

## A PERCEPTIONS AND KNOWLEDGE TOWARDS SNAKES: A STUDY FROM JORDAN

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**Abstract.**—There are two terms used to describe the snake in Jordan: *Afa'a*, referring to the venomous snakes whose characteristics are similar to the family Viperidae, and *Thu'ban*, which describes non- or mildly venomous snakes and usually is used to describe the rest of the snake species. It is, however, also mistakenly attributed to venomous species including the Palestinian Mole Viper (*Atractaspis engaddensis*) and the Black Desert Cobra (*Walterinnesia aegyptia*). Local folklore, in addition to the lack of awareness and inability to distinguish between venomous and non-venomous snakes, results in the indiscriminate and unprovoked killing of all snakes. This study was the first of its kind in Jordan to investigate the rationale behind the negative perceptions of the general public toward snakes by exploring the prevailing general knowledge and attitudes toward snakes in Jordan. The results of the paper support the development of policies, interventions, tools, and awareness campaigns in support of conservation efforts to protect this group of animals in Jordan.

**Key Words.**—attitude; conservation; Jordan; knowledge; perception; snakes

### INTRODUCTION

Several studies have been conducted worldwide to identify the factors driving the perceptions and fear of snakes of humans that drive the unnecessary killing of snakes, avoidable snake bites, and the general fear of these animals (Kellert and Berry 1987; Zinn and Pierce 2002; Özel et al. 2009). Among the factors driving increased conflict between snakes and people is urban development and population growth encroaching on natural habitats for snakes (Yue et al. 2019; Soulsbury and White 2016; Acharya et al. 2017; de Souza et al. 2018). Thirty-seven species of snakes have been reported from Jordan (Amr and Disi 2011), seven of them considered venomous species: the Palestinian Mole Viper (*Atractaspis engaddensis*), the Black Desert Cobra (*Walterinnesia aegyptia*), the Arabian Horned Viper (*Cerastes gasperettii gasperettii*), the Palestine Viper (*Daboia palaestinae*), the Arabian Saw-scaled Viper (*Echis coloratus*), the Levantine Viper (*Macrovipera lebetina obtuse*), and the Field's Horned Viper (*Pseudocerastes fieldi*). Despite thorough documentation of species diversity in Jordan, highlighting that only 18% of snakes are venomous species, the efficacy of conservation efforts and the minimization of threats posed by venomous species are either unknown or poorly defined. Therefore, understanding causes of public perception toward snakes is essential to understanding causes of snake-human conflict, which will support future attempts in

analyzing the threats to snakes due to human behavior.

Previous studies have documented both the number of snakebites and deaths from snakebite in Jordan. Swaroop and Grab (1954) reported 84 recorded deaths from snakebite in Jordan between 1948 and 1952. Amr and Amr (1983) reported 112 cases of snakebite, including seven fatalities based on data obtained from the Ministry of Health during 1970–1972 and 1975–1980. Disi et al. (1988) documented 65 cases of snakebite during 1982–1986 without fatalities, while 20 snakebites cases were reported by Jaghbir and Khoury (1989) from Balqa Governorate. Amr et al. (1994) confirmed 99 cases of snakebite during 1982–1992 and Al Shamari (2002) reported 60 cases at Ghor es-Safi, southern Jordan Valley, with 12% of cases severe, having a high risk of mortality with burdensome symptoms and treatment. The very low mortality rate and even the low snakebite rate in general in Jordan has not lessened fear of snakes by people and the continued killing of snakes when found. Concerns for safety regarding the prevention of potential lethal snake bites have escalated the rate of conflict between people and snakes (Kasturiratne et al. 2008). The overlap between humans and snakes sharing the same lands is a major reason behind these conflicts.

Snakes were always important in popular proverbs, stories, and popular wisdom of Jordanians and Arabs in general. They are mentioned in verses of the Holy Quran, where two terminologies are applied: *Afa'a* (referring to vipers) and *Thu'ban* (referring to

serpents). All short venomous snakes with triangular heads are referred to *Afa'a*, and the huge, long snakes that are either non-venomous or mildly venomous are called *Thu'ban*. This last term, however, is also used for venomous snakes in the families Atractaspididae and Elapidae, which are often confused with the non-venomous Black Whipsnake (*Dolichophis jugularis*). Despite the existence of the two terminologies folklore, misguided perceptions, continued encounters with wildlife during work or recreational activities, and the lack of environmental awareness persist and manifest themselves in the long-standing fear of snakes.

The conflict between humans and snakes has led to the countless killing and collecting of snakes over the years, regardless of the threat they might pose. Unfortunately, limited research on killing incidents and the reasons behind them is available from Jordan. The available literature has discussed trade and folk medicine (Aloufi and Eid 2016). For example, Amr et al. (2007) reported shipments of reptiles (snakes and tortoises) confiscated at the Jordanian border with Syria to be smuggled into Saudi Arabia. Eid et al. (2011) discussed the Dice Snake (*Natrix tessellata*) trade in the public animal market and reported a Black Whipsnake wrapped around a Red Fox (*Vulpes vulpes*) in the same market. Here, we present the first study to investigate knowledge and attitude toward snakes in Jordan. We aim to provide baseline data that could be used for conservation purposes, enhance awareness, and contribute to understanding snakes and the importance of their conservation in Jordan.

#### MATERIALS AND METHODS

We used a structured questionnaire completed in June 2020 (Appendix) to create a snowball sample (primary respondents were encouraged to share the questionnaire with other potential respondents to increase sample size). Our primary line of inquiry was the source of conflict and the means for mitigating conflict. We collected data on the demographic characteristics of respondents and their knowledge, attitude, and perceptions about snakes of Jordan. Also, we investigated the need and preference for awareness approaches (Appendix). We developed the survey using Google Forms and distributed it virtually by publishing it through the active Facebook page @ WildlifeofJordan. The Facebook page is volunteer-led and dedicated to spreading knowledge and awareness toward the wildlife of Jordan. The Facebook page further links this diversity with folklore. We also shared the link for the questionnaire using WhatsApp and email to reach a wider community. We summarized the results of the survey as the percentage of respondents choosing each response for each question.

#### RESULTS

**Demographics.**—We received 1,142 questionnaires, including 612 questionnaires (54%) from men and 530 (46%) from women. The majority of respondents were 26–40 y old ( $n = 506$ ), followed by 18–25 y ( $n = 359$ ), 41–50 y ( $n = 202$ ), and 51–60 y ( $n = 71$ ), with the fewest respondents above 70 y old ( $n = 4$ ). Of the respondents, 37% were collected from Amman Governorate, 19% from Ma'an, and 9% from Irbid. Governorates of Al-Balqa and El-Zarqa responded with 7% each, while Et-Tafila, Aqaba, and Karak represented 6%, 5%, and 4%, respectively. Jerash and Madaba contributed with 2% each, while 1% of responders represented the governorates of Ajloun and Mafrq. Most respondents were university degree holders (88%), followed by people with a secondary education (11%), and the remaining were distributed equally between the elementary, preparatory, and unschooled people (Table 1).

**Knowledge.**—Most respondents (63%) acknowledged that the term *Afa'a* (viper) is a different categorization of a type of snake from the snakes encompassed under the term *Thu'ban* (serpent). Fifteen percent responded that the two terms had the same connotation. Twenty-two percent of the respondents answered that they did not know. Of the 63% who recognized the difference between the two terminologies, 44% indicated that *Afa'a* are the venomous type, while 17% reported that *Thu'ban* are non-venomous. In addition, 31% reported that both serpents and vipers are venomous and only 8% stated they do not know which term is used for the venomous snake.

Most respondents (75%) believed that at least some snakes are aggressive. Forty-three percent of respondents believe some snakes are aggressive by nature and will chase humans to harm them, 25% believe they are not aggressive, and 23% believe all snakes aggressive. Only 9% of respondents were convinced that all snakes are aggressive animals.

Reported snake encounters varied greatly in location and time of day. Three-quarters of the respondents had encountered snakes in the field (31%), at home (24%), or on farms (21%). Other localities where snakes had been encountered include workstations (5%), university labs (1%), zoos (1%), and on television (1%). Sixteen percent reported Other without specifying the location. Encounters occurred mainly during the daytime, according to 46% of respondents, followed by encounters occurring both day and night (28%). Twenty-six percent of respondents reported encounters occurring exclusively at night. The summer season represents the highest peak of snake encounters with 86%, followed by spring with 13%, and autumn with 1%.

# Herpetological Conservation and Biology

**TABLE 1.** Demographic data of the respondents to a survey about perceptions and attitudes toward snakes in Jordan, 2020. Missing levels and values indicate that no respondents of that combination of governorate, education level, age, and sex responded to the survey.

| Governorate | Education level | Age (years) and Sex |      |        |      |        |      |        |      |      |
|-------------|-----------------|---------------------|------|--------|------|--------|------|--------|------|------|
|             |                 | 18–25               |      | 26–40  |      | 41–50  |      | 51–60  |      | > 70 |
|             |                 | Female              | Male | Female | Male | Female | Male | Female | Male | Male |
| Ajloun      |                 |                     |      |        |      |        |      |        |      |      |
|             | Secondary       |                     |      |        | 1    |        | 1    |        |      |      |
|             | University      | 2                   | 2    | 1      | 2    | 1      | 2    |        | 2    |      |
| Al-Balqa    |                 |                     |      |        |      |        |      |        |      |      |
|             | Secondary       |                     |      | 1      | 3    | 1      | 2    |        |      |      |
|             | University      | 11                  | 10   | 13     | 23   | 4      | 10   | 2      | 2    |      |
| Amman       |                 |                     |      |        |      |        |      |        |      |      |
|             | Preparatory     |                     |      |        | 2    | 1      |      |        |      |      |
|             | Secondary       | 6                   | 5    | 3      | 5    | 4      | 16   |        | 2    | 1    |
|             | Uneducated      | 1                   |      |        | 1    |        |      |        |      |      |
|             | University      | 49                  | 25   | 100    | 101  | 27     | 28   | 7      | 31   | 2    |
| Aqaba       |                 |                     |      |        |      |        |      |        |      |      |
|             | Secondary       |                     |      | 1      |      |        |      |        |      |      |
|             | University      | 14                  | 6    | 9      | 13   | 3      | 6    | 1      | 2    |      |
| El-Zarqa    |                 |                     |      |        |      |        |      |        |      |      |
|             | Preparatory     |                     |      | 1      |      |        | 1    |        |      |      |
|             | Secondary       |                     | 1    | 1      | 2    |        | 2    |        |      |      |
|             | University      | 14                  | 12   | 13     | 22   | 2      | 9    |        | 2    |      |
| Et-Tafila   |                 |                     |      |        |      |        |      |        |      |      |
|             | Elementary      |                     | 1    |        |      |        |      |        |      |      |
|             | Preparatory     |                     | 1    |        |      |        |      |        |      |      |
|             | Secondary       | 3                   | 2    | 4      | 3    |        | 3    |        |      |      |
|             | University      | 8                   | 3    | 16     | 16   | 6      | 6    |        |      |      |
| Irbid       |                 |                     |      |        |      |        |      |        |      |      |
|             | Preparatory     |                     |      |        |      |        | 1    |        |      |      |
|             | Secondary       | 1                   | 2    |        | 6    |        | 5    | 1      |      |      |
|             | University      | 15                  | 10   | 16     | 19   | 5      | 15   | 1      | 4    |      |
| Jarash      |                 |                     |      |        |      |        |      |        |      |      |
|             | Secondary       |                     | 1    |        | 1    |        | 1    |        |      |      |
|             | University      | 4                   | 3    | 6      | 5    | 1      | 1    |        | 1    |      |
| Karak       |                 |                     |      |        |      |        |      |        |      |      |
|             | Secondary       |                     |      | 1      | 3    |        | 1    |        |      |      |
|             | University      | 7                   | 1    | 8      | 7    | 2      | 7    | 1      | 2    |      |
| Ma'an       |                 |                     |      |        |      |        |      |        |      |      |
|             | Preparatory     |                     |      | 1      | 1    |        |      |        |      |      |
|             | Secondary       | 1                   | 4    | 3      | 5    |        | 5    |        | 2    |      |
|             | University      | 93                  | 28   | 15     | 35   | 3      | 11   |        | 6    | 1    |
| Madaba      |                 |                     |      |        |      |        |      |        |      |      |
|             | Secondary       | 1                   | 1    |        | 1    |        |      |        |      |      |
|             | University      | 4                   | 1    | 4      | 6    | 2      | 3    |        | 2    |      |
| Mafraq      |                 |                     |      |        |      |        |      |        |      |      |
|             | Secondary       |                     | 1    |        | 2    |        |      |        |      |      |
|             | University      | 1                   | 4    | 3      | 1    |        | 4    |        |      |      |
| Grand Total |                 | 235                 | 124  | 220    | 286  | 62     | 140  | 13     | 58   | 4    |

**Attitudes.**—If a snake was observed or encountered, then most responses (48%) indicated that it would be killed either directly (18%), with the support of a friend (29%), or after taking a photograph of it (1%). Thirty-two percent of responses indicated that they would run, and only 9% reported that they would leave it alone and tell no one because the snake should be conserved. Other responses included people who do not care (5%), those who would take a photograph from distance if applicable (5%), and some who would try to capture it for a photograph and then release it (1%).

Regarding snakebite incidents among the respondents, only 44 respondents (4% of the participants) reported a previous bite of which at least 82% were venomous (11% bitten by a non-venomous snake and 7% who indicated that the type of snake bite was unknown). Snakebites had occurred on the foot (55%), hand (43%), and neck (2%). The bite was caused suddenly according to 73% of the respondents, whereas 16% were bitten when the snake was in the hand (captured), and 9% were bitten trying to catch the snake. Two percent of bitten respondents stated Other without specifying how. More than half of these bites occurred in agricultural areas and 18% in the field. Fewer but equal numbers of reported bites happened at work (13%) or at home (13%). The majority of bites occurred in summer (91%), with far fewer in the spring (9%). No bites were reported in autumn or winter. Most bitten respondents reacted to snakebite by visiting the hospital directly (66%), though 13% stated their use of folk medicine. People who reported a non-venomous bite (7%) indicated that they did nothing.

**Awareness.**—Thirty-nine percent of the respondents stated that their inability to distinguish venomous snakes and potentially lethal bites are the reasons behind their fear of snakes. Others reported that their fear stems from rumors, myths, and stories revolving around snakes (28%). Other reasons behind fear included the strange shape of snakes and their locomotion (22%) and the sudden behavior and manner of appearance of snakes (11%).

**Conservation and education.**—Forty-six percent of the respondents stated that snakes should be conserved, while 24% think they should not. Twenty percent were not interested and did not care, and 10% did not answer if they think snakes should be conserved. Ninety-five percent of respondents believed that awareness of snake types (venomous, non-venomous) is not enough in Jordan, and 77% believe that media and social media can play a major role in bridging this knowledge gap. A minority of respondents supported the development of print materials (14%), training (8%), and organizing workshops (1%), especially at the school level, as tools to enhance knowledge and awareness toward snakes.

## DISCUSSION

Several scholars indicated that fear of snakes is mainly caused by risks some species represent, legends, beliefs, fables, myths, and other cultural aspects linked to these animals (Santos-Fita 2010; Frynta 2011; Alves 2012; Alves et al. 2014). The survey has shed light on the existence of fear of snakes in Jordan, mainly because of misguided perceptions. If this persists, then more eradication of snakes will occur in Jordan, leading to population depletion and threatening this group of animals. The majority of the respondents believed that social media could play a major role in educating Jordanians about snakes. It is more likely that awareness initiatives will focus on the management and avoidance of negative snake encounters. In this way, the results discussed here will contribute significantly toward designing appropriate awareness tools to aid conservation efforts.

Despite 88% of respondents holding university degrees, 56% cannot recognize which are venomous snakes based on the existing terminologies of *Afa'a* and *Thu'ban*. This will worsen in light of the presence of only two venomous snake species in Jordan: *Atractaspis engaddensis* and *Walterinnesia aegyptia*, which resemble (to the public) the characteristics of the non-venomous *Dolichophis jugularis*. The inability by people to distinguish different types of snakes is common among countries of the world. A study from Brazil on the perceptions and knowledge of students showed that all students interviewed have used the name snakes, which reveals that basic serpentiform morphology is the main criterion used to recognize these animals (Alves et al. 2014). A second study conducted by Pandey et al. (2016) showed that 50% of respondents cannot differentiate venomous from non-venomous species, which is leading to continuing eradication of snakes. In addition, 75% of respondents in this study reported on the aggressiveness of snakes, clearly indicating misguided perceptions that will contribute to panic from snakes. This fear will certainly lead to the killing of encountered snakes, which was supported by the results of our survey, whereby 48% of respondents indicated they would kill snakes directly.

The survey results showed that 61% of people bitten by snakes are males and 39% are females. The higher occurrence in males has been attributed to farming and outdoor activities, which are mainly carried out by males. Youth (ages 18–25 y) are at the highest risk of snakebite, followed by people 26–40 y old, according to our survey results. Moreover, people who responded to the survey specified that snakebites had been reported on the feet and hands in the summer season with only a few cases reported in the spring. These locations and seasonal occurrences are likely to be attributed to human behavior. During the summer people tend to

walk in natural areas and therefore are more susceptible to snakebite on the foot, while others will try to collect weeds or flowers or reach for objects while working in the farms, all of which increase their exposure to snakebite on the hands.

Bites occur in spring and summer as snake activities are influenced by weather variables, including temperature, humidity, and precipitation (Disi et al. 2001; Marques et al. 2001; Brown and Shine 2002; Butler et al. 2005; Amr and Disi 2011). Spawls et al. (2001) stated that snakes end their aestivation period after cool days, hiding in burrows, under large boulders, or in standing dead trees. Snake activity is connected with the seasons, and they become more active in the breeding season (Disi et al. 2001; Marques et al. 2001; Meshaka 2010; Amr and Disi 2011). Most incidents reported in this survey are from the agricultural lands and during field trips as habitats play a critical role in snake activity (Hartmann et al. 2009; Weatherhead et al. 2010). Seasonal variation in the incidence of snakebite may be attributed to farming activity and the grazing of animals, with rainfall and possibly the yearly reproductive cycle of snakes bringing people into contact with them. Participants report that it was common to encounter snakes inside the house, especially during summer season when snakes enter houses most likely to search for food. Snakes also enter homes during the long rainy season to get to a warm environment (Pough 1993; Heatwole 1977).

Lim (1982) suggested snake control, which includes habitat management, snake exclusion, and use of repellents. The information collected during this survey supports developing an awareness program and tools to overcome snake encounters and snakebites. The program and tools should be based on knowledge of the circumstances in which most bites occur, including season, preferred habitats, and especially for the dangerous snakes, and their peak of activity (i.e., time of day, season, and climate).

Although 80% of snakebites are healed by traditional medicine before visiting hospitals in developing countries such as those in Africa and Asia (Snow 1994; Gupta and Peshin 2012; Chandio 2000), our study showed that only 13% of respondents in Jordan used traditional medicine after a snakebite. The majority of snakebite patients have a high level of knowledge of the necessity of visiting a hospital whenever snake bites happen (likely because of the high level of education of respondents), which indicates that they are well-informed and knowledgeable about the potential consequences of snake venom and that trustworthy treatment is found in hospitals. This study will help to develop tools and approaches to conserve snakes and manage snakebites appropriately in Jordan. The development of awareness and educational programs and campaigns from this

survey will strengthen the understanding of this often misunderstood group of animals.

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## APPENDIX

### Survey. Questionnaire about attitudes toward snakes in Jordan.

- (1) Sex
  - (a) Male
  - (b) Female
- (2) Age group
  - (a) 18-25
  - (b) 26-40
  - (c) 41-50
  - (d) 51-60
  - (e) Above 61
- (3) From which Governorate are you?
  - (a) Amman
  - (b) Irbid
  - (c) Salt
  - (d) Karak
  - (e) Tafilah
  - (f) Aqaba
  - (g) Maan
  - (h) Mafraq
  - (i) Ramtha
  - (j) Albalqa
  - (k) Ajloun
  - (l) Jarash
  - (m) Madaba
- (4) What is your educational background?
  - (a) Uneducated
  - (b) Elementary
  - (c) Preparatory
  - (d) Secondary
  - (e) University
- (5) What is your affiliation?
  - (a) Academic and Educational Sector
  - (b) Agricultural Sector
  - (c) Army and Security Sector
  - (d) Free-lance Sector
  - (e) Government Sector
  - (f) Health Sector
  - (g) Industrial Sector
  - (h) NGOs Sector
  - (i) Other
  - (j) Private Sector
- (6) Do you think Afa'a is different from Thu'ban?
  - (a) Yes
  - (b) No
  - (c) I do not know
- (7) If your previous answer was yes, then which one is the venomous?
  - (a) Afa'a
  - (b) Thu'ban
  - (c) Both
  - (d) I do not know



## Herpetological Conservation and Biology

- (8) Can you recognize venomous from non-venomous snakes?
- (a) Yes
  - (b) No
  - (c) I do not know
- (9) Do you think snakes are aggressive species?
- (a) All snakes are aggressive
  - (b) Most snakes are aggressive
  - (c) Snakes are not aggressive
  - (d) Some snakes are aggressive
- (10) Have you encountered a snake before?
- (a) Yes
  - (b) No
- (11) If your previous answer was yes, then where did this happen?
- (a) At a university laboratory
  - (b) At home
  - (c) At my workplace
  - (d) In agricultural land (farm)
  - (e) In the field
  - (f) On TV
  - (g) In a zoo
  - (h) Other
- (12) At what time will snakes be encountered?
- (a) Day time
  - (b) Night time
  - (c) Day and night
- (13) At what season snakes will be encountered?
- (a) Spring
  - (b) Summer
  - (c) Autumn
  - (d) Winter
- (14) If you encounter a snake, what will be your first reaction?
- (a) Chase it until it is killed
  - (b) I do not care about it at all
  - (c) I hurry to get help to get rid of them
  - (d) I tell no one since these species should be conserved
  - (e) Run away and avoid it
  - (f) Take a photo of it from a distance
  - (g) Try to capture it for a photo and then kill it
  - (h) Try to capture it for a photo and then release it
- (15) Have you ever been bitten by a snake?
- (a) Yes
  - (b) No
- (16) Where was the bite location?
- (a) Foot
  - (b) Hand
  - (c) Neck
  - (d) Other
- (17) Was it a venomous snake that bit you?
- (a) Yes
  - (b) No
- (18) How did the bite happen?
- (a) Bitten while handling it
  - (b) Inattention and suddenly it happened
  - (c) Other
  - (d) Trying to catch it

- (19) Where did the bite occur?
- (a) At home
  - (b) At work
  - (c) During a hiking trip with friends or family
  - (d) In the farm
- (20) In which season did the bite occur?
- (a) Spring
  - (b) Summer
  - (c) Autumn
  - (d) Winter
- (21) What did you do after the bite?
- (a) Went directly to the hospital
  - (b) I didn't do anything because I knew it was non-venomous
  - (c) Other
  - (d) Treatment through folk medicine
  - (e) Tried to kill the snake as a first step
- (22) In your opinion, what is the reason behind people's panic from snakes?
- (a) Inability to distinguish the toxic type from the non-toxic and which part is venomous
  - (b) Its strange shape and how it crawls on the ground
  - (c) National Geographic programs
  - (d) Rumors, myths, and stories revolve around it
  - (e) Sudden behavior and manner of appearance
- (23) Do you think snakes should be conserved?
- (a) I do not know
  - (b) No
  - (c) Not interested
  - (d) Yes
- (24) Do you think there are enough awareness programs toward snakes in Jordan?
- (a) No
  - (b) Yes
- (25) What would be the best tools to raise awareness toward snakes in Jordan?
- (a) Education (schools and workshops)
  - (b) Media and social media tools
  - (c) Printed materials
  - (d) Training, especially first aid kits and snake precautionary measures