Wildlife Society Bulletin 43(3):447–454; 2019; DOI: 10.1002/wsb.993

Original Article

Hunting Interacts with Socio-demographic Predictors of Human Perceptions of Urban Coyotes

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ABSTRACT Recent research suggests hunting participation interacts with other variables (e.g., bird-watching participation) to shape attitudes about wildlife. We build on this research by evaluating how hunting participation interacted with key variables to predict affectual attitudes toward coyotes (*Canis latrans*), support for coyotes on the landscape, and support for coyote management approaches in urban North Carolina, USA. We conducted surveys of urban hunters and nonhunting urban residents during 2015, and modeled relationships between respondent attributes and perceptions of coyotes. Among non-hunters, men liked coyotes more than women did, but the relationship was reversed among hunters. Similarly, men supported killing coyotes more than women did, but the difference was less pronounced among hunters. Pet owners liked coyotes and opposed killing coyotes more than non–pet owners did, but those differences disappeared among hunters. Having a rural background predicted lower tolerance for coyotes among hunters but not nonhunters. Finally, age was negatively related to support for lethal coyote management among hunters but positively related to support among nonhunters. Participation in hunting may moderate how socio-demographic variables predict perceptions of coyotes and change or reverse previously described relationships between these variables and perceptions of wildlife.

KEY WORDS *Canis latrans*, carnivore, coyotes, hunting, moderating effects, urban.

Hunters consistently differ from nonhunters in their perceptions of wildlife by holding less favorable attitudes toward carnivores than did other groups (Kellert 1985). Traditionally, hunters are understood to have utilitarian and dominionistic perceptions of wildlife, and more negative attitudes toward carnivores than are held by nonhunters (Kellert 1978, Zeiler et al. 1999, Ericsson and Heberlein 2003, Peterson et al. 2009). This relationship may be explained by rational choice theory, which suggests people make decisions that maximize personal utility by optimizing trade-offs between costs and benefits of decisions (Boudon 2009). Carnivores may be perceived as reducing the utility of investments in hunting by reducing the number of game species available to hunt or limiting opportunities to hunt (Gompper 2002). Despite this, hunters tend to have among the greatest levels of wildlife knowledge in a community, on par with birders and wildlife advocates, and are likely to participate in other, nonconsumptive, outdoor activities (Kellert 1985, Ericsson and Heberlein 2002).

Recent research suggests participation in hunting may interact with other variables of interest in more nuanced ways. Although these studies typically do not explicitly test for interaction effects, study outcomes suggest underlying interactions may exist. For instance, Cooper et al. (2015) determined that hunters who watched birds were more likely to participate in conservation behaviors (e.g., donating

Received: 30 October 2017; Accepted: 3 May 2019
Published: 23 August 2019

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to conservation, advocating for wildlife, enhancing public land) than were people who exclusively hunted or watched birds. Kaltenborn et al. (2012) concluded that ptarmigan (*Lagopus* spp.) hunters' willingness to refrain from shooting birds was predicted by belief that humans are part of nature in small, but not large, hunting areas. Similarly, Ericsson and Heberlein (2003) determined participation in hunting interacted with geographic area and attitudes toward carnivores; hunters who lived in proximity to wolves (*Canis lupus*) had more negative attitudes toward wolves than did nonhunters in the same area and hunters living outside the area. Also, participation in hunting may interact with occupation, resulting in greater acceptance of lethal wildlife control methods among hunter–farmers in Greece (Liordos et al. 2017).

These studies highlight a need for systematic research exploring the potential for participation in hunting to have a 'moderating effect' on how an individual's perceptions of wildlife relate to key variables highlighted in the literature. A moderating effect is defined as an interaction in which a third variable, in this case participation in hunting, alters the direction or strength of a relationship between a predictor and a criterion variable, such as gender and perceptions of wildlife (Baron and Kenny 1986). Past studies of perceptions of wildlife among the general population focused largely on the effects of socio-demographic factors, with gender, age, pet ownership, and rural–urban childhood backgrounds having emerged as the most commonly studied factors (Clark et al. 2017). Among these socio-demographic factors, gender was a strong predictor of wildlife attitudes; women exhibited stronger emotional attachment to animals than men did, whereas men were more willing to exploit wildlife and support lethal management of coyotes (*C. latrans;* Kellert 1984, Kellert and Berry 1987, Tucker and Bond 1997, Jackman and Rutberg 2015). With the exception of some invertebrate and pest taxa, pet owners view most wildlife species in a more positive light than do non–pet owners (Bjerke et al. 2003). Perceptions of wildlife varied with a person's age, with older people expressing negative perceptions of wildlife (Kleiven et al. 2004). Individuals in rural areas were more likely than those in urban areas to have utilitarian views of wildlife and participate in hunting more often (Stedman and Heberlein 2001). Indeed, Kellert (1984) reported that Caucasians raised in rural settings retained strong utilitarian views of wildlife after moving to cities. It is clear from previous research that both demographic factors and participation in hunting have a strong relationship with perceptions of wildlife; however, it remains unknown whether these previously established demographic relationships extend to the hunting community or whether hunting has a moderating interaction with key demographic variables.

We began addressing these research needs with a case study of hunter and nonhunter perceptions of coyotes in 4 major metropolitan areas of North Carolina, USA. Since 2007, the majority of the world's population has resided in an urban area; by 2020, urban areas may represent the only areas of net population growth (Davis 2003, United Nations 2014). Wildlife species, including black bear (*Ursus americanus*), white-tailed deer (*Odocoileus virginianus*), and mountain lions (*Puma concolor*), are also increasingly using urban spaces (Gehrt et al. 2010). Coyotes are the most ubiquitous of urban carnivores, and now present in most North American cities, including all major North Carolina urban centers (Poessel et al. 2017). Hence, the focus on urban coyotes in our case study provides potential for generalizations relevant to contemporary perceptions of wildlife shared across urban North America.

Several studies have focused on people's affectual (i.e., emotional) connection to wildlife, view of wildlife as part of the landscape, support for wildlife in the landscape, and support for lethal removal of wildlife (Bjerke et al. 2003, Martínez-Espiñeira 2006, Draheim et al. 2011, Frank et al. 2016). We incorporated 4 similar metrics of coyote perception to facilitate the comparison of our results with previous work and provide a general foundation of knowledge for future investigations of how hunting may moderate relationships between socio-demographic variables and perceptions of wildlife and wildlife management. We tested several hypotheses about how hunting interacts with key socio-demographic variables to predict positive affect for coyotes (*affect*), acceptance of coyotes as part of nature (*nature*), support for having coyotes on the landscape (*tolerance*), and support for lethal coyote management (*killing*). Specifically, we hypothesized that hunting would moderate relationships to reduce the positive effects of female gender, pet ownership, urban background, and younger ages on *affect, nature,* and *tolerance,* and reduce negative effects of the same variables on *killing.*

METHODS

Data Collection

We assessed residents' perceptions of coyotes in the Asheville, Greenville, Charlotte, and Triangle (the Raleigh–Durham–Chapel Hill region) metropolitan areas of North Carolina (Fig. 1) with 2 surveys: a mail survey for the general public and a web-based survey for hunters. Both surveys were self-administered and consisted of identically worded questions. For the mail survey, we purchased a sampling frame representative of the 4 metropolitan areas from Survey Sampling, Inc., of Fairfield, Connecticut, USA, which used a combination of drivers' licenses, property records, and phone registries (landline and cellular) to achieve an approximately 76% coverage for the sample frame. Municipalities adjoining the focal cities were included as part of the metropolitan area, from which the samples were drawn and delineated by ZIP code. From this sample frame, we selected 1,400 recipients to receive a questionnaire in each metropolitan area for a total of 5,600 recipients. We contacted recipients 4 times over a 5-week period in July and August 2015 via mail, following the protocols of Dillman et al.'s (2014) tailored design method. The 4 mailings consisted of an initial letter of intent, a survey packet, a reminder postcard, and a final survey packet. Survey packets included a cover letter, informed

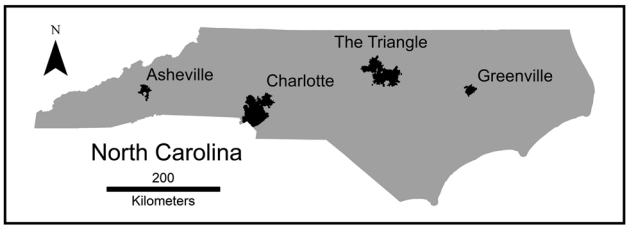

Figure 1. Map of North Carolina, USA, illustrating the 4 study cities (black polygons) where hunter and nonhunter surveys were conducted in 2015.

consent letter, survey booklet, and self-addressed return envelope.

We used an electronic survey to assess hunters who lived in the same municipal regions as the mail survey. We created a sample frame from the North Carolina Wildlife Resources Commission Automated License and Vessel Information Network database, which consisted of all North Carolina residents who held annual or short-term hunting licenses with effective dates from 1 January 2014 through 31 December 2015. From this sample frame, we selected 4,800 individuals (1,200 in each urban area) randomly and invited them to participate in the survey via e-mail. We sent 3 reminder emails over a 3-week period in January and February 2016 (Dillman et al. 2014). All e-mails contained informed consent information and a web link that directed respondents to the survey.

Questionnaire Development

We used expert elicitation and interviews with North Carolina Wildlife Resources Commission biologists to help develop the questionnaires. The survey questionnaire was initially pretested in a single mailing to 300 urban residents evenly split among the 4 study areas. We used the pretest and interview responses to revise the questionnaire for clarity. All survey methods and questions were approved by the Human Subjects Internal Review Board of North Carolina State University (protocol #5798).

We explored 4 dependent variables in this study, all of which were measured with questions employing a 1–5 scale. Respondents were asked to gauge their agreement (1 = Strongly Disagree, 5 = Strongly Agree) with the statements 'I like coyotes' (*affect*), 'I support having wild coyotes in North Carolina' (*tolerance*) and 'Coyotes are an important part of nature in rural areas' (*nature*) as well as to indicate the level of acceptability (1 = Highly Unacceptable, 5 = Highly Acceptable) of 'Officials shooting coyotes' (*killing*). We measured respondents' gender (Are you male or female?), age (In what year were you born?), pet ownership (Do you own any cats or dogs?), and the size of the respondent's home town (Which of the following best describes where you spent the most time before the age of 18?: Rural Area [pop <10,000], Small Town [10,000–50,000], Large Town [50,000–250,000], Small City [250,000–1,000,000], or Large City [>1,000,000]). To facilitate testing for nonresponse bias, we also collected education data that were comparable to census data. We assessed whether the respondent possessed at least a 2-year college degree (What is the highest level of schooling–education that you have completed?). We did not include education in interaction models because literature did not suggest a likely interaction *a priori*.

Data Analysis

We conducted all analyses using JMP Pro 13 (SAS Institute Inc., Cary, NC, USA). We collapsed education and hometown size categories into binary variables describing whether respondents possessed a college degree (Associate's degree or above) and whether their hometown was rural (<10,000 people) or urban (>10,000 people). We created a hunting variable describing whether a response came from the mail survey (Nonhunting) or the e-mail survey (Hunting). To check for nonresponse bias, we compared demographic responses from the mail survey with 2014 American Community Survey 5-year estimates for all 4 study sites combined (US Census Bureau 2014). We compared e-mail responses with demographic data from 35 randomly selected nonrespondents from the original sample frame, who were administered an abbreviated version of the survey by phone. We used Pearson's chi-square tests of independence to compare gender, ethnic makeup, and proportion of college educated individuals, and used Student's *t*-tests to compare mean ages. We detected no differences between the e-mail survey respondents and nonrespondents ($P > 0.05$), but mail survey respondents were older and more likely than census averages ($P < 0.05$) to possess a college degree. To mitigate any latent sampling biases, we adjusted the probability weights of the mail survey data for age and college education rates to reflect census levels.

We constructed 16 ordinary least-squares models to explore the moderating effect of hunting on the relationship between gender, pet ownership, hometown size, and age and 4 response variables. Each model included a hunting term, a single socio-demographic term, and an interaction term. We created a model for every permutation of socio-demographic and response variables. We used a Holm–Bonferroni correction to adjust the significance levels of the interaction terms to account for multiple comparisons (Holm 1979; Table 1).

A male bias among hunters was expected given demographics of the hunting community in North Carolina, and this bias had the potential to confound tests of the interactions between hunting participation and other variables (Dalrymple et al. 2010). To evaluate this possibility, we replaced hunting participation in all significant models with the gender variable.

Table 1. Parameter estimates of interaction models in North Carolina, USA, from public surveys conducted during 2015. Models consist of the interaction between a demographic factor (gender, pet ownership, hometown size, age) and hunting with 4 response variables (*affect, nature, tolerance, killing*). To control for family-wise error rate within each of the 4 demographic groupings, we used sequential alphas of 0.013, 0.017, 0.025, and 0.05 and compared each *P*-value, in ascending order, to these thresholds.

Response	Model component	Standardized estimate	SE	*P*
1. I like coyotes (*affect)*	Female	0.044	0.045	0.332
	Hunting	−0.203	0.045	<0.001
	Female × Hunting	0.112	0.045	0.013
2. Coyotes are part of nature (*nature*)	Female	0.021	0.048	0.667
	Hunting	−0.220	0.048	<0.001
	Female × Hunting	0.135	0.048	0.005
3. I support coyotes in NC (*tolerance*)	Female	0.017	0.050	0.728
	Hunting	−0.264	0.050	<0.001
	Female × Hunting	0.064	0.050	0.201
4. Support for lethal control (*killing*)	Female	−0.184	0.047	<0.001
	Hunting	0.709	0.047	<0.001
	Female × Hunting	0.070	0.047	0.136
5. I like coyotes (*affect*)	Pet ownership	0.105	0.031	<0.001
	Hunting	−0.229	0.031	<0.001
	Pets × Hunting	−0.123	0.031	<0.001
6. Coyotes are part of nature (*nature*)	Pet ownership	0.133	0.034	<0.001
	Hunting	−0.293	0.034	<0.001
	Pets × Hunting	−0.038	0.034	0.254
7. I support coyotes in NC (*tolerance*)	Pet ownership	0.157	0.035	<0.001
	Hunting	−0.272	0.035	<0.001
	Pets × Hunting	−0.105	0.035	0.003
8. Support for lethal control (*killing*)	Pet ownership	−0.104	0.033	<0.001
	Hunting	0.735	0.033	<0.001
	Pets × Hunting	0.067	0.033	0.041
9. I like coyotes (*affect*)	Urban (*hometown*)	0.033	0.033	0.322
	Hunting	−0.303	0.033	<0.001
	Urban × Hunting	0.067	0.033	0.044
10. Coyotes are part of nature (*nature*)	Urban	0.149	0.035	<0.001
	Hunting	−0.316	0.035	<0.001
	Urban × Hunting	0.087	0.035	0.013
11. I support coyotes in NC (*tolerance*)	Urban	0.111	0.036	0.002
	Hunting	−0.336	0.036	<0.001
	Urban × Hunting	0.109	0.036	0.003
12. Support for lethal control (*killing*)	Urban	−0.089	0.034	0.009
	Hunting	0.714	0.034	<0.001
	Urban × Hunting	0.065	0.034	0.059
13. I like coyotes (*affect*)	Age	−0.406	0.075	<0.001
	Hunting	−0.289	0.028	<0.001
	Age × Hunting	0.157	0.075	0.038
14. Coyotes are part of nature (*nature*)	Age	−0.064	0.080	<0.001
	Hunting	−0.309	0.030	<0.001
	Age × Hunting	0.063	0.080	0.427
15. I support coyotes in NC (*tolerance*)	Age	−0.700	0.082	<0.001
	Hunting	−0.319	0.030	<0.001
	Age × Hunting	−0.080	0.082	0.330
16. Support for lethal control (*killing*)	Age	0.122	0.079	0.122
	Hunting	0.763	0.029	<0.001
	Age × Hunting	−0.262	0.079	0.001

If the new models retained significant interactions among pet ownership, home town size, or age, when gender was the moderating variable instead of hunter status, we concluded that a confounding relationship between hunting participation and gender was likely, requiring future research with larger samples sizes to address. Within the models directly exploring the interaction between gender and hunting participation, the small number of females within the hunter sample may lead to an increase of Type II errors. However, significant interactions were observed within 2 of these models, demonstrating that these models were effective despite having reduced statistical power.

RESULTS

Nonhunting urban respondents ($n = 856$, 15.3% response rate) were mostly male (55.4%), college educated (76.4%), and pet owners (65.4%). The majority were Caucasian (88.3%) and raised in urban areas (small town or larger, 76.2%). Mean age was 54.2 ± 16.1 (SD) years old. Hunters residing in urban areas ($n = 1{,}692$, 35.3% response rate) had a mean age of 46.0 ± 14.7 (SD) years and were predominately male (95.7%), Caucasian (95.2%), college educated (76.8%), pet owners (78.9%), and from an urban background (65.6%). Ninety-four mail survey respondents who

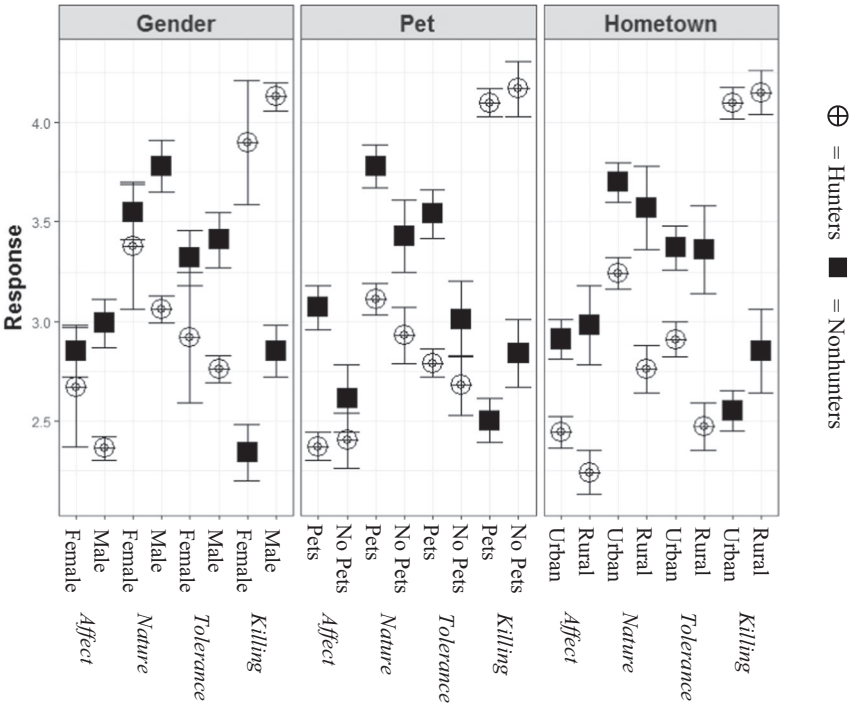

Figure 2. Mean responses to dependent variables with 95% confidence intervals by gender, pet ownership, and hometown size from surveys conducted in North Carolina, USA, during 2015. Hunters are given as crosshairs and nonhunters are given as solid squares. Responses are given on a 1–5 scale for 4 questions: *affect* = 'I like coyotes,' *nature* = 'Coyotes are a part of nature in rural areas,' *tolerance* = 'I support having wild coyotes in North Carolina,' and *killing* = 'How acceptable would officials shooting coyotes be?'

indicated they participated in hunting were removed from the sample. The male bias among hunters reflects results of previous studies involving North Carolina hunters (Dalrymple et al. 2010).

We observed significant interaction effects between hunting and socio-demographic factors in 7 of 16 models (Table 1). Hunting interacted with gender in 2 models; with pet ownership in 2 models; with hometown size in 2 models; and with age in 1 model. Male hunters had lower *affect* (2.36 ± 0.06) and *nature* (3.06 ± 0.07) scores than did nonhunters (2.99 ± 0.12 and 3.78 ± 0.13, respectively; Fig. 2), whereas hunting participation had no detectable influence on female *affect* or *nature* scores (Fig. 2). Although the main effect of gender was not significant for these 2 factors, the interaction was significant. The general directionality of gender differences was opposite between hunters and nonhunters, with *affect* and *nature* increasing with female gender among hunters and decreasing with female gender among nonhunters. Nonhunting pet owners scored higher on *affect* (3.07 ± 0.11) and *tolerance* (3.54 ± 0.12) than did non–pet owners, but pet ownership had no effect among hunters. Hunters from urban backgrounds had higher *nature* (3.24 ± 0.08) and *tolerance* (2.91 ± 0.09) scores than did hunters from rural backgrounds (2.76 ± 0.12 and 2.47 ± 0.12, respectively), whereas nonhunter perceptions did not vary in relation to rural versus urban upbringing (Fig. 2). Support for *killing* increased with age among nonhunters, with the opposite trend occurring among hunters (Fig. 3). Although the other interactions were not significant after the Holm–Bonferroni correction, they all mirrored the general trends seen in significant effects with hunting and socio-demographic variables interacting such that support for *affect, nature,* and *tolerance* declined among hunters, but support for *killing* increased. The male bias among hunters was not problematic for significant interactions that included gender (Table 1; Models 1 and 2), but potentially confounded significant interactions that did not include gender (Table 1; Models 5, 7, 10, 11, and 16). When we replaced hunting with gender in other significant models (Table 1; Models 5, 7, 10, 11, and 16), the interaction only remained significant for the pet ownership variable (Table 1; Model 5 [$P < 0.001$] and Model 7 [$P < 0.001$]). Gender and hunting participation could not be differentiated for models predicting *affect* and *tolerance* among pet owners.

Though not the central focus of our study, we noted numerous main effects within the model set. Within every model tested, there was a significant effect of hunting, with hunters having lower *affect, nature,* and *tolerance* scores and higher *killing* scores than did nonhunters. Among all respondents, women had lower support than men for *killing*. Pet owners had larger scores on *affect, nature,* and *tolerance* than did non–pet owners, and decreased support for *killing.* Respondents that grew up in an urban background had greater *nature* and *tolerance* and lower *killing* scores than did respondents with rural backgrounds. As respondent age increased, *affect, nature,* and *tolerance* all decreased.

DISCUSSION

Rational choice theory may explain why, among hunters, women had more positive emotional connections to coyotes

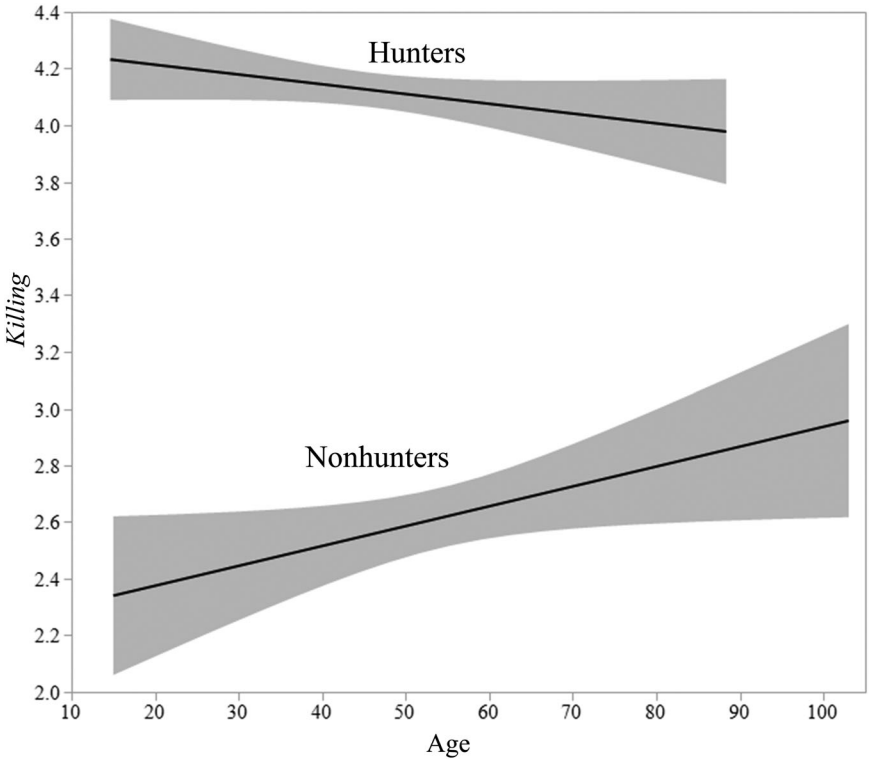

Figure 3. Mean responses to the *killing* variable with 95% confidence intervals by age, for hunters and nonhunters, from surveys conducted in North Carolina, USA, during 2015. Responses are given on a 1–5 scale for 'How acceptable would officials shooting coyotes be?'

and a greater belief that coyotes are a part of nature than men did. The opposite relationship existed for nonhunters; this positive relationship between male gender and carnivore perceptions has been established before (Dressel et al. 2015). Rational choice theory may help explain why gender operated in a different fashion among hunters (McLeod et al. 2015). Hunters engage in a series of costly preparatory actions (e.g., purchasing licenses, preparing equipment, and dedicating time) to facilitate the action of hunting and will negatively view anything that threatens this investment. When coyotes are believed to reduce prey populations, a commonly held viewpoint in the hunting community, coyotes become negatively viewed (lower affectual connection to coyotes and support for coyotes in nature) by hunters that are highly invested in hunting (M. D. Drake, unpublished data). Past research indicates that female hunters exhibit lower dedication to hunting than do males, and this reduced dedication may result in less extreme negative perceptions of coyotes among female hunters (Decker et al. 1984, Hansen et al. 2012). Although we did not detect interaction effects for how hunting may shape the relationship between gender and both lethal control of coyotes and support for coyotes existing on the landscape, future research with larger sample sizes of female hunters are needed to conclusively evaluate these relationships.

The utilitarian view of animals held by many hunters may explain the quantitative interaction between hunting and pet ownership, which was consistent with our hypotheses. The tendency for pet ownership to predict greater *affect* and *tolerance* scores among nonhunters supports the relationship identified by Bjerke et al. (2003) that pet owners generally liked wildlife more than non–pet owners did. However, the interaction expressed by pet-ownership not affecting scores among hunters may be explained by why hunters own pets. Nonhunters own pets primarily for companionship and value them as family members. In addition to these values, hunters may own pets to assist in hunting and value them for that utilitarian purpose (Beck and Meyers 1996). Hunters who do not hunt with their dogs may still possess the dominionistic and utilitarian views of animals that are prevalent within the hunting community, focusing on the practical value of pets or their ability to control animals (Peterson et al. 2009). Hence, pet ownership for hunters may not reflect a strong affectual connection to animals, as it is understood to in the general public (Kellert 1985).

Contrary to our hypotheses, our results only indicated differences between urban and rural respondents among hunters, which suggests that hunting participation may be a tie to rural areas that renders perceptions of coyotes more resistant to change after people move to urban centers. Specifically, hunting may promote cultural ties to rural areas, and 'rural' typology of perceptions of coyotes, when people move from rural to urban areas. Nonhunters from rural areas may more readily adopt the positive perceptions of carnivores that are prevalent in urban areas because they more readily adopt urban culture in general (Bjerke et al. 1998). Stedman and Heberlein's (2001) conclusions that rural individuals without a hunting father are more likely to participate in hunting than urban individuals without a hunting father suggests that hunting holds a more central

cultural role in rural areas than in urban areas. Similarly, Brandth's (2016) conclusions that hunting perpetuates intergenerational bonds in rural areas indicate the practice may represent an important tie to rural culture. Future qualitative research could explore the role hunting may play in making rural culture and associated perceptions of wildlife resilient among people migrating to urban areas. An age effect could serve as an alternate explanation to this relationship because respondents from urban backgrounds may have a lower average age than that of respondents from rural backgrounds. However, different significant interaction effects were noted in the hometown size and age models, suggesting that age is not driving both sets of models.

Multiple explanations exist for why support for lethal control of coyotes increased with age among nonhunters but decreased with age among hunters, as was hypothesized. First, this trend could be the result of a generational shift, reflecting older respondents, and hunters, being raised in a society focused more on 'Materialist' values of securing physical and material safety, and younger respondents being raised in a 'Post-Material' society focused on quality of life (Inglehart 2015). This explanation suggests older people, and hunters, may be more concerned with threats coyotes pose to material well-being. Second, this relationship could be due to a life-cycle effect, in which nonhunting individuals become more accepting of lethal wildlife management over the course of their life while hunters move in the opposite direction. In a study that noted a similarly negative trend in perceptions of wildlife with age, Manfredo and Zinn (1996) suggested a generation effect driving their results rather than a life-cycle one. It is difficult to determine which explanation best fits the general population, but declining support for lethal coyote management among older hunters warrants a closer look at life-cycle effects. The act of killing an animal may become less important to the hunting experience as hunters mature from 'achievement-motivated' hunters (i.e., hunting to meet a self-determined standard of performance) to 'appreciative-motivated' hunters (i.e., hunting to obtain a sense of peace, familiarity, or belonging; Decker et al. 1984, Purdy and Decker 1986). This life-cycle change is perhaps best described in Aldo Leopold's (1949) 'Thinking Like a Mountain' essay. Reflecting on a wolf hunt in his youth, Leopold laments that "I was young then, and full of trigger itch; I thought that because fewer wolves meant more deer, that no wolves would mean hunters' paradise." Finally, a latent relationship between hunting and gender may help explain the interaction if female respondents were more concerned about safety than were male respondents (Zinn and Pierce 2002). We, however, consider this unlikely because female respondents tended to be more tolerant of coyotes than were male respondents in this study.

This study highlights new depth and breadth in how hunting moderates relationships between demographic variables and public perceptions of coyote management. Based on these findings, we suggest a need to re-evaluate the treatment of hunting as an independent factor, autonomous from other socio-demographic variables (Kellert 1984, Ericsson and Heberlein 2002). Although we documented support for our initial hypotheses that hunting can moderate other variables' relationships, future research using aggregate measures of *affect, nature, tolerance,* and *killing* (vs. single item measures) would facilitate more rigorous and nuanced evaluation of the interaction effects. Future research is needed to differentiate between hunting participation and gender in interaction models predicting *affect* and *tolerance* among pet owners. Studies with gender stratified samples of hunters likely would ensure sufficient statistical power to disentangle hunting participation and gender in these 2 cases. Additionally, metrics accounting for hunter dedication and acculturation (e.g., years hunted, annual days spent afield) could be used to determine how the relationships identified in this study differ within the hunting community. Perceptions of wildlife, especially within the hunting community, are related to a web of factors that cannot be thought of in isolation. Instead, these perceptions are best understood through a combination of demographics, related behaviors, and interacting effects. Participation in hunting may change, or even reverse, the relationship between socio-demographic factors and perceptions of predators.

MANAGEMENT IMPLICATIONS

Our results can help wildlife managers more accurately access socio-demographic loci for support and opposition to several forms of coyote management by highlighting how hunting changes the way different groups approach coyotes and their management. For example, pet ownership was positively linked to positive attitudes toward coyotes, support for coyotes on the landscape, and opposition to lethal management of coyotes among the general public, but not among hunters. Thus, nonhunting pet owners may represent an important support group to engage in nonlethal management efforts. Conversely, older nonhunters may support policies and practices using lethal control of coyotes, but the core support for lethal coyote management among hunters likely resides among younger hunters. Given these interactions, outreach efforts associated with lethal coyote management may need to target entirely different age groups depending on whether hunters or nonhunters are affected and engaged. This study contributes to hunter recruitment, retention, and reactivation programs, by suggesting a heretofore neglected outcome of the programming: slowing the rapid change in wildlife-related preferences, attitudes, and values associated with rapid urbanization (Larson et al. 2014). Slowing these changes by maintaining or re-establishing hunting as a rural tie will not necessarily make wildlife management easier because some rural stances, such as lower acceptance of predators can be difficult to address, but it should help wildlife managers better keep up with changing stakeholder preferences (Kleiven et al. 2004). Further, our results suggest new avenues for human dimensions of wildlife research exploring how the moderating relationships of hunting extend to other taxa or geographic regions and whether moderating effects can be driven by additional wildlife related activities.

ACKNOWLEDGMENTS

Funding was provided by the North Carolina Wildlife Resources Commission through the Pittman–Robertson

Federal Aid in Wildlife Restoration Act. We thank anonymous reviewers and Associate Editor J. Hinton for constructive criticism and editing suggestions. We thank C. Burke, R. Valdez, M. McAlister, and J. Gough for their support on this project.

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Associate Editor: Hinton.