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M. Nils Peterson [a]; Mitch Sternberg [b]; Angelica Lopez [c]; Jianguo Liu [d]
[a] Fisheries & Wildlife Program, Department of Forestry and Environmental Resources, North Carolina State University, Raleigh, North Carolina, USA [b] Lower Rio Grande Valley National Wildlife Refuge, Alamo, Texas, USA [c] Department of Recreation, Park & Tourism Sciences, Texas A&M University, College Station, Texas, USA [d] Center for Systems Integration and Sustainability, Department of Fisheries and Wildlife, Michigan State University, East Lansing, Michigan, USA

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Ocelot Awareness among Latinos on the Texas and Tamaulipas Border

M. NILS PETERSON,[1] MITCH STERNBERG,[2] ANGELICA LOPEZ,[3] AND JIANGUO LIU[4]

[1]Fisheries & Wildlife Program, Department of Forestry and Environmental Resources, North Carolina State University, Raleigh, North Carolina, USA
[2]Lower Rio Grande Valley National Wildlife Refuge, Alamo, Texas, USA
[3]Department of Recreation, Park & Tourism Sciences, Texas A&M University, College Station, Texas, USA
[4]Center for Systems Integration and Sustainability, Department of Fisheries and Wildlife, Michigan State University, East Lansing, Michigan, USA

Knowledge about wildlife represents a critical component of conservation. Although several variables (e.g., gender, education, length of residency) predict components of wildlife knowledge, previous research on the topic has rarely included multivariate analysis and has not focused on Latinos, the largest ethnic minority in the United States. We addressed this gap with a survey assessing the ability of residents on the Texas–Tamaulipas border to identify an ocelot. Few residents (13%, n *= 402) could identify an ocelot. Males, those with higher education and income levels, longer-term residents, and residents owning rural and agricultural properties were most likely to identify ocelots correctly. These results suggest wildlife education and extension activities in borderland communities should target females, new residents, and residential property owners. Future research should address the extent these findings apply for Latino populations outside borderland contexts.*

Keywords endangered species, gender, Hispanic, knowledge, Latino, Lower Rio Grande Valley, Mexican American

Introduction

Public ability to identify wildlife species is a critical component of biodiversity conservation for several reasons (Berkes, Colding, & Folke, 2000; Nyhus, Sumianto, & Tilson, 2003). First, people must know an endangered species exists before they can generate attitudes toward it, care for it, or consciously take action on its behalf (Fishbein & Ajzen, 1975; Petty & Cacioppo, 1981; Schwartz, 1977; Stern, Dietz, Kalof, & Guagnano, 1995). Second, wildlife populations in developed areas require support from people living in dwindling habitat (Farmer, 1993). Third, knowledge about wildlife can improve the relationship between general environmental values and specific management preferences (Tarrant, Bright, & Cordell, 1997). Without a minimal amount of wildlife knowledge (e.g., knowing a species exists), people are less likely to connect their general values (e.g., we should care for nature) to beliefs that are more specific (e.g., we should restore habitat for endangered ocelots [*Leopardus pardalis*]).

Address correspondence to M. Nils Peterson, Fisheries & Wildlife Program North Carolina State University, Raleigh, NC 27695, USA. E-mail: nils_peterson@ncsu.edu

Research assessing predictors of knowledge about wildlife has identified gender (Kellert & Berry, 1987), land ownership type (Rodriguez, Krausman, Ballard, Villalobos, & Shaw, 2003), and length of residency (Nyhus et al., 2003), as important variables, but few previous studies controlled for confounding effects of variables traditionally considered in social research (e.g., age, income). Some research suggests females are less knowledgeable of wildlife species and wildlife habitat requirements than males (Huxham, Welsh, Berry, & Templeton, 2006; Kellert & Berry, 1987; Nyhus et al., 2003). This gender gap may relate to males having more direct experience with wildlife than females (Nyhus et al., 2003), males having cognitive perceptions of animals while females have more emotional perceptions of animals (Gilligan, 1982; Kellert & Berry, 1987), and males viewing wildlife as objects (i.e., things that are acted upon) whereas females view wildlife as subjects (i.e., actors; Bell, 2001; Huxham et al., 2006). The latter perspective suggests that western education, which characterizes wildlife as objects not subjects, favors male learning about wildlife (Bell, 2001; Huxham et al., 2006).

Differences in land ownership status also may influence the quality and content of knowledge about wildlife. Farmers and ranchers may have more direct experience with wildlife species, but may also adhere to negative stereotypes of species traditionally associated with crop damage or livestock depredation (Rodriguez et al, 2003; Zinn, Manfredo, & Vaske, 2000). Length of residency also should be considered because many areas with high biodiversity (e.g., the Lower Rio Grande Valley [LRGV]) have high proportions of recent migrants (Nyhus et al., 2003). Recent migrants may provide less valuable local knowledge than longer-term residents due to lack of experience with local species among shorter-term residents (Berkes et al., 2000; Nyhus et al., 2003).

Within this context, the lack of human dimensions research and outreach materials addressing Latino populations represents a conspicuous need (Lopez et al., 2005). Latinos are the largest and fastest growing ethnic minority in the United States (Lopez et al., 2005) and Latino culture may embrace conceptual models of wildlife and wildlife management different from non-Latino whites (Valdez, Guzman-Aranda, Abarca, Tarango-Arambula, & Sanchez, 2006). Cross-cultural knowledge is essential for successful wildlife conservation (Teel, Manfredo, & Stinchfield, 2007), especially in areas with high migration rates. Global sustainability depends on understanding how diverse cultures know, perceive, and relate to nature (Diamond, 1997; Milton, 1996). This case study addresses these knowledge gaps by assessing predictors of knowledge about ocelots on the Texas and Tamaulipas border in the LRGV.

Background

The Lower Rio Grande Valley (LRGV) is more than 90% Latino (U.S. Bureau of the Census, 2001). Although Latino culture relates in part to place, some general cultural values related to the environment can be identified (Peña, 1998). Latinos tend to see natural resources as communal rather than as privately owned and see environmentalism as a struggle to address threats to human health and well being (Peña, 1998; Peterson, Peterson, & Peterson, 2007; Pulido, 1996). Our selection of test variables (length of residency, land ownership, gender, and education) potentially predicting wildlife knowledge emerged from analysis of the relationship between Latino culture and nature in the Rio Grande Valley (Peña, 1998). Latino culture in the Rio Grande Valley emerged from a milieu of traditions brought by early settlers, regional ecology, and politics (Montejano, 1987; Peña, 1998). The early settlers brought an agrarian lifestyle to the Rio Grande Valley. The sense of place engendered by an agrarian tradition may influence relationships with, and knowledge of, wildlife (Peña, 1998; Thompson, 2003). Accordingly we use length of residency as a test

variable indicative of the extent respondents were immersed in the agrarian tradition. Hypothetically, longer-term residents would have a more intimate relationship with, and thus knowledge of, local wildlife.

Massive efforts to dispossess land from Latinos, however, may have diluted the legacy of early agrarian culture. After the Treaty of Guadalupe Hidalgo in 1848 Mexicans living on lands that were originally part of northern Mexico instantly became conquered second-class U.S. citizens (Montejano, 1987). The Hidalgo County, Texas government ordered sheriff's sales, or auctions, where Latino owned lands were sold to the highest bidder (non-Latino whites) at unreasonably low prices. By 1892, Cameron County, Texas saw 1.3 million acres, of 1.5 million total acres in the county, change into the hands of non-Latino whites by similar means. Today, the majority of large land parcels in these two counties are still owned by non-Latino whites, and both counties, comprised mainly of Latinos, are among the poorest in the nation and state. The deep poverty of rural Latino communities along the entire Rio Grande reflects rural economies deprived of a land base (Pulido, 1998). This disenfranchisement from agricultural land led us to focus on land ownership as a test variable. Hypothetically, respondents who maintained ownership of agricultural lands would retain knowledge of the local environment, whereas those alienated from the land would lack that knowledge. Although no research has compared wildlife knowledge of Latino landowners to wildlife knowledge of non-landowners, Rodriguez et al. (2003) found private land owners in Mexico had high knowledge scores regarding wolves.

Peña's (1998) account of Latino culture on the upper Rio Grande paints a picture of distinct gender roles in Latino relationships with wildlife where males hunted wildlife species and females cared for domestic animals or tame wildlife. Peña noted this ethnographic account holds limited inference, but it does raise the question whether gender plays a significant role in the wildlife knowledge of Latinos living in semi-agrarian borderland communities. Within this context males would hypothetically have more wildlife knowledge, particularly of species relevant to hunting activities (Nyhus et al., 2003). Finally, education represents an important test variable because it is intuitively related to knowledge and because Latinos lag behind non-Latino whites in educational attainment in the United States, Texas, and the LRGV (Lopez et al., 2005; Peterson et al., 2007).

Wildlife knowledge is a diverse and multidimensional construct. Previous studies addressing the topic have ranged from testing the ability to identify species from photographs (Nyhus et al., 2003) to long tests with items measuring knowledge rooted in personal experience, literature, folk knowledge, and interactions with animals (Kellert & Berry, 1987). We focused our assessment of knowledge about wildlife on ocelot identification. The ocelot represents the flagship species for wildlife conservation in this region, and is featured on the Laguna Atascosa, Santa Ana, and LRGV National Wildlife Refuge Web pages, tourist information brochures, and used in an Adopt-An-Ocelot program to generate funds for habitat conservation. Public awareness of ocelots is necessary step toward generating public pressure for conservation activities (e.g., wildlife crossing structures in the rapidly expanding road network). Roads without provisions for wildlife are proliferating rapidly in the LRGV due to human population growth, an even faster increase in the number of households (Liu, Daily, Ehrlich, & Luck, 2003), and the LRGV's role as the Southern U.S. terminus of the I-69 international trade corridor (Secretary of Transportation, 2004).

Methods

During June–August 2005 we administered a questionnaire to the person who answered the door of every fifth dwelling while moving northeast to southwest along the U.S.–Mexico

border between Hidalgo and Brownsville, Texas. This sampling strategy was designed to avoid bias associated with only interviewing at households that were on the grid and has been used in similar contexts (Nyhus et al., 2003). Traditional sampling methods using phone records or county tax roles were problematic because multiple households often existed on one property owned by a family patriarch or matriarch and utilities were occasionally shared among residences. We sampled homes along 140 km of the farthest southeastern border between the United States and Mexico. We included all homes that fronted directly on the Military Highway (the southern most transportation corridor along the U.S. border), neighborhoods connected to the highway, and neighborhoods between the highway and the Mexican border. We skipped abandoned structures and a trailer park occupied by seasonal migrants. This approach yielded a sample size of 432 households. When no one was home, we noted the address and returned daily until the interview was completed. There is little evidence for interviewer effects on response quality or quantity with Hispanic populations, although some gender effects have been identified (Webster, 1996). We minimized and facilitated evaluation of gender related interviewer effects by employing one male and one female interviewer. We did not detect differences in interview duration, response rate, or item omission related to gender.

Survey Content

We designed English and Spanish versions of the questionnaire via a forward and backward translation process (Marín & Marín, 1991). To assess knowledge of ocelots we asked respondents to identify an ocelot in a color photograph. After asking the identification question we asked respondents whether they had seen the animal in the picture. If they responded yes, we asked them to identify the sighting location on a paper map. We created an ordinal variable to capture land ownership type (1 = not an owner, 2 = residential, 3 = rural, and 4 = agricultural). All landowners with properties larger than 65 acres farmed their property, so we coded respondents owning > 1 acre and ≤ 65 as rural, and those owning > 65 acres as agricultural. We collected data for previous year's annual income (1 = ≤ $14,999, to 9 = ≥ $200,000), age, ethnicity, education (1 = less than high school, to 7 = graduate or professional degree), length of residency, and gender. To facilitate future meta-analysis we collected most demographic data using standard U.S. Census–style metrics and scales. We assessed ethnicity by asking respondents "What is your race or ethnicity?" The options were Hispanic or Latino, White, Black or African American, American Indian or Alaska Native, Asian, Native Hawaiian or other Pacific Islander, and other. Although the Hispanic or Latino category represents diverse groups, more than 80% of Latinos in the LRGV are of Mexican origin (U.S. Bureau of the Census, 2001).

Data Analysis

We used *t*-tests to compare demographics of Latino and non-Latino respondents. When data failed to meet assumptions of parametric statistics we used Kruskal-Wallis tests. We used binary logistic regression to evaluate our test variables (education level, length of residency, land ownership, and gender) as predictors of ability to identify ocelots while controlling for potentially confounding effects of age and income. We evaluated model fit using the Hosmer-Lemeshow goodness of fit test. Finally, we measured the performance of variables for predicting ability to identify ocelots (effect size) using odds ratios.

Results

We conducted 402 interviews (93% response rate, ±4.9% sampling error). Our sample was 58% female and 94% Latino, which approximated census data for tracts that overlapped with our study area (52% female and 94% Latino [U.S. Bureau of the Census, 2001]). Latinos differed from non-Latino whites in terms of younger age, shorter length of residency, larger household sizes, smaller properties owned, lower incomes, and lower education levels (Table 1). The largest group (44%) of Latino respondents had annual family incomes below $15,000. Most Latino respondents had not completed high school or its equivalency exam (73%). Half (50%) were native to the rural study area. Most of the Latino migrants (those moving from outside the study area; $n = 185$), however, were from urban (61%) or town (27%) areas.

Only 16% ($n = 57$) of respondents could correctly identify an ocelot from a photograph. Other names supplied for the pictured ocelot were: tigre (12%), bobcat (9%), wildcat (6%), gato montés (6%), tiger (5%), leopard (5%), cheetah (4%), cat (3%), leopardo (3%), tigrillo (2%), jaguar (1%), panther (1%), puma (0.5%), gato rabón (0.5%), gato salvaje (0.5%), and gato silvestre (0.5%). The largest group of respondents (24%) stated they did not know the name for the pictured ocelot. Ability to identify ocelots only reached 50% for respondents with agricultural properties (50%) and respondents with graduate school level educations (67%). Few (21%, $n = 72$) respondents reported seeing an ocelot in the wild. Less than half of those respondents ($n = 31$) could identify the sighting location on a map. No sightings could be verified, but all sightings were in or adjacent to patches of suitable habitat (>75% brush cover: Harveson, Tewes, & Anderson, 2004).

The logistic regression model fit the ocelot identification data, χ^2 (8, $n = 402$) = 11.09, $p = .197$, and explained about one third of the total variance (Nagelkerke $R^2 = .34$). The likelihood of being able to identify an ocelot was significantly associated with 4 out of 5 test variables (gender, land ownership type, education, and years of residency; Table 2). Gender and land ownership type had the largest effect on ocelot identification ability (Table 2). Males were more than twice (22%) as likely to correctly identify an ocelot as females (7%; Table 2). Each unit increase from not owning property toward owning agricultural size property nearly doubled the odds of correctly identifying an ocelot (Table 2).

Table 1
Demographic comparison of Latino ($n = 371$), and non-Latino white ($n = 25$) respondents

	Mean (SE)				
Variable	Latinos	Non-Latino whites	*t*	$\chi^{2\,a}$	*p*
Age	41.74 (0.845)	55.33 (3.174)	3.98		<.001
Years resident	26.40 (1.082)	36.75 (5.118)	2.34		.020
Household size	4.39 (1.909)	3.40 (1.826)		6.75	.009
Urban background[b]	1.61 (0.048)	1.72 (0.891)		0.51	.477
Land ownership size[c]	2.00 (0.033)	2.76 (0.185)		20.19	<.001
Income level	2.22 (0.079)	4.04 (0.434)		19.18	<.001
Education level	2.36 (0.087)	3.92 (0.420)		15.19	<.001

[a]Kruskal-Wallis Test.
[b]Scale ranged from 1 (rural, <5,000) to 3 (urban, >100,000).
[c]Scale ranged from 1 (no property) to 4 (agricultural property, > 65 acres).

Table 2
Logistic regression model of ocelot identification ability (1 = able, 0 = not able) among survey respondents in the Lower Rio Grande Valley study area in 2005 (n = 402)

Variable	Coefficient	Wald-statistic	p	Odds ratio (95% CI)
Constant	–7.810	49.113	.000	—
Gender[a]	1.450	14.974	.000	4.263 (2.045–8.886)
Land ownership type[b]	0.582	4.104	.043	1.789 (1.019–3.142)
Income	0.275	5.158	.023	1.316 (1.038–1.669)
Education	0.272	6.004	.014	1.312 (1.056–1.630)
Ethnicity[c]	0.143	0.053	.818	1.154 (0.341–3.901)
Years of residency	0.024	4.824	.028	1.025 (1.003–1.047)
Age	0.006	0.154	.695	1.006 (0.978–1.034)

[a]Female coded as 1 and male coded as 2.
[b]Ranges from no property (1) to agricultural size property (4).
[c]Latino coded as 2 and Non-Latino white coded as 1.

Discussion

The diverse ways respondents identified ocelots suggests wildlife managers in borderland contexts face unique challenges. Although some names (e.g., tiger and tigre) are lexical equivalents, they may have different meanings in different cultural groups. In this study the broader jaguar category may represent the second largest (19%) response group because tigre, tiger, and panther are used as referents for jaguars among Latinos in much of Central and South America. Similarly, gato rabón, gato montés, and bobcat were used interchangeably by respondents. These results suggest wildlife managers in borderland contexts where language, culture, and history blend must develop multicultural perspectives to effectively communicate and interact with stakeholders (Lopez et al., 2005).

Gender, land ownership type, education, and years of residency influenced knowledge about ocelots among respondents in the LRGV and the relationships we identified matched theoretical expectation based on previous wildlife knowledge research (Berkes et al., 2000; Kellert & Berry, 1987; Nyhus et al., 2003; Rodriguez et al., 2003). Males demonstrated more knowledge about ocelots than females, and income, education, length of residency, and property size were positively related with knowledge about ocelots. This suggests wildlife educators working in Latino communities should target females, newer residents, those with lower education and income levels, and those owning non-agricultural properties.

Although previous studies used diverse metrics for assessing knowledge about wildlife, they all found knowledge was related to gender, length of residency, education, and income (Huxham et al., 2006; Kassilly, 2006; Kellert & Berry, 1987; Nyhus et al., 2003). The consistent relationships between independent variables and metrics of wildlife knowledge suggest both simple (e.g., species identification) and complex knowledge scales have tapped similar elements of wildlife knowledge. Future studies using measures of contextual wildlife knowledge that go beyond species identification and factual knowledge are needed.

Our findings do not explain the gender gap in wildlife knowledge, but expand inference to Latinos from populations in Kenya, Indonesia, the United Kingdom, and

non-Latino whites in the United States (Huxham et al., 2006; Kassilly, 2006; Kellert & Berry, 1987; Nyhus et al., 2003). Future research should address the extent to which a gender gap in wildlife knowledge stems from problems with public education (Bell, 2001; Huxham et al., 2006), psychological differences between genders (Gilligan, 1982; Kellert & Berry, 1987), or gender roles in Latino culture (Peña, 1998). Efforts to reduce the gender gap in factual wildlife knowledge may be facilitated by portraying wildlife as subjects, rather than objects in education and extension materials (Bell, 2001; Huxham et al., 2006).

The relationship between education and knowledge about ocelots identified in this study (Table 2) suggests a serious challenge for wildlife education. Education, particularly completion of graduate school, was a significant predictor of wildlife knowledge and Latinos trail non-Latino whites in attaining this level of education (Lopez et al., 2005). Promoting wildlife knowledge among Latinos requires both efforts to include wildlife related material before the college level and efforts to promote Latino participation in wildlife programs at the university level (Lopez et al., 2005).

Longer-term residents may have demonstrated more knowledge about ocelots than newer residents for several reasons. The most evident reason is that as residents live in the region longer they are more likely to see ocelot crossing signs on public roads, visit a wildlife refuge dedicated in part to ocelot conservation, or be exposed to news related to local ocelot conservation efforts. The 72 unconfirmed sightings by respondents suggest living in the area does expose residents to information about ocelots if not ocelots themselves. Newer residents may simply have less experience with local species (Berkes et al., 2000; Nyhus et al., 2003).

The tendency for owners of rural and agricultural lands to be more aware of ocelots than those not owning land or owning residential property may relate to high profile cases where rural and agricultural landowners faced potential land use restrictions due to endangered species management in the area (Peterson, 1997). The LRGV Agriculture Wildlife Coexistence Committee brokered deals between farmers, the USFWS, and EPA to ensure conservation of the aplomado falcon (*Falco femoralis*) during the late 1980s and early 1990s. A lack of wildlife knowledge among respondents not owning agricultural lands, however, may reflect communities torn from their agrarian heritage. The Latinos renting or living in residential neighborhoods in our study area, and much of the Rio Grande, live in extreme poverty rooted in historical losses of family or communal lands (Pulido, 1998; Peterson et al., 2007). The respondents who retained some agricultural land may have also retained wildlife knowledge associated with their agrarian culture.

These findings combine to support both the concept of cross-cultural knowledge (Teel et al., 2007) and the critical importance of local context (Peña, 1998). Our results suggest cross cultural relationships by sharing similar predictors of wildlife knowledge with research in Indonesia, Britain, Mexico, and the United States (Kellert & Berry, 1987; Bell, 2001; Nyhus et al., 2003; Valdez et al., 2006). The history of the LRGV, however, shaped how gender, time as a resident, land ownership, and education influenced wildlife knowledge. In this case study, the history of Latinos losing their agricultural lands explains why the relationship between land ownership type and knowledge about wildlife predicts inability to identify ocelots among residents of our study area. Considering local history in wildlife education efforts will facilitate trust building and inhibit erroneous interpretations of relationships between Latino culture and conservation (Peña, 1998).

Future research on wildlife knowledge should address how this study's findings apply for Latinos in non-border contexts and for other rapidly growing Latino groups such as Central Americans. The drastic demographic differences between Latinos and non-Latino whites identified in this study suggest consideration of modifications to traditional survey

protocol. In many cases traditional categories for income and education, such as those used in this study, lack sufficient resolution for the lower levels of income and education. Further, this study suggests systematic sampling of households within a region defined by research objectives provides a viable survey approach when traditional sample sources (e.g., phone or tax records, driver's license databases) do not adequately document the population of concern.

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