Perceptions and Knowledge of the Jaguar Among Children in Communities Neighboring the Montes Azules Biosphere Reserve in Chiapas, Mexico

Authors: Mascote, Coral, Castillo, Alicia, and Peña-Mondragón, Juan L.

Source: Tropical Conservation Science, 9(4)

Published By: SAGE Publishing

URL: https://doi.org/10.1177/1940082916679407

Research Article

Tropical Conservation Science
October-December 2016: 1–11

DOI: 10.1177/1940082916679407
trc.sagepub.com
SAGE

Perceptions and Knowledge of the Jaguar Among Children in Communities Neighboring the Montes Azules Biosphere Reserve in Chiapas, Mexico

Coral Mascote[1], Alicia Castillo[1], and Juan L. Peña-Mondragón[1]

Abstract

This study describes perceptions and knowledge of the jaguar among children in communities neighboring the Montes Azules Biosphere Reserve in Chiapas, Mexico. There have been several cases of livestock depredation by the jaguar in these communities, and the study aimed to determine children's perceptions of the jaguar in light of this problem. A total of 102 children from four communities on the banks of the Rio Lacantún River, adjacent to the Montes Azules Biosphere Reserve, were involved in the study. The children were between 6 and 12 years old. Interviews, drawing, and participant observation were the main research tools employed. A high percentage of the children recognize the jaguar as a species that lives in the jungle. Likewise, they consider it to be a dangerous animal that eats people and livestock. In general, the children had little knowledge of the physical characteristics of the species. This study represents an initial step in defining methodologies for socioecological studies with children. Immediate lines of action have been identified from the data generated, and these will form a basis for an environmental education strategy in the region.

Keywords

children's drawings, *Panthera onca*, Lacandona jungle, environmental education

Introduction

Globally, there has been a general decline in the population size of large carnivorous mammals. Felines around the world, particularly larger species, are currently in a grave situation, in some cases even facing extinction. This can, in part, be explained by habitat loss and fragmentation, land use changes (mainly the transformation of tropical forest into livestock grazing pasture), and illegal hunting, which is often in response to livestock depredation (Hoogesteijn & Hoogesteijn, 2011; Inskip & Zimmermann, 2009; Mazzolli, Graipel, & Dunstone, 2002; Ripple et al., 2014). Livestock depredation provokes conflicts between humans and felines; a situation that affects 29 of the 37 existing felid species (Inskip & Zimmermann, 2009). These species include the jaguar (*Panthera onca*), the distribution of which ranges from northern Mexico to northern Argentina (Chávez & Ceballos, 2006; Seymour, 1989). The Jaguar is listed as a species in danger of extinction in terms of the NOM-059-SEMARNAT legislation in Mexico (SEMARNAT, 2010). To date, however, the decline in jaguar populations has been addressed mainly from a biological–ecological perspective (Chávez & Ceballos, 2006; Medellín et al., 2002), which has not included a much needed social analysis of the problem. To understand and quantify human–jaguar conflict, we believe that it is essential to investigate the historical, economic, sociopolitical, and cultural factors that drive it (Dickman, Hazzah, Carbone, & Durant, 2014; Manfredo & Dayer, 2004). While the biological–

[1]Instituto de Investigaciones en Ecosistemas UNAM campus Morelia, Morelia, Michoacán, Mexico

Received 10 August 2016; Revised 6 October 2016; Accepted 17 October 2016

Corresponding Author:
Juan L. Peña-Mondragón, Instituto de Investigaciones en Ecosistemas y Sustentabilidad (IIES), UNAM-Campus Morelia, Antigua Carretera a Pátzcuaro 8701, Morelia, Michoacán 58190, Mexico.
Email: jlpena@cieco.unam.mx

ecological focus is necessary, it alone cannot reach a comprehensive understanding of the problem. An interpretative social research focus (Cantrell, 1996) documenting the views of people most affected by the presence of the jaguar can generate insights explaining why people attribute livestock losses to the jaguar, and why they respond with measures as drastic as destroying these animals (Madden, 2004; Peña-Mondragón et al., 2016). Through this research approach, it is possible to document and analyze social perceptions toward the jaguar and explore the ideas and views of the people who share a habitat with them. In addition, the data gathered can help identify potential conflicts involving the species. Understanding local perceptions is also necessary when trying to solve environmental problems since strategies for modifying people's actions can only successfully be implemented if the manner in which they comprehend and evaluate a problem is first understood (Arizpe, Salinas, & Velázquez, 1993; Lazos & Paré, 2000).

In Mexico, studies of perceptions toward the jaguar have mainly been conducted with adults because of the necessity of obtaining results that can inform jaguar conservation in the short and medium term (Álvarez, Gerritsen, & Cruz, 2015; Peña-Mondragón, 2011). Studies of the views of children and young adults have thus not been explored. We believe it is of fundamental importance to document the perceptions of rural children who share their environment with jaguars, not least because it is these children who are likely to be the ones making decisions as adults in the future, and decisions that will dictate the rate and extent of ecosystem transformation and the fate of jaguars in the region. It is likely that what children see and learn from adults will greatly influence their decisions, and how they manage their environment when they grow up (Cabezas, 2007). Decisions about the conservation or mitigation of the jaguar–human conflict should therefore be understood in this context, too.

Over time, children construct a perception of the jaguar that is based on the values and learned habits of the adults that surround and influence them: their families, people at school, and the communication media to which they are exposed (Barraza, 1999). The present study was conducted in rural communities in the zone of Marqués de Comillas in Chiapas, Mexico, where cases of livestock depredation by the jaguar have been documented. The central objective of the study was to determine the manner in which the children in this region perceive the species and to document their knowledge of it.

Methods

Study Area

The work was conducted in four *ejidos* (a type of land tenure that combines private and communal land management) neighboring the Montes Azules Biosphere Reserve (MABR) in the Lacandon jungle region. The *ejidos* were Loma Bonita, Boca de Chajúl, López Mateos, and Reforma Agraria, all of which are located in the municipality of Marqués de Comillas, in the state of Chiapas, Mexico (see Figure 1). This is one of the regions of highest biodiversity in Mexico and is considered to be a priority zone for jaguar conservation at the national level (Ceballos, Chávez, List, & Zarza, 2007; Gómez-Pompa, Dirzo, Fernández, & Becerra, 1995; SEMARNAP, 2000). The MABR is located in the southeast of Mexico and is delimited to the south by Guatemala. The predominant vegetation is tropical high evergreen forest, which almost completely covers the reserve. The reserve contains more than 600 species of vertebrates and 24.8% of the total number of mammals in Mexico. This means that the site has the greatest richness of mammals in Mexico (Gómez-Pompa, Dirzo, Fernández, & Becerra, 1995; SEMARNAP, 2000). It is estimated that there are between 51 and 132 jaguars in the MABR (de la Torre & Medellín, 2011). The economy of the communities in the zone is based on extensive livestock production and agriculture, activities that have been promoted since the 60 s by the federal and state governments and which are responsible for a large part of the loss of the original tropical forest vegetation (De Vos, 2002; SEMARNAP, 2000).

Research Approach and Instruments

Our research approach is socioecological because it is the interaction of human groups with ecosystems that is at the center of the conflict under study (Berkes & Folke, 2000). Given the central role of people within the study, we adopted a qualitative–interpretative focus (Taylor & Bogdan, 1987). The main research instruments were interviews, participant observation, and the use of drawings as a medium for children to express their views. Drawing is particularly effective in eliciting views and perceptions as it allows non-invasive interaction with the research participant (Cabezas, 2007). The children's responses were backed up by researcher observations and by analyses of ideas given by children during the sessions. These were used to reinforce and triangulate the data obtained through interviews and through the children's drawings (Taylor & Bogdan, 1987).

Age and School Selection

Children aged 6 to 12 (in first to six grade of the primary school system) were considered for participation in the study, since this age range generally constitutes a stage in which a child is interested in representing the models, classifications, and dominant symbols of his or her culture (Ives & Gardner, 1984). Four *ejidos* were selected based on sites where there have been confirmed cases of

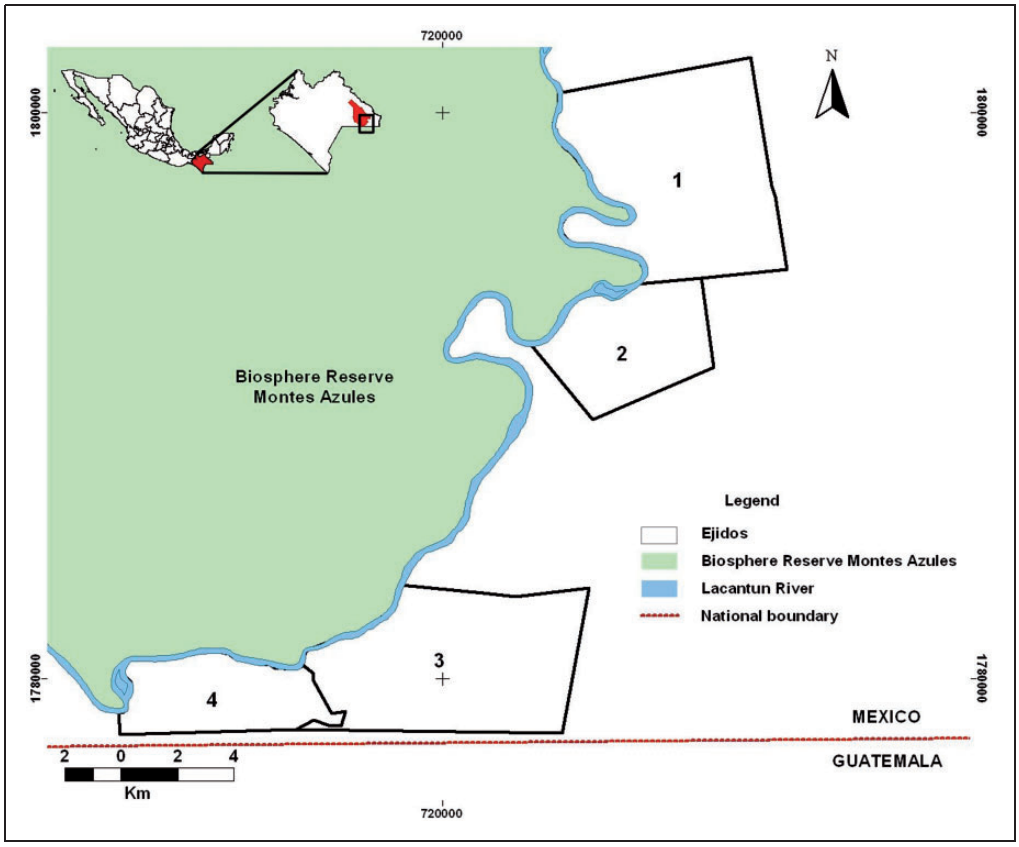

Figure 1. Location of the ejidos in Chiapas, Mexico, where the study was conducted; (1) Reforma Agraria, (2) Adolfo López Mateos, (3) Boca de Chajúl, and (4) Loma Bonita.

livestock depredation by the jaguar (Amador-Alcalá, Naranjo, & Jiménez-Ferrer, 2013; Peña-Mondragón et al., 2016). All children in each primary school in these *ejidos* were invited to participate in the study (Figure 1). It is important to note that there are not enough primary school teachers in schools in rural areas such as our study sites. In Boca de Chajul school, there were three teachers: one for first and second grades, another for third and fourth, and the third for fifth and sixth. In Loma Bonita y López Mateos, there were two teachers in each school (first, second, and third grades in one group and fourth, fifth, and sixth in another group). The school at Reforma Agraria had only one teacher for all six grades.

Working With the Children

We conducted one session per day with children from each school. Prior to each session, written permission was sought from the parents and teachers, to whom the purpose of the study was fully explained. The sessions were conducted outside the schools in order to create a different environment, one in which the children felt comfortable without the pressure of being under academic evaluation. These sessions were held in two tourist centers, Las Guacamayas and El Arca de Noé. Parents were also invited to be present during the sessions.

At the start of each session, the children and parents were welcomed, and some games were played which served as icebreakers and helped enable trust to be established between the children and the research team, so that they could feel comfortable during the activity. It was explained to the children that the activity would consist of drawing the Lacandon jungle and the animals that live in it. To avoid skewing the results through suggestion, no initial mention was made of the jaguar (or tiger, as the children commonly know it).

The children were given 30 minutes to create a drawing in response to each of three questions: (a) what animals live in the jungle? (b) which are the most dangerous animals that live in the jungle? and (c) what does the jaguar look like and what does it eat? This latter question was put in two parts: first, the children were asked to draw a jaguar and, 15 minutes later, to draw what it eats in the same drawing. The objective of the first question was to determine whether the children consider the jaguar to be an animal that lives in the jungle. The second question aimed to determine which animals they consider dangerous and whether this includes the jaguar. The objective of the third question was to establish how the children view

the physical characteristics of the jaguar, to determine their knowledge of the species, and also to determine what the children consider to be the jaguar's prey.

On completion of the first drawing, comments were made and recorded prior to continuing with the second and third drawings. Asking children to describe the details of their drawings was used as a method to obtain data to contextualize and support the information obtained from the drawings and to facilitate analysis. Thus, in addition to noting any comments made by the children among themselves regarding their drawings, each child was asked what their drawing represented, and the response was noted on the back of each drawing. The research team was careful at all times not to influence the children's comments and drawings.

At the end of the drawing session, an integration activity was conducted. This consisted of providing the children with lunch and then, with the company and prior permission of parents and teachers, they were taken into the interior of the Reserve where they were given a guided tour with explanations about the functioning and importance of the tropical rainforest.

Data Analysis

The drawings were ordered according to child, grade, and school and were numbered in order to facilitate the construction of a database. Each drawing was digitized and entered into the software Atlas.ti version 5.5. Analysis was conducted according to academic grade and question. All of the features present in each drawing were identified including, for example, trees, snakes, and a waterfall. Each of these features was assigned an identifying code that was used throughout the analysis. For example, the code for tree was assigned to all of the trees represented in all of the drawings, regardless of type, form, or color. On completion of the codification process, each feature or code of each drawing was quantified and grouped into tables following the same order, according to grade and question.

Results

A total of 102 children (58 girls and 44 boys) were able to participate in the study. In this section, we present the data gathered from the three questions asked in the exercise carried out with the children.

Which Animals Live in the Jungle?

The children identified a total of 16 species of fauna. The four most commonly identified were fish (46%), snakes (42%), birds (35%), and in fourth place, the jaguar (33%; Figures 2 and 3).

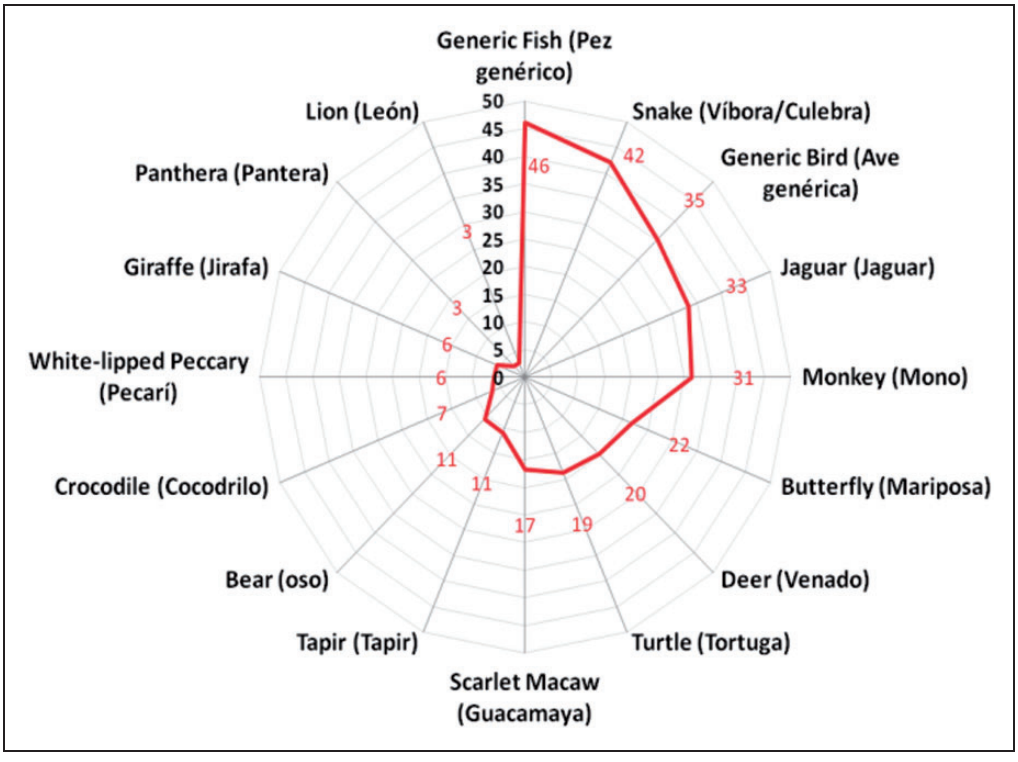

Figure 2. Animals that live in the jungle. Total of frequencies documented for the question: Which animals live in the jungle? Names in English are taken from the IUCN. Common names in Spanish are provided in brackets.

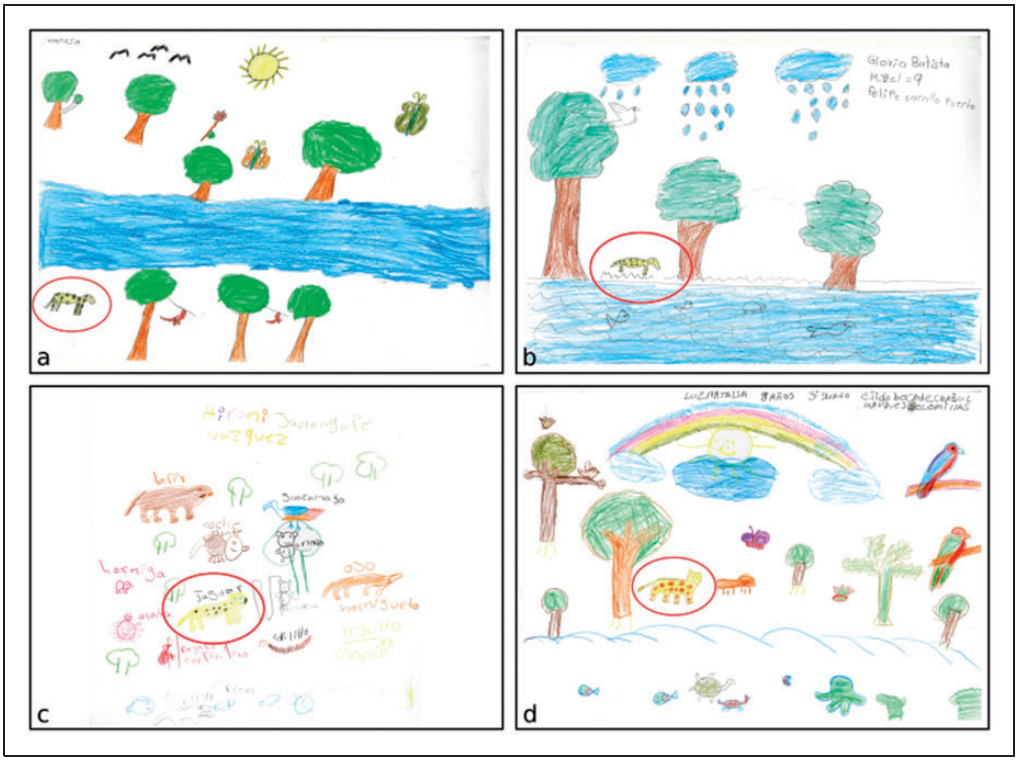

Figure 3. Examples of children's drawings in response to the question: what animals live in the jungle? We have circled the jaguars in red.

Which Are the Most Dangerous Animals in the Jungle?

The children drew a total of six different animals they considered to be the most dangerous. The snake appeared in first place (91%) while the jaguar was in second place, mentioned in 65% of the responses (Figures 4 and 5).

What Does the Jaguar Look Like?

The most frequently noted characteristic were spots in the form of a rosette or a circle (63%). The jaguar was also drawn without ears (35%), without spots (19%), teeth bared (13%), and with claws (9%; Figure 6). Jaguars were also drawn expressing an "attitude." A total of 23% of the children drew a smiling jaguar, 13% drew it baring its teeth, 14% drew it eating food in general, 7% drew it eating humans, 1% drew it smoking, and another 1% drew it with a firearm (Figure 7).

What Does the Jaguar Eat?

The children noted a total of 22 different kinds of food, classified into three main prey types: (a) domestic animals: the most frequently mentioned were cows (37%), domestic birds (15%), dogs and sheep (12%); (b) wild animals: the three most frequently mentioned were deer (32%), the white-lipped peccary (8%), and rabbit (7%); and (c) other types of prey: humans (22%) and meat in general, represented by images of lumps of meat (13%; Figures 8 and 9).

Discussion

We discuss our findings according to the main themes that arose from the study and, building on this discussion, offer possible measures to mitigate human–jaguar conflict in the Lacandona region.

The Jaguar as a Part of the Surroundings

From the age of 9 upwards, the number of times children mentioned jaguars increased, and their drawings were also more detailed. This is due to the physical and mental growth of the children and how their motor and sensory capacities increase as they grow older. Furthermore, interaction with their surroundings increases with age and contributes to the process of knowledge development (Barraza, 1999; Piaget & Inhelder, 1997; Serulnikov & Suárez, 2003). In the context of this study, the images most often drawn by the oldest children can also be related to the fact that children 9 years and older already accompany their parents into the jungle during their productive activities (agriculture, tending to livestock, or forestry). Older children thus

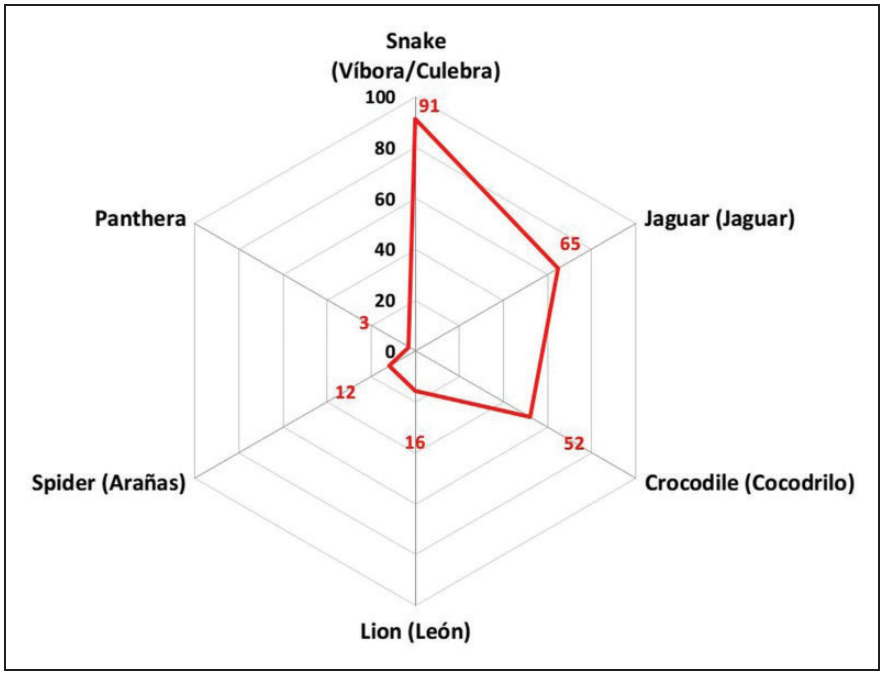

Figure 4. Dangerous animals. Total of frequencies documented for the question: Which are the most dangerous animals?

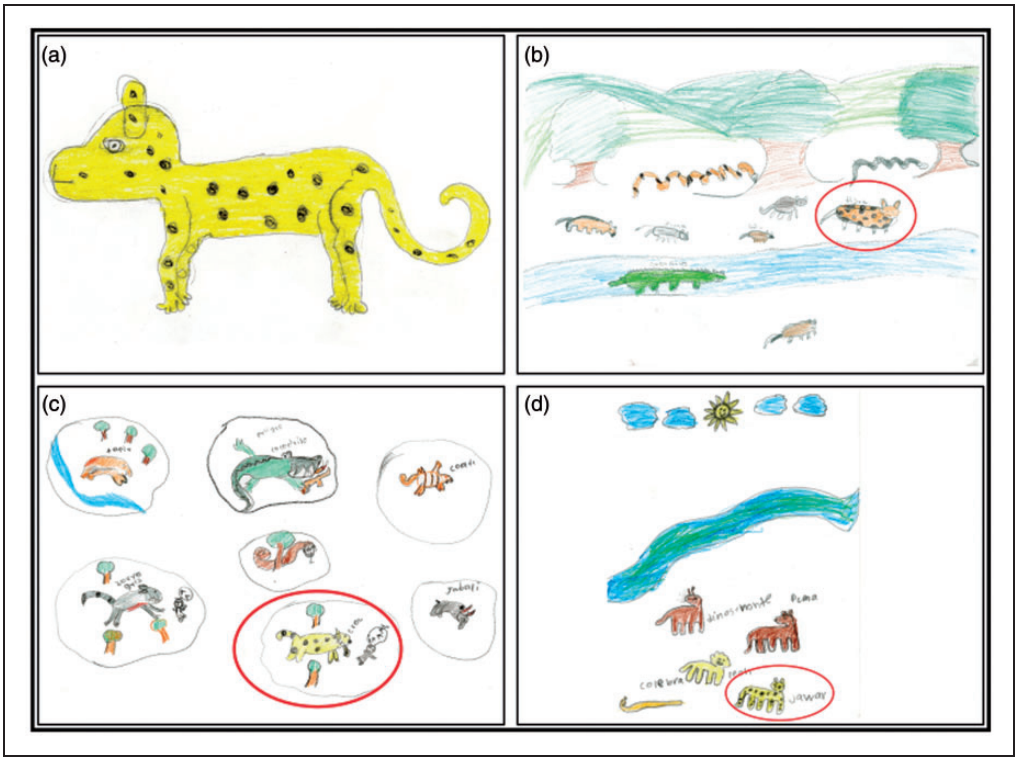

Figure 5. Examples of drawings in response to the question: Which are the most dangerous animals that live in the jungle? We have circled the jaguars in red.

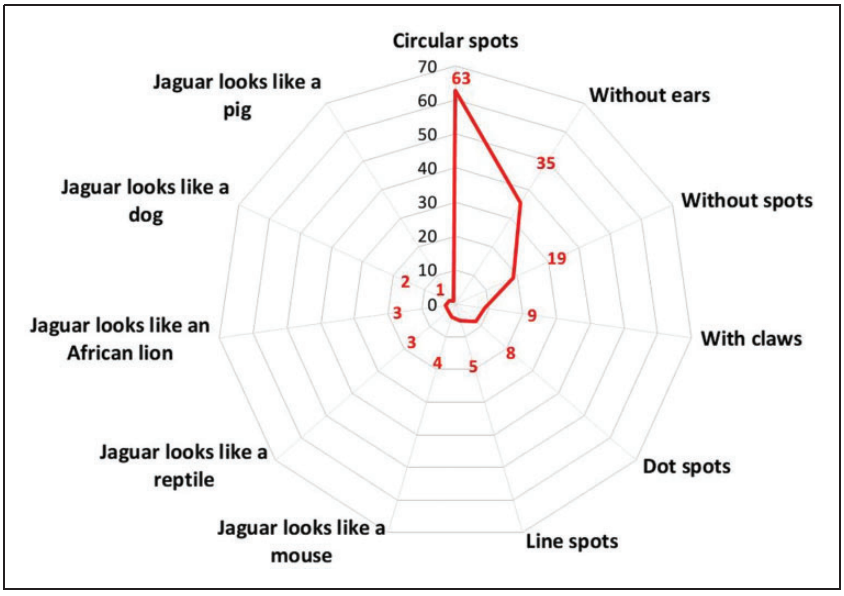

Figure 6. Knowledge of basic features of the jaguar. Eleven corporal features were coded in the children's' drawings; frequencies obtained for these codes are shown.

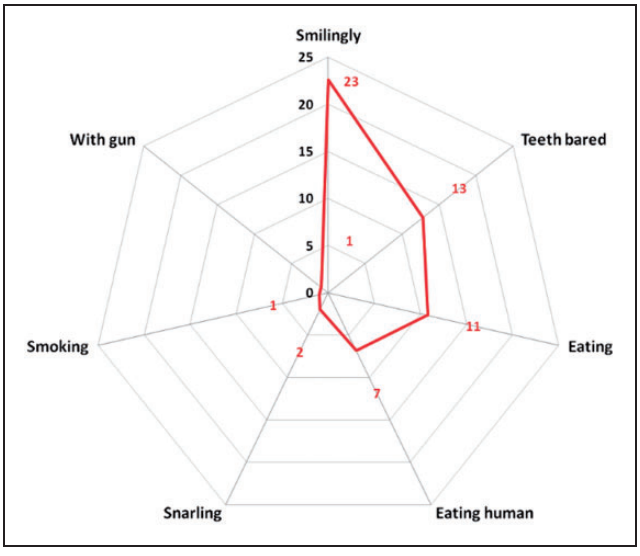

Figure 7. Perceptions toward the jaguar. Seven codes were constructed according to attitudes of the jaguar given by the children and total of frequencies for these codes are shown.

have had greater contact with biodiversity and are more aware of the problem of livestock predation by the jaguar. Campos, Nates, and Lindemannn-Matthies (2013) suggest that environmental knowledge is directly related to experience and the use of natural resources, as well as dependency on these resources and the extent to which people interact with the environment. Furthermore, even in these rural communities, most of the families have open and cable television, which implies a greater access and exposure to information such as natural history programs.

The Jaguar as a Dangerous Animal

Perceptions of the danger associated with the jaguar that were demonstrated by a proportion of the children may be linked to their awareness of the predation of livestock and domestic animals, since livestock represents an important part of their families' economic income, and the subject is openly discussed in their family circle (Peña-Mondragón et al., 2016). Conflict between livestock production and the jaguar directly impacts on the children's family circles. For them, it is common to hear their parents blaming the jaguar for eating an animal from their herds of livestock as is evident from the comments made by some children. For example: "The jaguar attack the livestock . . . In my uncle's pasture a cow was eaten and it had its whole chest eaten; . . . only the head and skin were left, everything else was eaten." Another child said: "Leave a cow out and the tiger will eat it." Likewise, the children raised a fear that the jaguar can also eat people and is thus a direct danger to themselves and their families. These perceptions of danger reflect the fact that in the study area, there have recently (last 5 years) been cases of livestock predation by the jaguar. However, there is no record of a jaguar attacking a human in the communities that were the focus of this study.

In a study of children's attitudes toward spiders and bats, Prokop and Tunnicliffe (2008) found that the

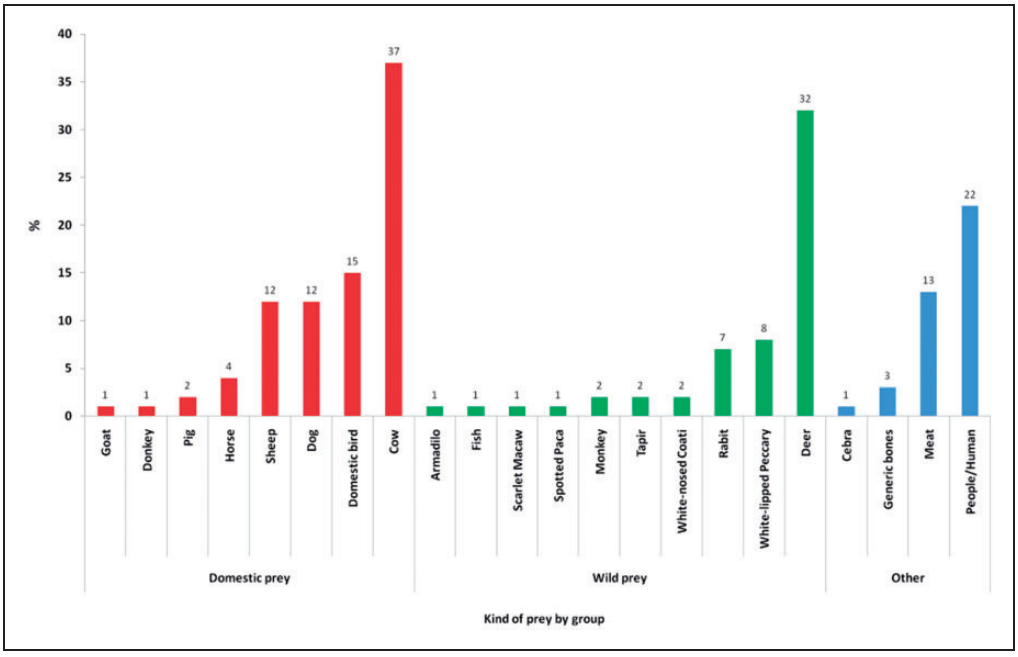

Figure 8. Jaguar prey types mentioned by the children. Examples of domestic animals are shown in red, wild prey in green and other types of food, including humans, are shown in blue.

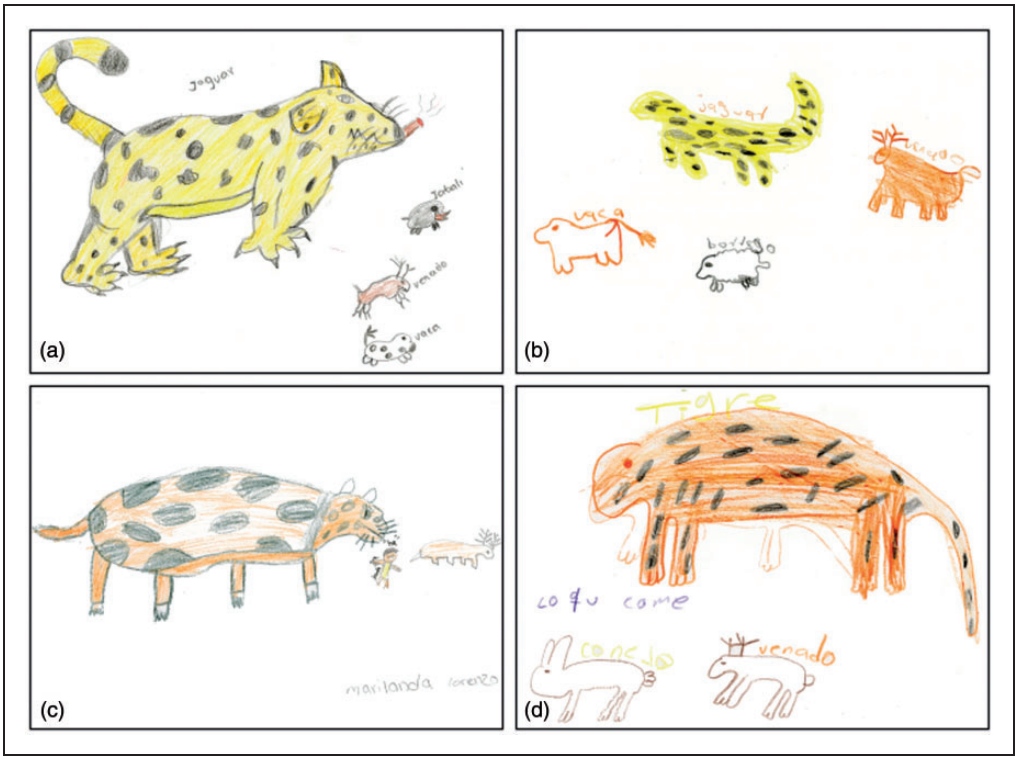

Figure 9. Examples of drawings showing jaguars' features as well as the type of food the children believe they consume. Drawings (a), (b), and (d) depict the jaguar eating livestock, and drawing (c) shows a human as food.

more myths there were circulating, the more negative were children perceptions and attitudes toward them. This has also been demonstrated with wolves worldwide. In the communities where we conducted our study, it is likely that such myths exist and that they feed negative perceptions toward the jaguar as has been recorded in other sites where this species is found in Mexico (Álvarez et al., 2015; Peña-Mondragón, 2011).

Knowledge of the Jaguar

The children were aware of the basic appearance of the jaguar (in that it is yellow with rosettes), which indicates a basic level of knowledge of the species. While possible, it is rare to see a jaguar in the wild. It is therefore probable that the children are aware of them for other reasons. In their communities, the jaguars are hunted, and the children may therefore have had contact with the corpses and pelts of the dead animals. Likewise, they listen to adults talking about the jaguar and have access to photos and images of the species in the mass communication media. Some said that they have had jaguar cubs in their houses that were subsequently released: according to some of the children, it is common to have wild animals as pets (Bocanegra, Berny, Ocampo, & del Valle, 2011; Gil & Guiascón, 2015).

Perception toward the jaguar. The ''smiling tigers'' drawn by some of the children could be interpreted as a positive perception toward the jaguar: It could express the perception that the jaguar is not to be feared; indeed, it seems to suggest a certain empathy. However, the fact that some children drew the jaguar baring its teeth could signify that they regard it as dangerous. The portrayal of a jaguar eating a human is undoubtedly a negative perception that could perhaps be explained by the child's experience of jaguars killing domestic animals, and the knowledge that jaguars approach their communities and homes. dos Santos, de Almeida, and Silveira (2008) found similar results and considered that a drawing which portrayed an interaction that implied a jaguar attacking a human, or vice versa, was an expression of negative perceptions. The idea of a jaguar eating humans could generate fear toward the species since the children, recognizing that this could be a reality, would be likely to conclude that they are at risk of being attacked and eaten. It is evident, from the perceptions of the jaguar that the children shared, that they are not fully aware of all of the elements related to the conflict between the communities and animals such as the jaguar. Their drawings reflected things as they saw them, which was closer to their reality, informed by their perceptions. In other words, if they draw a jaguar smiling or eating humans, this was simply a reflection of the reality of their perception of jaguars (Ives & Gardner, 1984). The notion of reality, we would suggest, is a social construct—as several schools of thought within the social sciences have convincingly argued (Berger & Luckmann, 1996; O'Brien & Kollock, 2001).

The Jaguar's Diet

The jaguar's diet comprises a variety of species throughout its distribution in Mexico, including the collared and white-lipped peccary, the armadillo, the white-tailed deer, the red brocket, and the badger (Aranda, 1993; Núñez, Miller, & Lindzey, 2002; Ortega-Huerta & Medley, 1999; Rosas-Rosas, Bender, & Valdez, 2008). Livestock is present in parts of its distribution and is also commonly considered part of the jaguar's diet. Given that Jaguar predation on livestock, particularly cows and sheep, has already been reported in our study sites (Amador-Alcalá et al., 2013; Peña-Mondragón et al., 2016), it is no surprise that the children reported that domestic animals form part of the jaguar's diet.

It is important to highlight that, despite the fact that there are no documented cases of attacks on people in Mexico, some children portrayed humans as jaguar's prey. These portrayals may themselves be perpetuating and intensifying perceptions of jaguars as dangerous. However, there have been reports of such attacks in Brazil (Neto, Neto, & Haddad, 2011), which is a reason that an attack can never be discounted and contingency plans should be created and maintained by environmental and public health authorities.

The consumption of livestock and the sense of potential attack on human beings are aspects of children's perceptions which need attention because the children may grow up with perceptions of the jaguar as dangerous and harmful which could lead to poor environmental decisions in the future.

Implications for Conservation

Analyses of children's perceptions of wildlife provide elements of great value to the formulation and planning of environmental education programs. This study shows that, at least for the Lacandon jungle, it is essential to invest in measures to mitigate or resolve conflicts in order to reverse perceptions of the jaguar as a dangerous animal in the forest and to reinforce the benefits that the presence of this species can bring to these ecosystems. In educational terms, while it is important to change children's and adults' perceptions of the jaguar, it is also essential that adequate livestock management programs are established in the local communities and that incentives are provided to mitigate the problem in order to establish a better interaction of people with wildlife species in the long term.

Acknowledgments

The authors would like to thank the teachers, parents, and children for their invaluable participation and for allowing this study to be conducted. The authors are also very grateful to Erika de la Peña, Edna Ayala-Ortega, Rafael Lombera, Isaías, Lombera, and Ana González-Di Pierro for their logistical assistance. Thanks also to Cabañas el Arca de Noé, Estación Chajúl, and the Centro Turístico Las Guacamayas for the facilities they provided. Finally, the authors would like to thank Keith MacMillan and Sara Bologna for his help in translation and revision of the English language.

Declaration of Conflicting Interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Funding

The author(s) received no financial support for the research, authorship, and/or publication of this article.

References

Álvarez, N., Gerritsen, P., & Cruz, J. (2015). Farmers' perceptions of the jaguar in ten localities of the Sierra de Manantlán Biosphere Reserve in Western Mexico: Implications for conservation. *Sociedad Y Ambiente*, *1*(September): 35–56.

Amador-Alcalá, S., Naranjo, E. J., & Jiménez-Ferrer, G. (2013). Wildlife predation on livestock and poultry: Implications for predator conservation in the rainforest of south-east Mexico. *Oryx*, *47*(2): 243–250.

Aranda, M. (1993). Food habits of jaguar (Panthera onca) in the Calakmul Biosphere Reserve, Campeche. In: R. Medellín & G. Ceballos (Eds.), Avances en el Estudio de los Mamíferos de México. *Publicaciones Especiales*, Vol. 1 (pp. 231–238). México: Asosiación Mexicana de Mastozoología A.C.

Arizpe, S., Salinas, L. P., & Velázquez, M. F. (1993). *Cultura y cambio global: percepciones sociales sobre la desforestación en la Selva Lacandona [Culture and global change: Social perceptions of deforestation in the Lacandon Jungle]*. Cuernavaca, México: UNAM-CRIM. Miguel Angel Porrúa.

Barraza, L. (1999). Children's drawings about the environment. *Environmental Education Research*, *5*(1): 49–66.

Berger, P. L., & Luckmann, T. (1996). *The social construction of reality: A treatise in the sociology of knowledge*. Penguin, England: Anchor Books.

Berkes, F., & Folke, C. (2000). Linking social and ecological systems for resilience and sustaintability. In: F. Berkes, & C. Folke (Eds.). *Linking social and ecological systems. Management practices and social mechanisms for building resilience* (pp. 1–25). Cambridge, England: Cambridge University Press.

Bocanegra, K. G., Berny, E. R., Ocampo, M. C. E., & del Valle, Y. G. (2011). Wildlife use by rural communities in the Catazaj – La Libertad Wetlands, Chiapas, Mexico. *Ra Ximhai: Revista Científica de Sociedad, Cultura Y Desarrollo Sostenible*, *7*(2): 219–230.

Cabezas, C. (2007). *Analysis and characteristics of child drawing*. España: Ittakus/Sociedad para la Información/S.L. Jaén.

Campos, C. M., Nates, J., & Lindemannn-Matthies, P. (2013). Perception of and knowledge about biodiversity by urban and rural students of central-west drylands of Argentina. *Ecología Austral*, *23*, 174–183.

Cantrell, D. C. (1996). Alternative paradigms for research in environmental education. In: R. Mrazek (ed.) *A*lternative paradigms for research in environmental education (pp. 97–123). Ciudad de México, México: Universidad de Guadalajara, NAAEE y Secretaría de medio Ambiente, Recursos Naturales y Pesca.

Ceballos, G., Chávez, C., List, R., & Zarza, H. (2007). *Jaguar conservation and management in Mexico: Case studies and prospects*. Ciudad de México, México: Conabio/Alianza WWF/Telcel/Universidad Nacional Autónoma de México.

Chávez, C., & Ceballos, G. (2006). The Mexican jaguar in the XXI Century: Current situation and management. *CONABIO–UNAM–Alianza WWF Telcel, México DF*.

de la Torre, J. A., & Medellín, R. a. (2011). Jaguars *Panthera onca* in the Greater Lacandona Ecosystem, Chiapas, Mexico: Population estimates and future prospects. *Oryx*, *45*(4): 546–553.

De Vos, J. (2002). *A land to sow dreams recent history of the Selva Lacandona 1950–2000*. Ciudad de México, México: FCE/CIESAS.

Dickman, A. J., Hazzah, L., Carbone, C., & Durant, S. M. (2014). Carnivores, culture and ''contagious conflict'': Multiple factors influence perceived problems with carnivores in Tanzania's Ruaha landscape. *Biological Conservation*, *178*, 19–27.

dos Santos, F. R., de Almeida, J. A. T., & Silveira, L. (2008). Humans and jaguars in five Brazilian biomes: Same country, different perceptions. *Cat News*, *4*, 21–25.

Gil, R. A. P., & Guiascón, O. G. R. (2015). Wildlife management by a community Maya in Valle de Guadalupe, Campeche, Mexico. *Etnobiología*, *10*(2): 1–11.

Gómez-Pompa, A., Dirzo, R., Fernández, B. H., & Becerra, E. G. (1995). *Biosphere reserves and other protected natural areas of Mexico*. Ciudad de México, México: SEMARNAP. INE. CONABIO.

Hoogesteijn, R., & Hoogesteijn, A. (2011). *Anti-predation strategies for cattle farms in Latin America: A guide*. Campo Grande, Brazil: PANTHERA. Gráfica y Editora Microart Ltda.

Inskip, C., & Zimmermann, A. (2009). Human-felid conflict: A review of patterns and priorities worldwide. *Oryx*, *43*(1): 18–34.

Ives, S. W., & Gardner, H. (1984). Cultural influences on children's drawings: A developmental perspective. In: R. W. Ott, & A. Hurtwitz (Eds.). *Education: An internal perspective* (pp. 13–30). Philadelphia, PA: Pennsylvania State University Press.

Lazos, E., & Paré, L. (2000). *Indigenous perspectives on a "saddened" nature: Perceptions of environmental degradation among Nahua of southern Veracruz*. Ciudad de México, México: Instituto de Investigaciones Sociales-UNAM/Plaza y Valdes.

Madden, F. (2004). Creating coexistence between humans and wildlife: Global perspectives on local efforts to address human–wildlife conflict. *Human Dimensions of Wildlife*, *9*(4): 247–257.

Manfredo, M. J., & Dayer, A. A. (2004). Concepts for exploring the social aspects of human–wildlife conflict in a global context. *Human Dimensions of Wildlife*, *9*(4): 1–20.

Mazzolli, M., Graipel, M. E., & Dunstone, N. (2002). Mountain lion depredation in southern Brazil. *Biological Conservation*, *105*(1): 43–51.

Medellín, R., Equihua, C., Chetkiewicz, C., Rabinowitz, A., Redford, K. H., Sanderson, J. G., & Taber, A. B. (2002). *The jaguar in the new millennium*. Ciudad de México, México: Fondo de Cultura Económica/Universidad Nacional Autónoma de México/Wildlife Conservation Society.

Neto, M. F. C., Neto, D. G., & Haddad, V. (2011). Attacks by jaguars (*Panthera onca*) on humans in Central Brazil: Report of three cases, with observation of a death. *Wilderness & Environmental Medicine*, *22*(2): 130–135.

Núñez, R., Miller, B., & Lindzey, F. (2002). Ecology of jaguar in the Chamela Biosphere Reserve Chamela -Cuixmala, Jalisco, Mexico. In R. Medellín, C. Equihua, C. L. B. Chetkiewicz, P. G. Crawshaw, Jr., A. R. Rabinowitz, K. H. Redford, . . . A. B. Taber (Eds.), The jaguar in the new millennium (pp. 107–126). Distrito Federal: Fondo de Cultura Económica/ Universidad Nacional Autónoma de México/Wildlife conservation Society.

O'Brien, J., & Kollock, P. (2001). *The production of reality: Essays and readings on social interaction*. London, England: Pine Forge Press, Thousand Oaks.

Ortega-Huerta, M. a., & Medley, K. E. (1999). Landscape analysis of jaguar (*Panthera onca*) habitat using sighting records in the Sierra de Tamaulipas, Mexico. *Environmental Conservation*, *26*(4): 257–269.

Peña-Mondragón, J. L. (2011). E*conomic impact on livestock and social perceptions of the jaguar (Panthera onca veraecrucis Nelson and Goldman, 1933) in the Great Sierra Folded, Nuevo Leon, Mexico* (MSc Thesis). Universidad Nacional Autónoma de México, Morelia, México. Retrieved from http://oreon.dgbiblio.unam.mx/F/CEQI1LQG3K7GNPLGLJT44YTLLJQQ373AVHJVRN13CKQ71DGEVJ-05324?func=full-set-set&set_number=036558&set_entry=000015&format=999

Peña-Mondragón, J. L., Castillo, A., Hoogesteijn, A., & Martínez-Meyer, E. (2016). Livestock predation by jaguars *Panthera onca* in south-eastern Mexico: The role of local peoples' practices. *Oryx*, 1–9. doi:10.1017/S0030605315001088.

Piaget, J., & Inhelder, B. (1997). *Child psychology* (Vol. 369). Madrid, España: Ediciones Morata.

Prokop, P., & Tunnicliffe, S. D. (2008). Disgusting animals: Primary school children's attitudes and myths of bats and spiders. *Eurasia Journal of Mathematics, Science & Technology Education*, *4*(2): 87–97.

Ripple, W. J., Estes, J. A., Beschta, R. L., Wilmers, C. C., Ritchie, E. G., Hebblewhite, M., . . . Wirsing, A. J. (2014). Status and ecological effects of the World's largest carnivores. *Science*, *343*(6167): 1241484.

Rosas-Rosas, O. C., Bender, L. C., & Valdez, R. (2008). Jaguar and puma predation on cattle calves in northeastern Sonora, Mexico. *Rangeland Ecology & Management*, *61*(5): 554–560.

SEMARNAP, S. de M. A. R. N. y P. (2000). *Management program. Reserva de la Biosfera Montes Azules*. Ciudad de México, México: Author.

SEMARNAT. (2010). *NOM-059-SEMARNAT. Protección ambiental-Especies nativas de México de flora y fauna silvestres-Categorías de riesgo y especificaciones para su inclusión, exclusión o cambio-Lista de especies en riesgo [Environmental Protection. Native species of Mexico of wild flora and fauna. Risk categories and specifications for inclusion, exclusion or change. List of species at risk]. Legal Rule or Regulation*. Ciudad de México, México: Diario Oficial de la Nación.

Serulnikov, A., & Suárez, R. (2003). *Jean Piaget para principiantes* (Vol. 43). Buenos Aires, Argentina: Era Naciente SRL.

Seymour, K. (1989). Panthera onca. *Mammalian Species*, *340*, 1–9.

Taylor, S. J., & Bogdan, R. (1987). *Introduction to qualitative research methods*. Barcelona, Spain: Paidós.