

Human-Felid Interactions in Three Mestizo Communities of the Selva Lacandona, Chiapas, Mexico: Benefits, Conflicts and Traditional Uses of Species

Nashieli Garcia-Alaniz · Eduardo Jorge Naranjo · Frank F. Mallory

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Introduction

For thousands of years, native people inhabiting neotropical forests have hunted and used wildlife as an essential source of animal protein as well as for clothing, medicine, tools, ritual objects, symbols and companions (Ojasti and Dallmeier 2000). Worldwide studies on hunting have shown that the few species which are hunted specifically for food are not the only species significantly affected by hunting. Indeed, to most tropical forest hunters, game is essentially any terrestrial vertebrate encountered (Ruddle 1970; Vickers 1991). For rural hunters in tropical ecosystems mammals, especially ungulates, primates and rodents, are the most important in terms of biomass harvested (Robinson and Bodmer 1999). Bennett and Robinson (2000) note that, as well as providing meat, wildlife is also socially and culturally important. In addition, acquisition of animal trophies as cultural artefacts is common, either for personal adornment, or to increase individual status in the community. Furthermore, due to agricultural encroachment, wildlife species often become a threat to cultivated plants and domestic animals and are actively hunted (Bowland *et*

al. 1992) in many rural areas even when they are not a critical food resource (Bennett and Robinson 2000).

Large carnivores are particularly vulnerable to conflict with people because of their predation of livestock, contributing to the global decline in most species (Michalski *et al.* 2006). Studies have shown that top predators with large ranges also play key roles in maintaining biodiversity by limiting the number of prey species and altering the ecosystem's structure and function (Terborgh 1992; Terborgh *et al.* 2002; Treves and Karanth 2003).

The Selva Lacandona in the State of Chiapas is one of the major remnants of rainforest in Mexico, where the majority of people are low income farmers who use wildlife to supplement their livelihood (Naranjo 2002). Over three fifths of this forested area is within the Montes Azules Biosphere Reserve (MABR). Despite this, the Selva Lacandona is critically threatened by human activity, notably flora and fauna extraction for commercial and subsistence purposes, and the high growth rate of human populations (Medellin 1994). Wildlife species in tropical forests, in contrast to those in temperate areas, are rarely managed. This situation derives in part from the belief that hunting has been a traditional element of rural economies and indigenous cultures in the tropics for millennia, and is thus sustainable (Robinson and Bodmer 1999).

In the Selva Lacandona, many species of vertebrates are used by local people (Naranjo *et al.* 2004), including the five species of felids: margay (*Leopardus wiedii*), ocelot (*Leopardus pardalis*), jaguarundi (*Puma yagouaroundi*), puma (*Puma concolor*), and jaguar (*Panthera onca*). Residents used a number of common names to identify felid species. Margays were referred to as tigrillo, tecuanillo and pichigueta. Ocelots were named ocelote, mijilote, tecuan, tigre cangrejero and corralero, while jaguarundis

N. Garcia-Alaniz · E. J. Naranjo (✉)
El Colegio de la Frontera Sur, Unidad San Cristobal,
Departamento de Ecología y Sistemática Terrestres,
El Colegio de la Frontera Sur,
Ap.63,
San Cristobal de Las Casas 29290 Chiapas, Mexico
e-mail: enaranjo@ecosur.mx

N. Garcia-Alaniz
e-mail: ngalaniz@gmail.com

F. F. Mallory
Department of Biology, Laurentian University,
Sudbury, Ontario P3E 2C6, Canada
e-mail: fmallory@laurentian.ca

were called leoncillo, gato de monte and onza. Pumas were puma or leon, while jaguars were called tigre or jaguar. According to the Red List of Threatened Species (IUCN 2005), the populations of the first three are in the category of least concern, while the last two are classified as near threatened. However, with the vast number of species declining due to hunting and habitat degradation, it is probable that most of these species would be reclassified if better local information were available (Nowell and Jackson 1996).

Our objective here is to classify the interactions between felid species and native people from three mestizo communities adjacent to MABR as benefits or conflicts, and to document a) people's knowledge of felid species present in the area, b) how felid products are used, and c) incidences of felid damage to domestic animals and people themselves. We hope these data will provide a basis for wildlife managers to integrate government policy with local knowledge on these species.

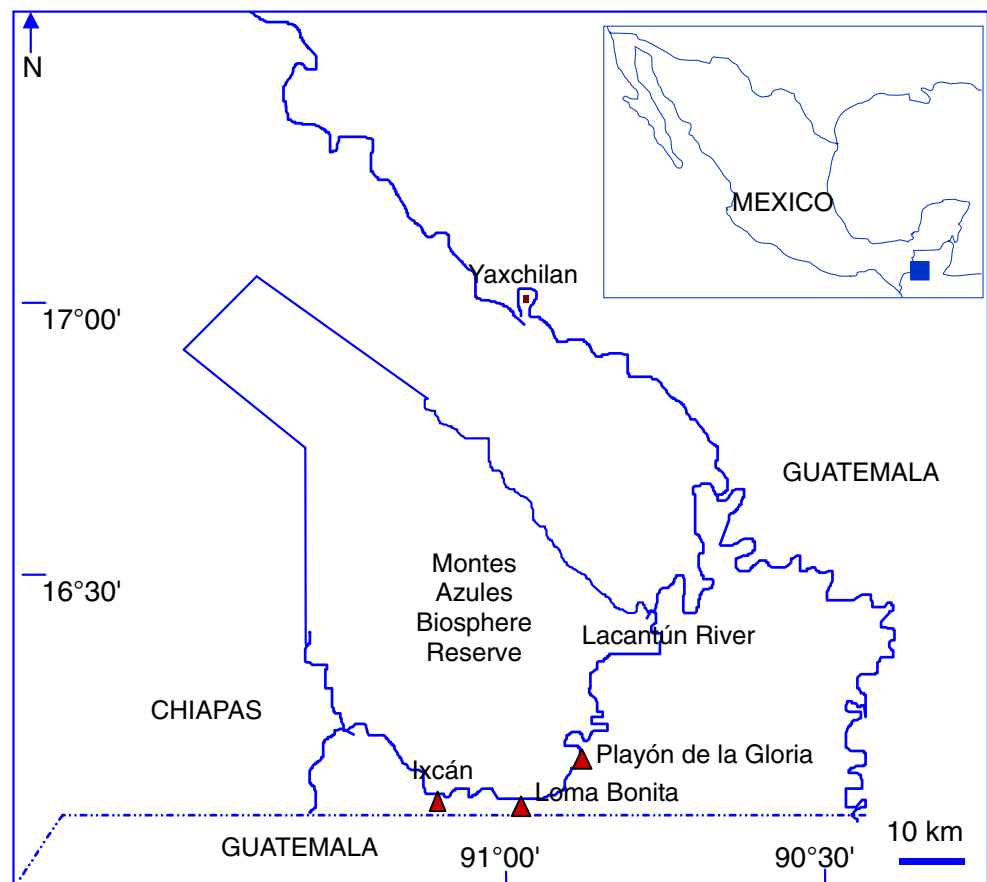
Study Site

The State of Chiapas is located in the southeast of Mexico and the Selva Lacandona is located in the south-eastern

portion, bordering Guatemala on the east, north and south and the Chiapas Highlands on the west (Naranjo *et al.* 2004). Because of the high cultural and biological diversity in this region, MABR is a priority area for conservation at national and international levels (INE 2000). This reserve, being over 3,300 km², constitutes the largest protected area in the Selva Lacandona. Average annual temperatures range from 24° to 26°C, with maximum and minimum values in May (28°C) and January (18°C), respectively. Mean annual rainfall is 2,500 to 3,500 mm, with 80% of rainfall occurring between June and November (INE 2000).

Three communities (Playón de Gloria, Loma Bonita and Ixcán) adjacent to MABR were selected for this study (Fig. 1). These communities were formed during the 1970s and their inhabitants are mainly second and third generation mestizos, immigrants from Veracruz, Oaxaca and other regions of Chiapas (Naranjo *et al.* 2004). Land tenure in these communities is based on *ejidos*, which are properties given by the federal government to landless peasants, who subsist on natural resources and farming (Gordillo 1988). Most houses in the area are built of wood and have tin roofs and usually have electricity. However, running water is uncommon. The main activity of residents is farming (corn, beans, chili peppers, and

Fig. 1 Location of the communities associated with the Selva Lacandona, Chiapas, Mexico



coffee), and cattle ranching (Naranjo 2002). The most common agrarian system is the use of milpas, which are small plots of cleared land where corn, beans, and squash are cultivated. Generally, men attend the crops and cattle while women take care of poultry, pigs and trees planted around the houses.

Methods

The three communities, of at least 200 residents, were visited for 10 days each month between January and June 2005 and 2006. Data were gathered by one of the authors (NGA) through participant observation. Interviews were conducted only during 2006, once residents' trust was gained. The survey in 2006 was administered to households representing 20% of ejidatarios (families). A standard questionnaire was used to determine interactions of native people with felid species and the uses to which they are put, and to gather information concerning gender, educational level, first language and length of residency in the village. A color plate with photos of all felid species in the area was shown to each family interviewed to ensure correct identification and to elicit common names for each species.

Incidents relating to these species were classified as benefits or conflicts. We recorded the uses to which people put felid products, such as food, clothing or furnishing, medicine, ritual objects (i.e., fangs and claws), and also conflicts such as felids preying on domestic animals. Information on hunting and hunting methods for each felid species was also gathered during these interviews, as well as data on the knowledge of the legal status and official hunting regulations concerning each species. For the percentage obtained in each category analyzed, we calculated the binomial proportion confidence intervals with 95% probability.

Results

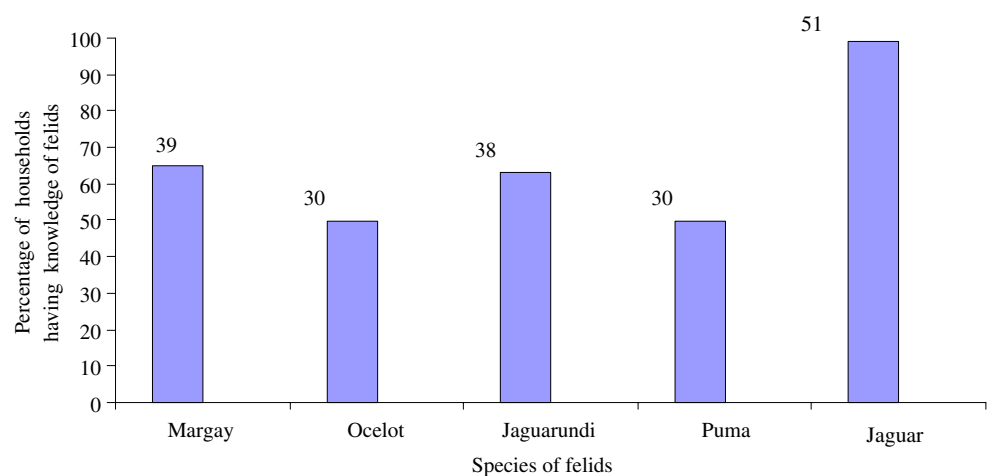
The survey included 60 people from three communities and all respondents were adult mestizos, with both Spanish and Indian ancestry. Of these, 57 spoke Spanish as their first language and did not speak any other language. Among those interviewed 16% had not attended school, 58% had attended elementary school, 20% had attended secondary school (complete or incomplete), and 5% had attended high school. On being shown the color pictures of each felid species, approximately 50% of all individuals could identify the five species, while almost 100% could identify the jaguar.

Considering that in these communities, men and women carry out different tasks, the kinds of interactions they might have with felids varied. Incidents also varied according to the species of felid. While medium/small species usually prey on medium/small domestic animals usually kept at home, large species prey on cattle in the fields.

The uses to which people put felids also vary according to characteristics such as their gender and age. As a result, interviews were conducted when whole families were present thus obtaining interaction results per household. When analyzing whether interviewees could identify each of the five felids, results varied among species. A significant number of households had knowledge of margay (65%, CI 51–76%), jaguarundi (64%, CI 49–75%), and jaguar (98%, CI 91–99%), while the number of interviewees that could identify ocelots and pumas was 50% (CI 36–63%) (Fig. 2).

Analysis indicated that use of felid products was low, as only 31% ($n=19$, CI 20–44%) of households had used any of these species or their parts. The remaining 69% ($n=41$, CI 55–79%) had never used any of them. Although not all households that used these species hunted them specifically for their pelts, they all mentioned that it was a regular

Fig. 2 Number of households (%) familiar with felid species in the Selva Lacandona, Chiapas, Mexico



practice to sell the skins and fangs on the illegal market when possible. Those who used felid species reported different uses and methods (Table 1). Responses relating to damage caused by felids to domestic livestock were obtained from 51% ($n=31$) of households. Analyses of these data indicated that there was no significant difference in the number of households reporting damage compared with those reporting no damage. The jaguarundi was most frequently cited as the species that caused damage to livestock, while the puma was the least frequently mentioned (Fig. 3).

Data obtained on hunting frequency indicated that 38% ($n=23$, CI 26–51%) of households had hunted at least one felid species within the last 10 years, leaving 62% ($n=37$, CI 48–73%) who had not hunted them. Among the households that reported having hunted these species, different hunting methods were cited (Table 2). Methods reported included killing the animal with a gun (Fig. 4) and using elaborate instruments that mimic their vocalizations to attract jaguars into a killing zone (Fig. 5). Data gathered on the knowledge of local people regarding the legal status of wild felids indicated that 38% were aware that it was illegal to hunt these animals. However, the majority stated that they had the right to kill predators if they cause damage or threaten the community. Among the remaining households, 13% believed it was legal to hunt wild felids, and 13% were uncertain.

Discussion

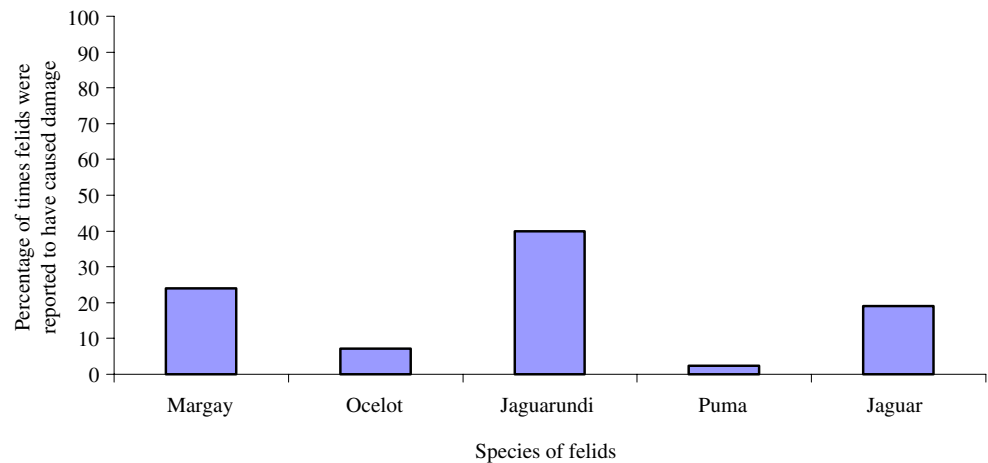
Based on responses to the color pictures, it was evident that the knowledge of felids varied among households, with the jaguar being the best known species and the puma and ocelot being the least known. The fact that the jaguar is the best known could be due to its being the largest predator in the Selva Lacandona, which makes it a symbol of strength and power. In addition, jaguars have played an important mythological role in Mayan and Mesoamerican cultures and have been continuously represented in art and iconography throughout the region (Coe 1972; Saunders 2001). However, these differences may merely reflect variations in abundance among the species and the frequency of interactions with humans, and may not be directly related to species size, as the margay and jaguarundi were well known to 60–70% of the people.

As noted by Naranjo *et al.* (2004), most mammalian species are hunted for food in the Selva Lacandona, but felids are exceptions. People confirmed that felids are basically hunted to control populations and limit damage to livestock. These reasons, as well as the use of pelts, fangs and claws, have been reported for other neotropical communities (Naranjo 2002; Mouro and Almeida 2006). Felid fur has been used for millennia by Mesoamerican societies but this is currently limited in the study communities as most residents know it is illegal and there is no

Table 1 Uses and methods reported by the mestizo people associated with the Selva Lanandona, Chiapas, Mexico for felid species and their parts

Species	Part/product	Uses	Methods of application
Jaguar Puma Ocelot Margay Yaguarundi	Fat	Reduce muscular pain	Fat of the felid is applied evenly and directly on the affected area. This is repeated for a few days until pain disappears
Jaguar Puma Ocelot Margay Yaguarundi	Fat	Cure asthma and coughs	Raw fat is boiled and the oil obtained is consumed in a drink
Jaguar Puma Ocelot Margay Yaguarundi	Fat	Attractant to hunt other jaguars	Fat obtained from dead jaguars is used as bait by hunters
Jaguar Puma Ocelot Margay Yaguarundi	Fat	Frighten herbivores that may cause crop damage	Fat obtained from dead jaguars is mixed with water and spread around field crops
Jaguar	Fat	By women unable to get pregnant	Fat is applied to abdominal area for many days with the expectation that pregnancy occur
Jaguar	Gastrointestinal tract	By shaman to induce an evil spirit on another person	Method unknown

Fig. 3 Survey results documenting the extent each species of felid had caused damage to livestock in the communities. The number at the top of each bar indicates the number of households responding for each species



legal market for felid pelts or other of their parts. Felid parts were reportedly used by local residents for therapeutic purposes. These practices were often guided by a shaman and have traditionally been related to the jaguar, as a mythical entity of supremacy and power in Mesoamerican culture (Valverde 1996). This traditional use of felids seems to be diminishing in mestizo communities, possibly due to the decline of felid populations and the increasing influence of modern life (Jorgenson 1995). This is in contrast to some Indian communities of the Selva Lacandona described by

Naranjo *et al.* (2004), where the use of felids and their parts remains common.

In the communities included in this study, the number of households reporting damage by felids was not significantly greater than the number that reported no damage. The jaguarundi appears to be the most common wild felid preying on domestic animals, which may reflect a greater tolerance to human disturbance or just a greater abundance than the other associated species (Oliveira 1998). Jaguarundi are thus seen as a nuisance species, encouraging

Table 2 Hunting methods used to capture felids as described by households associated with Selva Lacandona, Chiapas, Mexico

Species	Method	Description of the hunting method
Margay Ocelot Jaguarundi	Baiting	Hunters attracted felids by placing a dead chicken outside their houses, where wild cats had been seen killing poultry. Hunters wait overnight for and shoot them when approaching
Puma Jaguar	Baiting	A variant of the former method occurred when a calf was killed, as hunters wait for the cat by hiding near cattle
Margay Ocelot Jaguarundi	Snaring	Hunters occasionally used leg snares to catch cats. The trap was set where the cat had been seen killing poultry. Once the animal was caught, it was shot or killed with a machete
Margay Ocelot Jaguarundi Puma Jaguar	Poisoning	Two persons reported the use of poison to the control predation on domestic animals. Agrochemicals such as <i>Tiodan</i> were used and it was spread on dead chickens or calves killed by felids
Margay Ocelot Jaguarundi Puma Jaguar	Casual encounters	People occasionally encountered felids, while working in the field or while going to remote areas to hunt for other wildlife species. During these encounters, people shoot at felids because they had the opportunity to do so
Jaguar	Jaguar calling	Some hunters use an instrument locally known as <i>tigrera</i> to attract jaguars. This instrument was home-made and consisted of a large wooden or plastic bowl covered with deer or peccary skin to create a resonance chamber. A thin rope embedded in bee wax was inserted through the center of the skin and pulled from inside the resonance box and resembled the call of a female jaguar in heat. Hunters using this method also build a small wood platform at least 4 m high in a tree and the platform was occupied at night to call jaguars with the <i>tigrera</i> and jaguars were shot when they approached



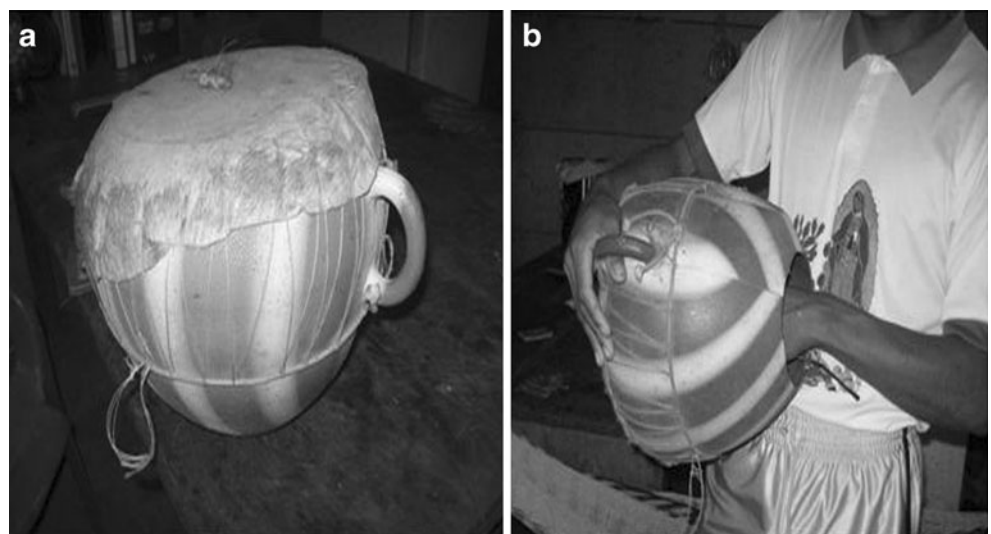
Fig. 4 Ocelot (*Leopardus pardalis*) shot at one of the houses, while hunting chickens (Photo E. Inda)

their hunting (Hoogesteijn and Mondolfi 1992). Previous studies have reported that conflicts with people, particularly over predation on small and large livestock, are one of the major causes of decline in most large carnivore species (Hoogesteijn and Mondolfi 1992; Michalski *et al.* 2006). However, our data suggest that felids do not prey systematically on livestock in mestizo communities of the Selva Lacandona. This may be due to reduced felid populations or because their natural environment offers sufficient resources. Therefore, it would be interesting to study the correlation between these practices by local people and the actual population abundance of felids in the study area. Farrell (1999) in a 10 year study in Venezuela similarly reported that jaguars were responsible for less than 1% of the total mortality of cattle lost, while pumas were responsible for 7.5% (primarily calves). Similarly, both Polisar *et al.* (2003) and Patterson *et al.* (2004) reported that cattle constituted an alternative prey for large felids in Venezuela and Kenya, respectively.

Felids generally avoid human settlements and domestic animals when their natural environment offers enough resources and space to survive and therefore increased predation on domestic animals may be an indicator of ecosystem degradation, fragmentation, and subsequent prey decline (Hoogesteijn 2003). In spite of this, virtually any interaction that generates damage to native people caused by felids will usually end with the killing of the carnivore. Although most felid studies and reported cases of domestic animal predation deal with large species, this is one of the first studies documenting the fact that small felids also represent significant predators of domestic livestock, and that their populations are affected negatively by hunting. Approximately 70% of the people interviewed in this study knew that it was illegal to hunt felids and that they were protected by governmental regulations. However, it was also acknowledged that farmers could hunt felids when damage was incurred to their livestock. To avoid further conflicts between native people and wild felid populations in the region, it is essential to understand the causes and consequences of feline-human interactions. Population monitoring, as well as the establishment of select community-based management and conservation strategies for felids, is recommended.

In contrast to the Indian communities reported by Naranjo *et al.* (2004) in the same area, this study suggests that in the mestizo communities studied, the use of felids is declining. This could be due to a combination of factors such as declining felid populations or increasing knowledge of their protected status by local peoples. Increasing deforestation and expansion of human agriculture may have produced an increase in human-felid conflicts. Despite that, our study suggests a low number of incidents. We highlight the importance of this evidence and suggest that future work in the study area is urgently needed. Exhaustive

Fig. 5 **a** An instrument called a tigrera, used by local people to attract and hunt jaguars (*Panthera onca*) in the Selva Lacandona, Chiapas, Mexico; **b** the tigrera is operated by drawing a rope covered with bee wax through a hole in the attached membrane, producing a sound similar to a female jaguar in heat (Photo N. Garcia Alaniz)



data on the frequency of incidents, in addition to the development of projects that generate ecological knowledge about the situation of these species populations, are essential to understand the main causes of these incidents and facilitate the development of effective management and conservation measures.

Better management of livestock by mestizo peoples inhabiting the region should be encouraged by government agencies and conservation organizations. Such management could include the use of fences to confine domestic animals such as poultry, and limiting cattle grazing near areas of rainforest, thereby offering protection against predation by felids. Appropriate supervision and technical support in these areas by academic institutions and non-governmental organizations could generate adequate collaborative management practices that would result in fewer felid-human interactions. Promotion of ecotourism, where local people obtain benefits from these species, could also help reduce conflicts. In addition, environmental education programs to increase the knowledge of these species in the community could lead to the development of community-based management and conservation strategies.

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