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Ecuadorian Children's Willingness to Protect Endangered Species – Identifying Behavioral Predictors in a Biodiversity Hotspot

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Abstract

The loss of biodiversity is a problem that particularly affects biodiversity hotspots. Children play a crucial role in the conservation of endangered species. One important prerequisite for conservation behavior is the willingness to protect endangered animal species. The present study investigated the influence of several variables on Ecuadorian children's willingness to protect domestic endangered animal species ($N = 154$; $M_{Age} = 8.57$; $SD = 0.55$; 48.1% female). Gender, caring beliefs (a subdimension of the wildlife value orientation), dispositional empathy with endangered animals, and threat perception of the Andean condor (*Vultur gryphus*) toward humans were strong predictors of the willingness to protect them. Conversely, psychological distance, and threat perception of both the Andean bear (*Tremarctos ornatus*) and the jaguar (*Panthera onca*) had no significant influence on willingness to protect. However, their effects may be indirect. The results of this study are relevant for biodiversity conservation and educators in schools.

Keywords

willingness to protect endangered animals – wildlife value orientation – dispositional empathy with endangered animals – psychological distance – threat perception – children – biodiversity hotspot

Humans are at the point of destroying ecosystems worldwide, with biodiversity loss occurring at an alarming rate (Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services [IPBES], 2019). This threatens the basis of life for humans and other species by compromising ecosystem services such as the provision of food, water, and breathable air (IPBES, 2019), a problem particularly relevant in Ecuador.

Ecuador hosts several ecosystems, as well as animal and plant species, in a very small land area: 25.3 million hectares in mainland Ecuador and 0.8 million hectares in the Galapagos Islands (Cuesta et al., 2017). While covering 0.06% of the global land area, Ecuador hosts about 16% of the world's bird species (1,616), 8% of amphibians (422), 5% of reptiles (394), and 8% of mammals (362) (Mestanza-Ramón et al., 2020). Moreover, Ecuador has approximately 25,560 plant species (Christenhusz & Byng, 2016; Mestanza-Ramón et al., 2020; depending on the source, biodiversity data differ slightly, but approximate to 8% when compared to global numbers).

Two biodiversity hotspots cover Ecuador, namely the Tumbes-Chocó-Magdalena and Tropical Andes hotspots (Mittermeier et al., 2011). Biodiversity hotspots contain at least 1,500 endemic plant species and have lost at least 70% of their original vegetation (Myers et al., 2000). Moreover, forest cover in Ecuador is still declining (Food and Agriculture Organization of the United Nations, 2016), and the number of endangered species is relatively high (International Union for Conservation of Nature [IUCN], 2021; Ministerio del Ambiente del Ecuador, 2015). Thus, Ecuador not only has a particularly high level of biodiversity, but is also highly threatened (Mittermeier et al., 2011).

In a remarkable effort to protect its biodiversity (Cuesta et al., 2017), Ecuador currently has nearly 20% of its land area under protection (Mestanza-Ramón et al. 2020). In addition, the Ecuadorian government has developed new approaches to biodiversity conservation (Rieckmann et al., 2011) by incorporating the indigenous concept of *Sumak Kawsay* (English: *Good Living*; Spanish: *Buen Vivir*) as *Rights of Nature* into its constitution (Asamblea Constituyente de Ecuador, 2008).

Sumak Kawsay is based on harmony, dialogue, and equity among human beings as well as between humankind and nature, including the sustainable use of natural resources (Rieckmann et al., 2011). According to *Sumak Kawsay*, Earth is seen as *Pachamama* (English: *Mother Earth*; Acosta, 2016; Lalander, 2016; Rieckmann et al., 2011). Assigning rights to nature is a pioneering approach (Rieckmann et al., 2011) because it breaks with western paradigms (Acosta, 2016). Moreover, the *Rights of Nature* form the basis for a harmonious coexistence of people and nature and thus for the conservation of biodiversity (Rieckmann et al., 2011). However, some authors state that Ecuadorian policies are still characterized by economic interests that hinder the effective implementation of new biodiversity conservation measures (Lalander, 2016; Rieckmann et al., 2011). Nevertheless, the debate on *Sumak Kawsay* and the *Rights of Nature* has contributed to a growing sociocultural awareness of biodiversity conservation among the Ecuadorian population.

According to the "National Biodiversity Strategy 2015–2030," the Ecuadorian population should "achieve an adequate level of knowledge, appreciation, and awareness of the importance of biodiversity and implement measures for its conservation and sustainable use" (Ministerio del Ambiente del Ecuador, 2016, p. 157). One way to achieve this is through environmental education programs in schools (Dornhoff et al., 2019; United Nations, 1992). Although Ecuador has had a National Environmental Education Strategy for Sustainable Development since 2018 (Ministerio del Ambiente del Ecuador, 2018), there has been little research on implementing biodiversity topics in schools (Anderson

& Jacobson, 2018). Examining factors that influence young people's biodiversity conservation behaviors in Ecuador can provide potential starting points for designing effective educational interventions.

To date, there have been few studies on knowledge, attitudes, and behaviors related to biodiversity issues among young people in Ecuador. However, it appears that children in Ecuador score relatively high in nature relatedness (Dornhoff et al. 2019; Molina-Cando et al. 2021). In addition, Ecuadorian adolescents report more concern about the consequences of environmental problems for egoistic and biospheric reasons, compared to German adolescents who were most concerned for altruistic reasons (Dornhoff et al., 2019). Ecuadorian college students also score relatively high on environmental concern (Schultz, 2001).

For the present study, we focused on a specific conservation intention by examining Ecuadorian primary school children's willingness to protect endangered native animal species, while focusing on potential predictors: psychological distance, caring beliefs, dispositional empathy with endangered animals, and threat perception of certain animals. Psychological distance has been used to predict individuals' willingness to protect in several environmental contexts (e.g., return of the wolf: Büssing et al., 2019; environmental threats: Carmi & Kimhi, 2015; climate change: Spence et al., 2012). Another effective predictor of behavioral conservation intentions is a person's wildlife value orientation (Manfredo et al., 2009), specifically the subdimension, "caring beliefs" (Büssing et al., 2019; Hermann & Menzel, 2013b). Dispositional empathy with nature has also frequently been shown to influence willingness to protect the environment (Berenguer, 2007; Tam, 2013; Young et al., 2018) and was operationalized as dispositional empathy with endangered animals for the present study. Additionally, many researchers have suggested that threat perception (of endangered animals) affects the willingness to protect (Axelrod & Lehman, 1993; Cárdenas & Lew, 2016; Hermann & Menzel, 2013a). Moreover, we tested the influence of sociodemographic factors (gender and place of growing up).

Materials and Methods

Study Design and Sample

To investigate the factors influencing Ecuadorian children's willingness to protect endangered animal species, we conducted a cross-sectional study with a paper-pencil questionnaire. Fourth-grade students from three public primary schools in Cuenca participated in June of 2019 ($N = 154$). Cuenca is the

third-largest city in Ecuador and has a population of approximately half a million residents. It is an emerging city characterized by high quality-of-life indicators (Molina-Cando et al., 2021). The students filled out the questionnaire in their respective classrooms. During the study, three supervising researchers and the class teacher were present. Participants' ages ranged from eight to ten years ($M_{Age} = 8.57$; $SD = 0.55$). Seventy-four of the students were female (48.1%; 77 were male, 3 did not specify). Most of the children grew up exclusively or primarily in the city ($n = 119$, 77.2%), while fewer grew up in rural areas ($n = 10$, 6.4%) or equally in both ($n = 23$, 14.9%; 2 did not specify). The Committee of Bioethics in Health Research of the Cuenca University approved the study (Universidad de Cuenca; 2019-0111EO-1). Moreover, statements of consent were obtained from the respective school administrators and the legal guardians of the children. The participants' anonymity was guaranteed throughout data collection and analyses. Children were free to withdraw from the study at any time without negative consequences.

Test Instrument and Variables

This study was part of a larger project and included more variables than those presented in this article (see supplementary material for the questionnaire). The questionnaire was administered in Spanish. Multiple fluent English and Spanish speakers with a background in biology, biology didactics, and environmental psychology translated the scales for which no Spanish version existed using the back-translation method. Before the questionnaire was implemented, it was discussed with several children of a similar demographic using the think-aloud method (van Someren et al. 1994). This method was used to gain insight into the children's cognitive processes, to detect possible misconceptions, and to adapt the scales to their age and local conditions. As a result, some items were modified to adjust for the language skills of primary school students (David et al., 2014). Except for threat perception, the original format of all scales was reduced to a five-point Likert-type scale from 0 = "strongly disagree" to 4 = "strongly agree." As "most children might have difficulty providing answers when the Likert response formats are based on numbers" (Mellor & Moore, 2014, p. 377), we used a response format based on words (Mellor & Moore, 2014). Since children in our age group of interest are generally able to answer abstract questions about their feelings and attitudes using Likert scales (Mellor & Moore, 2014), we assume that they understood our questionnaire and that it provided reliable results. One indicator of this is that all scales used had satisfactory reliability with Cronbach's α scores being higher than .80 (Field, 2018). All descriptive statistics are reported in Table 1.

TABLE I Pearson correlation (lower triangle), sample size (upper triangle), and descriptive statistics for all variables.

Variable	1	2	3	4	5	6	7	8	9
1. Gender	—	.149	.150	.149	.151	.111	.112	.121	.147
2. Place of growing up	-.12	—	.151	.150	.152	.111	.112	.121	.148
3. Psychological distance	-.14	-.09	—	.152	.153	.112	.114	.122	.149
4. Caring beliefs	.18*	.07	-.70***	—	.152	.111	.113	.121	.148
5. Dispositional empathy	.09	.03	-.59***	.58***	—	.113	.114	.123	.150
6. Threat perception jaguar	.21*	.00	-.10	-.06	.22*	—	.89	.100	.112
7. Threat perception Andean bear	.13	.19*	-.11	.09	.15	.28**	—	.100	.111
8. Threat perception Andean condor	.04	-.13	-.14	.15	.29**	.15	.35***	—	.121
9. Willingness to protect	.29***	.05	-.56***	.59***	.57***	.22*	.29**	.38***	—
Mean	—	.68	1.58	2.75	2.49	1.43	1.77	1.81	2.90
Median	—	.00	1.50	3.00	2.67	1.00	2.00	2.00	3.17
Standard deviation	—	1.02	1.22	1.09	1.04	1.12	1.10	1.16	1.22
Skewness	—	1.39	.35	-.92	-.55	.05	-.39	-.46	-.91
Kurtosis	—	1.12	-1.02	-.03	-.41	-1.36	-1.16	-1.27	-47

Note: * $p < .05$; ** $p < .01$; *** $p < .001$; all variables except threat perception were measured on a 5-point Likert-type scale (0–4), with threat perception on a 4-point scale (0–3).

Willingness to Protect Endangered Animals

In the present study, we assessed primary school students' willingness to protect endangered animals. Willingness to protect is often regarded as an important predictor for actual conservation behavior (Sheeran & Webb, 2016).

We measured the willingness to protect endangered animal species with items from the willingness to sacrifice scale (Stern et al., 1999) modified according to Hermann and Menzel (2013b), and Büssing et al. (2019). An example item is "*I am willing to convince my schoolmates of the importance to protect endangered animals.*"

Sociodemographic Data

We inquired about gender (0 = "male"; 1 = "female") and where the participants were growing up (0 = "*All the time in the city*" to 4 = "*All the time in the countryside*") to test for these two factors (Hypothesis 1). Generally, the importance of gender for pro-environmental behavior is disputed, with some studies indicating that it plays an important role while others do not support this (Ballouard et al., 2013; Carmi & Kimhi, 2015; Vicente-Molina et al., 2018). For the present study, we assumed that girls will report a higher protection motivation as this is in line with most findings. Research frequently suggests that contact with natural environments and parts of nature such as plants, animals, soils, and waters – from gardens to wilder environments – during childhood leads to a higher willingness to protect the environment (e.g., Hosaka et al., 2017; Soga et al., 2016). Given these findings, we predicted that place of growing up would be a predictor, with children who grew up in the countryside reporting a stronger willingness to protect.

Psychological Distance

Psychological distance describes the perceived distance to certain objects, events, or actions (Liberman & Trope, 2014; Trope & Liberman, 2010). According to the construal-level theory of psychological distance, people feel close to an object, event, or action when it affects them personally (social distance), when it is in their close spatial environment (spatial distance), when it occurs at an immediate time (temporal distance), and when its occurrence is rated as highly probable (hypothetical distance) (Büssing & Heuckmann, 2021; Liberman & Trope, 2014; Trope & Liberman, 2010). Psychological distance may also be associated with a sense of relevance (Büssing & Heuckmann, 2021; Liberman & Trope, 2014; Trope & Liberman, 2010).

Carmi and Kimhi (2015) showed that having a smaller psychological distance from environmental threats strongly predicts the willingness to engage in environmental conservation. In addition, Jones et al. (2017) found

that reducing the psychological distance toward climate change resulted in increased pro-environmental behavioral intentions. In contrast, Büssing et al. (2019) did not find a relationship between psychological distance and the willingness to protect wolves in Germany. Thus, it is important to further investigate this construct in the context of biodiversity conservation. Additionally, there are initial suggestions on how the concept of psychological distance can be used in environmental education (Büssing & Heuckmann, 2021). We predicted that students with smaller psychological distances would demonstrate a stronger willingness to protect endangered animal species (Hypothesis 2).

In line with Büssing et al. (2019), we measured psychological distance with four items, one for each dimension:

- 1) *"I am concerned by the decline of endangered animals in my geographical surroundings"* (spatial distance).
- 2) *"I will be affected, in the near future, by the decline of endangered animals"* (temporal distance).
- 3) *"I am personally affected by the decline of endangered animals"* (social distance).
- 4) *"The extinction of endangered animals is very likely"* (hypothetical distance).

All four items were recoded so that high values indicated a larger perceived distance.

Caring Beliefs and Wildlife Value Orientation

The wildlife value orientation describes how humans view their relationship with nonhuman animals. While individuals with a domination orientation prioritize human interests, those with a mutualism orientation desire an equal coexistence of humans and wild animals (Manfredo et al., 2009). One subdimension of the mutualism wildlife value orientation is caring beliefs, i.e., to what extent somebody personally cares about the wellbeing of wild animals (Büssing et al., 2019). In previous studies, caring beliefs were a particularly strong predictor of the willingness to protect wolves (Büssing et al., 2019; Hermann & Menzel, 2013b) and general pro-environmental behavior (Manfredo et al., 2009). Therefore, we predicted that caring beliefs would positively predict the willingness to protect endangered animal species (Hypothesis 3).

In line with previous studies (Büssing et al., 2019; Hermann & Menzel, 2013b), we measured caring beliefs using four items. The translation by Chase (2013) was used as a template for the Spanish version. An example item used to assess caring beliefs is: *"It would be more rewarding for me to help animals rather than people."*

Dispositional Empathy with Endangered Animals

Dispositional empathy with nature is defined as the ability to understand the natural world and to comprehend and share its emotions (Tam, 2013). It can be divided into a cognitive component (perspective-taking) and an affective component (empathic concern). Perspective-taking describes how well another's emotions can be comprehended, while empathic concern describes the sharing and understanding of the emotions of another being (Tam, 2013). Dispositional empathy with nature predicted pro-environmental behavior in various studies (e.g., Chawla, 2009; Young et al., 2018). In the present study, rather than assessing dispositional empathy with nature as a whole, we focused on dispositional empathy with endangered animals to capture the ability to empathize with endangered animal species. We predicted that dispositional empathy with endangered animals would positively influence the willingness to protect endangered animal species (Hypothesis 4).

We based our items on those in the study by Sevillano et al., (2017), who used a Spanish translation of the six original items by Tam (2013). For this study, the wording "*animals and plants*," was changed to "*endangered animals in Ecuador*." As a result, this section contained items such as: "*I can easily put myself in the place of suffering endangered animals in Ecuador*."

Threat Perception

In the context of the present study, threat perception is the perceived threat level of selected native Ecuadorian animal species (Hermann & Menzel, 2013a). We predicted that the perceived severity of a threat would positively influence the willingness to protect endangered animals (Hermann & Menzel, 2013; Hypothesis 5). Since children consider species that they know to be particularly worth protecting (Ballouard et al., 2015), it was important to include well-known animals in the analyses. Accordingly, we selected ten native animal species from the 2006 children's book *Un Día Más y Otras Historias: Cuentos Sobre Animales en Peligro de Extinción* [One More Day and Other Stories: Tales About Endangered Animals] by Edna Iturralde, a well-known author in Ecuador. The ten species selected are vertebrates native to Ecuador, and most are listed as threatened (the exception is the common anaconda; International Union for Conservation of Nature [IUCN], 2020). Subsequently, the threat level of each species was evaluated by the students. The possible answers ranged from 0 = "*not threatened*" to 3 = "*high level of threat*." An alternative answer was "*I don't know the animal*," which we subsequently regarded as a missing value (Table 2). In our analysis, we included only animals familiar to at least 80% of the children: the Andean bear (81.4%), the Andean condor (87.9%), and the jaguar (81.9 %; Table 2).

TABLE 2 Children's threat perceptions of selected animal species

Species	Scientific name	EN	EN	NT	NT	VU	NT	LC	VU	EN	Not listed
Silver	<i>Lagothrix poeppigii</i>	8.5	9.4	12.1	22.5	15.0	18.6	10.9	3.8	13.6	20.0
woolly	<i>Inia geoffrensis</i>	5.6	15.8	9.9	19.6	15.0	12.9	11.7	6.1	12.1	11.0
monkey	<i>Amazona aestiva</i>	17.6	20.9	16.3	21.7	25.0	22.9	15.3	16.2	20.7	9.7
	<i>Andigena laminirostris</i>										
	<i>Panthera onca</i>										
	<i>Tremarctos ornatus</i>										
	<i>Vultur gryphus</i>										
	<i>Ensifera ensifera</i>										
	<i>Priodontes maximus</i>										
	<i>Chelonia mydas</i>										
	<i>Eunectes murinus</i>										

TABLE 2 Children's threat perceptions of selected animal species (cont.)

Species	Silvery woolly monkey	Amazon river dolphin	Plate-billed Mountain toucan	Jaguar	Andean bear	Andean condor	Sword-billed hummingbird	Giant armadillo	Green sea turtle	Common anaconda
Scientific name	<i>Lagothrix poeppigii</i>	<i>Inia geoffrensis</i>	<i>Andigena laminirostris</i>	<i>Panthera onca</i>	<i>Tremarctos ornatus</i>	<i>Vultur gryphus</i>	<i>Ensifera ensifera</i>	<i>Priodontes maximus</i>	<i>Chelonia mydas</i>	<i>Eunectes murinus</i>
"I don't know the animal"	63.4	30.9	48.9	18.1	18.6	12.1	47.4	55.4	30.7	33.8
Sample Size ^a	142	139	141	138	140	140	137	130	140	145
<i>M</i>	1.52	1.83	1.58	1.43	1.77	1.81	1.64	2.10	1.76	1.61
<i>sD</i>	1.00	1.04	1.11	1.12	1.10	1.16	1.10	0.95	1.12	1.38

Note: Presented are the colloquial and scientific names, threat levels of the animals, as well as the frequency of mentions (%) and descriptive statistics. Measured from 1 ("Not threatened") to 4 ("High level of threat"); threat levels obtained from International Union for Conservation of Nature (2020): EN = endangered, NT = near threatened, VU = vulnerable, LC = least concern.

^a Sample size equates all participants of the total $N = 154$ who answered the question.

Data Analysis

For data analyses, IBM SPSS Statistics (Version 26) was used. Since most of the scales were modified, their dimensionality was investigated via exploratory factor analysis (principal component analysis with varimax rotation). As predicted, the results indicate a one-dimensional structure for all scales. In addition, all variables were investigated for normality using Q-Q plots. We did not detect strong deviations from normality. Further, we tested the following assumptions of regression analysis: multicollinearity (no evidence, with *VIF* ≤ 4), autocorrelation (no evidence, with Durbin-Watson statistic = 2.03), and homoscedasticity (no violation by inspection of scatterplots). Accordingly, we proceeded to use parametric tests. Pearson correlations were calculated to identify associations between variables (Table 1). Finally, a regression model tested whether the predictor variables influenced the willingness to protect endangered animal species (Table 3).

TABLE 3 Results of the regression on willingness to protect endangered animals

Predictor variables	B	SE	β	T	p
Constant	.79	—	—	1.42	.161
Gender	.43*	.19	.17*	2.25	.027
Place of growing up	.10	.09	.06	1.11	.270
Psychological distance	-.18	.11	-.16	-1.63	.108
Caring beliefs	.30*	.13	.26*	2.38	.020
Dispositional empathy	.24**	.12	.29**	2.00	.049
Threat perception jaguar	.04	.09	.04	.40	.690
Threat perception Andean bear	.14	.09	.13	1.53	.129
Threat perception Andean condor	.22**	.09	.15**	2.60	.013

Note: * $p < .05$; ** $p < .01$; Gender coded as 0 = *male*, 1 = *female*; $R^2 = .56$; R^2 adjusted = .52; Total degrees of freedom = 88.

Results

Correlations between Variables

The sociodemographic variables correlated significantly with a few other variables (Table 1). Gender correlated positively with the willingness to protect endangered animals ($r = .29$, $p < .001$), caring beliefs ($r = .18$, $p = .029$), and perceived threat to the jaguar ($r = .21$, $p = .031$). Furthermore, children

growing up in rural areas perceived a lower threat to the Andean bear ($r = -.19$, $p = .041$).

Willingness to protect endangered animals correlated strongly (psychological distance: $r = -.56$, $p < .001$; caring beliefs: $r = .59$, $p < .001$; dispositional empathy with endangered animals: $r = .57$, $p < .001$); or moderately strongly (threat perception jaguar: $r = .22$, $p = .022$; threat perception Andean bear: $r = .29$, $p = .002$; threat perception Andean condor: $r = .38$, $p < .001$) with the predictor variables in the hypothesized direction (Table 1; Cohen, 1992). Moreover, psychological distance had a negative correlation with caring beliefs ($r = -.70$, $p < .001$) and dispositional empathy ($r = -.59$, $p < .001$), the other two correlated positively with each other ($r = .58$, $p < .001$). However, only dispositional empathy correlated significantly (moderate effect) with threat perception of the jaguar ($r = .22$, $p = .018$) and the Andean condor ($r = .29$, $p = .001$).

Regression on the Willingness to Protect Endangered Animals

A regression analysis was performed to test the influence of the sociodemographic variables, psychological distance, caring beliefs, dispositional empathy with endangered animals, and threat perception on the willingness to protect endangered animals. Overall, this regression model explains 55.3% of the variance in the children's willingness to protect endangered animals ($p < .001$). Of the included variables, four appear to be significant predictors of the willingness to protect. Gender was a positive predictor ($\beta = .18$, $p = .027$), indicating that females are more willing to protect endangered animals. Caring beliefs ($\beta = .26$, $p = .020$) and dispositional empathy with endangered animals ($\beta = .20$, $p = .049$) were both positive predictors explaining significant parts of the variance in willingness to protect. Finally, threat perception of the Andean condor was also a significant predictor ($\beta = .211$, $p = .013$). The remaining variables did not significantly predict willingness to protect. However, this might be due to the low power, which is caused by the large number of missing values for the threat perception variables (see Tables 1 & 2). It appears that many participants did not rate their perceived threat for all of the animals, leading to a reduction in degrees of freedom, and subsequently also of power (see Table 3). As such, we performed the analyses without the threat perception variables to test if our results would hold up in a more powerful model.

Regression Excluding Threat Perception Variables

The model excluding the threat perception variables explained slightly less variance ($R^2_{adjusted} = .48$). Nevertheless, it had more degrees of freedom ($df_{total} = 146$) and thus more statistical power. In this model, the previous three significant variables remained strong predictors (gender: $\beta = .20$, $p = .002$; caring

beliefs: $\beta = .26, p = .005$; dispositional empathy: $\beta = .30, p < .001$). The other two remaining variables remained nonsignificant, although psychological distance ($\beta = -.19, p = .050$) was right on the brink of being significant. In summary, the results are comparable to the main model with less power.

Discussion

Willingness to Protect Endangered Animals

The present study on Ecuadorian primary school students' willingness to protect endangered animal species confirms the findings of previous studies on the willingness of young people to protect wild animals. Similar to the present study, Ballouard et al. (2013) as well as Hermann and Menzel (2013b) reported a high willingness to protect wild animals, particularly in school children.

Influence of Predictors

As previously reported and predicted (Axelrod & Lehman, 1993; Berenguer, 2007; Chawla, 2009; Hermann & Menzel, 2013a, 2013b; Manfredo et al., 2009; Tam, 2013; Young et al., 2018), gender, caring beliefs, dispositional empathy with endangered animals, and threat perception of the Andean condor were significant positive predictors of the willingness to protect endangered animal species. Moreover, after adjusting for the number of variables, our final regression model was able to explain more than 50% of the variance in students' willingness to protect, which is a large effect (Cohen, 1992).

Hypothesis 1: Gender and Place of Growing Up

We found a significant effect of gender on the willingness to protect endangered animals, with girls being more likely to report protection intentions. This is in line with some previous studies (Vicente-Molina et al., 2018) but goes against other findings (Carmi & Khimi, 2015). Place of growing up was not identified as a significant predictor. Since all of the children came from roughly the same region, it is reasonable that the places where the children grew up did not differ that strongly. This could explain why we did not find an effect on willingness to protect endangered animal species (Hermann & Menzel, 2013b).

Hypothesis 2: Psychological Distance

The results for psychological distance were not fully in line with our hypothesis and the results of previous studies (Carmi & Kimhi, 2015; Jones et al., 2017). It is likely that any potential effect was absorbed by the inclusion of other variables in the regression model. A similar effect was observed by Spence et al.

(2012) in the context of psychological distance to climate change, as they also found that the direct effect was reduced after including concern about climate change as a mediator.

Accordingly, the “caring beliefs” and “dispositional empathy” variables could function as mediators that reduce the direct effect of psychological distance on the willingness to protect endangered animals. The high correlations we found between these variables may also be indicative of this. However, as far as we are aware, the relationships between these variables have not been analyzed in previous studies and thus should be the subject of future research. Other variables that could play an important role in this regard and should be considered in future research are participants’ attitudes (Büssing et al., 2019) or emotions (Carmi & Kimhi, 2015) toward animals.

Previous research suggests that to promote protection motivation, it is important to reduce children’s perceived distance toward the extinction of endangered species. The loss of biodiversity should not be discussed as a (geographically) distant occurrence (Ministerio del Ambiente del Ecuador, 2016); rather, it should be presented as an issue in their direct surroundings. One possible method to reduce the perceived distance is to incorporate videos or excursions that emphasize the geographical, temporal, and social dimensions of biodiversity loss at a level that is relatable for the students (Jones et al., 2017).

Hypothesis 3: Caring Beliefs

Caring beliefs, a subdimension of the mutualism wildlife value orientation, significantly predicted the willingness to protect endangered animals, thereby supporting Hypothesis 3. Previous studies similarly showed that strong caring beliefs positively affected attitudes toward the return of the wolf, which in turn predicted the willingness to protect wolves (Büssing et al., 2019; Hermann & Menzel, 2013b).

In our study, we assumed that individuals’ wildlife value orientations, and thus also their caring beliefs, are permanent beliefs upon which attitudes are formed and behaviors develop (Chase, 2013; Manfredo et al., 2009). These beliefs are shaped by socialization at an early age as well as an individual’s experiences (Featherstone, 2011; Manfredo et al., 2017; Stern et al., 1995). Previous research has suggested that these beliefs can change as a result of long-term socioeconomic shifts (Manfredo et al., 2017), but are otherwise stable (Fulton et al., 1996; Stern et al., 1995). Therefore, schools are crucial in promoting values that foster the conservation of biodiversity (Dornhoff et al., 2019). Participatory methods that allow students to actively experience biodiversity have been suggested to be impactful. One method that could be applied

is to encourage active reflection on the students' behavior in the context of biodiversity conservation (Hermann & Menzel, 2013b).

Hypothesis 4: Dispositional Empathy

Empathy with endangered animal species was the strongest predictor of Ecuadorian children's willingness to protect endangered animals in the present study. The positive influence of empathy corresponds with previous results indicating that empathy with nature reliably predicts the willingness to protect the environment (Tam, 2013). Consequently, we found evidence in favor of Hypothesis 4.

This result holds particular value for educators because empathy can especially be developed during childhood (Chawla, 2009; Tam, 2013). Primary school children are already able to empathize with other people and creatures (Chawla, 2009). To further develop an empathic relationship with nature, two possible approaches have been suggested. The first approach demands regular intimate contact with natural environments and parts of nature, whereas the other approach attempts to focus on the transmission of the moral rights of animals through stories and images (Chawla, 2009). Research suggests that such empathy training can be effective long term (Butters, 2010). For example, reading a fictional story could strengthen the subjects' empathy as long as they felt transported into the narrative (Bal & Veltkamp, 2013; Johnson, 2012). However, during empathy training, it needs to be considered that school children tend to prefer animals over plants, which may require different approaches (Tamir, 1975). In any case, empathy with endangered species could be enhanced through the application of appropriate media in school. In turn, this would positively affect the willingness to protect these animals.

Hypothesis 5: Threat Perception

In the present study, we found that while the perceived threat of the jaguar and the Andean bear did not predict the willingness to protect endangered animals significantly, threat perception of the Andean condor did. Thus, there appears to be some evidence in favor of Hypothesis 5. These results are in line with findings that the willingness to protect can be species-dependent (Cárdenas & Lew, 2016). Important factors in this context are perceived sympathy and prominence, which positively influence the willingness to protect (Ballouard et al., 2013, 2015), as well as the perceived aggressiveness of the species, which acts as a negative predictor (Prokop & Fančovičová, 2017). The jaguar is a species that is often associated with human-wildlife conflicts (Marchini & Macdonald, 2019), thus it might not be surprising that the perceived threat level did not

influence willingness to protect. Moreover, Andean bears are often perceived as aggressors that harm humans or their livestock, however, this could also be argued for the Andean condor (Restrepo et al., 2019; Zukowski & Ormsby, 2016). Nevertheless, the condor is a charismatic species and is present in the Ecuadorian national coat of arms (Gade, 2016), perhaps explaining the different results for these species. Yet, this discrepancy between the species cannot fully be explained by the present data. As such, future research should aim to investigate the perceptions of these species.

In addition to these theoretical explanations, it is also important to note the described lack of power. As a result, these findings should be viewed with caution and may not hold for larger samples.

Limitations

One limitation of the present study is our operationalization of threat perception, which was assessed with self-created single items for each animal species. Notably, in line with the protection motivation theory, threat appraisal is a multidimensional construct that can predict several pro-environmental behaviors. We chose to use single items because it was important to keep the complexity of the questionnaires as low as possible due to the young age of the participants (Mellor & Moore, 2014). Nevertheless, future studies should aim to assess threat perception as operationalized in the protection motivation theory.

Another limitation is that we substantially modified the willingness to protect endangered animals scale from Stern et al. (1999). However, this adjustment seemed unavoidable due to the young age of the sample; if left unchanged, the statements would not have been meaningful since primary school children cannot donate money or sign requests (David et al., 2014). Despite the changes, the reliability and factor analyses indicated successful adaptation of the scale.

The likeability of a species plays an important role in children's willingness to protect it (Ballouard et al., 2013). However, this was not assessed in this study and should thus be addressed in future research. Specifically, future studies should focus on how likeability interacts with other factors.

Furthermore, we made implicit distinctions between "humans and animals" as well as between "culture and nature" within our questionnaire. While concepts of "nature" do not differ fundamentally between children and adults, for example, both do not usually regard humans as part of nature (Gebhard, 2020). Some recent research has shown that children perceive the human and non-human animal relationship differently from adults as they sometimes morally prioritize animals over humans (Wilks et al., 2021). Consequently,

the present study cannot answer whether the children's understanding corresponds to the "mature" concepts of adults or if their concepts are more differentiated. However, we can assert with certainty that the children understood the items within the framework of their conceptual interpretation and did not show any difficulties in understanding them (cf. section test instrument and variables). Moreover, while there is some debate on the use of Likert scales with children, it appears that they can be suitable if pre-tested appropriately (Mellor & Moore, 2014). Nevertheless, it is important to keep in mind that the present results for children may not be representative of the older population.

Furthermore, it should be considered that the willingness to engage in the protection of endangered animal species cannot be equated with actual protective behavior. As such, researchers should aim to investigate actual behaviors (Sheeran & Webb, 2016).

Finally, it must be mentioned that the data were gathered in only three primary public schools and thus are not representative of the population of all primary (private and public) school children in Cuenca or Ecuador. However, the similarity of the results to those of other studies suggests that the findings may also apply to other reference groups.

Conclusion

The focus of the present study was to investigate the influence of selected factors on Ecuadorian children's willingness to protect endangered animal species. This study confirms the results of previous studies with participants from Europe, North America, and Asia. Caring beliefs, dispositional empathy with endangered animals, and threat perception of the Andean condor were identified as strong predictors of the willingness to protect endangered animal species. Another significant predictor was gender, with girls showing a higher protection motivation than boys. There were no significant effects of place of growing up, psychological distance, or the threat perception of the jaguar or Andean bear. Based on our findings, it appears that schools could indeed be crucial in increasing children's willingness to protect endangered species. Future research should not only focus on identifying predictors of willingness to protect endangered animal species, but also specifically investigate the effectiveness of educational interventions in long-term experimental studies. In this way, effective environmental education programs with a focus on (local) biodiversity may be developed.

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