

# What do Mountaineers and their Guides in Serbia Know about Venomous Snakes? A Pilot Questionnaire Analysis

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## Abstract

*More and more people go/return to nature seeking recreation, relaxation, stress/anxiety relief, socializing with like-minded persons, etc. Not all of them know what they can stumble upon walking through various terrains. We wanted to check how much hikers/mountaineers and those who took a course for excursion and hiking guides know about venomous snakes present in Serbia and the basic first aid in the case of a bite. For this purpose, we designed a questionnaire containing 20 simple questions that addressed recognition, ecology, distribution, the basics of venomous snakes' conservation, first-aid measures, and people's feelings regarding these reptiles. Results suggest that our target group is agreeably well informed given the amount and quality of easily accessible data for Serbia. However, some misconceptions were detected that must be corrected. There are indications of an increase in mountain/adventure tourism in Serbia, which is partially conditioned by the COVID-19 pandemic. Therefore, we must invest additional effort in examining and educating both mountaineers and "plain" tourists so both the people and snakes would stay safe. To achieve this long-term goal, we should exchange knowledge and experiences with experts from various fields, i.e. biology, medicine, tourism, economics, geography, etc.*

**Keywords:** Outdoor recreation; Mountaineering; Serbia; Snakebites; First aid.

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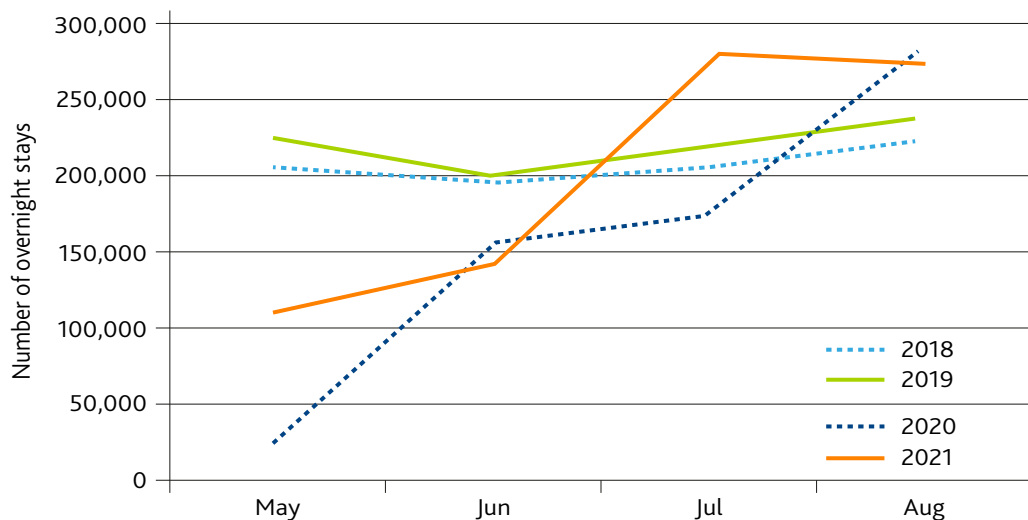
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## Introduction

It was shown that even short periods spent in natural surroundings or urban green spaces, but also exposure to virtual-reality nature are beneficial to emotions and performance, i.e. physical and mental health and that connectedness to nature has numerous positive effects on humans (Taylor, Kuo, 2009; Howell et al., 2011; Pearson, Craig, 2014; Browning et al., 2020; Meredith et al., 2020). In accord with changes in the general public understanding and attitude regarding nature and its significance for overall human well-being (Mayer et al., 2009), nature trips are becoming increasingly popular. We are witnessing “The huge increase in outdoor leisure in recent decades” (Bartlett, 2013), but “The stay of tourists in the mountains affects the quality and quantity of protected areas” (Vujadinović et al., 2013).

Visits to more or less undisturbed nature and urban green spaces became more important (Sachs, 2020) and intensified during the COVID-19 pandemic when people could not travel as much as in previous times. Instead of travelling abroad, many people started “discovering” Serbian mountains, spas, villages, etc. (Damnjanović, 2020). The influence of the pandemic on tourism has already been analysed in numerous papers (e.g. Humagain, Singleton, 2021).

After a strong decline during 2020 (Đorđević, Milićević, 2021), the numbers of both domestic and foreign tourists who visited the Serbian mountains increased during July 2021 compared to the same periods of 2020 and 2018/9 (Figure 1).

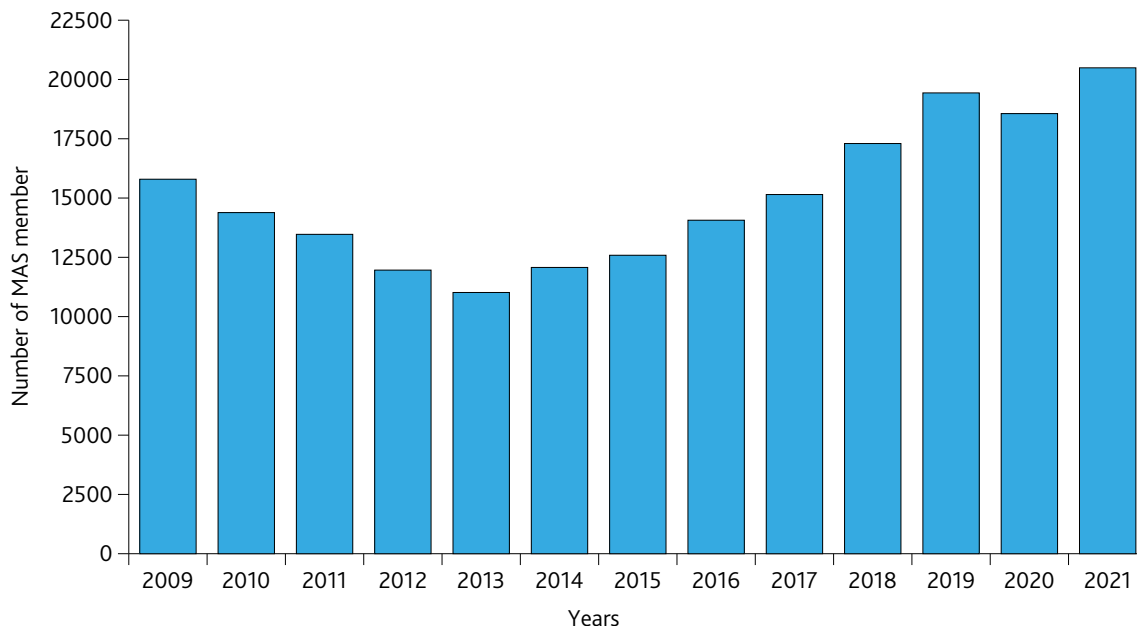


**Figure 1.** Total numbers of overnight stays in Serbian mountains between May and August, from 2018 to 2021.

Source: Statistical Office of the Republic of Serbia

We could not obtain the number of mountaineers who visited Serbian mountains in the same period, but as an illustration of the changes in the numbers of hikers, climbers, and other mountaineers during the last 13 years, we got the numbers of members of the Mountaineering Association of Serbia, MAS. This number doubled between 2013 and 2021 (Figure 2).

Mountaineering/hiking is one of the disciplines that is changing and adapting to new circumstances: “The traditional mountaineer is an amateur and the modern a professional...” (Beedie, Hudson, 2003; Bartlett, 2013). In recent years, adventure tourism is gaining popu-



**Figure 2.** The number of MAS members from 2009 to 2021.

Source: Mountaineering Association of Serbia

larity: it was included in the Serbian Tourism Development Strategy (Vujadinović et al., 2013). This type of tourism can be risky because not all tourists are skilled enough to overcome all challenges professional sportsmen can. Importantly, destinations targeted by adventure tourism are often remote and isolated: high mountains are especially attractive, many with gorges and canyons (*ibid.*).

Among the potential perils “lurking” in the wilderness are venomous snakes, poorly understood creatures that provoke unfounded fear and disgust in many people (Prokop, 2016), including those who have never seen a living serpent.

In Serbia, there are ten species of snakes; only three of these are venomous, all from the genus *Vipera*. Since the beginning of this manuscript preparation, another, eleventh species was recorded in the territory of Serbia (Simović et al.), but this finding has still not been published hence it is unknown outside the expert circles. All snake species in Serbia are protected by law, nine (10) strictly (including two of the three vipers) (Tomović et al., 2015). The largest and potentially the most dangerous of the vipers is widely distributed in Serbia (nosehorned/sand viper, *Vipera ammodytes*); the second (adder, *V. berus*) can be found in several both high-mountain (common knowledge) and lowland habitats (the fact that many are not aware of), and the third (meadow viper, *V. ursinii*) is extremely rare and restricted to only a few localities in high mountains at the margins of our country and in several other places (Tomović et al., 2019; Lakušić et al. 2022). Despite their rarity and secretive lifestyle, all three can be encountered by (inexperienced) people. Because vipers are well camouflaged and often remain motionless even when closely approached, sometimes people do not see them and risk being bitten; however, some try to catch or kill them (Častven et al., 2000; Boyd et al., 2007). Information regarding venomous snakebites (to people and domestic animals), their prevention, first aid measures and later treatment are available for the neighbouring countries and other parts of the world (Anlén, 2008; Di Nicola et al., 2021; overview for the Balkans in Niko-

lić, 2020). For Serbia, such information was almost completely inexistent until recently (Nikolić et al., 2019, 2021).

Due to the increase in the number of people who spend time in mountainous terrains, the risk of venomous snakebites potentially rises. Because mountaineers are in a position to get in the closest touch with nature, we found this group ideal for our pilot analysis: how well do they know venomous snakes and first aid measures in the case of a bite. We found only one study similar to the one we performed (Čubrić, Crnobrnja-Isailović, 2022). Although very simple in the means of design, distribution, and analysis, our investigation did yield satisfying and useful results. Therefore, we concluded that it might be used in wider contexts, with appropriate modifications. Once we get a more complete picture of the state of knowledge and interest in snakes (and nature in general), we will be able to design and conduct appropriate educational activities.

## Methods and data

The questionnaire we used was a part of the exam for an excursion and hiking guide taken by Isidora Radonjić (IR). It was designed *ad hoc*, as a pilot survey, by Sonja Nikolić (SN); SN and Zorana Miloradović (ZM) analysed it.

All 20 questions were closed-ended: we offered between two and six potential answers, with no possibility for the respondents to express their own opinions. The questionnaire was fully anonymous. Of personal information, we needed only gender and approximate age (10-year age categories from “10–20” to “41–50”, and “over 51”). The questionnaire was distributed as a free online Google survey. It was sent to other people who took the guide course and to IR’s acquaintances from mountaineering societies and clubs. The participants filled it in between June 22<sup>nd</sup> and July 6<sup>th</sup> 2021.

The data were analysed in Microsoft Excel and with a free online calculator available at [www.quirks.com](http://www.quirks.com) (t-tests between percent). Google forms provided percentages and graphs. To obtain sequences of respondents with similar opinions/knowledge regarding venomous snakes and first aid in a case of a bite, a hierarchical cluster analysis was performed in SPSS Statistics 21. Respondents were divided into three clusters using Ward’s method (squared Euclidean distance interval). Significant differences between clusters ( $p < 0.05$ ) were determined by the Mann-Whitney U test, using the same software.

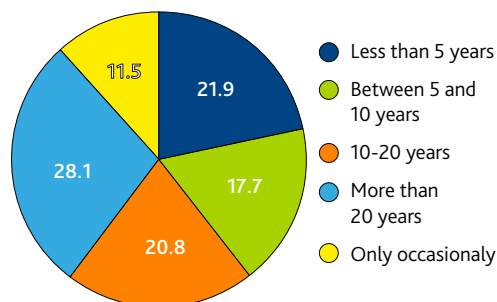
## Results

Ninety-six respondents completed the questionnaire. Only one question – the effectiveness of the antivenom produced in the national Institute – remained unanswered by two persons. The percentages of all answers are given in the Appendix, Table 1.

### Descriptive analyses – percentages of answers

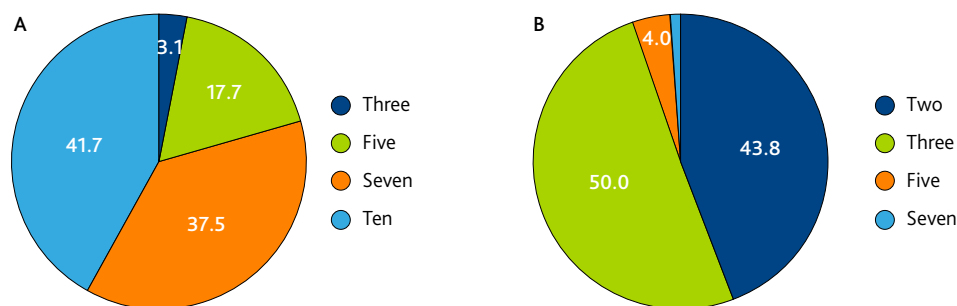
All our examinees were older than 20 years, and almost 71% were people older than 41. More women filled out the questionnaire, 63.54% ( $t_{95}=2.747$ ,  $p=0.007$ ). The majority of our participants were members of mountaineering societies (66.70%); 10.40% were guides (six men and four women), and approximately 20% only occasionally go on excursions. Regarding the number of years spent among mountaineers/hikers, 11.50% of people go on excursions only occa-

sionally; in the other four categories (“less than five years” to “more than 20 years”) we had between 17.70% and 28.10% (Figure 3).



**Figure 3.** Numbers of years our participants have spent in or near mountaineering societies/clubs

The largest percentage of respondents (41.70%) answered correctly that in Serbia there are 10 snake species in total, but as many as 37.50% thought that there were only seven. Regarding venomous snake species, approximately equal numbers of respondents (43.75% and 50.00%, respectively) thought that there were two, i.e. three species (the latter is correct: Figure 4).

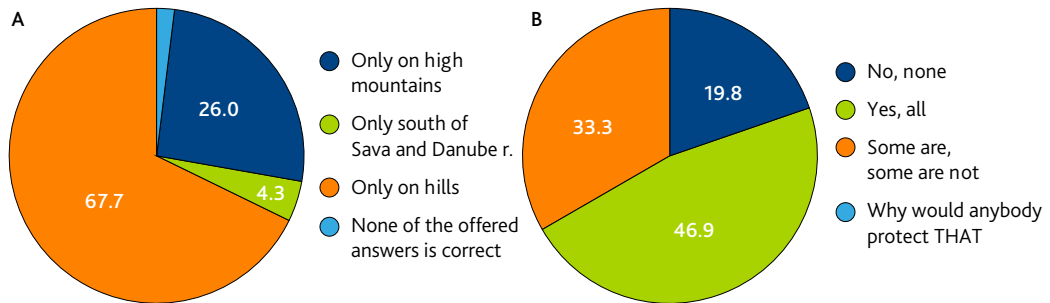


**Figure 4.** Responses regarding the total number of snake species (A) and the number of venomous snake species in Serbia (B)

Several questions regarded the snakes’ ecology and distribution. The majority of our respondents (67.71%) knew that the snakes are not active only during the warmest periods of the day. Also, almost all (90.63%) correctly answered in which types of habitats venomous snakes can (not) be found. On the other hand, almost one-third (26.04%) thought that there were no venomous snake species north of the Sava and Danube rivers, while 67.71% did answer correctly that venomous snakes can be found in the Vojvodina province as well (Figure 5A). Regarding the conservation status of our snakes, 46.88% of the respondents knew that all our species are protected by law; still, high percentages (33.33 and 19.79, respectively) thought that only some or none are under legal protection (Figure 5B).

Another important result is the fact that exactly half of the respondents thought that all our venomous snakes have triangular heads, which is not correct. More women knew the right answer, 37.50% compared to 12.50% of men ( $t_{95}=3.703$ ,  $p<0.001$ ).

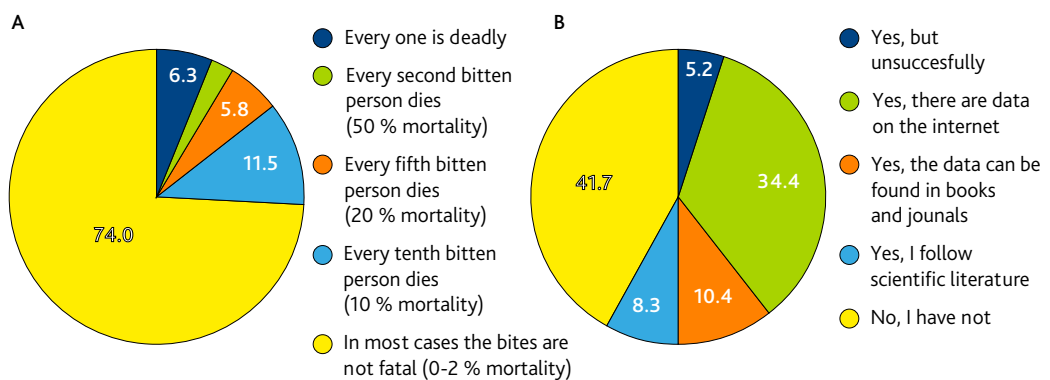
Almost all respondents have met some snake in nature more than once: 2–5 times 40.63% and 6–10 times 50.00%. Only two persons (from Clusters 2 and 3, see later) have never met a



**Figure 5.** Percentages of answers regarding the venomous snakes' distribution (A) and snake species conservation status (B)

snake in nature (one of these two is a member of a mountaineering society for over 20 years). Seven respondents met a snake only once (of these, one is a guide with more than 20 years of mountaineering).

One of the positive and encouraging results of our questionnaire is that 96.88% of respondents correctly answered that snakes do not attack people but only defend themselves when provoked. Also, a high percentage (73.96%) was aware that mortality due to our venomous snake-bites is very low (0–2%) (Figure 6A).



**Figure 6.** Opinions regarding the deadliness of our venomous snakes' bites (A), and attempts to find information (B)

One of the interesting results was the fact that 40 of 96 respondents (41.67%) have never tried to find information regarding snake species present in Serbia, and 33 (34.38%) were convinced that there is information on the internet. The rest sought information from books/magazines and scientific journals (Figure 6B). Interestingly, more than half (23 of 40) of the people who admitted that they have not tried to find information regarding snakes thought that the available data is adequate regarding quality, clarity, and usefulness (60.40% of all respondents: Appendix, Table 1).

The following questions were the most important: first aid measures, the effectiveness of the available antivenom, and antivenom administration. Regarding first aid, we made four combinations of actions that should (not) be taken: sucking (by mouth) vs. squeezing the wound/venom, and firm vs. gentle tying of the tourniquet around the bitten limb. A substantial percentage of respondents answered correctly (squeezing + gently tied elastic tourniquet,

41.67%) but, regrettably, slightly more (43.75%) thought that the tourniquet should be firmly tied around the bitten extremity after the venom is squeezed from the wound (Figure 7A). Importantly, nine of the ten guides responded correctly. Almost all respondents (85.42%) knew that the antivenom produced in Serbia is effective in the treatment of our autochthonous venomous snake bites. Unfortunately, many (as much as 40.63%) thought that antivenom has to be administered in the field (Figure 7B); nevertheless, all ten guides knew that it must not be administered that way.

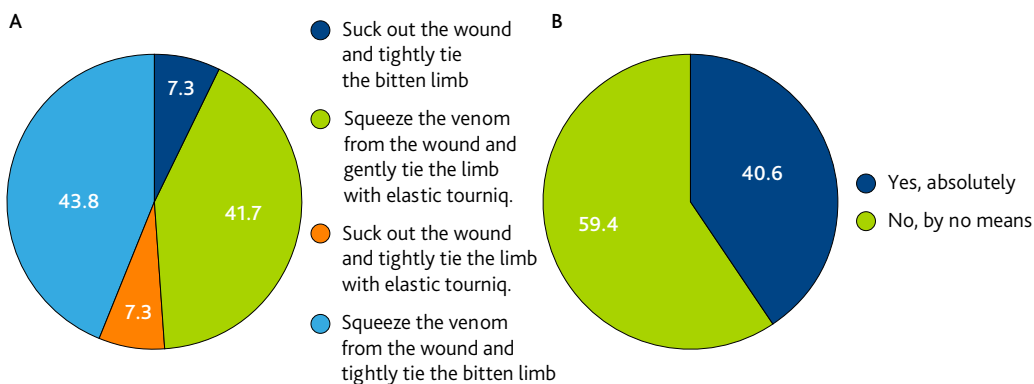


Figure 7. Opinions regarding first aid measures (A) and administration of antivenom (B)

Finally, we wanted to know what our respondents felt towards snakes: a total of 26.04% felt fear, disgust or both, 34.38% checked awe and 8.34% admiration, and 31.26% stated they had no specific feeling regarding snakes (Figure 8).

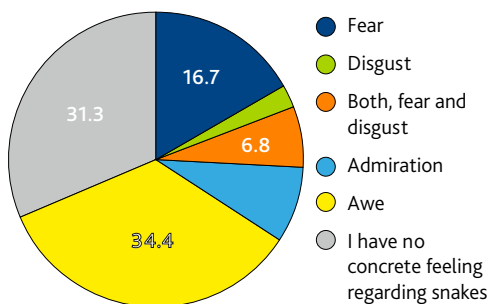


Figure 8. Percentages of different feelings towards snakes

We checked for differences between the sexes regarding these feelings (one-sample t-test between percentages): fear was felt by 1.04% of males and 15.63% of females ( $t_{95}=3.749$ ,  $p<0.001$ ), and both fear and disgust by 1.04% of males and 5.21% of females ( $t_{95}=1.658$ ,  $p=0.101$ ). Other differences between the genders in this respect were not significant; admiration and nothing specific were checked by identical percentages of men and women (Appendix, Table 1).

### Cluster analysis

Our cluster analysis classified the respondents into three clusters. The Mann-Whitney U-test revealed that the largest number of significant differences existed between clusters 1 and 2;

the differences between clusters 2 and 3 were significant for only three answer frequencies (Appendix, Table 1).

The first cluster singled out the people (35 participants, 36.46% of the entire sample; 16 women, 19 men) who had the longest mountaineering experience (16.67% over 20 years), the most 6–10 encounters with snakes (25.00% of all respondents), who were informed regarding the first aid measures better than the people in other two clusters (although we had wrong answers here as well). All of them have previously tried to find information regarding snakes, the majority knew the basics of snakes' preferred habitats and activity periods, and almost 23% felt admiration and/or awe towards snakes (of 19 men, nobody felt fear ± disgust, which was checked by only one woman). Nine of ten guides fell in this cluster. However, the proportions of wrong answers regarding the overall number of snakes and venomous snake recognition, i.e. wrong opinion regarding triangular head shape were high, 21.88% each, but a decent percentage knew that all our snake species are protected by law, 19.79% (Appendix, Table 2). This cluster could be defined as *Well-informed, courageous active mountaineers*. This cluster was the only one that contained a little more men than women (shown by significant differences revealed by Mann-Witney U-test: Appendix, Table 1).

The second cluster (26 women, 12 men) contained the highest percentage of people who are members of mountaineering clubs (28.13%) and who only occasionally go on excursions (Appendix, Table 2), but many have been doing this between 11 and 20 years (10.42%). Numerous were the wrong answers regarding the numbers of all and venomous snakes (22.92% and 20.83%, respectively). In this cluster, equal percentages of respondents (19.79% of the entire sample) thought that all venomous snakes do and do not have triangular heads and 18.75% that snakes are active only during the warmest periods of the days (20.83% did answer correctly). Also, 25.00% did not know that all snakes are protected. In addition, 31.25% have never tried to find information regarding snakes, 22 women and 8 men (10 of 22 women thought that available information is sufficient). Importantly, 28.13% of these people did not know the proper first aid measures (8 men and 19 women), and 22.92% thought that antivenom must be given in the field, six men and 16 women. Only one woman felt fear and disgust, 19.79% of people checked admiration/awe, and 18.75% had no concrete feeling regarding snakes (Appendix, Table 2). This group can be termed *Long-term facultative hikers, uninterested, not well informed*.

The third cluster contained only 23 respondents, one of whom was a guide. The percentages of most of the answers were between the first two clusters. Here, the majority has been hiking for less than 10 years. In this cluster, more people thought that there were two venomous snakes in Serbia, but the majority knew that their heads are not all triangular (15.63% vs. 8.33%). However, more respondents did answer correctly regarding the antivenom administration. What did emerge was the fact that all participants in this cluster (19 women, 4 men) felt fear and/or disgust (23.96% of the entire sample) (Appendix, Table 2). This group could be characterized as *Timid, moderately informed, occasionally hiking people*.

## Discussion

Depending on the mountain, tourist presence peaks in different seasons, i.e. some are popular during winter, but others are crowded in spring and summer months. All-year-round activity is what tourist workers wish for and plan – but that would negatively influence the environment, including protected areas (Vujadinović et al., 2013; Bratić et al., 2019). The impacts of an increase in human presence on nature and wildlife are still not fully investigated and understood. “With



the exception of certain protected areas, most destinations have been caught off-guard regarding the negative environmental impacts such as littering or overvisitation of fragile ecosystems resulting from the sheer volume of tourists. Those places might be years and budgets away from recovery” (Damjanović, 2020). Mountain and, especially, adventure tourism is yet to be appropriately regulated and organized (Milićević et al., 2021). One of the aims of nature-oriented tourism development must be the long-term protection of the environment, which can be achieved through adequate education. To the best of our knowledge, our questionnaire is the second of this kind, but can be adapted and more widely used, not only for snakes.

Numerous people who were not spending time out of the cities earlier started travelling to more or less “wild” parts of our country, often without proper preparation (corresponding to our Clusters 2 and 3). To adventure tourists especially attractive are high mountains, many with gorges and canyons – which are often populated by venomous snakes (Vujadinović et al., 2013; Tomović et al., 2019).

Although they are not too frequent, venomous snakebites in Serbia occur every year and can cause complications (Milićević, 1968; Popović et al., 1998; Častven et al., 2000; Nikolić et al., 2021). Contrary to the popular belief, they are rarely fatal (Chippaux, 2012). Medical doctors in Serbia are successful in treating this medical condition (Nikolić et al., 2021).

The “season of venomous snakebites” (in Western Serbia from May to August, with a peak in June or July in Milićević, 1968 and Nikolić et al., 2021) coincides with the increase of overnight stays in mountain resorts, i.e. July and August (Figure 1, and Vujadinović et al., 2013). A recent study (Nikolić et al., 2021) showed that hikers/tourists usually received bites to the legs, compared to agricultural workers who were the most affected but most often received bites to the hands/arms. This difference probably resulted merely from the difference in the main activity of these two groups, not from the intention to tamper with snakes or the lack of it. We assume that most of the mountaineers/hikers got bitten when they unintentionally provoked snakes. Therefore, all mountain visitors need to be better informed before venturing into the “wilderness” (Boyd et al., 2007).

In Serbia, it is not unusual that people confuse non-venomous snakes (most often *Natrix tessellata* or *Coronella austriaca*) with venomous species, although Balkan vipers usually clearly differ from non-venomous species. Neither laypeople (local or visiting) nor medical workers are always well informed regarding the species of snakes present in their surroundings or holiday destinations, hence sometimes the species in the cases of bites are erroneously reported (Nikolić et al., 2021). In Serbia, this is not a serious problem because the antivenom produced by the national Institute of Virology, Vaccines and Sera is efficient in the cases of bites by both our medically important venomous snakes (“Torlak”), and the administered symptomatic therapy is appropriate. Nevertheless, the venom compositions do differ between the species and their effects are distinguishable so snakebite patients should be treated accordingly (Latinović et al., 2016).

The fact that many of our respondents did not know how many snake species live in Serbia is not surprising: that is a fact one has to search for intentionally, not something that is regularly mentioned e.g. in mass media. In addition, three (four) of the ten (11) species are extremely rare and restricted to small regions of our country (Tomović et al., 2014; Simović et al. unpublished) hence not many people are in a position to see them in nature. Nevertheless, mountaineers should be properly educated regarding snake fauna. Many in our sample (26.04%) were not aware that venomous snakes are present in Vojvodina (predominantly lowland area north of the Sava and Danube rivers). Adders were recorded in several localities in this province, both hilly and lowland (Nikolić, Simović, 2017; Tomović et al., 2019), and nose-horned vipers were

also reported (Džukić, Kalezić, 2005). Also, the possibility of meadow viper's presence in the "northern lowlands of Serbia" has not been fully rejected, because "known favourable meadow habitats" persist there (Jelić et al., 2013). In several localities in Serbia, two or even all three species of vipers can be found together, in sympatry (Tomović et al., 2019).

Among our examinees, more people knew that snakes are not active only during the warmest periods of the day, 67.70% vs. 32.30% ( $t_{95} = 3.709$ ,  $p < 0.001$ ). Indeed, snakes can be active at temperatures as low as 9–10°C and were documented e.g. during mid-autumn nights (Dyugmedzhiev et al., 2021). Some can be found even under a thin layer of snow and agitated in a very short time (Đorđević, 2015).

Many people think that all our venomous snakes have triangular/heart-shaped heads, i.e. that any snake with a triangular head is venomous (such a statement is present in some old mountain guides, e.g. Smerke, 1989). This common misbelief has to be changed. Only the nose-horned viper's head is triangular/heart-shaped – and even that is not always clearly noticeable (Figure 9A). On the other hand, non-venomous snakes can spread their jaws and make their heads look triangular (Figure 9B) – which serves to scare off potential predators.



**Figure 9.** A) The nose-horned viper (Photo: Aleksandar Simović) and B) the non-venomous grass snake in a defensive posture (Photo: Marko Anđelković)

The heads of the other two venomous snakes in Serbia are oval (Figure 10). In other words, head shape is not a reliable character in snake recognition.



**Figure 10.** A) The adder and B) the meadow viper (Photos: Aleksandar Simović)

Venomous snakes do not attack people: humans are too large to be their prey; also, venom is metabolically costly and it cannot kill immediately, so snakes cannot use it to deter a potential

predator (Pucca et al., 2020). In addition, the amount of venom our vipers produce cannot kill a healthy adult human (Achille, 2015). Snakes perceive people as threats/predators, so they try either to stay motionless and 'invisible' or to flee if there is any chance of escape; if approached/cornered, they often hiss and try to appear bigger than they are, to frighten and deter a human; some, including vipers, feign death to avoid attack (Hodges, 2013). Snakes bite only in self-defence and sometimes deliver a 'dry' bite (Pucca et al., 2020).

Regarding first aid measures, fortunately, only 14.60% of our examinees thought that the venom should be sucked out from the wound. Based on current knowledge, even mechanical suction is not recommended (Boyd et al., 2007). Of those who knew that this is the wrong approach (85.50%), still more people thought that the tourniquet should be tightly tied around the bitten limb (43.80%) after the venom is squeezed from the wound. This is wrong and can lead to serious complications (Boyd et al., 2007; WHO, 2016). Also, 40.60% of respondents thought that antivenom should be administered in the field (Appendix, Table 1). In the producer's manual, it is clearly stated that the antivenom must be kept at 2°C–8°C, and that proper medical treatment should be available for reacting to a potential anaphylactic shock ("Torlak"). That is usually not achievable in the field. Incorrect ideas regarding first aid (the correct ones were described e.g. by Boyd et al., 2007) and antivenom administration might result either from not searching for information or from incorrect recommendations that can be found in some mountaineering manuals based on outdated information (Smerke, 1989).

In the basic education programs and mass media in our country, information regarding (venomous) snakes is scarce, partly due to the lack of reliable facts specific to Serbia that would be properly presented and disseminated. Even the comprehensive expert analysis of the past and present distribution of venomous snakes in our country was published only recently, and that was in a scientific journal (Tomović et al., 2019).

Boyd et al. (2007) analysed the prevention and management of snakebites in mountainous terrain. They compiled the data and "presented the core knowledge and recommendations made by the Medical Commissions of the International Committee for Alpine Rescue (ICAR) and the International Mountaineering and Climbing Federation (UIAA MEDCOMS)". Such texts are very valuable. They should be analysed by local experts and adapted to circumstances in the Balkans. For example, Boyd and co-authors (2007) omitted *Vipera ammodytes* from the list of vipers occurring in mountains, but this species can be found up to 2,500 m altitude (Crnobrnja-Isailović, Haxhiu, 1997; Đorđević, 2015). The main conclusions and recommendations should be presented publicly, in a way laymen can easily comprehend.

All Serbian mountain and tourist guides, i.e. tour leaders should be properly educated and prepared to efficiently respond to encounters with venomous snakes and potential snakebites in remote locations. Training and teaching aids of the Mountain Rescue Service of Serbia do include the treatment of snakebites that is regularly updated and improved by the Service's medical commission (pers. comm. J. Đoković, M. Mrkonjić, MRSS, November 2021). We suggest that tour leaders should also know the basics of the snakes' distribution, ecology, and behaviour (Crnobrnja-Isailović et al., 2007; Bauwens, Claus, 2019; Tomović et al., 2019) so they could properly instruct the people they take outdoors to walks and adventures. This information should also be added to online/printed guides for (beginner) mountaineers, in addition to the crucial data regarding the terrain, weather, equipment etc. In return, properly educated mountaineers and tourists could make a significant contribution to scientists' knowledge regarding the distribution, abundance, variability, ecology and phenology of our venomous snakes and other wildlife, but also regarding the pressures imposed on their populations and habitats by human presence and activities (Durso et al., 2021). All this is especially important

in light of hopes and intentions of intensifying mountain tourism in Serbia (Milićević et al., 2021; Žerajić, 2021).

## Conclusion

Compared to some other open-air sports (Ouren et al., 2007; Ristić et al., 2012), mountaineering is a non-invasive outdoor activity and it should be well-promoted and further developed. Being aware of all the benefits nature has on human emotional and physical health, we do support and encourage new beginnings in hiking/mountaineering/adventurism, but not at any cost, i.e. not without proper preparation and education, “mountaineering apprenticeship” (Beedie, 2003; Mykletun et al., 2021). To avoid any inconveniences, before venturing to a chosen destination, people should be properly informed not only of the terrain and weather but also of the presence of venomous snakes and all should be instructed on how to behave if they meet one. Regarding long-term education, snakebite prevention and numerous conservation issues, a transdisciplinary approach should be adopted (Alcoba et al., 2021).

A questionnaire such as the one presented herein (with necessary changes and improvements, i.e. adaptations to specific target groups) should be disseminated to a larger sample of mountaineers/tourists so we could get a better picture of their knowledge regarding venomous snakes and snakebite treatment to properly design future educational activities. We intend to give lectures regarding venomous snakes in mountaineering societies or online. Also, similar questionnaires could be designed for other parts of the world: an increase in nature-oriented tourism and a supposed rise in the numbers of tourists once the pandemic finishes are global phenomena.

## Acknowledgements

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## References

- Achille, G. 2015. *Snakes of Italy. Herpetological treatise on the biology and iconography of Italian ophidians*. Springer Briefs in Animal Sciences. Springer.
- Alcoba, G., Ochoa, C., Babo Martins, S., Ruiz de Castañeda, R., Bolon, I., Wanda, F., et al. 2021. Novel transdisciplinary methodology for cross-sectional analysis of snakebite epidemiology at national scale. *PLOS Neglected Tropical Diseases* 15(2), e0009023.
- Anlén, K. G. 2008. Effects of bites by the European adder (*Vipera berus*) in seven Swedish horses. *The Veterinary Record* 162, 652–656.
- Bartlett, P. 2013. Is Mountaineering a Sport? *Royal Institute of Philosophy Supplement* 73, 145–157.

- Bauwens, D., Claus, K. 2019. Seasonal variation of mortality, detectability, and body condition in a population of the adder (*Vipera berus*). *Ecology and Evolution* 9(10), 5821–5834.
- Beedie, P. 2003. Mountain guiding and adventure tourism: reflections on the choreography of the experience. *Leisure Studies* 22, 147–167.
- Beedie, P., Hudson, S. 2003. Emergence of mountain-based adventure tourism. *Annals of Tourism Research* 30(3), 625–643. DOI: 10.1016/S0160-7383(03)00043-4.
- Boyd, J. J., Agazzi, G., Svajda, D., Morgan, A. J., Ferrandis, S., Norris, R. L. 2007. Venomous snakebite in mountainous terrain: prevention and management. *Wilderness and Environmental Medicine* 18, 190–202.
- Bratić, M., Lesjak, M., Đorđević, M., Đorđević, M., Radivojević, A. 2019. Seasonal movement in mountain tourism of Serbia: a review of methods and literature. *Serbian Journal of Geosciences* 5(2019), 13–20.
- Browning, M. H. E. M., Mimnaugh, K. J., van Riper, C. J., Laurent, H. K., LaValle, S. M. 2020. Can simulated nature support mental health? Comparing short, single-doses of 360-degree nature videos in virtual reality with the outdoors. *Frontiers in Psychology* 10, 2667.
- Chippaux, J-P. 2012. Epidemiology of snakebites in Europe: A systematic review of the literature. *Toxicon* 59(1), 86–99.
- Crnobrnja-Isailović, J., Haxhiu, I. 1997. *Vipera ammodytes* (Linnaeus, 1758). In: Gasc, J. P., Cabela, A., Crnobrnja-Isailović, J., Dolmen, D., Grossenbacher, K., et al. (Eds.). *Atlas of amphibians and reptiles in Europe*. Societas Europaea Herpetologica and Muséum National d'Histoire Naturelle, Paris, 384–385.
- Crnobrnja-Isailović, J., Ajtić, R., Tomović, L. 2007. Activity patterns of the sand viper (*Vipera ammodytes*) from the central Balkans. *Amphibia-Reptilia* 28, 582–589.
- Častven, J., Šinžar, T., Kovačević, D., Moroanka, E., Mitrović, D., Stanivuković, M. 2000. Snakebites in the region of Vršac Mountains – case reports. *Acta Infectologica Yugoslavica* 5, 75–82. (in Serbian with English summary)
- Čubrić, T., Crnobrnja-Isailović, J. 2022. A view on human perception of snakes in Serbia with special reference to nose-horned viper. *Biologica Nyssana* 13(1), 47-57.
- Damnjanović, I. 2020. Pandemic tourism brings surprises to Serbia. Domestic destinations cope with profitable, unpracticed tourists. *Destination Stewardship Report* 1(2). Available at <https://www.gstcouncil.org/pandemic-tourism-brings-surprises-to-serbia/>, last accessed on November 25, 2021.
- Di Nicola, M. R., Pontara, A., Kass, G. E. N., Kramer, N. I., Avella, I., Pampena, R., Mercuri, S. R., Dorne, J. L. C. M., Paolino, G. 2021. Vipers of major clinical relevance in Europe: Taxonomy, venom composition, toxicology and clinical management of human bites. *Toxicology* 453, 152724.
- Durso, A.M., Ruiz de Castañeda, R., Montalcini, C., Mondardini, M.R., Fernandez-Marques, J. L. et al. 2021. Citizen science and online data: Opportunities and challenges for snake ecology and action against snakebite. *Toxicon* X 9–10.
- Dyugmedzhiev, A. V., Andonov, K. I., Slavchev, M. L. 2021. Further insights on the nocturnal activity of the nose-horned viper *Vipera ammodytes* (Linnaeus, 1758) (Reptilia: Viperidae) in Bulgaria: first observation in October. *Acta Zoologica Bulgarica* 73(4), 633–636.
- Džukić, G., Kalezić, M. 2005. Nose-horned viper (*Vipera ammodytes*) is a native snake in Vojvodina! *Yearbook of the Naturalists' Society Gea* 5, 13. (in Serbian with English summary)
- Đorđević, S. 2015. The nose-horned viper awakened from under the snow. *Ecologica Montenegro* 3, 62–63.

- Dorđević, N., Milićević, S. 2021. The impacts of COVID-19 pandemic on the tourism development. In: Thematic Proceedings of the 6<sup>th</sup> International Scientific Conference *Tourism challenges amid COVID-19*, (399–414). Vrnjačka Banja, Serbia.
- Hodges, R. 2013. *Vipera berus* (common viper). Feigning death. *Herpetological Bulletin* 125, 30–31.
- Howell, A. J., Dopko, R. L., Passmore, H-A., Buro, K. 2011. Nature connectedness: Associations with well-being and mindfulness. *Personality and Individual Differences* 51, 166–171.
- Humagain, P., Singleton, P. A. 2021. Exploring tourists' motivations, constraints, and negotiations regarding outdoor recreation trips during COVID-19 through a focus group study. *Journal of Outdoor Recreation and Tourism* 36, 100447.
- Jelić, D., Ajtić, R., Sterijovski, B., Crnobrnja-Isailović, J., Lelo, S., Tomović, Lj. 2013. Distribution of the genus *Vipera* in the western and central Balkans. *Herpetozoa* 25(3/4), 109–132.
- Lakušić, M., Bjelica, V., Anđelković, M., Tomović, L. 2022. Updated distribution of the endangered and highly specialized meadow viper (*Vipera ursinii macrops*) in Serbia. In: Crnobrnja-Isailović et al. (Eds), Program and book of abstracts of the XXI European Congress of Herpetology, (95). Belgrade: Institute for Biological Research "Siniša Stanković".
- Latinović, Z., Leonardi, A., Šribar, J., Sajevec, T., Žužek, M. C., Frangež, R., Halassy, B., Trampuš-Bakija, A., Pungercar, J., Križaj, I. 2016. Venomics of *Vipera berus berus* to explain differences in pathology elicited by *Vipera ammodytes ammodytes* envenomation: Therapeutic implications. *Journal of Proteomics* 146, 34–47.
- Mayer, F. S., McPherson Frantz, C., Bruehlman-Senecal, E., Dolliver, K. 2009. Why is nature beneficial? The role of connectedness to nature. *Environment and Behavior* 41(5), 607–643.
- Meredith, G. R., Rakow, D. A., Eldermire, E. R. B., Madsen, C. G., Shelley, S. P., Sachs, N. A. 2020. Minimum time dose in nature to positively impact the mental health of college-aged students, and how to measure it: A scoping review. *Frontiers in Psychology* 10, 2942.
- Milićević, M. 1968. Overview of the patients bitten by venomous snakes treated between 1960 and 1968. *Serbian Archives of Medicine* 96(10), 999–1006. (in Serbian with German summary)
- Milićević, S., Bošković, N., Lakićević, M. 2021. Sustainable tourism development in mountain areas in Šumadija and Western Serbia. *Journal of Mountain Science* 18(3), 735–748.
- Mykletun, R. J., Oma, P. Ø., Aas, Ø. 2021. When the hiking gets tough: "New adventurers" and the "extinction of experiences". *Journal of Outdoor Recreation and Tourism* 36, 100450.
- Nikolić S. 2020. Venomous snakebites in Serbia through 125 years: what we do (not) know in comparison with neighboring countries. A literature review. *Acta Medica Medianae* 59(4), 95–103. DOI: 10.5633/amm.2020.0413.
- Nikolić, S., Simović, A. 2017. First report on a trichromatic lowland *Vipera berus bosniensis* population in Serbia. *Herpetological Conservation and Biology* 12(2), 394–401.
- Nikolić, S., Vučanović, M., Mitrović, D. 2019. Detailed description, with personal experience, of a neurotoxic envenomation by *Vipera berus bosniensis* in Vojvodina, Serbia. *Timok Medical Gazette* 44(3), 136–141.
- Nikolić, S., Antić, M., Pavić, A., Ajtić, R., Pavić, S. 2021. Analysis of the venomous snakebite patients treated in the Užice General Hospital (Western Serbia) between 2006 and 2018. *Serbian Archives of Medicine* 149(3-4), 189–195.
- Ouren, D. S., Haas, C., Melcher, C. P., Stewart, S. C., Ponds, P. D., Sexton, N. R., Burris, L., Fancher, T., Bowen, Z. H. 2007. *Environmental effects of off-highway vehicles on Bureau of Land Management lands: A literature synthesis, annotated bibliographies, extensive bibliographies, and internet resources*. U.S. Geological Survey, Open-File Report 2007-1353.

- Pearson, D. G., Craig, T. 2014. The great outdoors? Exploring the mental health benefits of natural environments. *Frontiers in Psychology* 5, 1178.
- Popović, N., Baljošević, S., Katanić, R., Bojović, K. 1998. Clinical picture of the disease caused by the bite of a venomous snake – our experiences. *Acta Infectologica Yugoslavica* 3, 109–116. (in Serbian)
- Prokop, P. 2016. Universal Human Fears. In: Shackelford, T. K., Weekes-Shackelford V. (Eds). *Encyclopedia of Evolutionary Psychological Science*. Springer, Cham.
- Pucca, M. B., Knudsen, C., Oliveira, I. S., Rimbault, C., Cerni, F. A., Wen, F. H., Sachett, J., Sartim, M. A., Laustsen, A. H., Monteiro, W. M. 2020. Current knowledge on snake dry bites. *Toxins* 12, 668.
- Ristić, R., Kašanin-Grubin, M., Radić, B., Nikić, Z., Vasiljević, N. 2012. Land degradation at the Stara Planina Ski Resort. *Environmental Management* 49, 580–592.
- Sachs, N. 2020. Access to nature has always been important; with COVID-19, it is essential. *Health Environments Research & Design Journal* 13(4), 242–244.
- Smerke, Z. 1989. *Mountaineering and alpinism, II edition*. Mountaineering Association of Croatia, Kozarčeva 22, Zagreb, and RO “Zrinski” TIZ, Čakovec.
- Statistical Office of the Republic of Serbia, Statistics of catering and tourism. Available at [www.stat.gov.rs/en-US/oblasti/ugostiteljstvo-i-turizam/turizam](http://www.stat.gov.rs/en-US/oblasti/ugostiteljstvo-i-turizam/turizam), last accessed on 26 October 2021.
- Taylor, A. F., Kuo, F. E. 2009. Children with attention deficits concentrate better after walk in the park. *Journal of Attention Disorders* 12, 402–409.
- Tomović, Lj., Ajtić, R., Ljubisavljević, K., Urošević, A., Jović, D. et al. 2014. Reptiles in Serbia – Distribution and diversity patterns. *Bulletin of the Natural History Museum Belgrade* 7, 129–158.
- Tomović, Lj., Urošević, A., Vukov, T., Ajtić, R., Ljubisavljević, K. et al. 2015. Threatening levels and extinction risks based on distributional, ecological and life-history datasets (DELH) versus IUCN criteria – example of Serbian Reptiles. *Biodiversity and Conservation* 24, 2913–2934.
- Tomović, Lj., Anđelković, M., Krizmanić, I., Ajtić, R., Urošević, A. et al. 2019. Distribution of three *Vipera* species in the Republic of Serbia. *Bulletin of the Natural History Museum Belgrade* 12, 217–42.
- “Torlak” Institute of Virology, Vaccines and Sera: *Viekvin® equine antiserum Patient Information Leaflet*. Available at: [www.torlakinstitut.com/pdf/Viekvin-en.pdf](http://www.torlakinstitut.com/pdf/Viekvin-en.pdf), last accessed on October 28, 2021.
- Vujadinović, S., Šabić, D., Joksimović, M., Golić, R., Gajić, M., Živković, M., Milinčić, M. 2013. Possibilities for mountain-based adventure tourism: the case of Serbia. *Bulletin of Geography. Socio-economic Series* 19, 99–111.
- WHO, Regional Office for South-East Asia, World Health Organization 2016. *Guidelines for the management of snakebites*, 2<sup>nd</sup>ed.
- Žerajić, A. 2021. COVID-19 effects on tourism sector and implications for tour guides profession in Serbia. In: Thematic Proceedings of the 6<sup>th</sup> International Scientific Conference *Tourism challenges amid COVID-19*, (62–77). Vrnjačka Banja, Serbia.

## Appendix

**Table 1.** All questions and possible answers with percentages of men and women who answered them. Presented as % in the entire sample, N (96 respondents), and within genders (Nm = number of men, Nw = number of women). Significant differences between the Clusters are indicated in superscript lower case letters: a (between clusters 1 and 2), b (clusters 2 and 3), and c (clusters 1 and 3).

Questions	Possible answers	Percent in entire sample N = 96	Men		Women	
			Nm = 35	% of 96 36.46	Nw = 61	% of 96 63.54
1. How old are you?	i) 10–20	0.00	0	0.00	0	0.00
	ii) 21–30	3.10	2	2.08	1	1.04
	iii) 31–40	26.00	7	7.29	18	18.75
	iv) 41–50	36.50	15	15.63	20	20.83
	v) >51	34.40	11	11.46	22	22.92
2. You are:a,b	i) Male	36.50				
	ii) Female	63.50				
3. You are	i) member of the mountaineering club	66.70	20	20.83	44	45.83
	ii) excursion and hiking guide	10.40	6	6.25	4	4.17
	iii) I go to excursions only occasionally	20.80	8	8.33	12	12.50
	iv) My child(ren) go, I do not	2.10	1	1.04	1	1.04
	i) less than five years	21.90	3	3.13	18	18.75
	ii) between five and 10 years	17.70	7	7.29	10	10.42
4. How long have you been hiking?	iii) 11–20 years	20.80	7	7.29	13	13.54
	iv) over 20 years	28.10	15	15.63	12	12.50
	v) I go to excursions only occasionally	11.50	3	3.13	8	8.33
	i) three	3.10	1	1.04	2	2.08
5. How many snakes in total are there in Serbia?	ii) five	17.70	4	4.17	13	13.54
	iii) seven	37.50	16	16.67	20	20.83
	iv) 10	41.70	14	14.58	26	27.08
	i) two	43.80	16	16.67	26	27.08
6. How many venomous snakes are there in Serbia?	ii) three	50.00	18	18.75	30	31.25
	iii) five	5.21	1	1.04	4	4.17
	iv) seven	1.04	0	0.00	1	1.04



Questions	Possible answers	Percent in entire sample N = 96	Men		Women			
			Nm = 35	% of 96 36.46	% of men	Nw = 61	% of 96 63.54	% of women
7. Snakes are active only during the warmest periods of day <sup>a</sup>	i) True	32.30	8	8.33	22.86	23	23.96	37.70
	ii) False	67.70	27	28.13	77.14	38	39.58	62.30
	i) Exclusively in rocky terrain.	9.40	1	1.04	2.86	8	8.33	13.11
	ii) Exclusively on high mountains.	0.00	0	0.00	0.00	0	0.00	0.00
8. In which habitats do Serbian venomous snakes live? <sup>a</sup>	iii) Exclusively in forest edges.	0.00	0	0.00	0.00	0	0.00	0.00
	iv) In all of the above and in some other habitats.	90.60	34	35.42	97.14	53	55.21	86.89
	i) Only on high mountains.	2.08	1	1.04	2.86	1	1.04	1.64
	ii) Only south of the Sava and Danube rivers (no venomous snakes live in Vojvodina)	26.00	10	10.42	28.57	15	15.63	24.59
9. In which parts of Serbia do venomous snakes live?	iii) Only on hills.	4.17	0	0.00	0.00	4	4.17	6.56
	iv) None of the offered answers is correct.	67.70	24	25.00	68.57	41	42.71	67.21
	i) True	50.00	23	23.96	65.71	25	26.04	40.98
	ii) False	50.00	12	12.50	34.29	36	37.50	59.02
10. All our venomous snakes have triangular head.	i) No, none.	19.80	3	3.13	8.57	16	16.67	26.23
	ii) Yes, all.	46.90	22	22.92	62.86	23	23.96	37.70
	iii) Some are, some are not.	33.30	10	10.42	28.57	22	22.92	36.07
	iv) Why would anybody protect THAT?!	0.00	0	0.00	0.00	0	0.00	0.00
11. Are snakes in Serbia protected by law?	i) Yes, without cause.	3.10	1	1.04	2.86	2	2.08	3.28
	ii) No, they only defend themselves when provoked.	96.90	34	35.42	97.14	59	61.46	96.72
	i) Every one is deadly.	6.25	2	2.08	5.71	4	4.17	6.56
	ii) Every second person dies (50% mortality).	2.08	0	0.00	0.00	2	2.08	3.28
12. Do snakes attack people?	iii) Every fifth person dies (20% mortality).	6.25	3	3.13	8.57	3	3.13	4.92
	iv) Every tenth person dies (10% mortality).	11.50	5	5.21	14.29	6	6.25	9.84
	v) In most cases the bites are not fatal (0%-2% mortality).	74.00	25	26.04	71.43	46	47.92	75.41
13. How dangerous are the bites of our venomous snakes? <sup>a,c</sup>								

Questions	Possible answers	Percent in entire sample N = 96	Men		Women		
			Nm = 35	% of 96	Nw = 61	% of 96	
				36.46		63.54	
14. Have you tried so far to find information regarding snakes in Serbia? <sup>a,b,c</sup>	i) Yes, unsuccessfully.	5.21	2	2.08	3	3.13	4.92
	ii) Yes, there is data on the Internet.	34.40	13	13.54	20	20.83	32.79
	iii) Yes, the info can be found in books and journals.	10.40	5	5.21	5	5.21	8.20
	iv) Yes, I follow the scientific literature.	8.30	5	5.21	3	3.13	4.92
	v) No, I have not.	41.70	10	10.42	30	31.25	49.18
	i) Yes.	60.40	20	20.83	38	39.58	62.30
15. Do you think that snakes-related information for Serbia is sufficient?	ii) No.	39.60	15	15.63	23	23.96	37.70
	i) No, never.	2.08	1	1.04	1	1.04	1.64
	ii) Yes, once.	7.29	1	1.04	6	6.25	9.84
	iii) Between two and five times.	40.60	11	11.46	28	29.17	45.90
16. Have you ever met a snake in nature? <sup>a,b</sup>	iv) Between six and 10 times.	50.00	22	22.92	26	27.08	42.62
	i) Suck out the wound (with mouth) and tightly tie the bitten limb.	7.30	1	1.04	6	6.25	9.84
	ii) Squeeze the venom from the wound (with fingers) and use wide/elastic tourniquet to gently tie the limb.	41.70	21	21.88	19	19.79	31.15
	iii) Suck out the wound (with mouth) and use wide/elastic tourniquet to gently tie the limb.	7.30	2	2.08	5	5.21	8.20
17. What are the first aid measures in the case of a bite? <sup>a,b</sup>	iv) Squeeze the venom from the wound (with fingers) and tightly tie the bitten limb.	43.80	11	11.46	31	32.29	50.82
	i) Yes.	85.42	31	32.29	51	53.13	83.61
18. The "Toriak" institute produces antivenom. Is it efficient against all our venomous snakebites? <sup>b</sup>	ii) No.	12.50	4	4.17	8	8.33	13.11
	i) Yes, obligatorily.	40.60	12	12.50	27	28.13	44.26
19. Should the antivenom be administered in the field? <sup>a</sup>	ii) No, by no means.	59.40	23	23.96	34	35.42	55.74

Questions	Possible answers		Percent in entire sample N = 96	Men		Women		
	Nm = 35	% of 96		Nw = 61	% of 96	% of women		
20. Regarding snakes, I feel: a. b. c.	i) fear.	1	16.70	1.04	2.86	15	15.63	24.59
	ii) disgust.	2	3.13	2.08	5.71	1	1.04	1.64
	iii) both fear and disgust.	1	6.25	1.04	2.86	5	5.21	8.20
	iv) admiration.	4	8.30	4.17	11.43	4	4.17	6.56
	v) awe.	12	34.40	12.50	34.29	21	21.88	34.43
	vi) I have no concrete feeling regarding snakes.	15	31.30	15.63	42.86	15	15.63	24.59

**Table 2. Percentages of answers of the examinees grouped into clusters. Percentages of the answers given by men and women (pooled, M+F, and separately) in the entire sample (%N) and respective clusters, NCn. Notation of questions and answers is the same as in Table 1.**

	Cluster 1, NC1 = 35										Cluster 2, NC2 = 38										Cluster 3, NC3 = 23									
	M	F	M+F%	% M in N	% M in CI	% F in N	% F in CI	M	F	M+F%	% M in N	% M in CI	% F in N	% F in CI	M	F	M+F%	% M in N	% M in CI	% F in N	% F in CI									
1	i	0	0	0.00	0.00	0.00	0.00	12	26	39.58	12.50	31.58	27.08	68.42	4	19	23.96	4.17	17.39	19.79	82.61									
	ii	2	0	2.08	5.71	0.00	0.00	0	1	1.04	0.00	0.00	1.04	2.63	0	0	0.00	0.00	0.00	0.00										
	iii	5	4	9.38	5.21	14.29	4.17	0	9	9.38	0.00	0.00	9.38	23.68	2	5	7.29	2.08	8.70	5.21	21.74									
	iv	8	5	13.54	8.33	22.86	5.21	7	6	13.54	7.29	18.42	6.25	15.79	0	9	9.38	0.00	0.00	9.38	39.13									
	v	4	7	11.46	4.17	11.43	7.29	5	10	15.63	5.21	13.16	10.42	26.32	2	5	7.29	2.08	8.70	5.21	21.74									
3	i	11	11	22.92	11.46	31.43	11.46	8	19	28.13	8.33	21.05	19.79	50.00	1	14	15.63	1.04	4.35	14.58	60.87									
	ii	5	4	9.38	5.21	14.29	4.17	0	0	0.00	0.00	0.00	0.00	1	0	1.04	1.04	4.35	0.00	0.00										
	iii	3	1	4.17	3.13	8.57	1.04	3	6	9.38	3.13	7.89	6.25	15.79	2	5	7.29	2.08	8.70	5.21	21.74									
	iv	0	0	0.00	0.00	0.00	0.00	1	1	2.08	1.04	2.63	1.04	2.63	0	0	0.00	0.00	0.00	0.00										
4	i	2	5	7.29	2.08	5.71	5.21	1	7	8.33	1.04	2.63	7.29	18.42	0	6	6.25	0.00	0.00	6.25	26.09									
	ii	3	1	4.17	3.13	8.57	1.04	2	5	7.29	2.08	5.26	5.21	13.16	2	4	6.25	2.08	8.70	4.17	17.39									
	iii	3	3	6.25	3.13	8.57	3.13	3	7	10.42	3.13	7.89	7.29	18.42	1	3	4.17	1.04	4.35	3.13	13.04									
	iv	10	6	16.67	10.42	28.57	6.25	5	3	8.33	5.21	13.16	3.13	7.89	0	3	3.13	0.00	0.00	3.13	13.04									
	v	1	1	2.08	1.04	2.86	1.04	1	4	5.21	1.04	2.63	4.17	10.53	1	3	4.17	1.04	4.35	3.13	13.04									

	Cluster 1, NC1 = 35							Cluster 2, NC2 = 38							Cluster 3, NC3 = 23						
	M	F	M+F%	% M in N	% M in C1	% F in N	% F in C1	M	F	M+F%	% M in N	% M in C1	% F in N	% F in C1	M	F	M+F%	% M in N	% M in C1	% F in N	% F in C1
5	i	0	1	1.04	0.00	0.00	2.86	1	1	2.08	1.04	2.63	1.04	2.63	0	0	0.00	0.00	0.00	0.00	0.00
	ii	3	1	4.17	3.13	8.57	2.86	0	9	9.38	0.00	0.00	9.38	23.68	1	3	4.17	1.04	4.35	3.13	13.04
	iii	10	6	16.67	10.42	28.57	17.14	4	7	11.46	4.17	10.53	7.29	18.42	2	7	9.38	2.08	8.70	7.29	30.43
	iv	6	8	14.58	6.25	17.14	22.86	7	9	16.67	7.29	18.42	9.38	23.68	1	9	10.42	1.04	4.35	9.38	39.13
6	i	7	6	13.54	7.29	20.00	17.14	7	10	17.71	7.29	18.42	10.42	26.32	2	10	12.50	2.08	8.70	10.42	43.48
	ii	12	8	20.83	12.50	34.29	22.86	4	14	18.75	4.17	10.53	14.58	36.84	2	8	10.42	2.08	8.70	8.33	34.78
	iii	0	2	2.08	0.00	0.00	5.71	1	1	2.08	1.04	2.63	1.04	2.63	0	1	1.04	0.00	0.00	1.04	4.35
	iv	0	0	0.00	0.00	0.00	0.00	0	1	1.04	0.00	0.00	1.04	2.63	0	0	0.00	0.00	0.00	0.00	0.00
7	i	2	3	5.21	2.08	5.71	8.57	5	13	18.75	5.21	13.16	13.54	34.21	1	7	8.33	1.04	4.35	7.29	30.43
	ii	17	13	31.25	17.71	48.57	37.14	7	13	20.83	7.29	18.42	13.54	34.21	3	12	15.63	3.13	13.04	12.50	52.17
	iii	0	0	0.00	0.00	0.00	0.00	1	6	7.29	1.04	2.63	6.25	15.79	0	2	2.08	0.00	0.00	2.08	8.70
8	ii	0	0	0.00	0.00	0.00	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0	0	0.00	0.00	0.00	0.00	0.00
	iii	0	0	0.00	0.00	0.00	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0	0	0.00	0.00	0.00	0.00	0.00
	iv	19	16	36.46	19.79	54.29	45.71	11	20	32.29	11.46	28.95	20.83	52.63	4	17	21.88	4.17	17.39	17.71	73.91
	i	0	0	0.00	0.00	0.00	0.00	1	0	1.04	1.04	2.63	0.00	0.00	0	1	1.04	0.00	0.00	1.04	4.35
9	ii	7	3	10.42	7.29	20.00	8.57	1	6	7.29	1.04	2.63	6.25	15.79	2	6	8.33	2.08	8.70	6.25	26.09
	iii	0	0	0.00	0.00	0.00	0.00	0	4	4.17	0.00	0.00	4.17	10.53	0	0	0.00	0.00	0.00	0.00	0.00
	iv	12	13	26.04	12.50	34.29	37.14	10	16	27.08	10.42	26.32	16.67	42.11	2	12	14.58	2.08	8.70	12.50	52.17
10	i	13	8	21.88	13.54	37.14	22.86	7	12	19.79	7.29	18.42	12.50	31.58	3	5	8.33	3.13	13.04	5.21	21.74
	ii	6	8	14.58	6.25	17.14	22.86	5	14	19.79	5.21	13.16	14.58	36.84	1	14	15.63	1.04	4.35	14.58	60.87
11	i	1	5	6.25	1.04	2.86	14.29	2	8	10.42	2.08	5.26	8.33	21.05	0	3	3.13	0.00	0.00	3.13	13.04
	ii	12	7	19.79	12.50	34.29	20.00	7	7	14.58	7.29	18.42	7.29	18.42	3	9	12.50	3.13	13.04	9.38	39.13
	iii	6	4	10.42	6.25	17.14	11.43	3	11	14.58	3.13	7.89	11.46	28.95	1	7	8.33	1.04	4.35	7.29	30.43
12	iv	0	0	0.00	0.00	0.00	0.00	0	0	0.00	0.00	0.00	0.00	0.00	0	0	0.00	0.00	0.00	0.00	0.00
	i	1	0	1.04	1.04	2.86	0.00	0	2	2.08	0.00	0.00	2.08	5.26	0	0	0.00	0.00	0.00	0.00	0.00
13	ii	18	19	38.54	18.75	51.43	54.29	12	24	37.50	12.50	31.58	25.00	63.16	4	19	23.96	4.17	17.39	19.79	82.61
	i	0	0	0.00	0.00	0.00	0.00	2	4	6.25	2.08	5.26	4.17	10.53	0	0	0.00	0.00	0.00	0.00	0.00
	ii	0	0	0.00	0.00	0.00	0.00	0	1	1.04	0.00	0.00	1.04	2.63	0	1	1.04	0.00	0.00	1.04	4.35

What do Mountaineers and their Guides in Serbia Know about Venomous Snakes?  
A Pilot Questionnaire Analysis

Cluster 1, NC1 = 35										Cluster 2, NC2 = 38					Cluster 3, NC3 = 23				
M	F	M+FN	% M in C1	% F in C1	M	F	M+FN	% M in C1	% F in C1	M	F	M+FN	% M in C1	% F in C1	M	F	M+FN	% M in C1	% F in C1
19	16	35	54.29	16.67	47.51	12	26	39.58	12.50	31.58	27.08	68.42	4	19	23.96	4.17	17.39	82.61	
iii	0	1	0.00	1.04	2.86	2	2	4.17	2.08	5.26	2.08	5.26	1	0	1.04	1.04	4.35	0.00	0.00
iv	2	0	2.08	0.00	0.00	3	3	6.25	3.13	7.89	3.13	7.89	0	3	3.13	0.00	0.00	3.13	13.04
v	17	18	36.46	18.75	51.43	5	16	21.88	5.21	13.16	16.67	42.11	3	15	18.75	3.13	13.04	15.63	65.22
i	2	3	5.21	3.13	8.57	0	0	0.00	0.00	0.00	0.00	0.00	0	0	0.00	0.00	0.00	0.00	0.00
ii	12	9	21.88	9.38	25.71	1	2	3.13	1.04	2.63	2.08	5.26	0	9	9.38	0.00	0.00	9.38	39.13
iii	4	2	6.25	2.08	5.71	0	1	1.04	0.00	0.00	1.04	2.63	1	2	3.13	1.04	4.35	2.08	8.70
iv	1	2	3.13	2.08	5.71	3	1	4.17	3.13	7.89	1.04	2.63	1	0	1.04	1.04	4.35	0.00	0.00
v	0	0	0.00	0.00	0.00	8	22	31.25	8.33	21.05	22.92	57.89	2	8	10.42	2.08	8.70	8.33	34.78
i	12	10	22.92	10.42	28.57	7	13	20.83	7.29	18.42	13.54	34.21	1	15	16.67	1.04	4.35	15.63	65.22
ii	7	6	13.54	6.25	17.14	5	13	18.75	5.21	13.16	13.54	34.21	3	4	7.29	3.13	13.04	4.17	17.39
i	0	0	0.00	0.00	0.00	1	0	1.04	1.04	2.63	0.00	0.00	0	1	1.04	0.00	0.00	1.04	4.35
ii	0	1	1.04	1.04	2.86	0	4	4.17	0.00	0.00	4.17	10.53	1	1	2.08	1.04	4.35	1.04	4.35
iii	4	6	10.42	6.25	17.14	5	14	19.79	5.21	13.16	14.58	36.84	2	8	10.42	2.08	8.70	8.33	34.78
iv	15	9	25.00	9.38	25.71	6	8	14.58	6.25	15.79	8.33	21.05	1	9	10.42	1.04	4.35	9.38	39.13
i	1	1	2.08	1.04	2.86	0	3	3.13	0.00	0.00	3.13	7.89	0	2	2.08	0.00	0.00	2.08	8.70
ii	14	9	23.96	9.38	25.71	4	7	11.46	4.17	10.53	7.29	18.42	3	3	6.25	3.13	13.04	3.13	13.04
iii	0	1	1.04	1.04	2.86	2	4	6.25	2.08	5.26	4.17	10.53	0	0	0.00	0.00	0.00	0.00	0.00
iv	4	5	9.38	5.21	14.29	6	12	18.75	6.25	15.79	12.50	31.58	1	14	15.63	1.04	4.35	14.58	60.87
i	16	10	27.08	10.42	28.57	11	23	35.42	11.46	28.95	23.96	60.53	4	18	22.92	4.17	17.39	18.75	78.26
ii	3	5	8.33	5.21	14.29	1	3	4.17	1.04	2.63	3.13	7.89	0	0	0.00	0.00	0.00	0.00	0.00
i	4	4	8.33	4.17	11.43	6	16	22.92	6.25	15.79	16.67	42.11	2	7	9.38	2.08	8.70	7.29	30.43
ii	15	12	28.13	12.50	34.29	6	10	16.67	6.25	15.79	10.42	26.32	2	12	14.58	2.08	8.70	12.50	52.17
i	0	0	0.00	0.00	0.00	0	0	0.00	0.00	0.00	0.00	0.00	1	15	16.67	1.04	4.35	15.63	65.22
ii	0	0	0.00	0.00	0.00	0	0	0.00	0.00	0.00	0.00	0.00	2	1	3.13	2.08	8.70	1.04	4.35
iii	0	1	1.04	1.04	2.86	0	1	1.04	0.00	0.00	1.04	2.63	1	3	4.17	1.04	4.35	3.13	13.04
iv	3	3	6.25	3.13	8.57	1	1	2.08	1.04	2.63	1.04	2.63	0	0	0.00	0.00	0.00	0.00	0.00
v	7	9	16.67	9.38	25.71	5	12	17.71	5.21	13.16	12.50	31.58	0	0	0.00	0.00	0.00	0.00	0.00
vi	9	3	12.50	3.13	8.57	6	12	18.75	6.25	15.79	12.50	31.58	0	0	0.00	0.00	0.00	0.00	0.00