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GOOD PREDATORS IN BAD STORIES: CROSS- CULTURAL COMPARISON OF CHILDREN'S ATTITUDES TOWARDS WOLVES

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Introduction

There is growing evidence that some predatory mammals play important roles in various terrestrial ecosystems (Estes, 1996). By controlling the populations of their phytophagous prey, the growth rates and density of some plants are increasing, thereby positively influencing the functioning of the ecosystems (McLaren & Peterson, 1994). Furthermore, the carnivores influence the distribution of the carcasses that result from predation, thereby, influencing positively the below-ground biochemical processes that are important ecological drivers of the above-ground community structure and functioning (Wardle, Bardgett, & Klironomos et al., 2004; Bump, Peterson, & Vucetich 2009). The maintenance of overall biodiversity is a consequence of reciprocal links between large carnivores and ecosystem function (Ripple and Beschta, 2004; Ray, Redford, Steneck, & Berger, 2005).

Grey wolf (*Canis lupus*) is the most controversial predator in Europe. Wolves were exterminated from the most of Northern and Western Europe in the last two centuries, probably reaching their minimum in the 1940's to 1960's (Mech, 1995; Salvatori & Linnell, 2005). In North America, wolves were virtually wiped out by European settlers seeking bounties, game, pelts, and predator-free farming (reviewed by Treves, 2008). The grey wolf (*Canis lupus*) survived primarily in the most remote and least developed tracts and is now classified as an endangered species in many countries (Mech, 1995).

Abstract. *In this study 103 children (aged 7 – 12 years) from two distinct countries with relatively low (Slovakia) and high (Turkey) wolf population density were interviewed to examine children's overall interest in wolves, their knowledge of wolves, the effects of their keeping pets and their reading stories about wolves. Children in both countries showed considerable factual knowledge about wolves, but the importance of wolves in nature was poorly understood. Perceptions of wolves in stories were generally negative and there was a significant effect from stories which generated fear and sympathy towards wolves suggesting that stories may have a significant impact on children's emotions. Turkish children reported their experience with less drastic stories about wolves and their interest in wolves was significantly higher and their fear of wolves was conversely lower, compared to the reactions of Slovakian children. The more the students were engaged in nature related activities, e.g. watching natural history films and walking in areas of nature, the less they demonstrated fear of wolves.*

Key words: *animals, children, perception, predators, wolf.*

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Children's Attitudes toward Predators

The term "attitude" used here follows traditional definitions (e.g. Eagly & Chaiken, 1993) according to which attitudes have three components. The cognitive component refers to knowledge about the objects. The affective component includes feelings about the object, and its assessment is performed using psychological indices (i.e. valuing, moral reasoning). The behavioural component pertains to the ways people act towards the object.

Although there is some research focussed on children's attitudes towards animals in general, little is known about children's attitudes towards predators in specifically. Current research reveals that human and non-human primates possess a developed fear mechanism for animals that were dangerous to our pre-technological ancestors (Mineka, Keir, & Price, 1980). The fear of predators (or harmful animals in general) predisposes children to attend to potentially dangerous animals and prepares them rapidly to learn to associate fear with such stimuli. Consequently, this effectively helps children to avoid contact with harmful animals or to escape from them. For example, LoBue and DeLoache (2008) showed that pre-school children more rapidly distinguished a predator (a snake) against a background of flowers and mushrooms than flowers or mushrooms against a background of snakes. Furthermore, infants at 5 months of age look longer at a schematic image of a spider than a partly or completely scrambled image of a spider but do not do so for schematic and scrambled images of a flower (Rakison & Derringer, 2008).

The studies of Prokop, Kubiátko and Fančovičová (2008), Prokop and Kubiátko (2008) and Prokop and Tunnicliffe (2010) examined attitudes towards animals (including predators) in various samples of approximately 10 – 15-year-old children in Slovakia. They found that a substantial number of children (44%) did not like it when a stronger predator such as the hawk killed a smaller prey such as the great tit (*Parus major*) (Prokop, Kubiátko, & Fančovičová, 2008). In a related survey in which a predator (wolf) and its prey (rabbit) were contrasted by researchers, it was found that the predator was perceived more negatively compared to its prey (Prokop & Kubiátko, 2008; Prokop & Tunnicliffe, 2010). Children held beliefs consistent with various myths about wolves. For example, 64% of children believed that the female wolf often kills her own offspring. It is, therefore, said that the mother wolf does not feed her offspring to encourage them to kill each other (Prokop & Kubiátko, 2008). Beliefs in myths (or untrue events) were also documented by O'Byrne (2009) who found that, for example, 92% of Grade 2 students believed that wolves were likely to attack campers in the wood. To conclude, even very young children show fear of some predators, and children have beliefs consistent with various myths about predators. Fear and myths correlate with other attitude dimensions (namely with scientific and ecologicistic attitudes and with factual knowledge), at least among adult students (Prokop, Fančovičová, & Kubiátko, 2009a). More frequent visits in the woods are also positively associated with the knowledge of forest animals (Strommen 1995). Similarly, more frequent natural activities (picnicking, fishing, hiking, and so on) and more experience in the natural regions positively contribute towards the protection of the natural environment (Erdogan, 2009). However, how these activities are related to the appreciation of predators remains unknown.

Most work consistently reveals that females express greater fear of predators than males (Bjerke, Reitan, & Kellert, 1998; Ericsson & Heberlein, 2003; Kaltenborn, Bjerke, & Nyahongo, 2006; Kellert, 1985a, b, c; Røskaft et al., 2003, 2007; Prokop, Özel & Usak, 2009b; Prokop & Tunnicliffe, 2010). Although there is still no convincing evidence explaining the gender differences in the fear of the predators, it is possible that they reflect different roles of males and females in our evolutionary history (Prokop & Fančovičová, 2010). Men were predominantly hunters (Kaplan 1996) and, therefore, had to deal directly with many dangerous animals (Hawkes, O'Connell & Blurton Jones, 1991). Women, on the other hand, probably stayed in the close vicinity of their camps because their parental duty was to raise and care for their children. Thus, women were more likely to develop fear against any threatening animals.



Are Stories about Wolves Related to Children's Attitudes towards Wolves?

In many European and Asian countries wolves never became the cultural "heroes." Instead, they have long since been identified as the images of evil (He, 2009). As Christianity began to dominate life in Europe, the Roman Church promulgated the view that the wolf (and its mythical counterpart, the werewolf) was an animal incarnation of evil itself (Case, 2008).

Red Riding Hood or other similar stories depicting a wolf as bloodthirsty predator that kills other animals or humans are well known worldwide (Table 1). Although we could not find any research explicitly examining how these stories may influence children's attitudes towards wolves, there is some evidence which indirectly supports the view that stories may have had a positive or negative impact on what children think and how they behave. Moreover, some suggestions reveal that this impact may have been negative, rather than positive probably reflecting the negative image of the wolves in myths and legends (Table 2). Firstly, stories may contain factual mistakes which may result in misconceptions or wrong understanding. For example, Rice (2002) examined 50 popular children's trade books and documented numerous errors such as labelling mushrooms as plants and describing snakes as slimy (despite the fact that mushrooms are fungi and snakeskin is dry). Secondly, false "facts" from stories are also learned especially by younger children. For example, when Marsh, Meade and Roediger (2003) investigated how people learn information from fictional sources with their general knowledge of the world, they found that reading errors in the short stories increased the production of those specific incorrect answers and reduced correct responding below the baseline. In addition, Fazio and Marsh (2008) showed that early elementary school aged children learned information from fictional stories. Hearing misinformation in a story increased the likelihood that children of all ages would choose the misinformation answer on a later multiple-choice general knowledge test. The effects of false facts in stories were lower as the child's age increased. Thirdly, there is evidence that frightened voices in stories attracted the child's attention. Very young children (7- to 18-month-olds) look longer at movies of snakes paired with a frightened human voice than at movies of snakes paired with a happy human voice (DeLoache & Lobue, 2009). Considering that attention enhances learning (Shirey & Reynolds, 1988), children would learn from stories with frightened voices, which are typical for stories with predators, more than from other stories. Fourthly, watching films may influence subsequent behaviour of the child. Anderson et al. (1995) and Anderson (1997) found that violent films may increase aggression by increasing hostile feelings and the accessibility of aggressive thoughts. Furthermore, smoking exposure in a film was significantly associated with an increased risk of smoking initiation (Titus-Ernstoff, Dalton, & Adachi-Mejia et al., 2008). Taking this evidence along with the high daily exposure of modern children to television (more than 90 minutes daily, Christakis, Ebel, Rivara, & Zimmerman, 2004; Thakkar, Garrison, & Christakis, 2006) into account, it is reasonable that stories about predators may influence children's attitudes towards them. In this study we examined children's views of wolves, as well as the potential impact of stories on children's attitudes towards wolves, in two distinct countries: Slovakia and Turkey.

Unfortunately, there are a very few published papers at national or international levels dealing with the public attitudes towards wolves in any country. Public media (especially local TV channels) sometimes brings some alerts about killing farm animals by wolves, but published items reporting the public views of wolves are missing.

Table 1. Examples of worldwide known stories about wolves.

Name of story	Brief description
Well, wait (rabbit)!	A series of 20 animated stories made in Russia. It has a similar scenario to "Tom and Jerry". The wolf wants to catch a rabbit, but it always escapes successfully.
Little Red Riding Hood	The wolf eats the little girl together with her grandmother. Finally, the wolf's gut is cannibalised by a hunter and, thus, the girl and her grandmother are saved.



Name of story	Brief description
The wolf and the seven young kids	The wolf eats six kids, but the last kid is concealed in the house. The mother goat catches the satiated wolf and cannibalises its gut and removes six kids which are still alive.
Three little pigs	The two little pigs build two houses of straw and sticks, but a wolf blows it down and eats both little pigs. The third pig builds a house of hard bricks. Because the wolf's attempts to burgle this house are not successful, he resolves to come down the chimney, whereupon the pig boils a pot of water into which the wolf plunges. The pig cooks the wolf for supper.
The boy who cried wolf	A bored shepherd boy entertained himself by tricking nearby villagers into thinking a wolf is attacking his flock of sheep. Villagers found that his alarms were false and that they had wasted their time. When the boy was actually confronted by a wolf, the villagers did not believe his cries for help and the wolf ate the flock.

The Current Status of Wolves in Slovakia and Turkey

In the report on the conservation status and threats against wolves (*Canis lupus*) in Europe (Salvatori & Linnell, 2005), the wolf population in Slovakia is over 900 single wolves, whereas, in Turkey it is estimated to be about 5000-7000 single wolves. According to the Red List of Mammals in Slovakia the wolf is categorised as a low risk: the *Nearly Threatened* and the wolf in Slovakia is a *partly protected* species based on National Legislation. However, the wolf is not strictly protected and no official quotas for wolf hunting have been established in Turkey. Even though the species is a "strictly protected fauna species" as reported in the Appendix II of the Bern Convention (Council of Europe 1979), Turkey has not yet developed any action plan and/or conservation-protection plan for the wolves (Salvatori & Linnell, 2005; Tuğ, 2005).

These results show that the wolf is *not a fully protected* species in either country. Wolf persecution by hunters or poachers as well as forest fragmentation and other factors are responsible for the wolf decline in Slovakia and Turkey. These two countries, however, differ in their estimated number of wolves. Considering the most optimistic numbers of wolf populations in these countries (see above), there are 0.018 of wolves per km² in Slovakia (especially in the eastern and central parts) and much less (0.009/km²) wolves in Turkey (no specific details about distribution exist). These values are important because they can influence overall attitudes towards animals. For example, most of the people in Norway want to have large carnivores far (>10 km) from their homes (Røskaft et al., 2007). Higher diversity of potentially harmful animals also increases negative attitudes towards these animals compared with countries with lower diversity of potentially harmful animals (Prokop, Tolarovičová, Camerik, & Peterková, 2010).

Table 2. Some examples of myths about wolves (after Lopez, 2004).

Examples of myths	Brief description
Werewolf (lycanthrope)	Mythological or folkloric humans with the ability to turn into an anthropomorphic wolf-like creature, either purposely, or by being bitten by another werewolf, or after being placed under a curse
Roman myth	The twins, sons of the god of War, Mars, who were nursed by the mother wolf were said to be the Roman ancestors, Romulus and Remus.
Some Middle Age myths	It was widely believed that a horse which stepped in a wolf print would be crippled.
	The gaze of a wolf was once thought to cause blindness.
	Others believed that the breath of the wolf could cook meat.



Purpose

This study examined children's knowledge and attitudes regarding the grey wolf in two culturally and geographically distinct countries: Slovakia and Turkey. These countries differ in their estimated number of wolf population and wolf protection legislation. The population of the wolves in Slovakia is relatively bigger, and wolves are partly protected by current laws. Wolves were chosen as a model species because their population size is decreasing as a result of public prejudice, poaching, illegal shooting and forest fragmentation. Moreover, children's perception of controversial predators, such as the grey wolf, is poorly understood (Thompson & Mintzes, 2002). Beliefs in myths about these animals may influence the attitudes and behaviour of the people and finally their acceptance and protection of the wolves in their natural environment. It is believed that this contribution will be useful for science and nature education instructions and environmental conservation programmes focussing on saving biodiversity, in general and on the protection of large predators, in particular.

The significance of this study is three-fold. Firstly, it examines the potential association between the perception of wolves by children from stories and children's attitudes towards them. Secondly, it provides in-depth information on children's knowledge of wolves and their ideas about wolf protection, extending existing research on children's knowledge and understanding of animals (e.g., Shepardson, 2002; Prokop, Kubiátko & Fančovičová, 2008; O'Byrne, 2009). Thirdly, it examines cross-cultural differences in perception of wolves among Slovakian and Turkish children.

This study tested the following hypotheses:

1. Children are influenced by perceptions of wolves presented in stories. The more negatively the wolves are perceived in stories, the more negative the children's attitudes towards the wolves in the wild will be expressed.
2. Females have a greater fear of wolves because of their less favourable attitudes towards large carnivores.
3. Children's out-of-school nature activities (i.e. watching natural history films, walking through areas of nature and reading natural history books) are associated with more positive attitudes towards wolves.
4. Slovakian children would have more negative attitudes toward wolves compared with Turkish children because predation threat is stronger and consequently folklore in this country would favour greater attention of wolves.

Methodology of Research

This study was carried out in two different countries from different continents: Slovakia (Europe) and Turkey (Asia). The sample of participants is lower compared with quantitative research works, but qualitative approach that was used in this study makes using larger samples extremely time spending.

The Sample

One hundred and three children, between the ages of 7 to 12, from four public primary schools (two schools per country) in Slovakia ($n = 40$ children, N 48°10', E 17°34') and Turkey ($n = 63$ children, N 36° 42', E 26° 45'), participated in this research. These schools located in the urban residence were chosen at random. The number of boys and girls was similar (51 and 52, respectively). These children were selected randomly from five classes in each country by the researchers. Because all participants were from public schools, the majority of them came from middle social class. The majority of Turkish children were Muslims (about 98%) and most of the Slovakian children were Roman Catholic. Questions about ethnicity were not, however, explicitly asked to these children. Permission for conducting interviews was gathered from the parents of these children in September 2007 by the classroom teachers. Research was conducted in the first half of the school year 2007/2008 and no child participating in the study had formal



instruction about the biology of the grey wolf. Other information on wolves that could be gathered by the children through informal learning was examined by the interview described below:

Data Collection Instrument; Interview Schedule

The interview schedule with semi-structured items was developed by the authors. All questions were firstly independently discussed with four primary teachers (two per country) who had experience in teaching these age groups of students. Teachers were explicitly asked whether proposed questions reflected broader understanding of the children's views of wolves. Questions were improved or removed according to their recommendation. The final interview protocol consisted of 40 questions and three additional demographic questions. Questions in interviews mainly focussed upon 1) children's basic demographic characteristics (gender, age, grade); 2) interest in wolves, 3) associations between presentation of wolves in stories and children's perception of wolves; 4) basic knowledge of wolves; and 5) children's views of wolf protection. Examples of interview questions include:

Would you like to learn more about wolves in school? Try to rate your fear of wolves from 1 (no fear), 2 (moderate fear) to 3 (high fear). What do you think what will happen if all the wolves become extinct? Is it a problem for you if a wolf kills a red deer? If yes, try to explain why! What stories (TV movies or books stories) about wolves do you know?

The full version of the interview schedule is available in the corresponding author upon request. During the interview, the students were also asked about how frequently they watched nature history films or documentaries, read nature history books and visited the areas of nature (nature walks). Children were not told any story by the researchers before or during the interview. Each child was asked the same questions in the same order according to interview protocol. The language used in the interview was Slovakian for Slovakian children and Turkish for Turkish children. The interviews in both countries were performed by two pre-service teacher students (one per country) trained by their supervisors (PP and MU). Both these students were native Slovakian and Turkish females with a great interest for teaching in future and with a positive attitude towards children.

Procedure

The interview schedule was firstly developed in English and then translated into the Slovakian and Turkish languages. Individual face-to-face interviews were undertaken with the children by the researcher during 20-minute sessions within the classroom environment where the students feel more comfortable and show personal trust. At the beginning of the session, the researcher introduced the purpose of the study and, also showed the questions in the schedule in the case the children asked to see. They were ensured about the confidentiality of their names and responses. All interviews were audio-taped based on the permission of the students. Once the interviews were completed, they were transcribed verbatim for content analysis and also scoring.

Scoring the Data

Based on all the children's explanations for each researcher's question about the wolf, the authors developed a scoring system depending on the nature of the data. For example, attitudes toward wolves were coded using a three-point scale: 1 = hate/do not like/disagree, 2 = undecided, 3 = like or like very much/agree. The perception of the wolves was scored by counting all the perceptions provided by the child, and then by subtracting the total number of positive perceptions by the total number of negative perceptions. Resulting positive or negative number indicated a prevalence of positive or negative perceptions, respectively. For example, if a child showed that a wolf has three positive characters (e.g., friendly, intelligent, peaceful) and four negative characters (bloodthirsty, dangerous, stupid, aggressive),



then the resulting number was “-1” suggesting that negative characters prevailed. Questions regarding keeping animals by children were restricted to only pets.

Data Analysis

The coding of the interviews was firstly done by the first author and then emerged codes were cross-checked by the other authors for validity of the content analysis. Further, scored data and quantitative data were analysed using with both parametric and non-parametric tests. When the dependent variable was a binary response, logistic regression was performed. All statistical tests were two-tailed and undertaken at significance level of 0.05 and 0.01. Statistics were performed with the software STATISTICA version 8 (StatSoft 2001, Tulsa, OK, USA, <http://www.statsoft.com>).

Results of Research

Differences in Perceptions of Wolves between Slovakian and Turkish Children

It was clear from the report that Slovakian children (28%) watched natural history films more frequently than Turkish children (11%) did [$\chi^2_{(2)} = 14.28, p < 0.01$]. In contrast, Turkish children (35%) tended to read natural history books more often than Slovakian children (20%) did [$\chi^2_{(2)} = 5.53, p = 0.06$]. Only 15% of Slovakian and 24 % of Turkish children reported that they did not read any nature related books at all. Walking in the natural areas (e.g. forest) was similarly frequent between the two countries: 38% of Slovakian and 27% of Turkish children reported going on nature walks at least twice per month. The partial correlation analysis indicated that walking in natural areas was but negatively correlated with the concern of meeting a wolf in its natural habitat [$r = 0.29, p < 0.01$]. Only 25% and 16% of all the Slovakian and Turkish children reported that they watched films or read a book specifically about the natural history of wolves.

Many children expressed their sorrow for the killing of the roe-deer by a wolf. Children told the reporters that it was unfair for a roe-deer to be killed by a wolf, or that the roe-deer was protected by law, thus, it should not be killed by wolves. Also, children told that the roe deer was “innocent” or a “very nice” animal that did not deserve to be killed. There was no influence of gender on the children's opinions [$\chi^2_{(2)} = 1.72, p = 0.42$], but a difference between the two countries was significant [$\chi^2_{(2)} = 32.95, p < 0.01$]. While 58 % of Slovakian children had moral problems with the roe-deer being killed by the wolf, 79 % of Turkish children did not. Typical responses of Turkish children were that the roe-deer was the natural prey of the wolf or that the roe-deer had been created by God as a prey of the wolf.

Preliminary analyses did not show any gender differences in attitudes toward wolves. However, there were significant differences between countries: Turkish children showed a greater sympathy, interest and lower fear of wolves.

Table 3. Differences in the perception of the wolves between Slovakian (SK) and Turkish (TR) children.

		Disagree	Undecided	Agree	χ^2
Sympathy towards wolves	SK	40	38	22	7.23*
	TR	22	19	59	
Interest in wolves	SK	12	30	58	21.41***
	TR	19	0	81	
Fear of wolves	SK	22	12	66	10.57**
	TR	41	0	59	

Numbers are % Chi-square tests calculated with $df = 2$. Asterisks (*) denote statistical significance (* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$).



A majority of children expressed a desire to learn more about wolves in schools (75% Slovakian and 68 % Turkish children). These results were not influenced by country or gender differences [$\chi^2_{(2)} = 2.88, p > 0.05$ and $\chi^2_{(2)} = 0.45, p > 0.05$, respectively].

Reading natural history books or watching natural history films did not significantly correlate with the interest in wolves measured by three variables listed in Table 3 (partial correlations, all p 's > 0.05). However, there was a non-significant tendency for negative correlation between the fear of wolves and watching natural history films [partial $r = -0.21, p > 0.01$] which suggests that the latter variable is associated with the lower fear of wolves.

Do Stories Influence Attitudes toward Wolves?

Some of the children from Slovakia (25%) and less from Turkey (14%) reported that they were currently watching or reading a story about wolves [$\chi^2_{(1)} = 1.87, p > 0.05$]. However, virtually all the children knew at least one story about wolves except for seven Turkish children. Almost all Slovakian children (95%), but less than half of Turkish children (46%) cited the famous "Red Riding Hood" [$\chi^2_{(1)} = 25.80, p < 0.01$]. In contrast, 48% of Turkish children cited "Casper", in which there are wolf figures. This story was not cited by Slovakian children [$\chi^2_{(1)} = 26.88, p < 0.01$]. Other stories exclusively cited in Slovakia were "Well, wait (rabbit)!" (8%), "The wolf and the seven young kids" (25%), "Three little pigs" (20%), "The wolf and the fox" (2.5%) and "The lone wolf" (5%). No other stories were cited by Turkish children. In summary, Slovakian children were more experienced with stories in which the wolf is depicted as a brutal predator compared to Turkish children.

The children's subjective perceptions of wolves depicted in stories were different between the countries [$F_{(1,99)} = 15.26, p < 0.01$], but not between the genders [$F_{(1,99)} = 0.06, p > 0.05$] or by interaction between the variables ($F_{(1,99)} = 0.03, p = 0.86$). Turkish children depicted perceptions of wolves somewhat more positively than Slovakian children (mean score \pm SE, -0.54 ± 0.15 versus -1.45 ± 0.18 , respectively), but negative mean scores in both countries clearly suggest that wolves are presented with negative perceptions rather than with positive perceptions. We did not find any correlations between story perceptions by children and their watching natural history films or reading books, with the fear of meeting a wolf in nature or with interest (partial correlations, all p 's > 0.05). However, there was a significant moderate correlation with the sympathy for and the fear of wolves and the perceptions of wolves in stories (partial $r = 0.31$ and -0.39 , both p 's < 0.01). This result implies that if a child perceives a wolf in stories as a positive subject, then the child has greater sympathy for and a lower fear of wolves.

Knowledge about Wolves

Slovakian children had somewhat more frequent exposure to living wolves compared to Turkish children, because about 30% of Slovakian, but only 10% of Turkish children reported that they had seen a wolf in a zoo [$\chi^2_{(3)} = 9.03, p < 0.05$]. Seeing a wolf in a museum (3% and 0%) or in the natural environment (5% and 6%) was rare among Slovakian and Turkish children, respectively.

Both Turkish and Slovakian children showed similar knowledge of the range of body mass (mean = 54 kg, SE = 2.38, range = 7.5 – 150 kg) and height (mean = 71.01 cm, SE = 3.28, range = 20 – 143 cm) of wolves. Mean values suggest that the body mass of the wolf was relatively well estimated and its height was somewhat underreported. These estimates were not different with respect to country, gender, or by interaction between the variables [$F_{(2,98)} = 0.95, 0.98$ and 0.99 , respectively, all p 's > 0.05]. All the children reported that the wolf looked like a dog. Turkish children compared the habit of a wolf to that of a tiger more frequently than Slovakian children [30% vs. 0%, $\chi^2_{(1)} = 14.79, p < 0.01$]. Virtually all the children also correctly reported that the best senses of a wolf are smell and audition. Most cited that the habitats of the wolves were forests and mountains. Only 15% and 20% of the children did not know (or were undecided), whether wolves were natural inhabitants of the environment in Turkey or in Slovakia, respectively. A total of 43% of all the children knew correctly



how long a wolf lived (6 - 20 years were accepted as correct), but the children's estimates were generally overestimated (mean = 31.71, SE = 2.17, range = 6 - 100 years). The food of the wolves was well known. About 83% of all the children reported that the wolves solely hunted for wild animals like deers, roe-deers, rabbits and so on. The remaining 17% reported farm animals or wild and farm animals as the main dietary habit of a wolf. One Turkish and one Slovakian child also noted that the human being was also prey of a wolf.

Children from both countries stated that wolves lived in groups (50%), on their own (28%), or both (7%) and the remaining 15% did not know. The litter size of the female wolf was well understood (mean = 2.13, SE = 0.19, range: 2 - 11). Young wolves were typically described as smaller than adults, with less developed senses like vision, hearing or smell. Three Turkish and one Slovakian child said that the mother taught small wolves how to catch a prey. The minority of the children (17%) did not have any idea about the wolfs' communal life. No child believed that wolves lived in the vicinity of their home, but significantly more Turkish children compared with Slovakian ones (56% vs. 18%) believed that the wolf were always aggressive towards human intruders if he/she entered into a wolf's territory [$\chi^2_{(1)} = 14.67, p < 0.01$].

Surprisingly, the phylogeny between wolves and domestic dogs was almost unknown. Most of the children (90%) did not know from what animal the domestic dog came from. Only 15% of Slovakian and 2% of Turkish children correctly recognised that the domestic dog came from a wolf. This difference favouring Slovakian children was statistically significant [$\chi^2_{(1)} = 6.95, p < 0.01$]. Notably, three Slovakian children thought that the domestic dog came from "wild dogs".

The importance of wolf in nature was poorly understood by the children of both countries. Half of children (53%) could not explain the importance of the wolves and the other 20% explicitly claimed that wolves did not play any important role in nature. Fourteen percent of the children noted that everything which was alive was somehow connected to each other, but these children could not explain these connections between the living organisms. Only 13% of all children showed that wolves regulated populations of other animals and were important for the functioning of the ecosystems.

To support their lack of understanding of the role of the wolves in the ecosystems, 59% of all the children said that nothing would happen if the wolf were extinct. A further 27% did not know and 12% of the children reported that other animals would be more preserved. The remaining 2% said that they would be happy if wolves became extinct.

What do the Children Think about the Idea of the Population of Wolves Being Exterminated by Being Shot?

The current status of wolves in two countries was well estimated by the children. Most of the Slovakian children (73%) knew that the wolf was partially protected by law (only 10% thought that the wolf was protected strictly and the others thought that the wolf was not protected). In Turkey, 67% of the children said that the wolves were not protected by Turkish law and fewer children thought that there was partial (29%) or total (4%) protection of wolves in Turkey. The differences between the two countries were significant [$\chi^2_{(2)} = 23.77, p < 0.01$].

To examine what children thought about the protection of wolves in future, the children's opinions about the shooting of wolves (agree or disagree, do not know responses were omitted) was considered as dependent variables into the multiple logistic regression model. Mean scores of sympathy, interest, fear, perceptions of wolves from stories, total number of animals at home and frequency of walks in areas of nature were independent continuous variables. Country and gender were assigned as categorical predictors. It was found that two variables influenced the children's decision about shooting or not shooting the wolves. If a child reported frequent nature walks, the likelihood of supporting shooting was significantly lower [Wald's $\chi^2_{(1)} = 3.92, p < 0.05$]. Turkish children (38%) agreed with shooting more than Slovakian children (20%) did. To understand the reasons for this difference better we examined the children's responses on the population size of wolves in each country in more detail. Although the Turkish and Slovakian children thought that the population of wolves is strong (40% vs. 40%), about 31% of the Turkish children as opposed to 5% of Slovakian



children were undecided [$\chi^2_{(2)} = 12.59, p < 0.01$]. Thus, low awareness about the population of the wolves could be at least partly responsible for the supporting of shooting wolves. Other variables showed no statistically significant effect (all p 's > 0.05).

Discussion

The results of this study reveal children's perception regarding one of the most controversial predators, the grey wolf, under conditions of two distinct contexts and cultures. Children in both countries showed solid factual knowledge and positive attitudes regarding wolves, but the importance of wolves in ecosystems was poorly understood. Several statistically significant associations were found between perceived attributions of wolves from stories and the fear of wolves and country differences in the overall perception of wolves, but the effects of keeping animals as pets and gender differences were observed to be insignificant. We discussed four hypotheses by considering the following results:

1. *Children are influenced by perceptions of wolves presented in stories. The more negatively the wolf is perceived, the more negative attitudes towards the wolf are expressed.* This hypothesis was evidenced by our data. There was a moderate correlation between both sympathy and perceptions or fear of wolves which suggests that children who think that the perceptions of wolves depicted in stories are mostly negative also have a greater fear of and less sympathy for wolves. These results indicate that wolves in stories are perceived negatively (Rice 2002) which could only be a very subjective view shared by some. Our data, therefore, provides overall support for the association between watching stories about wolves and children's emotional appreciation of wolves (sympathy, fear), but does not support the idea that stories influence behaviour which is consistent with the reports of Anderson, Deuser and DeNeve (1995), Anderson (1997), and Titus-Ernstoff et al. (2008); because there are no association resulting from the perceptions of wolves with regards to the children's decision to exterminate the wolf population by having it shot. Thus, these conclusions should be interpreted with caution because we have not checked on the time that children spent on watching or reading stories about wolves. Further experimental research is required where, for example, a frightened human voice (DeLoache and Lobue 2009), or overall story scenario (wolf with good image) can be manipulated. Another promising area focussing on understanding the human-wolf relationship is by examining the content and prevalence of the stories about wolves in countries with historically high and low wolf depredation pressures. In Turkey, children reported their experience with less drastic stories about wolves compared to those from Slovakia. Perhaps the stories had a protective character and the more harmful the wolves historically were, the more stories against them remained. More cross-cultural research would be helpful in examining this proposition.
2. *Females have a greater fear of wolves because of their less favourable attitudes towards large carnivores.* Although previous research on children above the age of 10 (Prokop & Tunnicliffe, 2010) and on older participants (Kellert 1985a,b,c; Bjerke et al., 1998; Røskaft et al., 2003, 2007) revealed that females have a more negative attitude towards wolves, this study found no gender differences in overall perception or knowledge of the wolf. According to some biologists, females should be more frightened by predators because they have a lower physical condition than males and, thus, the survival of attacks by large predators is less frequent (Treves & Naughton-Treves, 1999; Røskaft et al., 2003; Prokop & Fančovičová 2010). Females are also primary caretakers of infants, who need protection against predators (Kaltenborn et al., 2006). All these explanations could, however, be especially applied to sexually mature individuals because the physical condition of the infants is too low for successful defence against the predators and sexually immature females still do not invest more time to offspring than males. In summary, the low age of



- children in this sample would be responsible for the absence of gender differences in the perception of the wolves. Future research should be directed to ontogenetic changes in sex differences in the perception of the large predators among the large samples.
3. *Children's out-of-school nature activities (like watching natural history films, walking in nature or reading natural history books) are associated with positive attitudes towards wolves.* Supporting hypothesis 3, a moderate correlation was found between the fear of wolves and the watching of natural history films. Thus, watching natural history films is associated with lower level of fear of wolves. Furthermore, children who reported more frequent nature walks had lower concern for crossing a wolf in nature. This result is consistent with Røskaft et al. (2003) who found that more frequent nature trips correlated with lesser fear of predators. Kaltenborn et al. (2006) and Røskaft et al. (2003) similarly showed that urban people have a greater fear of large carnivores compared to rural people who live in closer vicinity to predators. However, there were no further associations between some of the out-of-school activities involved in our research, thus, this hypothesis was only partly supported.
 4. *Slovakian children would have more negative attitudes toward wolves compared with Turkish children.* This study showed some differences in the fear of wolves between the Turkish and Slovakian children. A significantly lower number of Turkish children showed a sorrow for killing roe-deer by a wolf, with a typical creationist explanation (Roe-deer was created by God as a prey for the wolf) which would be responsible for these results. Moreover, having less sorrow for killing a roe-deer does not itself explain the lower level of fear of wolves among the Turkish children. Another very strong cultural explanation that could not be ruled out relates to the Turkish epic "Grey Wolf Epos (Bozkurt Destani)". In this legend all Turkish people were killed by king of the Lin. There was only one baby boy who survived in this war. He was cared for by a female wolf called Bozkurt (Grey Wolf). According to this legend, this baby boy was the father of Turks (Sepetçioglu, 1986; Akyuz, 2009). Therefore, some of the Turkish children who have read this epic are interested in wolves. Further research involving participants from regions with a varying presence of wolves from the historical perspective, and with various cultural backgrounds, would be helpful with regards to a better understanding of the human fear of wolves.

Limitations of the Study

This study was cross-sectional and retrospective in nature, thus, no causal relationships were examined and no definite conclusions could be made. Furthermore, the examined attitudes to wolves were self-reports, no direct physiological measurements of some emotions (e.g. skin conductance responses, or pulse associated with fear) were made. The total time spent with watching films about wolves or reading and listening to book or stories about wolves were also not controlled. Finally, we did not measure whether children had phobias of wolves (or other animals) based on irrational fear or any direct experience with these controversial animals which could also partly influence obtained results. These issues may be challenges for further research. However, even if our research had limitations as listed above, we believe that gathering data with standard procedures like interviews and obtaining self-reports from children as is common in psychological practices may be useful and inspiring for planning further research in this field and some findings may be helpful for environmental educators, nature protectors and curriculum developers.

Conclusion

Although our study is not experimental, several significant associations between measured variables and preferences of wolves provide useful implications both for future research and science



education activities. It was found that children have surprisingly good knowledge about the biology of wolves; however, they are less able to connect their knowledge with the role of wolves in nature or with the importance of large carnivore predators in ecosystems. This needs to be improved, for example with problem-based educational settings. Stories about wolves seem to have impact on children perception of wolves, thus it is suggested that these stories should be considered in formal science/biology settings and re-evaluated in light of growing knowledge in ecology. This promotes potentially interesting and important discussions about the role of wolves in nature among children and teachers. Children should be encouraged to visit nature and watch especially nature history films about predators that might positively influence their perception of top predators in ecosystems.

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