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Surveying wildlife roadkills in the West Bank Governorates-Palestine

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Abstract

The paper aimed at surveying wildlife roadkills in the West Bank Governorates-Palestine from January 2016 till January 2017. The present survey results, thirteen target wildlife species were recorded, of which eight mammals and five reptiles corresponding to 78 (58%), and 56 (42%) accordingly. The mammal's species, include the following Species (*Procapra capensis*, *Erinaceus concolor*, *Vulpes ruppellii*, *Hyaena hyaena*, *Sus scrofa*, *Gazella gazelle*, *Hystrix indica*, and *Lepus capensis*), and the reptiles, Species include (*Testudo graeca*, *Chamaeleo chamaeleon*, *Vipera palestinae*, *Hemorrhoids nummifer* and, *dolichophis jugularis*).

The roadkills of mammalian species were higher in number (78) individuals when compared with the roadkills of reptiles species (56). The females were dominating among mammal's roadkills, and males were dominating among the recorded reptile's roadkills. The maximum frequency of road-kills was in the spring and summer months of the years, while the lowest frequency was during the autumn and winter months of October–March.

Keywords: Wildlife, Roadkills, Palestine

1. Introduction

Wildlife represents a significant and valued natural resource in Palestine. The mammal's fauna of Palestine consist of 65 species belonging to 29 genera and 26 families [1]; while the Palestinian herpetofauna harbor (4 Amphibians and 54 reptiles) [2]. Wildlife trying to cross the roads is vulnerable to road kills. In Palestine's roads, like many other countries, hundreds of animals are killed or wounded by unsuspecting drivers, and sadly, there's not much the average driver can do about it. One of the first people to comment on the significance of roadkills was the American naturalist Joseph Grinnell; he estimated the mortality count in California (back in 1920) ran into the hundreds if not thousands of animals every day [3]. One of the most studied effects on biodiversity in recent years is the wildlife roadkills. [4,5,6,7,8] These effects are related to the mortality of animals during the construction of a highway, mortality from collision with vehicles, modification in animal behavior, increasing the human use and occupation of the surrounding areas, habitat fragmentation, alter escape response and the introduction of exotic species [9].

Road traffic may be destructive to wildlife populations in two ways: directly, in the sense of actually killing animals; and indirectly by fragmenting a population's habitat, which in turn may lead to the isolation of populations, which may result in a reduced population size, and increased the stochastic risk of extinction [10,11]. The wildlife roadkills, occur because the highways cut through the habitat of the species, interfering with their natural range of movement and resulting in collisions with vehicles [12]. In addition, the attractions by the carcasses or roadkills dead body, are increasing the risk of new collisions and generating a continuous cycle of diversity loss [6]. The potential mitigation measures such as tunnels, fences, and other apparatuses, in a country like Palestine, are so limited by economic and political considerations.

The present study objective was to surveying wildlife roadkills in the West Bank Governorates-Palestine from January 2016 till January 2017

2. Materials and Methods

The present study was conducted in the West Bank Governorates roads, mainly the bypass roads that have been constructed following the peace process accords, and connecting major cities and governorates of the West Bank of Palestine.

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Additionally, the present study monitored roads that were located in the peripheral areas of cities, villages, and towns.

The present study referred to all kinds of media for news on wildlife -cars accidents were we focused on the involved wildlife species the roads location and the geographical coordinates where it was possible. We also tried to obtain information from the public relationship of Palestinian Police. From this source, there were no data about the age or the sex of the animal involved. Wildlife roadkills data were obtained during the time period from January 2016 till January 2017.

Another set of data obtained by 12 volunteers traveling on daily basis to their work in Ramallah governorate, from the entire West Bank governorates, each roadkilled animal was identified to species level, the collection date was noted and photos also were taken to confirm the proper identification of species. The roadkills data were grouped for each group of animals.

A table of wildlife species roadkills, the geographical locations, the sex, frequencies of species roadkills, and their conservation status according to the IUCN was prepared based on the present study data.

3. Results and discussion

This present survey is the first of its kind in Palestine, so it encourages other researchers to address the roadkills issues in the future, for better understanding and subsequent conservation measures. The present study, obtained a list of 13 roadkilled species, corresponding to 78, (58%), of the totaled recorded wildlife roadkills was roadkilled mammals belonging 8 species, these were Hyrax (*Procavia capensis*), Eastern European Hedgehog (*Erinaceus concolor*), Ruppelli's Fox (*Vulpes ruppellii*), Striped Hyena (*Hyaena hyaena*), Wild boar (*Sus scrofa*), Mountain gazelle (*Gazella gazelle*), Old world porcupine (*Hystrix indica*), and Cape hare (*Lepus capensis*), along with 56,(42%) individuals of the totaled recorded wildlife roadkills were reptiles, belonging to 5 Species including (Common Tortoise (*Testudo graeca*), Mediterranean chameleon (*Chamaeleo chamaeleon*), Palestine viper (*Vipera palestinae*), Coin-Marked Snake (*Hemorrhoids nummifer*) and Large Whip Snake (*dolichophis jugularis*), as shown in Table 1.

The Ruppelli's Fox (*Vulpes ruppellii*) (N= 37), was the major

victim among 8 species of mammals, followed by Eastern European Hedgehog (*Erinaceus concolor*) (N=13), then followed by Wild boar (*Sus scrofa*) (N=8) as well as the Hyrax (*Procavia capensis*) (N=8), then other species as shown in Table 1.

The Coin-Marked Snake (*Hemorrhoids nummifer*) (N=22) was the major victim among 5 species of reptiles, followed by Mediterranean chameleon (*Chamaeleo chamaeleon*) (N=19), then followed by Large Whip Snake (*dolichophis jugularis*) (N=7), and followed by Palestine viper (*Vipera palestinae*) (N=5). This case indicated snakes among reptiles showed the highest mortality due to their use of road substrate for their thermo regulation^[13,14].

The roadkills of mammalian species were higher in number to the roadkills of reptiles. The study results indicated that the maximum frequency of road-kills was in the spring and summer months of the years, while the lowest frequency of road-kills was during the autumn and winter months of October–March. The Mountain gazelle (*Gazella gazelle*), species is listed as Vulnerable^[15], and the Striped hyena (*Hyaena hyaena*), is listed as near threaten^[15], while the remaining six mammalian species are listed least concern^[15].

For near threatened species like a striped hyena and vulnerable species like Mountain gazelle, even the death of a few individuals might have an appreciable effect on small populations of Palestine.

As for the Roadkilled Reptiles, the only species, Common Tortoise (*Testudo graeca*) is listed as Vulnerable, while the remaining four reptilian species are listed least concern^[15].

The sex ratio among mammal roadkills indicated that 38% (30 individuals) of the recorded roadkills were male, while 55% (43 individuals) of the recorded roadkills were female, and the remaining 7% (5 individuals) were not possible to define their sex. These results indicate that the females were dominating among mammals roadkills.

But in the case of Reptiles roadkills, sex ratio, the results indicated that 9% (5 individuals) of the recorded reptile's roadkills were male, while 5% (3 individuals) of the recorded roadkills were female, and the remaining 86% (48 individuals) were not possible to define their sex. These results indicate that the males are dominating among the defined reptiles roadkills as shown in Fig 1.

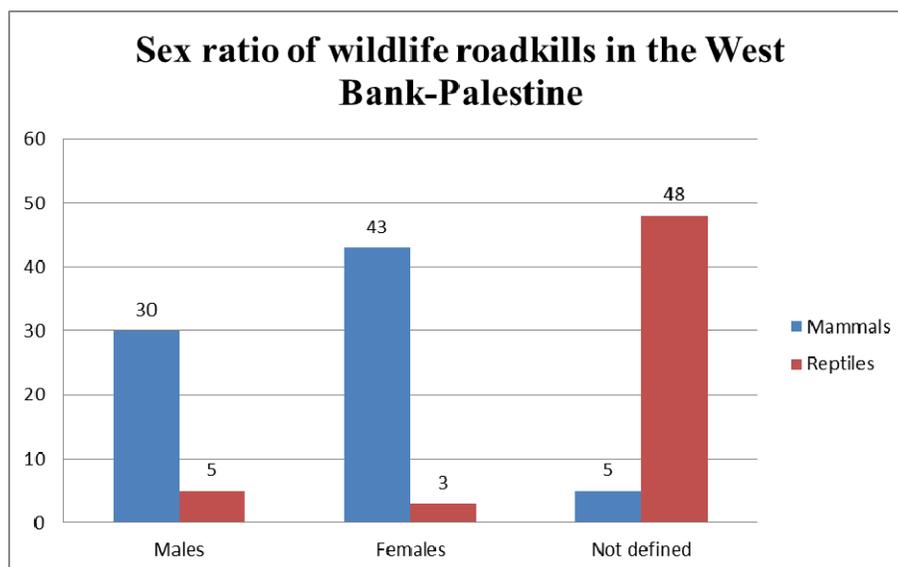


Fig 1: The sex ratio of wildlife roadkills in the West Bank governorates-Palestine.

The present study indicated that the average roadkill per month is estimated at 11.16 wild animals.

Unfortunately, our scarce data did not permit me to include bird's roadkills.

Table 1: A list of roadkilled wildlife species, the geographical location, sex, frequencies, and their conservation status according to the IUCN.

	Roadkilled Species		Geo-Location	Months of the Year	Sex		Frequency	% of total wildlife roadkills	IUCN Red list category
	English name	Scientific Name	Governorates		M	F			
1	Hyrax	<i>Procavia capensis</i>	Ramallah; Nablus; Tulkarem; Jenin; Tubas, Bethlehem	Jan-October	5	3	8	0.06	LC
2	Eastern European hedgehog	<i>Erinaceus concolor</i>	Hebron; Nablus; Tulkarem; Jenin; Tubas, Bethlehem	March-August	6	7	13	0.10	LC
3	Ruppelli's fox	<i>Vulpes ruppellii</i>	Hebron; Nablus; Tulkarem; Jenin; Tubas, Bethlehem, Ramallah, Salfit		15	22	37	0.28	LC
4	Striped hyena	<i>Hyaena hyaena</i>	Tubas			1	1	0.01	Near Threatened
5	Wild boar	<i>Sus scrofa</i>	Nablus; Tulkarem; Jenin; Tubas, Ramallah, Salfit		ND	5	8	0.06	LC
6	Mountain gazelle	<i>Gazella gazella</i>	Bethlehem		1	1	2	0.01	Vulnerable
7	Old world porcupine	<i>Hystrix indica</i>	Jericho, Tubas, Nablus		ND	3	5	0.04	LC
8	Cape hare	<i>Lepus capensis</i>	Hebron, Bethlehem		3	1	4	0.03	LC
9	Common Tortoise	<i>Testudo graeca</i>	Bethlehem		ND	ND	3	0.02	Vulnerable
10	Mediterranean chameleon	<i>Chamaeleo chamaeleon</i>	Hebron; Bethlehem		3+ND	5	19	0.14	LC
11	Palestine viper	<i>Vipera palestinae</i>	Hebron, Bethlehem, Nablus		ND	ND	5	0.04	LC
12	Coin-Marked Snake	<i>Hemorrhois nummifer</i>	Hebron; Nablus; Tulkarem; Jenin; Tubas, Bethlehem, Ramallah, Salfit		ND	ND	22	0.16	LC
13	Large Whip Snake	<i>dolichophis jugularis</i>	Hebron; Nablus; Tulkarem; Jenin; Tubas, Bethlehem, Ramallah, Salfit		ND	ND	7	0.05	LC

*ND. Not defined.

4. Conclusion

The findings of the present survey highlight that roads, either the bypass roads or the peripheral roads located in the inner areas of cities and towns are potential sources of threats to the Palestinian wildlife populations and should be considered in any strategy or plans for conservation of wildlife in Palestine. In addition, the survey results offer a useful source of information that can be used not only in the wildlife road tandem but also in other zoological, behavioral and ecological studies, such as those addressing species distribution, and abundance.

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