Received: 17 May 2024 | Revised: 13 January 2025 | Accepted: 24 February 2025

DOI: 10.1111/ssm.18350

RESEARCH ARTICLE

WILEY | SSMA

Iberian fauna perceived danger: A study with primary education students

António Almeida[1] | **Valter Rato**[2]

[1]Instituto Politécnico de Lisboa/CICS.NOVA, Universidade Nova de Lisboa/EDUNOVA.ISPA, Lisbon, Portugal

[2]Agrupamento de Escolas Daniel Sampaio, Almada, Portugal

Correspondence
António Almeida, Instituto Politécnico de Lisboa/CICS.NOVA, Universidade Nova de Lisboa/EDUNOVA.ISPA, Rua Moinho do Casalão 5, 2970-048 Sesimbra, Portugal.
Email: aalmeida@eselx.ipl.pt

Abstract

The present study sought to verify, through a questionnaire, how 270 primary school students assessed the dangerousness of 16 animals from the Iberian fauna and whether, in danger of extinction, these species should be saved. The animals considered most dangerous were three invertebrates—the Mediterranean black widow, the scorpion, and the Portuguese man of war—and three vertebrates—the blue shark, the Montpellier snake, and the Iberian wolf. The justifications were related to morphological, physiological, and behavioral features and the damage they can cause to humans. Some misconceptions were detected, such as the underrated danger of the mosquito, because it is small, and the overrated danger of the vulture, because it is necrophagous, or the bat, because it is hematophagous. The generalization of danger to all species of a given taxonomic group occurred in the case of the blue shark and the Montpellier snake. Even so, the students supported the need to fight against the extinction of the dangerous animals because they all have a role in nature. No differences in the results concerning the sex of the students were found. A few strategies to approach the present issue in school are presented.

1 | INTRODUCTION

The involvement of people in the preservation of biodiversity is an essential task nowadays since all citizens can have a positive role to play in this aim, based on the attitudes and behaviors they demonstrate towards the living world. Formal education can play a role to achieve this aim, helping to increase the ecological literacy of students, especially when it includes programs, or at least activities, designed for this purpose (Krnel & Naglic, 2009; Ozsoy et al., 2012). These programs can also promote an emotional involvement of students towards biodiversity with impacts on their preservation (Prokop et al., 2011).

Beedell and Rehman (1999), based on The Theory of Planned Behavior, state that a person's behavior is determined by the information or beliefs s(he) has, in the present case about different animal species. When these beliefs are positive, they can promote people's adherence to initiatives leading to biodiversity conservation (Bennett, 2016); when negative, they have the opposite effect. Consequently, unpopular species are more at risk of extinction because of destructive behavior towards the animals that are part of them, without any concern being expressed regarding this fact (Ballouard et al., 2013). This can explain why reptiles, insects, and other animals are considered harmful and receive less support for their preservation (Ceríaco et al., 2011; Knight, 2008).

Thus, any intervention with students of different ages must consider that the popularity of different species is very different, and that this can influence engagement in conservation practices as well as attitudes and behaviors when they meet different life forms. Therefore, identifying the ideas that children have about species of different taxonomic groups proves to be a fundamental survey for greater consistency in terms of the best strategies and activities to be implemented in schools. For this aim, it is

also important to analyze the factors that several studies conclude can affect the popularity of species, and the perception of the dangerousness of a species seems to be a relevant one.

Consequently, the problem that motivated the present study was the following:

> What perceptions do Portuguese children have about the dangerousness of some animals of the Iberian fauna, and what impact do these perceptions have on their stance regarding efforts to preserve different species?

To find an answer to this problem, the study has the following research questions:

- What are the perceptions of Portuguese children regarding the dangerousness of some species of the Iberian Peninsula from different taxonomic groups for humans and their goods?
- What features do these species possess that make them dangerous in the eyes of children?
- Do children consider it necessary to make efforts to save dangerous animals in case of the danger of extinction?
- Are there differences in the results according to the sex of the participants?

Based on the results, it will be possible to define guidelines to discuss animals' dangerousness in formal education.

2 | LITERATURE REVIEW

In the perception of the species of the animal world, the similarity to humans seems to be an important factor, a main reason for the undervaluation of invertebrates in relation to at least many vertebrates. But this trend has exceptions, as pioneering studies by Kellert (1980, 1993) demonstrated, since butterflies are appreciated for their aesthetic value and bees for their utilitarian value, or reptiles are depreciated for their appearance. Even so, for Mather (2023), invertebrates are generally excluded from any discussion about intelligence, sentience, and animal welfare. And in general terms, the factors that seem to affect animals' preference are their phylogenetic proximity to humans, their greater size, intelligence and beauty (Herzog, 2010), as well as the morphological and behavioral aspects that characterize mammals and birds (Hillman, 1991). Animals that don't fit with these features are ignored or considered not important, with consequences for the number of conservation programs associated with them. Even zoos, which advocate an increasing centrality in the preservation of species in their mission, fail to privilege the less popular taxonomic groups (Small, 2012).

When assessing species' perception, their dangerousness to humans or to their goods is also relevant (Löe & Röskaft, 2004). According to Athreya (2007), the assessment of what constitutes a dangerous animal depends on whom we ask, when, and where, which means that danger is a subjective feeling, which makes it difficult to apply to universal criteria in any circumstances. Even so, danger also certainly has an objective basis, which can fall into two dimensions: (i) risk of affecting the physical integrity of human beings or damaging their goods; and (ii) risk of contracting diseases through species that spread them.

The first dimension has been losing relevance, because of the decline of contact with nature, at least in the developed world (Almeida et al., 2023; Clements, 2004; Louv, 2010). This decline greatly reduces the possibilities of physical contact with hypothetically dangerous animals. Even so, in relation to the risk posed by different groups of animals, Kelly et al. (2019) argue that the risk large carnivores pose to humans is often exaggerated, especially when compared to other natural risks, like lightning, as these animals generally avoid human interaction. They emphasize the need to differentiate between intentional attacks, unintentional responses to perceived threats, and disruptive behavior caused by a pathological condition.

The second dimension, risk of contracting diseases, remains significant, particularly in urban areas where disease-vector animals can proliferate, especially with high insobriety levels. However, Cardak's (2009) study with elementary school students revealed that animals perceived as poisonous, wild, cunning, or large were most often considered dangerous. This reflects a common misconception that smaller animals cannot be dangerous, leading to perceptions of snakes as more dangerous than ticks.

Equally common is the negative perception of danger being generalized to a certain taxonomic group, when only a few species are, in fact, dangerous to humans. Argôlo (2004) notes that although some snakes are dangerous, there is a common misconception that all species pose a threat, which is not true. A similar misunderstanding applies to sharks, as only 10% of species are involved in attacks on humans, and it is important to differentiate between intentional attacks and reactions to human actions (Halstead, 1995). Seraphin (2010) adds that many students are unaware that shark species vary greatly in size and behavior, with some being active predators and others plankton feeders. However, Prokop et al. (2010) found that spiders, another group of unpopular animals,

were perceived more positively in places where the number of dangerous species of this group was low. This suggests that reducing the perception of danger can improve attitudes towards certain species or taxonomic groups, which depends on understanding the characteristics of the native fauna in each region.

The perception of a species' dangerousness involves both subjective and objective factors. Consequently, the real danger can be over- or underrated due to influences such as:

- Lived experiences. Typically, these experiences are associated with traumas that increase fear of certain animals. However, Gerdes et al. (2009) highlight that frequent encounters with bees and even being stung by them can put this danger into perspective since nothing particularly serious happens to most people.
- The image conveyed by the media. Looy and Wood (2006) argue that many TV shows fuel repulsion and horror toward invertebrates like earthworms, cockroaches, and larvae, reinforcing a lack of empathy for these species. Similarly, Ballouard et al. (2013) highlight that the media often generate negative, irrational beliefs about certain animals, distorting their image. Neff (2015) uses the film "Jaws" as an example that promotes the false idea that shark-human encounters are always lethal, sharks attack intentionally, and must be destroyed.
- Cultural beliefs and traditions. Ceríaco et al. (2011) discuss how traditional ecological knowledge, or "folk biology," can have both positive and negative effects on conservation. A negative example is the intentional killing of geckos in the Mediterranean due to misconceptions about them being repulsive, inducing fear, and causing skin diseases or poisoning, beliefs that are often resistant to change. Similar harmful traditions exist concerning wolves in various Scandinavian countries (Linnell et al., 2002). Stories like Little Red Riding Hood, The Three Little Pigs, and The Boy Who Cried Wolf are a kind of international cultural legacy that emphasizes the danger of this animal.
- The sex of the respondents. Several studies show that females express greater concern about the instrumental use of animals for human purposes, but greater fear of unpopular animals, for example, in relation to spiders and wasps (Gerdes et al., 2009) or large carnivores (Røskaft et al., 2003). Consequently, Lindemann-Matthies (2005) states that males tend to show greater empathy towards wild species. Kaltenborn et al. (2006) explain that evolutionary reasons may help to explain this difference, given that women were traditionally dedicated to protecting children from predators. Even so, cultural reasons may also influence sex differences, since men have more difficulty accepting their fears.

3 | METHODOLOGY

The present study has an exploratory nature, as it aims to obtain data on a topic little explored, at least in Portugal, covering autochthonous fauna. It uses a mixed methodology, since it combines quantitative and qualitative data.

3.1 | Sample

The study involved 277 primary school students attending the 5th and 6th years of schooling: 130 boys, with a mean age of 11.35 (SD = 1.167) and 147 girls, with a mean age of 11.27 (SD = 0.081). The children were from three state schools in the Lisbon metropolitan area, with a medium to low socioeconomic level. The selected schools collaborate with the researchers' institution in initial training courses, providing classes for the professional internship of pre-service teachers. Thus, the choice of schools was not random, although the classes to which the students belonged were chosen randomly.

3.2 | Data collection

In the aforementioned years of schooling, the topic of animal biodiversity is part of the curriculum, and its emphasis is on the morphological and behavioral features of species and their adaptation to the environment. The students' teachers were asked to include a set of animals when addressing these curricular items. This set included the animals present in the questionnaire designed for the data collection—to allow the children to get to know them a little—but the teaching practice should not be focused entirely on these species. It is important to highlight that the topic of the dangerousness of animals to humans and their goods was not subject to formal instruction, since it does not appear in the curricular guidelines or textbooks.

The questionnaire was divided into three parts: the first part included sociodemographic data of the participants; the second part surveyed the dangerousness of 16 animals with a request for one justification; and the third part consisted of a final question about whether dangerous animals should be saved or not in case of danger of extinction and why.

The animals present in the questionnaire were seven invertebrates and nine vertebrates that occur in the Iberian Peninsula in terrestrial and aquatic environments, likely to be perceived with a different degree of dangerousness. The invertebrates were from the classes Insecta, Arachnida, Chilopoda, and Hydrozoa, and the vertebrates from Mammalia, Aves, Reptilia, Amphibia, Chondrichthyes, and Actinopterygii. The

exact names of the species are mentioned in the presentation of the results.

To assess the dangerousness of each animal, a photo was included associated to a Likert scale, in which 1 meant "not dangerous at all" and 5 "very dangerous." Even knowing that the topic of the animals' dangerousness is not approached frequently, ideas about this subject could be acquired in different contexts, including in class when animal biodiversity is discussed. It was also considered plausible that by observing the photos of the animals certain inferences could also be made concerning the present topic, even knowing that many might be incorrect. The final question sought to know whether students would care about the possible extinction of dangerous species on the planet. It was a dichotomous question, yes or no, followed by the request for a justification (one reason).

3.3 | Data analysis

Descriptive and inferential statistics were used to analyze the results of the closed questions. Content analysis was used for the open questions.

For each animal, the absolute and relative frequency obtained for each item on the Likert scale was calculated. Simultaneously, the mean, median, and standard deviation values were calculated for each animal. The mean was included even knowing that the Likert scale items correspond to an ordinal scale, but it was considered a complementary indicator of the degree of dangerousness admitted by the respondents.

To check statistically significant differences in the assessment of the dangerousness of animals according to the sex of the participants, the Mann–Whitney *U* test was applied. In the dichotomous question about the possibility of saving dangerous species in case of extinction, the absolute and relative frequencies of positive and negative responses were calculated. To verify statistically significant differences according to sex, a chi-square test was used.

The content analysis of the open questions was based on a categorization of the responses, in order by group, firstly, similar ideas, even when stated in a different way. Then, the similar ideas were included in the following broader categories defined a posteriori: personal feelings, morphology and physiology of animals, behavioral features, usefulness for humans, harm for humans, and ecosystem role. The arguments associated with each category were, whenever possible, classified as positive or negative in relation to animals. For this classification, it was needed to check the value attributed by each student on the Likert scale. For example, a student justified the dangerousness of the bee with the fact that it is small, although the attribute of being big or small is not an indicator by itself of a positive or negative perception. Other answers were considered redundant, for example, "It is dangerous" or "It is not dangerous." Still others were classified as non-target answers, for example, "I saw a film about the animal"; "It eats the male, after the sexual act" or "I have already done schoolwork about the wolf."

3.4 | Validity and reliability

The questionnaire was piloted on 15 children from a class not included in the sample, to detect difficulties in the lexical understanding and vocabulary and also to test the time required for its administration. The questionnaire was also sent to two experts in science teaching to check its suitability for the study aims. From both processes, and due to the difficulties identified and suggestions given, it was decided to remove two mammals from the questionnaire, to reduce the incidence of this taxonomic group and also make the questionnaire shorter and possible to be administered in 45 min. It is important to highlight that the students' main difficulty was related to their ability to justify the dangerousness of each animal, an aspect increased by their difficulties in mother tongue. Thus, the answers were almost always synthetic, expressing an idea quite often in a very short sentence, for example, "it attacks"; "it causes disease"; "it doesn't hurt." Other responses were not exactly logical justifications given the request to assess the dangerousness of the animals, for example, "I don't like the animal" or "It is cute." This can be considered the main limitation of the study, even knowing that the participants were children. But it was considered important to maintain the request of a justification. The categorization of arguments was cross-checked by the authors for validity and the agreement value was 0.93. Divergent cases were due to incomplete statements or spelling that made their understanding more difficult.

3.5 | Ethical principles

The study received approval from school directors as well as from the teachers responsible for the classes where it was implemented. The consent of parents/guardians was also obtained, and the questionnaire was answered by the students who wanted to do so. One of the researchers presented the purpose of the study in each class and asked for children's participation. They were also informed that their responses would be confidential and that they could withdraw at any time from completing

the questionnaire. The presentation of the study to the participants followed the recommendation of O'Reilly et al. (2013) that it is important to convince the audience that their contribution is relevant, since it can help the understanding of a certain subject. The majority of the students expressed their interest in participating, but while filling out the questionnaire some expressed orally their difficulties in justifying the level of danger attributed as mentioned previously. They were encouraged to try, but to those who still stated their inability, no further insistence was made. In some classes, after finishing the questionnaire, students expressed interest in continuing to talk about the subject and in clarifying a few doubts about the animals. The doubts and other curiosities were clarified when the available time allowed. From all the questionnaires administered, 22 were eliminated due to the lack of answers to several closed questions.

The questionnaire was considered non-intrusive, as it did not address any personal dimension of the children's lives or cause any harm to the participants. On the contrary, the results may prove to be important for approaching the subject in a formal learning context, especially associated with programs of environmental education.

4 | RESULTS

Table 1 shows the results regarding the decreasing order of dangerousness attributed by the students to the animals presented in the questionnaire, with the invertebrates in gray.

The animals considered most dangerous were three invertebrates: the Mediterranean black widow, the scorpion, and the Portuguese man-of-war; and three vertebrates: the blue shark, the Montpellier snake, and the Iberian wolf. The least dangerous were three vertebrates: the gecko, the spiny toad, and the Mediterranean turtle; and one invertebrate: the ladybird. Therefore, there was no prevalence in terms of the perception of dangerousness revealed by the students in relation to the two large groups of animals. Table 2 shows the results according to the sex of the respondents.

Comparing the students' responses according to their sex, there were no statistically significant differences in the perception of the dangerousness of the different animals. The exception was for the ladybird, but this difference had no relevance, since students of both sexes expressed the perception that it is a small harmless animal, and only a greater number of girls scored the grade 2 on the scale. Even so, the median value for three

TABLE 1 Degree of dangerousness attributed by the children to different animals in descending order.

Animals	1	2	3	4	5	Mean	Median	SD
Mediterranean black widow *Latrodectus tredecimguttatus*	4 (1.4)	7 (2.5)	39 (14.1)	54 (19.5)	173 (62.5)	4.38	5	0.920
Scorpion *Buthus ibericus*	1 (0.4)	9 (3.2)	37 (13.4)	91 (32.9)	139 (50.2)	4.29	5	0.845
Blue shark *Prionace glauca*	4 (1.4)	9 (3.2)	50 (18.1)	62 (22.4)	152 (54.9)	4.25	5	0.961
Montpellier snake *Malpolon monspessulanus*	6 (2.2)	16 (5.8)	76 (27.4)	65 (23.5)	114 (41.2)	3.95	4	1.055
Portuguese man o' war *Physalia physalis*	9 (3.3)	24 (8.7)	64 (23.1)	70 (25.4)	110 (39.9)	3.89	4	1.123
Iberian wolf *Canis lupus*	1 (0.4)	19 (6.9)	72 (26.0)	116 (41.9)	69 (24.9)	3.84	4	0.890
Medit. banded centipede *Scolopendra cingulata*	13 (4.7)	16 (5.8)	87 (3 1.4)	62 (22.4)	99 (35.7)	3.78	4	1.133
Lesser weever *Echiichthys vipera*	30 (10.8)	35 (12.6)	108 (39.0)	61 (22.0)	43 (15.5)	3.18	3	1.170
Cinereous vulture *Aegypius monachus*	29 (10.5)	55 (19.9)	128 (46.2)	47 (17.0)	18 (6.5)	2.89	3	1.019
Gray long-eared bat *Plecotus austriacus*	56 (20.2)	48 (17.3)	99 (35.7)	40 (14.4)	34 (12.3)	2.81	3	1.260
Mosquito *Culex pipiens*	45 (16.2)	90 (32.5)	63 (22.7)	34 (12.3)	45 (16.2)	2.79	3	1.308
Bee A*pis melifera*	23 (8.3)	108 (39.0)	97 (35.0)	32 (11,6)	17 (6,1)	2.68	3	0.992
Common wall gecko *Tarentola mauritanica*	142 (51.3)	69 (24.9)	49 (17,7)	10 (3.6)	7 (2.5)	1.81	1	1.014
Spiny toad *Bufo spinosus*	176 (63.5)	64 (23.1)	27 (9.7)	4 (1.4)	6 (2.2)	1.55	1	0.889
Lady bird *Coccinella septempunctata*	267 (96.4)	9 (3.2)	1 (0.4)	-	-	1.03	1	0.213
Mediterranean turtle *Mauremys leprosa*	198 (71.5)	46 (16.6)	30 (10.8)	3 (1.1)	-	1.41	1	0.725

Note: The absolute and relative frequencies for each item on the Likert scale are presented, as well as the mean, median, and SD for each animal. In gray the animals that are invertebrates.

TABLE 2 The dangerousness of the animals according to the sex of the participants (Likert scale—1: "not dangerous" and 5: "very dangerous").

	1		2		3		4		5		Mean			Median		SD	
	M	F	M	F	M	F	M	F	M	F	M	F	*p*	M	F	M	F
Mediterranean black widow *Latrodectus tredecimguttatus*	2 (1.5)	2 (1.4)	3 (2.3)	4 82.7)	20 (15.4)	19 (12.9)	23 (17.7)	31 (21.1)	82 (63.1)	91 (61.9)	4.38	4.39	0.929	5	5	0.082	0.075
Scorpion *Buthus ibericus*	-	1 (0.7)	4 (3.1)	5 (3.4)	17 (13.1)	20 (13.6)	46 (35.4)	45 (30.6)	63 (48.5)	76 (51.7)	4.29	4.29	0.998	4	5	0.071	0.072
Blue shark *Prionace glauca*	3 (2.3)	1 (0.7)	4 (3.1)	5 (3.4)	23 (17.7)	27 (18.4)	34 (26.2)	28 (19.0)	66 (50.89	86 (58.5)	4.20	4.31	0.330	5	5	0.086	0.077
Montpellier snake *Malpolon monspessulanus*	3 (2.3)	3 (2.0)	8 (6.2)	8 (5.4)	34 (26.2)	42 (28.6)	36 (27.7)	29 (19.7)	49 (37.7)	65 (44.2)	3.92	3.98	0.619	4	4	0.091	0.087
Portuguese man o' war *Physalia physalis*	5 (3.8)	4 (2.7)	12 (9.2)	12 (8.2)	29 (22.3)	35 (24.0)	35 (26.9)	35 (24.0)	49 (37.7)	61 (41.8)	3.85	3.93	0.534	4	4	0.100	0.091
Iberian wolf *Canis lupus*	1 (0.8)	-	8 (6.2)	11 (7.5)	39 (30.0)	33 (22.4)	51 (39.2)	65 (44.2)	31 (23.8)	38 (25.9)	3.79	3.88	0.392	4	4	0.079	0.072
Mediterranean banded centipede *Scolopendra cingulata*	5 (3.8)	8 (5.4)	10 (7.7)	6 (4.1)	48 (36.9)	39 (26.5)	27 (20.8)	35 (23.8)	40 (30.8)	59 (40.1)	3.66	3.89	0.104	4	4	0.097	0.094
Lesser weever *Echiichthys vipera*	15 (11.5)	15 (10.2)	21 (16.2)	14 (9.5)	42 (32.3)	66 (44.9)	32 (24.6)	29 (19.7)	20 (15.4)	23 (15.6)	3.16	3.21	0.727	3	3	0.106	0.093
Cinereous vulture *Aegypius monachus*	13 (10.0)	16 (10.9)	31 (23.8)	24 (16.3)	48 (36.9)	80 (54.4)	27 (20.8)	20 (13.6)	11 (8.5)	7 (4.8)	2.93	2.85	0.474	3	3	0.095	0.078
Gray long-eared bat *Plecotus austriacus*	27 (20.8)	29 (19.7)	24 (18.5)	24 (16.3)	47 (36.2)	52 (35.4)	18 (13.8)	22 (15.0)	14 (10.8)	20 (13.6)	2.75	2.86	0.469	3	3	0.108	0.105
Mosquito *Culex pipiens*	22 (16.9)	23 (15.6)	38 (29.2)	52 (35.4)	38 (29.2)	25 (17.0)	13 (10.0)	21 (14.3)	19 (14.6)	26 (17.7)	2.76	2.82	0.665	3	2	0.111	0.111
Bee A*pis melifera*	12 (9.2)	11 (7.5)	55 (42.3)	53 (36.1)	46 (35.4)	51 (34.7)	7 (5.4)	25 (17.0)	10 (7.7)	7 (4.8)	2.60	2.75	0.195	2	3	0.877	0.811
Common wall gecko *Tarentola mauritanica*	74 (56.9)	68 (46.3)	26 (20.0)	43 (29.3)	26 (20.0)	23 (15.6)	2 (1.5)	8 (5.4)	2 (1,5)	5 (3,4)	1.70	1.90	0.107	1	2	0.082	0.088
Spiny toad *Bufo spinosus*	83 (63.8)	93 (63.3)	29 (22.3)	35 (23.8)	12 (9.2)	15 (10.2)	2 (1.5)	2 (1.4)	4 (3.1)	2 (1.4)	1.57	1.53	0.713	1	1	0.083	0.069
Lady bird *Coccinella septempunctata*	129 (99.2)	138 (93.9)	1 (0.8)	8 (5.4)	-	1 (0.7)	-	-	-	-	1.00	1.06	**0.014**	1	1	0.007	0.022
Mediterranean turtle *Mauremys leprosa*	92 (70.8)	106 (72.1)		26 (17.7)	16 (12.3)	14 (9.5)	2 (1.5)	1 (0.7)	-	-	1.44	1.38	0.505	1	1	0.067	0.056

Note: Bold indicates statistically significant values.

animals was different between girls and boys. In the case of the bee and the gecko, it was higher in girls (respectively, 3 instead of 2 in boys and 2 instead of 1 in boys) and the opposite in the case of the mosquito (2 compared to 3 in boys).

Given the lack of statistical differences between boys and girls, the justifications given in relation to the dangerousness of different animals were analyzed and counted together. The reasons mentioned are included in Tables 3 and 4.

The reasons most mentioned by the students to justify the dangerousness of the animals were precisely related to harm to humans: for example, "it stings," "it attacks or bites," "it kills," or "it causes allergies or illnesses." Also, the physiological feature of being poisonous was frequently mentioned in relation to animals such as the Mediterranean black widow, the scorpion, the Montpellier snake, and the Mediterranean centipede. The association of dangerousness with fear, disgust, and repulsion was also to be found in the case of the Mediterranean centipede and the gray long-eared bat. The behavioral aspects were essentially mentioned to minimize the danger. Thus, the idea that an animal "only attacks if threatened" was common and arose with special incidence in relation to the Iberian wolf and the bee. The reference to harmless behavior was also highlighted by the students in relation to the ladybird, the Mediterranean turtle, the spiny toad and the gecko.

In assessing the dangerousness of an animal, the reference to its role in the ecosystem came essentially in the case of the bee, since some children highlighted its role in pollination, saying that it was good for the environment, an argument that contributed to minimizing its danger.

It should be noted that in the case of animals such as the lesser weever, the Mediterranean centipede, the cinereous vulture, and the gray long-eared bat, the number of students who were unable to explain the reasons that justified the degree of dangerousness attributed was particularly high.

Finally, regarding the question of whether dangerous species should not be saved in case of the danger of extinction, 234 (84.5%) of the 277 students said no, and justifications are systematized in Table 5. Of these, 128 (87.1%) were girls and 106 (81.5%) were boys, a difference not statistically significant ($p = 0.204$).

TABLE 3 The features attributed by children to justify the dangerousness of the different species in the categories morphology and physiology and behavior (part 1).

	Features	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Morphology and physiology	It is poisonous	144	104		97	30		59	22		7	5	11	13	15		
	It is small or big	-						1					1				
	It has attack structures	-	11	14			9		9	6			18				
	It is agile	-					1										
	It is strong	-		1													
	Not all are poisonous				6												
	It is slow																10
Behavior	It is wild						16										
	It is carnivorous or a predator			21			12		4	11							
	It hides to attack	1	4		1	1											
	It feeds on blood										15						
	It feels the blood			2													
	It only attacks when threatened	10	9	17	9	5	32	2	4	6	9		65	3			5
	It attacks by mistake			12	13				2								
	It is harmless	3	2	8	11	12	9	10	29	33	53	30	16	138	172	203	174
	It has afraid of humans										6			17	5		3
	It eats dead bodies									35							
	It eats plants or insects										9				5	3	

Note: In gray the negative features. 1—Mediterranean black widow; 2—Scorpion; 3—Blue shark; 4—Montpellier snake; 5—Portuguese man o' war; 6—Iberian wolf; 7—Mediterranean banded centipede; 8—Lesser weever; 9—Cinereous vulture; 10—Gray long-eared bat; 11—Mosquito; 12—Bee; 13—Common wall gecko; 14—Spiny toad; 15—Lady bird; 16—Mediterranean turtle.

TABLE 4 The features attributed by children to justify the dangerousness of the different species in the categories harm to humans and personal feelings and ecossistemic role (part II).

	Features	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Harm to humans	It stings	23	64		11	9		21	28	21	2	61	100				
	It attacks, bites or hurts (people or cattle)	8	24	42	27	10	101	22	27	30	38	9	4	7	2		27
	It kills	35		100	30	50	52	20	13	14	7	17	2	3	1		
	It gives a shock					42											
	It causes allergies or illnesses	5	1			52		18	17		13	58	30	14	21		2
	It sucks our blood		1									60					
	It lives in a habitat without people			2			3		1								
	It helps agriculture															15	
	It protects us from harmful insects													5			
	It can be tamed													2	3		5
Personal feelings	I don't like the animal				1			2		1	1	2	1	3			1
	It scares, repulses or irritates	5	2	1	5	1	2	11	1	5	9	12		11	6		
	I t is ugly					1		3	3	2	1						
	It is evil	1			4		1		1	2	1						
	It is useless		1			1							1				
	I like the animal			1	1							1				2	1
	It is friendly, funny or cute													4	4		6
	I am not afraid							1	1							27	
	It is beautiful									3	4					5	1
Ecossistemic role	It cares for the environment									2			15				
	It kills other dangerous animals		1												6		
	Incomprehensible/Undirected answer	4	1	5		2	5	1	1	5	6	2	6	2	9	2	1
	Redundant answer	7	10		12	4	8	22	29	7	12	2	1		1		1
	Didn't answer/Don't know	31	18	39	49	57	32	88	103	94	85	18	5	57	33	20	40

Note: In gray the negative features. 1—Mediterranean black widow; 2—Scorpion; 3—Blue shark; 4—Montpellier snake; 5—Portuguese man o' war; 6—Iberian wolf; 7—Mediterranean banded centipede; 8—Lesser weever; 9—Cinereous vulture; 10—Gray long-eared bat; 11—Mosquito; 12—Bee; 13—Common wall gecko; 14—Spiny toad; 15—Lady bird; 16—Mediterranean turtle.

Among the arguments against extinction, students stressed the role in the ecosystem of each species and its inherent right to continue to exist. Although with much less frequency, it is relevant to note that five children stated that humans are also dangerous animals to other living beings, possibly assuming that this reason would not justify our own disappearance.

5 | DISCUSSION

The present study revealed some trends that are important to highlight regarding the dangerousness of certain animals, and which were not always in line with the results of other studies, proving the importance of these studies in different contexts. Therefore, the findings of Cardak (2009) that bigger animals are more dangerous than smaller ones were not borne out. In fact, the Mediterranean black widow and the scorpion, although arachnids, were identified as the most dangerous animals, since children identified these species as poisonous, capable of killing, stinging, attacking, and biting. Children also did not show a trend in perceiving vertebrate animals as more or less dangerous than invertebrates.

Consequently, the mosquito was considered moderately dangerous. Although almost half of the students mentioned that this animal bites and has a type of sting, just over 10% highlighted that the mosquito is responsible

TABLE 5 Reasons given by students for not avoiding (or preventing) the extinction of dangerous animals at risk of extinction.

Yes	43 (15.5%)
Harm to humans	42
They can kill and attack us	24
They are dangerous	18
No	234 (84.5%)
Behavior	21
They only attack if threatened	18
They attack based on instinct	3
Utility for nature	133
All animals are part of nature	132
The planet becomes safer	1
Personal feelings	5
I like animals	5
Other justifications	57
Everyone deserves to live	44
Humans invade their space	5
Human beings are also dangerous	5
Being dangerous is not their fault	3
It does not justify (in both answers—Yes or No)	13
Not understandable (in both answers—Yes or No)	6

for allergies or diseases. These ideas contrast with the real danger posed by this animal, highlighted by several authors. Bates (2016) considers it the most dangerous animal in the world and points out that different species are related to the transmission of diseases such as zika, yellow fever, dengue fever, Nile fever, and malaria. Leggewie et al. (2016) also mention that Nile fever can result in encephalitis, meningitis, or damage to the central nervous system. Shenton and Lindsay (2023) argue that climate change leads to the fear of the expansion of yellow fever to places where people have little or no immunity, which constitutes a real danger.

Still with insects, the bee was quoted as less dangerous because students, even recognizing that it stings, also stated that this animal only reacts when threatened, highlighting its environmental value as well. Therefore, students also revealed the previously stated idea that certain animals only attack as a response to a perceived threat.

The consideration that a certain species is dangerous just because it is part of a group in which some of the species are, in fact, dangerous was clearly verified in relation to the Montpellier snake and the blue shark. This is, in part, understandable because it is difficult for a non-specialist to make a reliable assessment of each species included in a taxonomic group. But it also reflects the principle of generalization that animals from a certain taxonomic group suffer in their perception, as pointed out in the literature review section. In fact, over a third of the students stated that the Montpellier snake was poisonous, which is a fact. But Valdoleiros et al. (2021) emphasize that its danger is slight, and even when it bites, the consequences are not serious. Haro (2012) presents a similar assessment, also stating that the probability of this bite is low because the fangs of this species are in the back of the mouth, which does not allow direct contact with human skin.

However, a study by Fátima de Souza et al. (2019) with adults in the Brazilian Pantanal revealed a negative perception of the species *Crotalus durissus* (rattlesnake), aggravated by the fact that the respondents considered that it should be eliminated from nature because of its dangerousness. But the danger of this snake is much higher than that posed by the Montpellier snake, since the population suffers a high risk of death after a bite. This difference shows that negative experiences with dangerous species can develop less tolerance for their existence.

A similar trend also presented in the literature review section occurred in relation to the blue shark, with students stating a high non-existent danger. Zachos (2018) states that selachophobia, the fear of sharks, is ancestral in humans and can be manifested in an undifferentiated way without considering the features of a species. In this way, the fictional broadcasting of certain media responds to this fear, aiming to captivate the viewer by feeding terror towards these animals.

The Iberian wolf was also assessed as dangerous by more than half of the students, considering that it can attack or even kill humans and livestock. McNay (2002) reports 80 cases of wolf aggression in Canada and Alaska over a period of 30 years. Of these, only 39 were due to healthy wolves (e.g., non-rabid) and the most serious attacks involved children. The fact that some people were with dogs increased the wolves' aggression. A study by Frank et al. (2015), carried out in Sweden but with adults, showed that respondents were more afraid of wolves attacking pets and livestock than people. Also, Linnell et al. (2003) remind us that wolf attacks on children were frequent until the end of the 19th century, since many were farm workers or shepherds, which is not common in the Western world nowadays. Likewise, wolf attacks on human beings are non-existent in Portugal. For Ribeiro and Petrucci-Fonseca (2012), attacks on livestock can happen because of the lack of natural prey and from deficient management of cattle, which are quite often kept in unprotected open spaces.

Thus, children's high perception of the dangerousness of the wolf cannot be the result of negative experiences with this species, while other reasons can certainly explain it. Traditional stories in which the wolf is seen as an aggressor may continue to have a role in this perception, an aspect not explored in the present study.

The Portuguese man-of-war and the Mediterranean centipede were assessed as dangerous due to their poisonous nature and the possibility of attacking and causing illnesses. In fact, Valdoleiros et al. (2021) point out the danger of both species, which in the case of the Portuguese man-of-war can have serious consequences for humans, although this contact is accidental, an idea that the children did not mention, considering instead the possibility of an intentional attack.

The lesser weever was considered moderately dangerous, although 10% of the students reported that it can sting, bite, or attack. However, more than a third of the students stated that they did not know how to justify the dangerousness of this animal, which became the most relevant data. The big-eared bat and the cinereous vulture were also assessed as moderately dangerous. Although more students considered these animals harmless, more than 10% also considered the possibility of these animals attacking humans. Concerning the bat, the conception that all these animals feed on human blood certainly helped this perception. However, it is important to highlight that all species of bats in the Iberian Peninsula are insectivorous (Purroy & Varela, 2016). But this generalization in relation to bats' diet was also noted in other studies, with primary or kindergarten children (Kubiatko, 2012; Prokop et al., 2009). In the case of the cinereous vulture, its scavenging nature seems to be a reason to accentuate its danger, which shows a clear misconception about this behavior.

The spiny toad, the ladybird, the Mediterranean turtle, and the common gecko were considered harmless animals, and the danger of the bee was put into perspective, even in the case of children who said they had already been stung. Studies by Small (2012) and Barua et al. (2012) obtained similar results, with the ladybird even being considered a symbol of good fortune in Western culture (Majerus & Kearns, 1994), which may increase empathy towards this animal.

In the case of the gecko, the present result is relevant since a study by Ceríaco and Marques (2013) concluded that this animal is seen as poisonous, sticky, and disgusting, causing dermatological diseases. However, very few students used these types of qualifications, and perhaps the fact that several stated that it was an animal like a small lizard, and therefore harmless, justifies this result. The possibility of less contact with these animals is not very plausible, given that different kinds of geckos also exist in urban environments.

In global terms, only the ladybird did not receive any qualifications associated with harm to humans. For all the other animals, there were always some children who stated the possibility of an intentional attack, although the frequency of this type of response was very high for the wolf and very low for the spiny toad. Even so, animals such as the blue shark, the Montpellier snake, the Iberian wolf, and the bee are often justified in attacking only when feeling threatened or by mistake.

Despite the consideration of the dangerousness of the different animals, there was a strong rejection of the idea that nothing should be done in the case of extinction of these animals. A study by Kahn et al. (2008) with North American children showed a similar result, although it focused only on bats. Thus, although students revealed fear of bats because they considered that these animals could harm them, a trend expressed more often by the youngest participants (6–10 years old), the vast majority were concerned about their welfare. Therefore, the assessment of an animal as dangerous does not seem to degenerate into a desire to eliminate it from the planet. Finally, the differences obtained according to sex were not significant, which seems to support Herzog's (2007) ideas that these differences are less important than imagined.

How the results of the present study can inform the approach to the dangerousness of animals in formal education is the final goal of the present study.

In fact, previous studies included this aim in teaching practice. A study of Ceríaco and Marques (2013) was implemented to improve the bad image of geckos among primary children, who considered these animals poisonous, dangerous, and responsible for skin diseases. The strategy was to explore an illustrated story about these animals where biological and ecological features of the species were included, as well as deconstructed misconceptions. Other activities were also set to improve children's scientific knowledge about them, and the overall intervention was successful in changing the negative perceptions about geckos. A study by Almeida et al. (2017), involving children between 9 and 13 years old, also showed that it is possible to improve the negative perception of some species using educational resources that highlighted their ecosystem role and value for human beings. However, in the reported intervention, if the personal feelings and aesthetic appreciations improved in relation to certain animals with a bad image (e.g., the mouse, the vulture and the shark), the assessment of the dangerousness of the species does not diminish significantly, which means that this feature needs more targeted strategies.

This difficulty in changing the perception of dangerousness could also be related to its evolutionary origin, which was created throughout human evolution because

of the intense contact with biodiversity (Barrett & Broesch, 2012; Linnell et al., 2003; Seraphin, 2010; Yorzinski et al., 2014), but a less deterministic approach can be supported.

Therefore, the findings of the present study, namely the ideas expressed by the children, can inform different types of activities in class and be associated with the following strategies: (a) Highlighting role in the ecosystem that each species plays. This approach for Leandro and Jay-Robert (2019) should be extended to invertebrates, particularly insects, which play an important role at this level. Consequently, they state: "Mosquitoes are not 'useless', they are part of a greater food web and play a part in ecosystem functioning" (p. 407); (b) Highlighting the direct and indirect importance of species for humans of dangerous species. For instance, the poisons produced by many prove to be extremely useful in cosmetics and medicine; (c) Addressing the dangers that some species pose and the ways to avoid them. It seems important to highlight that in most situations animals tend to avoid direct confrontation with humans. It is also important to show that the greatest danger posed by animal beavers of disease can be minimized when certain measures and behaviors are adopted. For example, Shenton and Lindsay (2023) highlight simple procedures to protect people from mosquitoes in their homes and prevent their spread, such as by installing windscreens, better waste management and the covering, emptying and cleaning of containers. Day (2016) points out that although many mosquitoes are beavers of disease, most of them only cause discomfort to humans. But, given that it is impossible to differentiate them, precaution is the best way to deal with these animals; (d) Deconstructing negative ideas about various species that persist in cultural tradition or are the result of misconceptions acquired in different contexts, analyzing myths and legends or confronting children with incorrect ideas. Studies that were focused on positive features of species had success in reducing fears and helping to decrease the perception of their dangerousness (e.g., Casola et al., 2022; Muris et al., 2008); (e) Promoting direct contact with nature and animals. A study by Zhang et al. (2014) showed that contact with nature fosters biophilic attitudes towards wildlife. In terms of certain species, direct contact with sharks, for example in oceanariums, can help to reduce their negative image (Casola et al., 2022). Also, continued contact with nature during childhood reveals an improvement in the perception of insects and their role (Leandro & Jay-Robert, 2019).

Future research is needed to assess the impact of activities based on these suggestions, not to ignore the danger that certain species pose to humans, but to inform correct ideas about animals' dangerousness, considering that they can help biodiversity preservation.

6 | CONCLUSIONS

This study found that children have some knowledge about the dangerousness of certain species, although the attributed danger for other species was overrated, for example, blue shark, Montpellier snake, and Iberian wolf, or underrated, for example, mosquito and lesser weever. Therefore, students also revealed a lack of knowledge concerning the meaning of certain behaviors and the morphological and physiological features of the animals.

The attribution of a danger to a species resulting from its belonging to a taxonomic group also occurred in the case of the blue shark, the Montpellier snake, and the gray long-eared bat. The consideration that the gecko is a non-dangerous animal was a surprising result, given the research that tends to show that these animals suffer from the popular belief that they are disgusting and transmit disease. Some children often justify the danger of an animal as a result of an intentional attack, but several others consider that the attacks are mainly when an animal feels threatened. The reference that an animal can attack due to any pathology is absent in the children's arguments. Also, the fact that the recognition of the dangerousness of the species is not a reason for supporting its elimination is a relevant result.

The results of the present study can help the design of activities to approach the dangerousness of species in formal contexts, also helping teachers to pay more attention to the present issue. Studies with children from different countries regarding the perception of the dangerousness of various animals help identify reasons strongly influenced by a specific cultural context, as well as others that are clearly universal across different realities. In this way, the goal of formal education to contribute to biodiversity preservation is strengthened by aiding in the development of better strategies and activities to address the topic under discussion.

The present study was implemented with children from an urban context. Therefore, other similar studies involving children from rural contexts could also be important indicators of children's perceptions and attitudes toward the dangerousness of different species and the ways to minimize their risk.

ACKNOWLEDGMENTS

We would like to thank all the children who participated in this study as well as their teachers and heads of the schools for their attention and availability. The present study is part of the project IPL/IDI&CA2024/GreenLink_ESELx, supported by the Instituto Politécnico de Lisboa.

FUNDING INFORMATION

No funding.

CONFLICT OF INTEREST STATEMENT

The authors declare no conflicts of interest.

ORCID

António Almeida https://orcid.org/0000-0002-3594-1324
Valter Rato https://orcid.org/0009-0000-9596-2007

REFERENCES

Almeida, A., García Fernández, B., & Silva, T. (2017). Changing negative perceptions of animals through teaching practice: A research in primary education. *Journal of Baltic Science Education*, *16*(4), 446–458.

Almeida, A., Rato, V., & Dabaja, Z. (2023). Outdoor activities and contact with nature in the Portuguese context: A comparative study between children's and their parents' experiences. *Children's Geographies*, *21*(1), 108–122.

Argôlo, A. (2004). *As Serpentes dos Cacauais do Sudeste da Bahia*. Editus.

Athreya, V. (2007). Living with dangerous animals. *Seminar*, *577*, 1–6.

Ballouard, J. M., Ajtic, R., Balint, H., Brito, J., Crnobrnja-Isailovic, J., Elmouden, E. L., Erdoğan, M., Feriche, M., Pleuguezuelos, J. M., Prokop, P., Sanchez, A., Santos, X., Slimani, T., Sterijovski, B., Tomovic, L., Uşak, M., Zuffi, M., & Bonnet, X. (2013). Schoolchildren and one of the most unpopular animals: Are they ready to protect snakes? *Anthrozoös*, *26*, 93–109.

Barrett, H., & Broesch, J. (2012). Prepared social learning about dangerous animals in children. *Evolution and Human Behavior*, *33*(5), 499–508.

Barua, M., Gurdak, D., Ahmed, R., & Tamuly, J. (2012). Selecting flagships for invertebrate conservation. *Biodiversity and Conservation*, *21*, 1457–1476.

Bates, C. (2016, January 31). E se eliminássemos todos os mosquitos transmissores de doenças? *BBC News Magazine*. https://www.bbc.com/portuguese/noticias/2016/01/160128_mosquito_erradicacao_lab

Beedell, J., & Rehman, T. (1999). Explaining farmers' conservation behaviour: Why do farmers behave the way they do? *Journal of Environmental Management*, *57*(3), 165–176.

Bennett, N. (2016). Using perceptions as evidence to improve conservation and environmental management. *Conservation Biology*, *30*, 582–592.

Cardak, O. (2009). Students' ideas about dangerous animals. *Asia-Pacific Forum on Science Learning and Teaching*, *10*(2), 1–15.

Casola, W. R., Beall, J. M., Peterson, M. N., Larson, L. R., & Price, C. S. (2022). Influence of social media on fear of sharks, perceptions of intentionality associated with shark bites, and shark management preferences. *Frontiers in Communication*, *7*, 1033347.

Ceríaco, L., Marques, M., Madeira, N., Vila-Viçosa, C., & Mendes, P. (2011). Folklore and traditional ecological knowledge of geckos in southern Portugal: Implications for conservation and science. *Journal of Ethnobiology and Ethnomedicine*, *7*, 26.

Ceríaco, L. M., & Marques, M. P. (2013). Deconstructing a southern Portuguese monster: The effects of a children's story on children's perceptions of Genkos. *Herpetological Review*, *44*(4), 590–594.

Clements, R. (2004). An investigation of the status of outdoor play. *Contemporary Issues in Early Childhood*, *5*(1), 68–80.

Day, J. (2016). Mosquito oviposition behavior and vector control. *Insects*, *7*, 65.

Fátima de Souza, P., Porfirio, G., & Herrera, H. (2019). Perceptions and attitudes of Urucum settlement residents about local wildlife. *Anthrozoös*, *32*(1), 117–127.

Frank, J., Johansson, M., & Flykt, A. (2015). Managing human fear of brown bear and wolf. *European Journal of Wildlife Research*, *21*(3), 122–130.

Gerdes, A. B., Uhl, G., & Alpers, G. W. (2009). Spiders are special: Fear and disgust evoked by pictures of arthropods. *Evolution and Human Behavior*, *30*, 66–73.

Halstead, B. (1995). *Dangerous marine animals that bite, sting, shock, or are non-edible* (3rd ed.). Cornell Maritime Press.

Haro, L. (2012). Management of snakebites in France. *Toxicon*, *60*(4), 712–718.

Herzog, H. (2007). Gender differences in human–animal interactions: A review. *Anthrozoös*, *20*(1), 7–21.

Herzog, H. (2010). *Some we love, some we hate, some we eat*. Harper Collins.

Hillman, J. (1991). *Going bugs*. Spring Audio Gracie Station.

Kahn, P., Jr., Saunders, C., Severson, R., Myers, O., Jr., & Gill, B. (2008). Moral and fearful affiliations with the animal world: Children's conceptions of bats. *Anthrozoös*, *21*(4), 375–386.

Kaltenborn, B. P., Bjerke, T., & Nyahongo, J. (2006). Living with problem animals: Self-reported fear of potentially dangerous species in the Serengeti region, Tanzania. *Human Dimensions of Wildlife*, *11*, 397–409.

Kellert, S. R. (1980). American attitudes toward and knowledge of animals: An update. *International Journal for the Study of Animal Problems*, *1*, 87–119.

Kellert, S. R. (1993). Values and perceptions of invertebrates. *Conservation Biology*, *7*(4), 845–855.

Kelly, J. R., Doherty, T. J., Gabel, T., & Disbrow, W. (2019). Large carnivore attacks on humans: The state of knowledge. *Human Ecology Review*, *25*(2), 15–34.

Knight, A. J. (2008). "Bats, snakes and spiders, Oh my!" How aesthetic and negativistic attitudes, and other concepts predict support for species protection. *Journal of Environmental Psychology*, *28*, 94–103.

Krnel, D., & Naglic, S. (2009). Environmental literacy comparison between ECO-schools and ordinary schools in Slovenia. *Science Education International*, *20*(1–2), 5–24.

Kubiatko, M. (2012). Kindergarten children's perception of animals focusing on the look and fear of animals. *Educational Sciences: Theory and Practice*, *12*(Suppl 4), 3181–3186.

Leandro, C., & Jay-Robert, P. (2019). Perceptions and representations of animal diversity: Where did the insects go? *Biological Conservation*, *237*, 400–408.

Leggewie, M., Badusche, M., Rudolf, M., Jansen, S., Börstler, J., Krumkamp, R., Huber, K., Krüger, A., Schmidt-Chanasit, J., Tannich, E., & Becker, S. (2016). *Culex pipiens* and *Culex torrentium* populations from central Europe are susceptible to West Nile virus infection. *One Health*, *2*, 88–94.

Lindemann-Matthies, P. (2005). "Loveable" mammals and "lifeless" plants: How children's interest in common local organisms can

be enhanced through observation of nature. *International Journal of Science Education*, *27*(6), 655–677.

Linnell, J., Andersen, R., Andersone, Z., Baltsiauskas, L., Blancos, J., Boitani, L., Brainerd, S., Breitenmoser, U., Kojola, I., Liberg, O., Loe, J., Okarma, H., Pedersen, H., Promberger, Z., Sand, H., Solberg, E., Valdmann, H., & Wabakken, P. (2002). *The fear of wolves: a review of wolf attacks on humans*. Norwegian Institute for Nature Research Oppdragsmelding.

Linnell, J., Solberg, E., Brainerd, S., Liberg, O., Sand, H., Wabakken, P., & Kojola, I. (2003). Is the fear of wolves justified? A Fennoscandian perspective. *Acta Zoologica Lituanica*, *13*(1), 34–40.

Löe, J., & Röskaft, E. (2004). Large carnivores and human safety: A review. *Ambio: A Journal of the Human Environment*, *33*(6), 283–288.

Looy, H., & Wood, J. (2006). Attitudes toward invertebrates: Are educational "bug banquets" effective? *The Journal of Environmental Education*, *37*(2), 37–48.

Louv, R. (2010). *Last child in the woods. Saving our children from nature-deficit disorder*. Atlantic Books.

Majerus, M., & Kearns, P. (1994). *Ladybird*. Richmond Publishing.

Mather, J. (2023). Ethics and invertebrates: The problem is us. *Animals*, *13*(18), 2827.

McNay, M. (2002). Wolf-human interactions in Alaska and Canada: A review of the case history. *Wildlife Society Bulletin (1973–2006)*, *30*(3), 831–843.

Muris, P., Mayer, B., Huijding, J., & Koning, T. (2008). A dirty animal is a scary animal! Effects of disgust-related information on fear beliefs in children. *Behaviour Research and Therapy*, *46*, 137–144.

Neff, C. (2015). The jaws effect: How movie narratives are used to influence policy responses to shark bites in Western Australia. *Australian Journal of Political Science*, *50*(1), 114–127.

O'Reilly, M., Ronzoni, P., & Dogra, N. (2013). *Research with children. Theory & practice*. SAGE.

Ozsoy, S., Ertepinar, H., & Saglam, N. (2012). Can eco-schools improve elementary school students' environmental literacy levels? *Asia-Pacific Forum on Science Learning and Teaching*, *13*(2), 1–25.

Prokop, P., Fančovičová, J., & Kubiatko, M. (2009). Vampires are still alive: Slovakian student's attitudes toward bats. *Antrozoös*, *22*(1), 19–30.

Prokop, P., Tolarovičová, A., Camerik, A. M., & Peterková, V. (2010). High school students' attitudes towards spiders: A cross-cultural comparison. *International Journal of Science Education*, *32*, 1665–1688.

Prokop, P., Usak, M., Erdogan, M., Fancovicova, J., & Bahar, M. (2011). Slovakian and Turkish students' fear, disgust and perceived danger of invertebrates. *Hacettepe University Journal of Education*, *40*, 344–352.

Purroy, F., & Varela, J. (2016). *Mamíferos de España*. Lynx Edicions.

Ribeiro, S., & Petrucci-Fonseca, F. (2012). Lobo (*Canis lupus*): um superpredador admirado e perseguido. In F. Loureiro, N. Pedroso, M. Santos, & L. Rosalino (Eds.), *Um Olhar sobre os Carnívoros Portugueses* (pp. 31–53). Carnívora.

Røskaft, E., Bjerkec, T., Kaltenborn, B., Linnell, J., & Anderson, R. (2003). Patterns of self-reported fear towards large carnivores among the Norwegian public. *Evolution and Human Behavior*, *24*, 184–198.

Seraphin, K. D. (2010). A partnership approach to improving student attitudes about sharks and scientists. *School Science and Mathematics*, *110*(4), 203–219.

Shenton, F., & Lindsay, S. (2023). Preventing yellow fever epidemics in Asian megacities: How can cities control mosquito-transmitted diseases? *Cities & Health*, *7*(3), 335–341.

Small, E. (2012). The new Noah's ark: Beautiful and useful species only. Part 2. The chosen species. *Biodiversity*, *13*(1), 37–53.

Valdoleiros, S., Gonçalves, I., Silva, C., Guerra, D., Silva, L., Martínez-Freiría, F., Rato, F., & Xará, S. (2021). Animais Venenosos em Território Português: Abordagem Clínica de Picadas e Mordeduras. *Revista Científica da Ordem dos Médicos*, *34*(11), 784–795.

Yorzinski, J., Penkunas, M., Platt, M., & Coss, R. (2014). Dangerous animals capture and maintain attention in humans. *Evolutionary Psychology*, *12*(3), 534–548.

Zachos, E. (2018). Why are we afraid of sharks? There's a scientific explanation. National Geographic. https://www.nationalgeographic.com/animals/article/sharks-attack-fear-science-psychology-spd

Zhang, W., Goodale, E., & Chen, J. (2014). How contact with nature affects children's biophilia, biophobia and conservation attitude in China. *Biological Conservation*, *177*, 109–116.

How to cite this article: Almeida, A., & Rato, V. (2025). Iberian fauna perceived danger: A study with primary education students. *School Science and Mathematics*, 1–13. https://doi.org/10.1111/ssm.18350