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Attitude of hunters on snake habitat and management system in Cyprus

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Abstract

Aim: Turkish Republic of Northern Cyprus is home to a number of snake species. This study aimed to investigate the effect of hunting on snakes in Northern Cyprus.

Methodology: Questionnaire was developed which had both qualitative and quantitative sections. The questionnaire was filled with personal interviews with hunters of old and young generations. Moreover, people from various fields were also interviewed for this purpose. Once the questionnaire was developed, specific public from the study area were identified.

Results: Most hunters know about the Blunt nosed viper (*Macrovipera lebetina*) as the only poisonous specie on the island but they only had the knowledge of 3 or 4 species so they mostly get confused Blunt nosed viper with other species like Coin snake (*Hemorrhois nummifer*), Cat snake (*Telescopus fallax*) and Large whip snake (*Typhlops vermicularis*) during sexual maturity. Most hunters think Co in snake is also poisonous due to its similarity with Blunt nosed viper. Cat snake is also thought to be poisonous among some hunters. Mostly, the grey and dotted, square or ring like patterns is considered as poisonous snake. Coin snake is the main victim of killing due to its similarity with the Blunt nosed viper.

Interpretation: Most hunters know that snake population is decreasing day by day and hunting is the biggest threat to them. Due to vigorous hunting on small island, the snakes are being targeted by the hunters. The second major threat is habitat loss due to land use.

Key words: Hunters, Northern Cyprus, Snake habitat

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Introduction

Environmental issues are being given increasing importance throughout the world during recent times. All the major problems are connected with each other as thread hold, impacting one another. One of the major concern is loss of biodiversity. Biodiversity is affected by other issues such as deforestation, climate change, urbanization, natural resource depletion and over population (Kilbert, 2000). Loss of biodiversity mainly due to urbanization affects all kind of species. The reduced number is due do different environmental issues, which finally leads to extinction of specie. Reptiles are also affected by environmental issues and are constantly decreasing in numbers. Most of them have been enlisted as endangered species. Snake population is one of the most affected groups among reptiles, however, with their decreasing population there are number of social issues along with the environmental issues (Pimm *et al.*, 1995). Lack of biodiversity threatens long-term firmness of this modern society (Chapin *et al.*, 2000). Even though international extinctions or disappearance have a root reason, *i.e.*, in particular growing human populace, the mechanisms that threaten the population are pushed extinct are complicated, numerous, and synergistic (Forester and Machlis, 1996). Commonly, anthropogenic traits consisting of agriculture, housing, and transportation infrastructure result in dropping and fragmentation of habitat that is utilized by different species. This lack of connectivity lead to decrease in genetic diversity and inbreeding despair in affected population, making them liable to illnesses and stochastic environmental events (Frankham *et al.*, 2002).

Human influences (Anthropogenic influences) are also causing a boom in frequency of stochastic environmental activities via mechanisms along with altered wildfire regimes, invasive species creation, and weather change (Coblentz, 1990; Meehl *et al.*, 2000; Syphard *et al.*, 2007). These anthropogenic disturbances change the structure and functioning of the biodiversity (flora and fauna) which adversely affect the soil system as well as whole forest / ecosystem (Kadeba and Aduayi 1985; Bargali *et al.*, 1992a and b; Bargali *et al.*, 1993; Joshi *et al.*, 1997; Bargali and Singh 1997a and b). The worldwide biodiversity crisis has acquired good sized interest during last decade (Pickett *et al.*, 1997). The decline of some vertebrate taxa has been documented, especially mammals, birds and lately amphibians. However, as a set, squamate reptiles (lizards and snakes) have received less attention (Dodd, 1987; 1993). Its miles broadly diagnosed that know-how distribution and abundance of organisms on the subject of variation in ecological factors is a crucial step in control. Despite the fact that the ecological relationship of lizards were tested in a few element over the past 30 years (Pianka, 1986), snakes have obtained rather little interest in this regard (Vitt, 1987).

Reptiles are 250 million year old specie that appeared in late Palaeozoic Era (Hedges and Poling, 1999). Reptiles like

snakes have evolved extensively adapting to almost varied temperature, tropical and desert environment, and to terrestrial, freshwater and marine habitats. Reptiles play a vital role in natural structures, as predators, prey, grazers, seed dispersers and commensal species; they serve as bioindicator for environmental fitness, and their regular unique microhabitat associations offer perfect look at machine to illustrate the biological and evolutionary processes underlying speciation (Raxworthy *et al.*, 2008; Read, 1998).

Snakes usually have narrower distributional levels than other vertebrates along with birds and mammals (Anderson, 1984; Anderson and Marcus, 1992), making them extra prone to hazard techniques, but there's a few marked version in variety length among special clades of reptiles (Anderson and Marcus, 1992). This combination of small variety and narrow area of interest necessities make reptiles prone to anthropogenic risk. Regional tests in Europe (Cox and Temple, 2009) and southern Africa (South Africa, Lesotho and Swaziland; Bates *et al.*, in press) suggest that 1/5th and 1/10th of reptilian species are at the verge of extinction. It has additionally been proposed that reptilian declines are comparable in taxonomic breadth, geographic scope and severity to those presently found in amphibians (Gibbons *et al.*, 2000). Decline in reptile population has been attributed to habitat loss and degradation, in addition to unsustainable exchange, invasive species, pollution, disorder and climate exchange (Cox and Temple, 2009; Gibbons *et al.*, 2000; Todd *et al.*, 2010). In all 9,084 species of reptiles have been described (Uetz, 2010), and new molecular evidence continues to unearth severa cryptic species that have not been previously detected through morphological analyses (Adalsteinsson *et al.*, 2009; Nagy *et al.*, 2012; Oliver *et al.*, 2009). Reptiles are perhaps one of the least studied vertebra as 65% of reptiles have now not been evaluated in IUCN purple listing checks (Böhm *et al.*, 2013). Additionally, of these species that have been evaluated, 20% of them were deemed facts deficient (Böhm *et al.*, 2013). That is troubling given latest concerns that reptiles perhaps experiencing worldwide declines on par with the ones in other taxa (Gibbons *et al.*, 2000; Böhm *et al.*, 2016). Among reptiles, snakes perhaps high-quality epitomize the hassle of each a extensive lack of statistics and current enigmatic declines across several continents (Winne *et al.*, Todd *et al.*, 2010). accordingly, figuring out which traits in snakes are associated with sensitivity to human land use described here as the absence of a species from human-dominated landscapes, either because of habitat selection or due to local extirpations may offer well timed statistics to save you declines of those regularly omitted or understudied species.

Materials and Methods

This research is based on the social survey which aims at finding out general information about snakes and the reasons behind declining population of snakes. This study aimed to investigate the attitude of hunters towards snake's habitat due to

Fig. 1 : Demographic distribution.

snake population decline and the management system of snake habitat in Cyprus. Questionnaire was prepared which had both qualitative and quantitative sections. The questionnaire was filled in personal interviews with hunters of old generation and young generation. Moreover people from various fields were also interviewed for this purpose. Once the questionnaire was developed, specific public from the study area were identified. Simple random sampling was used for interviewing purpose. They were hunters, primitive people, or belonged to specific related departments like wildlife or environmental education. These people were then interviewed with in person in a time period of three months. They were asked about their personal information like age, area, profession, education level etc. Some of the highlighted questions from the questionnaire included: Their knowledge about the number of snake species, their names, and nature. Why their population is declining or increasing? What is the impact of hunters on snakes? During research it was deemed that qualification of the study group was appropriate, the participants have answered all the queries frankly and correctly, and sufficient data is retrieved from literature. Total one hundred questionnaires were filled. Data was then compiled and was analyzed statistically by using SPSS 20.0.

Fig. 1 shows demographic distribution. Hunters between the age of 25-30, 31-45, 46-60, and 60 above were 16, 29, 13 and 10, respectively. 40 hunters had college level education, 16 just had elementary level while 14 respondents had university level education. They were 12 hunters from Lefkosa and its surrounding areas, 18 from Girne and Lapta region 18 from Famagusta and its surrounding areas 14 from Karpaz region and 8 from Guzelyurt.

Results and Discussion

This study explain the results obtained from respondents answer to the questionnaire and then discussed according to the outcome of analyses

How many snake species are present in North Cyprus?

Table 2 shows the number of hunters that were aware of snake species in North Cyprus. The study revealed that 20 hunters knew only 3 species of snakes, 30 hunters were aware of 4 species, 11 hunters of 5 species, 2 hunters knew about 6 species and only 1 about 11 species, respectively.

How many people are aware of snake species present in North Cyprus

Table 2 shows that Large Whip Snake (*Typhlops vermicularis*) and Blunt Nosed Viper (*Macrovipera lebetina*) were known to 70 respondents, Coin Snake (*Hemorrhois nummifer*) was well known by 64 respondents. Cat Snake (*Telescopus fallax*) was known 42 respondents. Worm Snake (*Typhlops vermicularis*), Dwarf Snake (*Eirenis levantinus*), Grass Snake (*Natrix natrix*) and Montpellier Snake (*Malpolon insignitus*) were known by very few respondents. Cyprus Whip Snake (*Hierophis cypriensis*) and Dahl's Whip Snake (*Platyceps najadum*) were among the rarest, as only one respondent was aware of them.

How many snake species are venomous?

Table 3 shows the frequency among hunters about the poisonous snakes. 38 respondents, knew that only 1 snake specie was poisonous, 26 respondents had idea of 2 poisonous snakes whereas 4 respondents knew about 3 species of poisonous snakes. Table 4 shows that Blunt Nosed Viper (*Macrovipera lebetina*) was known as poisonous snake by all the hunters. 28 respondents thought Coin Snake (*Hemorrhois nummifer*) as poisonous specie while 10 considered Cat Snake (*Telescopus fallax*) as poisonous specie as well.

Table 5 and 6 demonstrates lack of knowledge about the snake species in Northern Cyprus. Many hunters had no idea about how many species existed in the country. Majority of people only knew about three and four species of snakes and the

Table 1 : Knowledge of snake species number

Number of species	Frequency	Percent	Cumulative percent
3	26	37.1	37.1
4	30	42.9	80.0
5	11	15.7	95.7
6	2	2.9	98.6
11	1	1.4	100.0
Total	70	100	

Table 2 : Awareness of snake species

Names of species	Responses		Percent of Cases
	Number of Respondents	Percent	
Large Whip Snake (<i>Dolichophis jugularis</i>)	70	26.0	100
Worm Snake (<i>Typhlops vermicularis</i>)	6	2.2	8.6
Cyprus Whip Snake (<i>Hierophis cypriensis</i>)	1	0.4	1.4
Dahls Whip Snake (<i>Platycephalus najadum</i>)	1	0.4	1.4
Coin Snake (<i>Hemorrhois nummifer</i>)	64	23.8	91.4
Dwarf Snake (<i>Eirenis levantinus</i>)	5	1.9	7.1
Grass Snake (<i>Natrix natrix</i>)	7	2.6	10.0
Cat Snake (<i>Telescopus fallax</i>)	42	15.6	60
Montpellier Snake (<i>Malpolonin signatus</i>)	3	1.1	4.3
Blunt Nosed Viper (<i>Macrovipera lebetina</i>)	70	26.0	100
Total	269	100.0	384.3

Table 3 : Number of venomous species

Number	Frequency	Percent	Cumulative percent
1	38	54.3	54.3
2	26	37.1	91.4
3	4	5.7	97.1
4	2	2.9	100.0
Total	70	100.0	

knowledge of remaining seven to eight species were unknown.

Hunters knew that Large Whip Snake (*T. vermicularis*) was black in color and quiet large in size, but the problem arose after sexual maturity, when the Large Whip Snake (*T. vermicularis*) changed its color to light grey. People confused this snake with Blunt Nosed Viper (*M. lebetina*) and killed them. Coin Snake (*H. nummifer*) was the most misunderstood specie on the island with Blunt Nosed Viper (*M. lebetina*). Coin Snake (*H. nummifer*) is widely known by hunters but due to its similarity with Blunt Nosed Viper (*M. lebetina*) it gets killed most of the time due to similar grey color and less similar pattern. The moment of encounter is sudden so hunters are not able to differentiate it from the Blunt Nosed Viper (*M. lebetina*) and shoot them. Cat Snake (*T. fallax*) and Coin Snake (*H. nummifer*) are also confused with Blunt Nosed Viper (*M. lebetina*) due to same grey color and similar pattern on their bodies, hence they are shot by hunters.

Table 8 and 9 shows awareness of snake species which are poisonous amongst the hunters. Most of the hunters know about The Blunt Nosed Viper (*Macrovipera lebetina*) as the only poisonous specie on the island but they only had the knowledge of 3 or 4 species so they mostly confuse the Blunt Nosed Viper (*Macrovipera lebetina*) with other species, such as Coin Snake (*Hemorrhois nummifer*), Cat Snake (*Telescopus fallax*) and Large Whip Snake (*Typhlops vermicularis*) during sexual maturity, which lead to the problem for all these 4 species. Most hunters are of opinion that Coin Snake (*Hemorrhois nummifer*) is also poisonous due to its similarity with Blunt Nosed Viper (*Macrovipera lebetina*). Cat Snake (*Telescopus fallax*) is also thought to be poisonous by few hunters. Mostly, the color grey and dot, square or ring like patterns are considered as traits of a poisonous snake. Coin Snake (*Hemorrhois nummifer*) is the main victim due to its similarity with the Blunt Nosed Viper (*Macrovipera lebetina*).

Table 4 : Venomous snake species

Snake Specie	Responses		Percent of cases
	Number of respondents	Percent	
Coin Snake	28	25.9	40.0
Cat Snake	10	9.3	14.3
Blunt Nosed Viper	70	64.8	100.0
Total	108	100.0	154.3

Table 5 : Snake as importance factor in our environment

Idea	Frequency	Percent	Cumulative Percent
Agree	70	100.0	100.0

Table 6 : Snake's importance in our environment

Importance	Responses		Percent of cases
	Number of respondents	Percent	
Rodent control	70	65.4	100.0
Killing Poisonous snakes	13	12.1	18.6
Eating Dead Animals	13	12.1	18.6
Medicinal Use	11	10.3	15.7
Total	107	100	152.9

Do snake have importance in our environment?

All hunters had idea of snake as an important factor in our environment, yet they were killed by hunters.

How are snake important to our environment?

All the respondents were aware as snake's control rodent population, 13 respondents believed snake killing other poisonous snakes, 13 respondents believed in snake as eating dead animals and 11 respondents believed in snake used for medicinal use.

Is the population of snakes increasing or decreasing?

38 respondents believed that the population of snakes were decreasing, 10 people were uncertain about snake population, while 22 hunters believed that the snake population was increasing.

What factors affect the snake population negatively?

The factors responsible for snake population decrease according to the hunting population. The highest threat according to the data is hunting as 22 respondents believe in hunting is a major threat, 14 respondents believe in pesticides and chemicals as a threat, 17 people believe in habitat loss of snakes as building parks and farms on the snake habitats and destroying their

habitat, 13 hunters think of land use by farmers and for construction as a threat and 5 people believe in wild fires as completely whipping the area from snakes and other species.

Most hunters know that the snake population is decreasing day by day and the biggest threat is killing them while hunting. Due to excessive hunters and hunting on a small island, the snakes of every area are getting targeted by the hunters as avoiding them is impossible which leads to hunting as a major threat. The second major threat is habitat loss due to land use. North Cyprus, as the newly developing country, construction of buildings, land use by farmers and other recreational places is on its peak. Mostly they are done without any regard of species habitat and without specie welfare planning's, which leads in loss of habitat of snake species as well. Use of chemicals and pesticides lead to snake poisoning as snakes dwell in fields in search of rodents. Road kill is also a threat as mostly snakes are overrun by vehicles. Wildfire is infrequent, however, it has devastating effect on every specie of that area as it wipeout the whole ecosystem of that area.

How hunting impacting snake population?

Table 9 shows that 46 respondents believed that hunting negatively affected the snake population, 20 respondents were of opinion that hunting had no impact on snake population, 2 were unsure about the snake population and 2 respondents thought that hunting positively affected then.

Table 7 : Snake population ratio

Ratio	Frequency	Percent	Cumulative Percent
Decreasing	38	54.3	54.3
Uncertain	10	14.3	68.6
Increasing	22	31.4	100.0
Total	70	100.0	100.0

Table 8 : Factors affecting snake population

Factors	Responses		Percent of cases
	Number of respondents	Percent	
Road Kill	11	9.6	15.7
Hunting	22	19.3	31.4
Pesticides/Chemicals	14	12.3	20.0
Land Use	13	11.4	18.6
Wild Fires	5	4.4	7.1
Habitat Loss	17	14.9	24.3
Not Decreasing	32	28.1	45.7
Total	114	100	162.9

Table 9: Effect of hunting on snake population

Impact	Frequency	Percent	Cumulative percent
Positively	2	2.9	2.9
Negatively	46	65.7	68.6
Not Sure	2	2.9	71.4
No impact	20	28.6	100.0
Total	70	100.0	

Hunting is common in Cyprus. Due to lack of species identification, most hunters cannot differentiate between poisonous and non-poisonous snakes. Some hunters think hunting has no impact on snake population as they don't see them usually or as often. Two respondents were not sure about the impact of hunting on snakes while some thought hunting keep a check on their population.

Species awareness can play a key role in controlling snake population. Most hunters were unaware of the fact that 11 species were present on the island as had idea of 3 or 4 species. The confusion between species is also critical as most hunters thought different species as same one. They usually differentiate them by color and pattern, which most of the snakes share the same. Coin Snake (*Hemorrhois nummifer*), Cat Snake (*Telescopus fallax*) and Blunt Nosed Viper (*Macrovipera lebetina*) shares the same color and slightly similar pattern which confuse the hunters to think of them as Blunt Nosed Viper (*Macrovipera lebetina*) because the attach those traits with the Blunt Nosed Viper (*Macrovipera lebetina*). Large Whip Snake (*Typhlops vermicularis*) is known by every hunter, but the problem arises when at sexual maturity they change the color to slightly grey

which majority of hunters don't know, and think of it as Blunt Nosed Viper (*Macrovipera lebetina*). Blunt Nosed Viper (*Macrovipera lebetina*) and Large Whip Snake (*Typhlops vermicularis*) was known by every hunter as it is abundant in number and Blunt Nosed Viper (*Macrovipera lebetina*) is territorial and did not go away if they see a threat in their territory which makes them more visible than other snakes. Coin Snake (*Hemorrhois nummifer*) was also known by most of the hunters but they may confuse the Blunt Nosed Viper (*Macrovipera lebetina*) with the Cat Snake (*Telescopus fallax*). More than half of the hunters know about Cat Snake (*Telescopus fallax*) because it can be only differentiated by its eyes. Dwarf Snake (*Eirenis levantinus*), Grass Snake (*Natrix natrix*) and Montpellier Snake (*Malpolonin signatus*) were known by very few which makes them very rare species. Worm Snake (*Typhlops vermicularis*) is also know by few cause most of hunters think it is a lizard due to its similarity with some lizards. Cyprus Whip Snake (*Hierophis cypriensis*) and Dahls Whip Snake (*Platyceps najadum*) are only known by a single respondent which may be a sign that hunters confuse them with other species or these specie is almost at the edge of extinction. So the knowledge can play critical role as stated in study of (Bohm et al., 2013) which stated that affective

and targeted conservation required detailed information about the species.

The awareness of poisonous and non-poisonous species is crucial as most of the hunters kill the poisonous snakes at sight which cause the non-poisonous species to suffer as well with the poisonous species. There is only one poisonous species which is Blunt Nosed Viper (*Macrovipera lebetina*) but most of people confuse other non-poisonous species with Blunt Nosed Viper (*Macrovipera lebetina*) due to slight similarities in color and pattern. Most of the hunters think Cat Snake (*Telescopus fallax*) and Coin Snake (*Hemorrhois nummifer*) are also poisonous which leads to their killing as well. Some hunters think 3 snake species are poisonous leading to misunderstanding of venomous and non-venomous snake species. All the hunters know that snakes are an important factor in our environment and all of the species play an important role. Every hunter knew about the rodent control by snake population. They also knew that Large Whip Snake (*Typhlops vermicularis*) lives in the gardens and eat Blunt Nosed Viper (*Macrovipera lebetina*), it encounters each other. They also believe in snake as eating dead animals and for the use of medicines. Knowing all the benefits of snake population about how they are beneficial for the environment, the hunters still while hunting kill the snakes. The people living near to hilly areas are also more aware than the people living in plain areas about snake species and which are venomous and which are non-venomous. The knowledge of venomous and non-venomous is also important for hunters as that decide how to their attitude will change with them as stated in.

Most of the hunters believed in the decline of snake population due to various reasons. Among them hunting is the main reason as most of the hunters they kill the snakes while hunting. Habitat loss is also among the main factors as lots of new construction of buildings, parks, road etc. are done without planning about environmental impacts on species near the site. Land use by farming is also impacting the habitats of snakes. Wild fires are not often but when it occurs it wipes out the entire area of all the species giving a massive blow to their numbers. Pesticides and use of other chemicals also impact the snake population as some species lives in farms in search of rodents. Road kills also play a role in snake population decrease as they can easily be overrun by vehicles while crossing the roads. The results match the studies of (Clark et al., 2011) and (McDonald, 2012) which stated these factors as snake species decline factors.

Most of the hunters believe in hunting as the main problem for decline in snake population. The problem is that North Cyprus is a small island and the number of hunters too much to sustain and there are more licenses issued every few months which means the number will increase in time. There are also not licensed hunters the number are unknown. There are no specific spots for hunting which also increase the threat of affecting every area. Constant hunting also adds to the problem as every time

the snake population face hunters throughout the year. As little species awareness they don't know about venomous and nonvenomous species or get confused and kill them. Some of hunters think they have no impact on snake population is usually because they encounter them especially Blunt Nosed Viper (*Macrovipera lebetina*). Blunt Nosed Viper (*Macrovipera lebetina*) is territorial and stay at its spot when encounter a human and don't run away by which they think there is no decrease in their number. Thus the hunters disturb the habitat due to constant hunting which leads to decline in the snake's population as stated in (Bonnet et al., 2016).

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