

The two faces of Janus, or the dual mode of public attitudes towards snakes



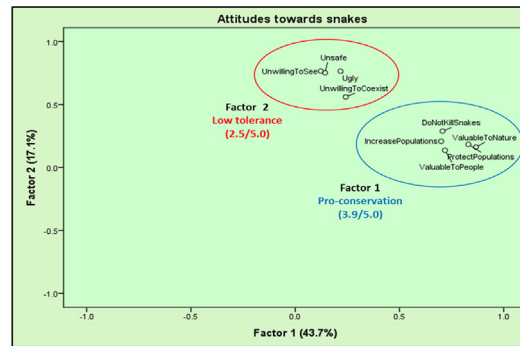
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HIGHLIGHTS

- Respondents were highly intolerant of snakes but favored their conservation.
- Tolerance attitude was positively correlated with conservation attitude.
- Increased knowledge of biology and behavior improved attitudes towards snakes.
- Moralistic and naturalistic attitudes were positively related to snake attitudes.
- Younger, more educated females were more positive towards snakes.

GRAPHICAL ABSTRACT



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ABSTRACT

Snakes are controversial animals, therefore a better understanding of public attitudes is critical for their effective protection and future survival. The attitudes towards snakes of 951 adults in Greece were investigated in personal interviews. Factor analysis revealed a dual mode of attitudes: respondents were highly intolerant of snakes, while they supported their conservation at the same time. Respondents had high knowledge about the behavior of snakes, medium knowledge of their biology and were strongly affected by folklore. Structural models revealed that tolerance was a positive mediator of conservation. Knowledge about snake behavior and biology was positively correlated with attitudes towards snakes. Moralistic and naturalistic attitudes were positively, and dominionistic attitudes negatively, correlated with snake tolerance and conservation attitudes. Younger, more educated people were more snake-tolerant than older, less educated people. Females were less snake-tolerant and more conservation-oriented than males. These findings increased the understanding of human attitudes towards snakes and helped identify factors critical for their conservation. As such they could be used to design environmental education programs incorporating both information-based and experiential activities that will improve attitudes, behaviors and, eventually, the chances for the survival of these uncharismatic animals.

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1. Introduction

Snakes (suborder Serpentes) are very important components of an ecosystem because they act as both top predators and prey, being at

the same time equally important to human societies, especially for medicinal purposes, rodent control, and protein sources in some countries (Mullin and Seigel, 2009). Snake populations are declining globally due to anthropogenic pressures, notably habitat degradation, intentional killing, biocides, and overexploitation for economic gain (Gibbons et al., 2000). Snakes are among the most endangered animals, with about 12% of the extant snake species of the world threatened with

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extinction (Böhm et al., 2013). This situation demanded immediate action and many governmental and non-governmental conservation programs have been implemented or are in progress, worldwide (Mullin and Seigel, 2009). As human activity is the primary cause for the decline and extinction of species and populations, the success of conservation programs largely depends on public attitudes towards snakes and their conservation (Teel and Manfredo, 2010; Zinn et al., 1998). Therefore, wildlife managers and policy makers need to understand and incorporate human attitudes into snake conservation actions and policies.

1.1. Attitudes towards snakes

Besides their ecosystem and utilitarian values (Mullin and Seigel, 2009), snakes are integral to human cultures, having been depicted in both positive and negative ways in many countries and regions worldwide (Morris and Morris, 1965). They have been considered a sacred deity, associated to the forces of nature due to their unique method of locomotion, similar to the movement of water and lightning, by many cultures and through the ages (García-López et al., 2017). Snakes are closely related to the earth, symbolizing the Great Mother Creator of the Cosmos, referring to both origin and death (De la Garza, 2003). Snakes and snake-like gods have been considered as protectors, healers, representatives of fertility, wisdom, terrestrial creative forces, and good luck (Ingersoll, 1928; Ringle et al., 1998; Wickkiser, 2008). Although only about 500 of the approximately 3600 snake species are venomous, humans have assigned supernatural powers to them due to the deadly poison that some species possess, and as such they are to be revered and feared of at the same time (García-López et al., 2017). However, it is the persistence of legends that portray snakes as hostile, repulsive and evil creatures that shaped negative dispositions towards these animals, endowing them with the worst reputation among all groups of animals (Alves et al., 2012; Ceriaco, 2012).

Public attitudes and how they might affect snake populations and conservation efforts have drawn the attention of human dimensions research in many countries. Ceriaco (2012) found that the presence of folklore (i.e., snakes are dangerous, poisonous and fatal to humans) and negative values (i.e., ugliness, creepiness, reluctance of coexistence or encounter, intentional killing) predicted persecution and anti-conservation attitudes towards reptiles (and amphibians) in Portugal. In Brazil, local residents believe that all snakes are in some way potentially dangerous and kill not only venomous snakes but also non-venomous individuals upon encounter (Alves et al., 2009, 2012; Fita et al., 2010). In Mexico, García-López et al. (2017) found that snakes are still very important for magical-religious and medicinal purposes, although the fear and misperception on the toxicity of snakes might represent a potential threat for their conservation. Public fear and ignorance about snakes and the need for their conservation were strong indicators of the propensity to harm or kill snakes in southern Nepal (Pandey et al., 2016). Several studies have reported fear and negative attitudes of students towards snakes (e.g. Brazil: Alves et al., 2014; Turkey and Slovakia: Prokop et al., 2009). Such attitudes were influenced by the potential risk and myths associated with these animals and a limited knowledge of their ecological and utilitarian importance.

1.2. General wildlife attitudes and demography

Moralistic, dominionistic, and naturalistic attitudes have also been found to affect public perceptions of wildlife (Knight, 2008; Loveridge et al., 2007). Moralistic attitudes refer to beliefs in the spiritual reverence and ethical concern for wildlife, whereas dominionistic attitudes, being essentially the opposite, refer to beliefs that humans have mastery, physical control and dominance of wildlife (Kellert, 1996). Prior research has found that those with moralistic attitudes are more positive towards nature and wildlife and more supportive of species protection than those with dominionistic attitudes (Knight, 2008; Liordos et al., 2017; Wilson, 1997).

Naturalistic attitudes refer to the direct experience and exploration of wildlife and can be categorized in consumptive, involving the harvest of wildlife, as in hunting and fishing, and nonconsumptive, which include non-extractive activities, such as wildlife-watching and photography (Kellert, 1996). Cooper et al. (2015) found that wildlife recreationists, both hunters and birdwatchers, were 4–5 times more likely than nonrecreationists to engage in conservation behaviors. Hunters have a long tradition of helping to conserve game animals and their habitat in many countries (Holsman, 2000; Loveridge et al., 2007).

Among demographic characteristics, age, gender, level of education and place of residence have been proposed as important factors influencing attitudes towards wildlife (e.g. Ceriaco, 2012; Pinheiro et al., 2016; Smith et al., 2014; Vaske et al., 2011). Most often studies report that younger, highly educated females tend to show greater emotional affection towards individual animals, are more concerned about animal cruelty and exploitation, have a general aversion to killing or violence and are more wildlife protection-oriented than older males with less education (Teel and Manfredo, 2010; Vaske et al., 2011). Women had more negative perceptions and were more afraid of snakes than were men (Alves et al., 2014; Pinheiro et al., 2016). People with lower education were more likely to consider all snakes as dangerous, and they also proved to be more hostile to these animals than those with higher education (Moura et al., 2010; Pinheiro et al., 2016). Less educated rural residents were more influenced by folklore and more likely to persecute snakes than more educated urban residents (Ceriaco, 2012). Rural residents are more exposed to wildlife and wildlife-related impacts and are therefore more likely to express negative attitudes and least likely to support wildlife conservation than urban residents (Kleiven et al., 2004; Smith et al., 2014).

1.3. Aims of the study

There are several studies of public knowledge about and attitudes towards snakes and their conservation, mainly originating from Central and South America (e.g. Alves et al., 2009, 2012, 2014; Fita et al., 2010; García-López et al., 2017) and Asia (e.g. Pandey et al., 2016; Sasaki et al., 2010). Fewer such studies have been carried out in European countries (e.g. Ceriaco, 2012; Prokop et al., 2009), whereas we know of only one study in Greece, concerning public support for the conservation of the endangered Milos viper (*Macrovipera schweizeri*) in comparison to other endangered animals (Liordos et al., 2017).

Most of the 23 snake species that are found in Greece and their habitats are strictly protected by the Bern Convention and the 92/43/EEC Habitats Directive (Table 1). Furthermore, 3 species have been included in the Greek Red Data Book: the endangered Milos viper, and the vulnerable western whip snake (*Hierophis viridiflavus*) and Greek meadow viper (*Vipera graeca*) (13% of total; Legakis and Maragou, 2009). Our main objective was therefore to understand public attitudes towards snakes that would allow for the application of successful conservation programs. First, we asked respondents to rate attitude-related statements. Next, we recorded demographic characteristics and explored respondents' knowledge about snakes, and their moralistic, dominionistic and naturalistic attitudes towards wildlife. Finally, we were interested in assessing the influence of knowledge, attitudes towards wildlife, and demography on public attitudes towards snakes.

Based on theory, previous findings and our research objectives, we hypothesized:

- H1.** Respondents will be more positive towards the conservation of snakes than towards their interaction with snakes.
- H2.** Moralistic and naturalistic attitudes will be positively, and dominionistic attitudes negatively, associated with attitudes towards snakes.
- H3.** Knowledge about snakes will be positively associated with attitudes towards snakes.

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