In Gaza zoos, two live

specimens and one preserved specimen have been recorded. Among these specimens, one was found alive in a small basin containing sand, and in order for some visitors to examine it, zoo workers tried to pull it out of the sand (**Figure 9(B)**).

**Syrian Black Snake *Dolichophis jugularis* (Linnaeus, 1758)**

The Syrian Black Snake (locally known as *Arbeed*) is the most common colubrid snake in Palestine and hence the Gaza Strip. The adults are long, stout and black dorsally. They can reach lengths of more than 200 cm. Immature or young snakes differ from adult snakes in that their colors are lighter. The Syrian Black Snake is found in many environments within the Gaza Strip, especially the agroecosystems. This incredibly fast-moving species is sometimes seen in trees and shrubs inside orchards and farms. Most Gazan farmers are aware of the benefits of this species in combating rodents that usually attack agricultural areas and grain crops and cause losses. The snake also feeds on reptiles, amphibians and small birds. The *Arbeed* (as it is locally called) is non-venomous and harmless, but it is very resistant and bites strongly if restrained. As many as ten live and preserved, adult and juvenile specimens were found in the private zoos scattered within the Gaza Strip (**Figure 9(C)** & **Figure 9(D)**). The live specimens were found put in wired or glassy cages. On one occasion, eight eggs were found in a cage containing an adult specimen (**Figure 9(E)**).

**Schmidt's Whip Snake or Red-bellied Racer *Dolichophis schmidtii* (Nikolsky, 1909)**

Although it is a rare snake species in the Gaza Strip, the Schmidt's Whip Snake or Red-bellied Racer, which may reach a length of more than 100 cm, occurs in a wide variety of habitats including wadis' banks, deserts, hillsides, cultivated fields, vegetated areas of eastern Gaza Strip and rural areas such as Beit Lahia in the north of the Gaza Strip. The snake, which has a head that is distinct from neck, feeds on rodents, lizards, snakes, birds, frogs and insects. Local people usually say that this snake is similar to the Syrian Black Snake—*Arbeed* (*Dolichophis jugularis*), and therefore it is a genetic mutation from it. They usually called it as a “red *Arbeed*”. It often inhabits areas similar to those inhabited by the Syrian Black Snake. Similar to the Syrian Black Snake, this species is non-venomous and harmless, but is very resistant and bites forcefully if restrained. Only one live specimen of this species was recorded at Gaza zoos (**Figure 9(F)**). The zoo owner said that he purchased the snake from a hunter and put it in a wire cage.

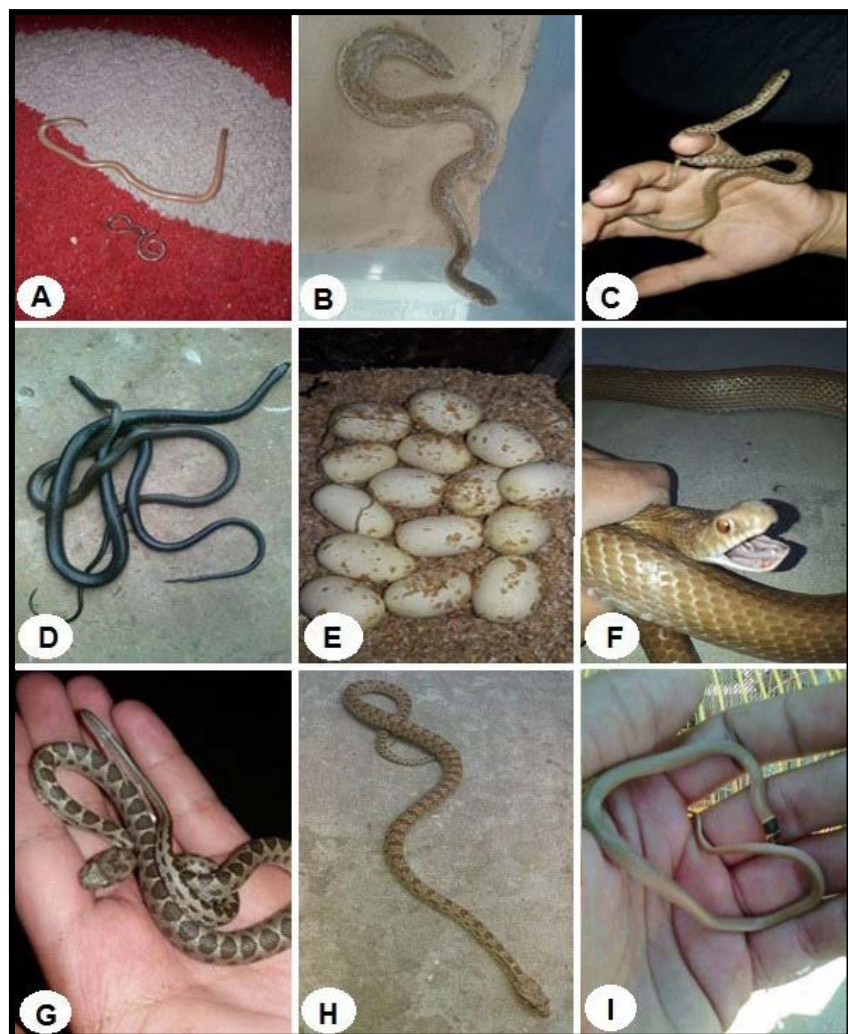
**Coin-marked Snake *Hemorrhhis nummifer* (Reuss, 1834)**

The Coin-marked Snake is not venomous and has a dorsal side that is usually covered by a median row of brown circular or oval spots that resemble coins; hence the name of the species. Some Gazans may be confused because the Coin-marked Snake mimics the Palestine Viper (*Daboia palaestinae*) in its posture as well as the body coloring pattern. In spite of confusion, the Coin-marked Snake is longer and may reach a length of about 100 cm. It feeds on rodents, small birds and reptiles. More than five live specimens of this species were recorded at Gaza zoos (**Figure 9(G)**). On one occasion, this species was found with other species of

snakes in the same wire cage (**Figure 2(A)**).

**Blotched Diadem or Clifford's Royal Snake *Spalerosophis diadema* (Schlegel, 1837)**

The Blotched Diadem Snake or Clifford's Royal Snake or Clifford's Snake or Camel Snake, which has a very distinct head from the neck, is a large, robust, non-venomous snake that can grow to about 100 cm in length. The dorsal side is covered with large brown spots. It lives in deserts, agricultural and vegetated areas, and feeds on rodents, lizards and small birds. When provoked, it makes a loud hiss. Often, some Gazans and even new snake hunters may mistake this species for the previously mentioned Coin-marked Snake (*Hemorrhoids nummifer*) due to their close resemblance. Only two specimens were found alive at Gaza zoos (**Figure 9(H)**).



**Figure 9.** Snake species recorded at Gaza zoos: (A) Eurasian Blind Snake *Xerotyphlops vermicularis*, (B) Sand Boa *Eryx jaculus*, (C & D) Juvenile and adult forms of Syrian Black Snake *Dolichophis jugularis*, (E) Eggs of Syrian Black Snake, (F) Schmidt's Whip Snake *Dolichophis schmidtii*, (G) Coin-marked Snake *Hemorrhoids nummifer*, (H) Diadem or Royal Snake *Spalerosophis diadema*, and (I) Roth's Dwarf Racer *Eirenis rothii*.

**Roth's Dwarf Racer *Eirenis rothii* (Jan, 1863)**

The Roth's Racer is a small, non-venomous snake that grows to be 25 - 35 cm long. The top of the head and neck are black. The body is brownish-yellow dorsally and white ventrally. The snake feeds on arthropods and small lizards. Only two live specimens were encountered throughout the study period at Gaza zoos (**Figure 9(I)**).

**Red Whip Snake or Collared Dwarf Racer *Platyceps collaris* (Müller, 1878)**

The Red Whip Snake is common in the Gaza Strip, and can be easily recognized by the light-dark-edged crossbars that mark its neck. The head cannot be easily distinguished from the neck. It may reach a length of 50 cm or more. This diurnal snake prefers sunny areas with sparse vegetation, and feeds on small lizards common in its habitat. This species is non-venomous and harmless, and when confronted, it quickly flees, often holding its head high. Although there were five preserved samples in the laboratories of the Biology Department at the Islamic University of Gaza, where the researcher works, only three live or preserved samples were encountered at Gaza zoos (**Figure 10(A)**).

**Black-headed Ground or Palestine Kukri Snake *Rhynchocalamus melanocephalus* (Jan, 1862)**

The Black-headed Ground Snake, which is known as the Palestine Kukri Snake or Black-headed Dwarf Snake or Palestine Black-headed Snake, is a small, slender and burrowing snake having a total length of 35 - 40 cm. The head is not distinct from the neck. The upper part of the head and neck is black. The back is tan to orange in color, while the belly is pure white. It spends most of its life underground. It feeds on a diversity of invertebrate species, mainly arthropods. It lives in humid areas found around clayey substrates prevailing in the eastern parts of the Gaza Strip. The species is non-venomous and harmless. Snake hunters claimed that they trapped the species of the three wadis: Wadi Gaza, Wadi As-Salqa and Wadi Beit Hanoun, crossing the Gaza Strip. Only one live specimen was encountered and photographed at Gaza zoos (**Figure 10(B)**).

**Dice or Water Snake *Natrix tessellata* (Laurenti, 1768)**

This is the only snake species that is associated with freshwater habitats such as Wadi Gaza and its associated ponds and pools having reeds and Tamarisk bushes. The presence of the species in the small wetlands characterizing Al-Mawasi ecosystem, the southern Gaza Strip, needs more research. The Dice Snake is slender and long, reaching a maximum length of more than 80 cm. The head is distinct and elongated. The snake feeds on reptiles and frogs available in or near its freshwater habitats. According to Wadi Gaza inhabitants, the Dice Snake was seen sunbathing on various substrates including the banks of Wadi Gaza and the proximate stones. Only one specimen was seen in the hands of a Gazan snake catcher who tried to sell it to a zoo in Gaza City (**Figure 10(C)**).

**Diademed Sand Snake *Lytorhynchus diadema* (Duméril, Bibron & Duméril, 1854)**

The Diademed Sand Snake or the Crowned Leaf-nose Snake is a non-venomous snake of Palestine. It prevails in a wide range of habitats including deserted and

coastal areas. The head is distinct and has an enlarged rostral scale (a medium plate on the tip of the snout that borders the mouth opening), and the neck is thin. It feeds on lizards, small rodents and arthropods. It is a rare species, as only one specimen of it was found in captivity inside a cage containing straw at Gaza zoos (Figure 10(D)).



**Figure 10.** Snake species recorded at Gaza zoos: (A) Red Whip Snake or Collared Dwarf Racer *Platyceps collaris*, (B) Black-headed Ground Snake or Palestine Kukri Snake *Rhynchocalamus melanocephalus*, (C) Dice or Water Snake *Natrix tessellata*, (D) Diademed Sand or Crowned Leaf-nose Snake *Lytorhynchus diadema*, (E & F) Black-headed Cat Snake *Telescopus nigriceps*, and (G) False Smooth Snake *Macroprotodon cucullatus*.

#### **Black-headed Cat Snake *Telescopus nigriceps* (Ahl, 1924)**

As the common name implies, the head of an adult Black-headed Cat Snake has blackish coloration. The snake is arboreal, and it comes down to the ground in search of food. It feeds on reptiles, frogs, birds, and small mammals. This species is slightly venomous but harmless, and its bites cause mild pain with slight swell-

ing. Only two live specimens of the snake were encountered at Gaza zoos (**Figure 10(E)**). However, a live specimen was spotted with a well-known snake catcher, a friend of the researcher, in the northern Gaza Strip (**Figure 10(F)**).

**False Smooth Snake *Macroprotodon cucullatus* (Geoffroy Saint-Hilaire, 1827)**

The False Smooth Snake is a mildly venomous colubrid snake in Palestine. The total length may reach 50 cm or more. The scales of the dorsum are smooth as its common name implies. It is a rare species that inhabits sandy, rocky and vegetated areas, in addition to arable lands in the Gaza Strip. It feeds on reptiles, small mammals and small birds. The snake is not harmful to humans. Only one living specimen of this snake has been found in a wide sand bowl at Gaza zoos (**Figure 10(G)**).

**Montpellier Snake *Malpolon monspessulanus* (Hermann, 1804)**

The Montpellier Snake is a mildly venomous rear-fanged colubrid that is common in the Gaza Strip, even in areas occupied by Gazans. It is not dangerous to humans in the sense that the rear fangs of this snake reduce the possibility of injecting venom. It has been said that human poisoning can occur when a finger is inserted into the snake's mouth. The Montpellier Snake can grow to over 200 cm in length, and has a dangerous and ferocious appearance, which sometimes leads to it being killed by Gazan farmers. It is described as a herpetophagus snake in the sense that it feeds on a variety of reptilian and amphibian species in spite of its probable feeding on small birds and mammals. During a TV interview in 2019, the researcher showed a live adult specimen of this snake to viewers during a TV program talking about the spread of snakes in the Gaza Strip (**Figure 11(A)**). As many as eight live and preserved specimens were encountered at Gaza zoos throughout the study period (**Figure 11(B)**). On one occasion, this species was found with other species of snakes in the same wire cage (**Figure 2(B)**).

**Schokari Sand Racer *Psammophis schokari* (Forskål, 1775)**

The Schokari Sand Snake or Afro-Asian or Forskål's Sand Snake has a cylindrical body with a long tail and head that is elongated and distinct from neck. It is locally called "Abu Al-Siyur" because it has two long lines extending on both sides of its body that resemble belts and tend to be white in color. There are different colors of this snake as shown in **Figure 11(C)** & **Figure 11(D)**. This diurnal and non-venomous snake is found in a variety of habitats in the Gaza Strip including wadis (valleys), sand dunes, agricultural and bushy areas and even cemeteries. This graceful, slender snake can move from bush to bush in the heat of the afternoon. It feeds on small reptiles such as lizards. This snake is sometimes sold in pet shops in the Gaza Strip. Four individuals were recorded alive and stuffed at Gaza zoos (**Figure 11(C)** & **Figure 11(D)**).

**Müller's Ground Viper *Micrelaps muelleri* (Boettger, 1880)**

The Müller's Ground Viper or Müller's Two-headed Snake or Müller's Black-headed Snake is a rare species in the Gaza Strip. It lives in valleys and agricultural areas. The head of this species is very dark, indistinct, slightly flattened, and has small eyes. The body has dark semicircular rings interspersed with lighter bands.

Its length may reach 50 cm. This species may be venomous, but because of its small mouth, its bites may not result in poisoning. Only one live specimen was recorded at Gaza zoos (**Figure 11(E)**).

**Palestine Saw-scaled Viper or Painted Carpet Viper *Echis coloratus* (Günther, 1878)**

The Palestine Saw-scaled Viper or Painted Carpet Viper has a head that is very distinct from neck. The dorsum has light blotches with dark borders. The total length may exceed 80 cm. On the side of the body, there is a row of brownish blotches. This nocturnal viper feeds on rodents, lizards, frogs and invertebrates. In spite of its rare occurrence in the Gaza Strip, the Arabian Saw-scaled Viper is the second most dangerous snake after the Palestine Viper (*Daboia palaestinae*) in Palestine, as it has been attributed to some dangerous bites. It lives in well-vegetated areas and in Wadi Gaza Nature Reserve. Only a formalin-preserved specimen was encountered at Gaza zoos. As zoo workers claimed, the specimen appeared more deformed because it was killed by someone who brought it to the zoo for taxidermy and preservation, so a clear photo from another source was used in **Figure 11(F)**.



**Figure 11.** Snake species recorded at Gaza zoos: (A & B) Montpellier Snake *Malpolon monspessulanus*, (C & D) Schokari Sand Racer *Psammophis schokari*, (E) Müller's Ground Viper *Micrelaps muelleri*, (F) Arabian Saw-scaled Viper or Carpet Viper *Echis coloratus*, and (G & H) Palestine Viper *Daboia palaestinae*.

### **Palestine Viper *Daboia palaestinae* (Werner, 1938)**

The Palestine Viper is an endemic snake species in Palestine. It is characterized by its stout body and its tail that tapers abruptly behind the cloaca. The viper reaches an average length of 70 to 90 cm, and sometimes more. Its head is triangular and distinct from the neck, while the upper part of the body is colored with large dark spots that form a zigzag pattern (**Figure 11(G)** & **Figure 11(H)**). The Palestine Viper is found everywhere in the Gaza Strip, especially its eastern parts which have different irrigated plantations and animal husbandries. This excellent climber viper feeds on a diversity of vertebrate organisms including rodents, reptiles and small birds perching on trees and shrubs. More than 90% of snake bites in Palestine have been attributed to this viper, and as a result, it was considered by all Palestinian health and environmental parties as the most dangerous snake in Palestine and its neighboring countries. The wide spread of this viper in the different environments of the Gaza Strip reflects the extent of its occurrence among the stuffed animals in the Biology Departments of Palestinian universities in the Gaza Strip (Personal Observations). Most Gaza zoos contained some specimens of the Palestine Viper that were recently caught in sealed containers due to their severe venom, in addition to a large number of taxidermied or stuffed individuals (**Figure 11(G)** & **Figure 11(H)**). On one occasion, this species was found with other species of snakes in the same wire cage (**Figure 2(C)**).

## **4. Discussion**

Despite its small area, Palestine (27,000 km<sup>2</sup>), located in the heart of the world, is home to a unique wealth of reptiles of various forms [30]. In the same context, the arid and semi-arid environment in the Gaza Strip hosts dozens of reptiles, as shown by many local studies mentioned above. The relatively small size and free movement of most terrestrial reptiles make it possible for researchers to record other reptile species found in Palestine and surrounding countries that have not been previously recorded in the Gaza Strip. This is due to the possibility that reptile species, especially lizards and snakes, arrived in the Gaza Strip from the Sinai Peninsula in Egypt or from the rest of the Palestinian territories occupied by Israel in 1948. In fact, the studies carried out on reptilian fauna in the rest of Palestine and the Sinai Peninsula in Egypt have shown a high occurrence and diversity [3] [5] [8]-[11] [31] [32]. Some reptile species can move across borders. For example, the Palestine Viper (*Daboia palaestinae*), which is endemic to Palestine and the Levant, has been recorded in Anatolia, Türkiye [68].

In terms of mismanagement in the zoos in the Gaza Strip, most of the reptiles that find their fate as captives in the zoos of the Gaza Strip die after a period of time due to poor care, lack of proper food and perhaps lack of proper space, and the lack of knowledge of the zoo owners on how to care for these poikilothermic or cold-blooded creatures. This is what made reptiles the vertebrates most frequently mummified, whether dry or wet, at Gaza zoos after their inevitable death (Personal Observations). The nature of reptiles as cold-blooded animals needs

special conditions that differ from those of birds and mammals which are warm-blooded animals (homeotherms) and tolerate wide variations in temperature [58] [69], During the researcher's visits in 2011 and 2013 to the Giza Zoo in Cairo, Egypt, he found that many terrestrial reptiles such as turtles, lizards, and snakes sheltered in the "Reptiles House" (Figure 12), which provides the microclimate that the reptiles need, thus reducing their mortality. Such reptile houses are efficient in keeping the ambient temperature consistent with the core temperature of reptiles.



**Figure 12.** The facade of the Reptiles House at Giza Zoo in Egypt houses and protects a collection of Egyptian and international reptiles.

The "Reptiles House" attracts many visitors to learn about Egyptian and international reptiles such as the Egyptian Cobra (*Naja haje*), which is one of the most venomous snakes in North Africa, the Indian Python (*Python molurus*), the Nile Monitor (*Varanus niloticus*), the Desert Monitor (*Varanus griseus*), the Egyptian or Negev Tortoise (*Testudo kleinmanni*), the Nile Crocodile (*Crocodylus niloticus*) and others (Personal Observations). Such reptile houses have not been recognized or built at Gaza zoos simply because of the lack of space, technical capabilities, and trained workers in Gaza zoos, which are all private and for-profit. In fact, if reptile houses were found in Gaza zoos, they would represent a qualitative leap in displaying reptiles of various forms, preserving their lives from destruction, and perhaps facilitating the means of reproduction of these animals. The success of introducing reptiles into a captive group at zoos depends on providing optimal climates and veterinary care [70]. In comparison with zoo birds and mammals, they are common at Gaza zoos as they receive relatively better attention from zoo owners and workers [50]-[52].

The Nile Crocodile, which went extinct in Palestine since the beginning of the 20<sup>th</sup> century, is the biggest reptilian encountered in the current study. In Africa, the species is found mostly in the River Nile and other rivers, lakes, marshes, and dams [71]. It is known as a problem animal, attacking and killing people and their livestock [72]. An indication of the presence of the Nile Crocodile in Palestine may come from the fact that the Al-Zarka River, which lies near Caesarea, north Palestine, was known before as the Crocodile River (*Nahr Al-Timsah*, in Arabic). The causes of extinction of the Nile Crocodile from Palestine may be similar to other localities of the species distributional range. They might include habitat loss, direct conflict with people, uncontrolled hunting for artisanal trade in leather goods, accidental entanglement in fishing nets and indirect anthropogenic effects such as pollutants [72]. Since 2007, many small-sized and newly hatched Nile Crocodiles have been smuggled from Egypt to the Gaza Strip through the border tunnels between Sinai of Egypt and the Gaza Strip. Over the past years, these small-sized crocodiles have grown to varying lengths, as shown in the results of the current study (Figure 6).

Despite its very small area, the Gaza Strip (365 km<sup>2</sup>) is fortunate to have land, freshwater and sea turtles, all of which are threatened within the Gaza Strip. Three species of threatened sea turtles known worldwide, numbering 7-8, have been recorded in the marine waters of the Gaza Strip and have washed up on the beach on several occasions [73] [74]. Two of these species of sea turtles have been found in zoos in Gaza, namely the Loggerhead Sea Turtle and the Green Sea Turtle (Table 1). These sea turtles usually do not survive long at Gaza zoos due to poor management. Their death is inevitable due to poor preservation, food shortage, shallowness of the small ponds that shelter them, and other factors. Therefore, a few specimens of them have been found stuffed after death at Gaza zoos (Figure 3). Wadi Gaza, in the middle of the Gaza Strip, is a keystone habitat of the freshwater Caspian Terrapin [37] [42]. In fact, the Caspian Terrapin is a common inhabitant of Wadi Gaza despite its high level of pollution. This species is also common in polluted and unpolluted rivers and waterways in Palestine [75]. Accordingly, all Caspian Terrapin specimens were brought to Gaza zoos from Wadi Gaza by children or even adults so that they could be easily caught and captured by hand or with nets (Personal Observations). This species is currently under real threat due to the destruction of the wetlands in Wadi Gaza, ongoing poaching, killing by children for unclear reasons, and collection for use as a zoo or pet animal, as confirmed by Al-Sweirki [76]. Similarly, adults and juveniles of the Spur-thighed or Greek Tortoise are easily captured and kept in cages by Palestinians in homes, zoos, and pet shops [76]. This species is the most common in terms of the number of specimens kept in cages at Gaza zoos. According to Bartolomé *et al.* [63], tortoises (family Testudinidae) and monitor lizards (genus *Varanus*) were the most enriched taxa in European zoos. This can be attributed to the fact that individuals of the Spur-thighed Tortoise can live for years due to their easy management and their plant-based diet [6] [77]. The local threats facing this species are not very different from

those reported by Bayley and Highfield [78] and Türkozan *et al.* [79], which include the pet trade, habitat destruction, modification and alteration.

As for lizards in the Gaza Strip, most geckos, skinks and small lizards do not attract the attention of zoo owners and visitors, and as a result they are rarely found in Gaza zoos' cages. Some of these small lizards may be found naturally in zoo yards or on their walls as well. However, there were some species of lizards preserved in formalin and stored inside secondary rooms of Gaza zoos. The arid and semi-arid nature of the Gaza Strip harbors a considerable number of lizards. Almost all of the lizard specimens displayed or kept stuffed at Gaza zoos were brought in by children or reptile hunters. Biological museums in Palestinian universities are usually full of stuffed lizards, as Abd Rabou [41] and Abd Rabou *et al.* [43] pointed out. The Desert Monitor is the largest lizard species found in the Gaza Strip. It inhabits sand dune ecosystems, although it is found in a variety of substrates within the Gaza Strip [39] [42]. In Egypt, the closest country to Palestine, this species has been found to be active and moving in sandy areas throughout the Eastern and Western Deserts, around the Suez Canal and in North Sinai [3] [9] [10] [80] [81]. Although this species is the most common lizard in captivity or kept stuffed at Gaza zoos, it is seriously endangered due to hunting and deliberate killing by Gazans. They claimed that they hunt and kill the animal due to its intimidating size and its predation on poultry and bird eggs. Such similar claims have been confirmed by regional studies [82] [83].

Snakes were found to be the most common reptiles caged or kept stuffed at Gaza zoos. This prevalence can be attributed to several factors, the first of which is that the presence of 18 species of snakes belonging to 6 families, at Gaza zoos reflects their relatively high prevalence in the Gaza Strip, despite the rarity of some species. Second, some Gazans, especially young people, have long specialized in hunting reptiles, especially venomous and non-venomous snakes. They feel a sense of pride and empowerment when they perform hunting shows and display the snakes they catch (Figure 13). Some of these snakes find their way, with or without financial reward, to Gaza zoos, as zoo owners and reptile hunters themselves pointed out. This fate contributed significantly to the diversity of snake species in zoos. Third, snakes, with their colors, lengths and terrifying shapes, are very attractive to zoo owners and visitors alike, and as a result, they are purchased from reptile hunters and kept in cages or even kept stuffed at Gaza zoos. It is worth noting that this study is the first to review a glorious and majestic diversity of venomous and non-venomous snakes (18 species) compared to previous local studies that dealt with reptiles among other vertebrate faunistic species in the Gaza Strip or even in the West Bank of Palestine [1] [31] [32] [35]-[43].

The Eurasian Blind or Worm Snake (*Xerotyphlops vermicularis*) is the smallest of all Gaza snakes. The snake is fossorial, as reptile hunters collect it from burrows and under rocks and stones. Similarly, the species was found under flat stones in meadows and sandy areas rich in shrubs and scattered deciduous trees [3] [84]. Family Colubridae is the largest and most common snake family worldwide, as it

comprises more than half the snake species [4]. In this study, this family was the biggest, having 11 species with terrestrial, aquatic, arboreal and fossorial forms. The Syrian Black Snake, which is known locally as *Arbeed*, (*Dolichophis jugularis*) is considered the most famous not only among the colubrid snakes, but among all known snakes occurring in the Gaza Strip, as indicated by several local studies [34] [42]. The length of the Syrian Black Snake, which was found to exceed 200 cm, usually imposes fear among the Gazan population, and as a result, the snake has been killed by locals. In spite of this painful fact, the snake, which is not poisonous, was respected by a lot of farmers because of its ecological role as a natural enemy to rodents and other pests that cause harm to both Gazan health and agriculture.



**Figure 13.** An amateur snake catcher displaying different species of snakes, most of them non-venomous, before releasing them back into the wild in the northern Gaza Strip.

The presence of the Dice or Water Snake in freshwater habitats in Wadi Gaza means that it coexists with a number of amphibians and reptilian species such as the Levantine Water or Bedriaga's Frog (*Pelophylax bedriagae* Camerano, 1882), European Green Toad (*Bufo viridis* Laurenti, 1768), Savigny's Tree Frog or Lemon-yellow Tree Frog, or Middle East Tree Frog (*Hyla savignyi* Audouin, 1827) and the Caspian Turtle or Striped-neck Terrapin (*Mauremys caspica* Gmelin, 1774) which may be suitable preys of the species. Wadi Gaza was found to harbor a few fish species as well. Similarly, the Dice Snake was encountered to coexist with many fish as well as amphibian species in the Azraq Nature Reserve pools, as pointed out by Amr *et al.* [85]. Special concern is locally and continuously paid to

the poisonous or venomous snakes encountered at Gaza zoos, particularly the Palestine Viper (*Daboia palaestinae*) and the rarely occurring Palestine Saw-scaled Viper (*Echis coloratus*). Many local studies [39] [40] highlighted the endemic Palestine Viper as the commonest venomous snake species in the Gaza Strip. Kochva [86] pointed out that about a quarter of the snakes in the region are poisonous, and that the Palestine Viper is the most widespread and poisonous among them. Due to its extreme toxicity and danger to public health, many studies have confirmed that most snake bites in the Levant are attributed to the Palestine viper [1] [4] [15] [34] [40] [67] [86]-[88]. Envenomation by the Palestine Viper is not restricted to humans, but it has also been reported in domestic animals as many Gazans claimed [40] and confirmed by Tirosh-Levy *et al.* [89].



**Figure 14.** The researcher displaying a stuffed specimen of the Field's Horned Viper or False Horn Viper (*Pseudocerastes fieldi* Schmidt, 1930) encountered at the museum of the Palestinian Red Crescent in Khan Youis, southern Gaza Strip.

Apart from the snakes recorded in the present study, there is one point the researcher would like to clarify regarding a specimen of the Field's Horned Viper or False Horn Viper (*Pseudocerastes fieldi* Schmidt, 1930) that was found stuffed in a small museum in the Gaza Strip. This species of venomous snake is endemic to the deserts of the Middle East [90] and is a Palestinian reptile, as documented by Merry *et al.* [30]. No specimens of this species have been found before during field studies or even at Gaza zoos. Only a stuffed specimen was found in the small museum of the Palestinian Red Crescent in Khan Yunis in 2012 in the southern Gaza Strip (Figure 14). In fact, no one knows where this preserved specimen came from. Did it come from Egypt, where the viper is widespread [6] [90], or was it

captured in the Gaza Strip and then preserved? It is worth noting that this snake lives in the Negev Desert near the Gaza Strip in southern Palestine [86]. In Jordan, the Field's Horned Viper is considered one of the most venomous snakes and is capable of causing life-threatening envenomation to humans [67] [91].

It is not surprising that other species of snakes and other reptiles will be counted in the Gaza Strip in the coming years, simply because the reptiles may move across the borders from the Sinai Peninsula or the rest of the occupied Palestinian territories to the Gaza Strip. In conclusion, the study recommends protecting reptiles in the Gaza Strip and reducing their pursuit and hunting, as they are part of the important Palestinian biodiversity, and their important ecological role in Palestinian nature cannot be underestimated in any way. The study also recommends improving the status of zoos in the Gaza Strip and providing appropriate care for their reptiles, including establishing a reptile house that provides suitable climates and meets the living needs of captive reptiles.

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### Conflicts of Interest

The author declares no conflicts of interest regarding the publication of this paper.

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