

SHORT NOTES

Perceived risks and coyote management in an urban setting

Carly C. Sponarski ^{1,*}, Craig Miller² and Jerry J. Vaske³¹Department of Wildlife, Fisheries, and Conservation Biology, University of Maine, Orono, ME 04469, USA,²Illinois Natural History Survey, Champaign, IL 61820, USA and ³Warner College of Natural Resources, Colorado State University, Fort Collins, CO 80523-1480, USA

*Corresponding author. E-mail: carlycs@maine.com

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Abstract

We used risk perceptions to understand the acceptability of nonlethal and lethal management of coyotes in an urban setting. We conducted a self-administered mail survey ($n = 1624$) of residents of the Greater Chicago Metropolitan Region during 2012 and examined the relationship between perceptions of risk and acceptance of different management strategies. Using cluster analysis we segmented respondents into three groups: (1) those who were not concerned about coyotes ($n = 536$), (2) those who were slightly to moderately concerned ($n = 424$) and (3) those who were extremely concerned ($n = 342$). Nonlethal management was the preferred response when a human or pet-coyote interaction happened once or more than once. There were significant differences among the risk perception clusters and management responses but all three favored nonlethal management regardless of the number of occurrences.

Key words: Greater Chicago Metropolitan Region, cluster analysis, human-coyote interaction, lethal management, risk perception, urban wildlife management

Introduction

Coyote (*Canis latrans*) populations have increased in many metropolitan regions in North America, from the Southwestern USA (Grinder and Krausman 2001; Riley et al. 2003) through the Midwest (Gehrt 2007) to the Northeastern USA and Canada (Way, Ortega, and Strauss 2004). Urban development has also increased at the same time as the increase in coyote populations. Increased coyote populations, coupled with range expansion, opportunistic behaviors and adaptive flexibility in terms of food and den site preference, have led to increased contact with humans (Timm et al. 2004; Gehrt 2007). From a human perspective, human-coyote interactions reflect a spectrum from positive, to nonthreatening (neutral) to negative (threatening). Negative human-coyote interactions can

include injuries to pets and people (Timm et al. 2004; Farrar 2007).

Traditional management tools for wildlife include trap and transfer, lethal removal, hunting or trapping. These approaches, however, may not be viable options in urban environments and the success of these methods vary by context. When public attitudes toward management strategies are understood and incorporated into decision-making, implementation of management plans is often more successful (Bruskotter, Vaske, and Schmidt 2009). Including public attitudes is especially important when the wildlife species (e.g. coyote) are perceived to be potentially dangerous to people.

Wildlife managers with the Illinois Department of Natural Resources wanted to understand public risk perceptions and management strategy preferences for coyotes in the Greater

Chicago Metropolitan Region (GCMR). This interest stemmed from increased reports of coyote sightings in the region (Bluett 2005, 2012). Reported complaints by residents have coincided with an increase in the coyote population (Gehrt 2004a, 2004b).

Risk perception

Risk perception is a subjective judgment of a potential risk made by individuals as opposed to an assessment by experts (Slovic 1993; Decker et al. 2010; Sponarski, Vaske, and Bath 2015). Two types of risk perceptions have been identified: (1) affective risk—feelings of trepidation or concern about potential hazards (Sjöberg 1998, 2000; Johansson et al. 2012) and (2) cognitive risk—the perceived probability of suffering injury or loss (Renn 1992; Weber et al. 2001). For our analysis we used affective risk, represented as fear of coyotes (Sjöberg 1998, 2000). Cognitive risk was not included due to questionnaire constraints and the needs of our collaborating government agency. Affective risk perception can often be related to a fear or phobia of a wildlife species and can directly influence how people want a species to be managed (Sponarski et al. 2016).

Acceptability of management

Human-coyote conflicts tends to be situation specific, can involve varying numbers of coyotes and people, occur on different landscape (e.g. backyards or city park) and vary in frequency and/or type. Given the types of scenarios in which humans and coyotes can interact we examined differences in acceptable management responses to hypothetical situations based on whether a scenario occurred once or more than once. The differences in number of occurrences were also compared with preferred responses given perceived risks.

Research questions

We examined the relationship between risk perceptions about coyotes and the acceptability of three management strategies (i.e. do nothing, nonlethal, lethal) given the human-coyote interaction occurring once or multiple times. We examined the following research questions:

1. Are perceptions of risk related to acceptable management strategies when certain human-coyote interactions occur once?
2. Are perceptions of risk related to acceptable management strategies when certain human-coyote interactions occur more than once?

Methods

We randomly selected 5000 single-family homeowners residing in the six counties (Cook, Lake, Du Page, Kane, Will and McHenry) comprising the GCMR. The GCMR is a 10860 mi² area with approximately 9.7 million people or 65% of Illinois' total population (U.S. Census Bureau 2012). We used Survey Sampling International (SSI, Inc., Shelton, CT) to select survey participants using residential property tax databases.

We mailed participants a cover letter, questionnaire and return postmarked envelope (questionnaire packet). Distribution of the questionnaire began during July 2012 and continued through December 2012. Approximately 10 days after the first mailing, we mailed nonrespondents a reminder postcard. We sent a second complete questionnaire packet to nonrespondents 1 month after the reminder postcard. We sent another reminder postcard to

nonrespondents 10 days following the second questionnaire packet. We sent a final questionnaire packet approximately 10 days later. Of the initial sample ($n = 5000$), 205 names were deleted due to incorrect addresses. A total of 1624 usable surveys were returned (response rate = 34%).

We conducted a telephone nonresponse survey of a random sample of 600 nonrespondents (26.8% response). No significant differences were noted between respondents and nonrespondents in terms of their demographic characteristics, perceived risks or beliefs regarding coyotes. Given this lack of difference, we did not weight the data.

Variables

We focused on 16 observed items, organized into two constructs: (1) risk perceptions (6 items) and (2) acceptability of management strategies (5 items, where an interaction with a coyote occurred once and 5 items, where an interaction with a coyote occurred more than once).

We measured perceived risks toward coyotes using six questions: "Because of coyotes, how concerned are you about ...". The scenarios were (1) being attacked by a coyote, (2) being injured by a coyote, (3) safety of children, (4) safety of pets, (5) contracting rabies and (6) disease transferred to pets. We examined relative responses to each of these variables using Pearson's bivariate correlation comparison. We measured all six risk scenarios on a unidimensional scale: not at all concerned (1–2); slightly concerned (3–4); moderately concerned (5–6) and extremely concerned (7–8).

We measured the acceptability of two types of interactions: scenarios where the human-coyote interaction occurred one time (five items) and scenarios where the same five scenarios occurred more than one time. The five management scenarios were (1) a coyote walks through your property, (2) you see more than one coyote on your property, (3) a coyote comes on your property when children are present, (4) a coyote chases your pet and (5) a coyote comes in your neighborhood when children are present. Response options for each of the scenarios were (1) I would not call and report, (2) managers say call back if coyotes stays more than 1 hour, (3) monitor situation but take no action, (4) post notice in area, (5) scare coyote away, (6) managers say supervise children and pets when outdoors and (7) trap and destroy coyote. Management response categories were collapsed into three categories: do nothing (1), nonlethal (options 2 through 6 above) and lethal (option 7 above).

Analysis

K-Means cluster analyses were used to segment the sample on the basis of (1) the six risk perception items, (2) the five management scenarios that occurred once and (3) the five management scenarios that occurred more than once. We ran 2, 3 and 4 cluster analyses to determine the best fit for the data for risk perceptions and the two management scenarios (i.e. interaction occurred once and more than once). We used the maximum likelihood chi-square test to examine the relationship between risk perception on the one time and multiple time management responses. We used Cramer's V for our effect size measure.

Results

Most (63%) respondents were not concerned about attacks or injuries by coyotes; however, safety of children and pets was of greater concern with proportionate percentages reporting

Table 1: Response frequencies for perceived risks from coyotes

| | Not at all concerned (%) | Slightly concerned (%) | Moderately concerned (%) | Extremely concerned (%) |
|--------------------------|--------------------------|------------------------|--------------------------|-------------------------|
| Attacked by coyote | 62.5 | 21.8 | 8.0 | 7.6 |
| Injured by coyote | 63.2 | 20.6 | 8.1 | 8.1 |
| Safety of children | 34.9 | 26.1 | 17.2 | 21.8 |
| Safety of pets | 34.8 | 22.7 | 18.2 | 24.4 |
| Contracting rabies | 49.2 | 17.9 | 12.8 | 20.1 |
| Disease transfer to pets | 44.6 | 18.4 | 14.6 | 22.4 |

Table 2: Pearson's correlation comparisons across risk perceptions

| | Attacked by coyote | Injured by coyote | Safety of children | Safety of pets | Contracting rabies | Disease transfer to pets |
|--------------------|--------------------|-------------------|--------------------|----------------|--------------------|--------------------------|
| Attacked by coyote | – | 0.974 | 0.693 | 0.553 | 0.683 | 0.615 |
| Injured by coyote | | – | 0.706 | 0.556 | 0.695 | 0.626 |
| Safety of children | | | – | 0.658 | 0.715 | 0.678 |
| Safety of pets | | | | – | 0.663 | 0.790 |
| Contracting rabies | | | | | – | 0.850 |

slightly and extremely concerned (Table 1). Pearson's bivariate correlation coefficients suggest that risk perceptions for an individual are similar across the six different risks, with perceived risks from threat of attack and injury showing closest association, followed by an association with disease transfer to pets and contracting rabies (Table 2). Of the 2, 3 and 4 group cluster analyses, the three-group cluster solution provided the best fit for segmenting respondents on the basis of their risk perceptions toward coyotes (Table 3). The first group was not concerned about coyotes in their neighborhood ($n=626$, 42%). Individuals in cluster 2 ($n=465$, 31%) were slightly to moderately concerned; respondents in the third cluster ($n=400$, 27%) were, for the most part, extremely concerned about coyotes across all risk perception items.

We used the same cluster analysis procedure for identifying segments of respondents supporting no action, nonlethal and lethal management responses. We performed separate analyses for human–coyote interactions that occurred once and more than once. The three-group cluster solution provided the best fit for segmenting respondents on the basis of their acceptance of different management strategies if a human–coyote interaction occurred once (Table 4). The three management clusters were do nothing ($n=916$, 67%), nonlethal management ($n=236$, 17%) and lethal management ($n=223$, 16%).

The two-group cluster solution provided the best fit for segmenting respondents on the basis of their acceptance of different management strategies for human–coyote interactions that occurred more than once (Table 2). The two management clusters were nonlethal management ($n=955$, 69%) and lethal management ($n=420$, 31%). 'Doing nothing' was an option for roughly 10% of the sample depending on the scenario. Due to this small proportion in the 'do nothing' category, the cluster analysis merged this group into the nonlethal management group.

We used chi-square to compare the risk perception clusters and the management response clusters (Table 5). We observed significant differences for both the occurred once scenario ($\chi^2 = 118.88$, $P < 0.001$) and the occurred more than once scenario

Table 3: Cluster solution for six perceived risks associated with human–coyote interactions^a

| | Cluster 1: Not concerned | Cluster 2: Slightly to moderately concerned | Cluster 3: Extremely concerned |
|-----------------|-----------------------------|--|-----------------------------------|
| Sample size (n) | 626 | 465 | 400 |
| Percent | 42 | 31 | 27 |

^aThe six perceived risk items were code: not at all concerned (1–2); slightly concerned (3–4); moderately concerned (5–6) and extremely concerned (7–8).

Table 4: Cluster solutions for two management scenarios: human–coyote interaction occurred once versus more than once^a

| Human–coyote interaction occurred: | Cluster 1: Do nothing | Cluster 2: Nonlethal control | Cluster 3: Lethal control |
|------------------------------------|--------------------------|---------------------------------|------------------------------|
| Once | | | |
| Sample size (n) | 916 | 236 | 223 |
| Percent | 67 | 17 | 16 |
| More than one time | | | |
| Sample size (n) | | 995 | 420 |
| Percent | | 69 | 31 |

^aThe one time occurrence scenario was a three-cluster solution; the more than one time occurrence was a two-cluster solution.

($\chi^2 = 91.31$, $P < 0.001$). In both the analyses, effect sizes were typical (Cramer's $V = 0.351$ and 0.265 , Vaske 2008).

If a human–coyote interaction occurred once, nonlethal was the most popular response for all three risk perception clusters (not concerned = 65%, slightly to moderately concerned = 72%, extremely concerned = 64%). Support for lethal control in situations where a human–coyote interaction occurred once

Table 5: Perceived risk clusters by two management scenarios: human–coyote interaction occurred once versus more than once

| Human–coyote interaction occurred: | Cluster 1: Not concerned, n = 536 | Cluster 2: Slightly to moderately concerned, n = 424 | Cluster 3: Extremely concerned, n = 342 | χ^2 | P-value | Cramer's V |
|------------------------------------|---|--|---|----------|---------|------------|
| Once | | | | 118.88 | <0.001 | 0.351 |
| Do nothing | 26% | 14% | 5% | | | |
| Nonlethal | 65% | 72% | 64% | | | |
| Lethal | 10% | 15% | 34% | | | |
| More than once | | | | 91.31 | <0.001 | 0.265 |
| Nonlethal | 81% | 69% | 51% | | | |
| Lethal | 19% | 31% | 49% | | | |

increased along the gradient of concern: 10% among the not concerned group, 15% for individuals slightly to moderately concerned and 34% among the extremely concerned group.

When presented with a situation whereby a human–coyote interaction occurred more than once, 81% of the not concerned group supported nonlethal management. The comparable percentages for the slightly to moderately concerned and extremely concerned clusters were 69% and 54%, respectively. Support for lethal control in situations where a human–coyote interaction occurred more than once was greater than the one-time scenario: 19% among the not concerned group, 31% for the slightly to moderately concerned group and 49% for those extremely concerned.

Discussion

Acceptable management strategies were related to an individuals' risk perceptions when coyote behavior occurred once. Respondents who perceived low risk from coyotes were more likely to prefer 'do nothing' or nonlethal management strategies. Acceptable management strategies were also related to perceived risks when coyote behavior occurred more than once. When an interaction took place more than once, perceptions of risk also increased and individuals were more likely to want management (lethal or nonlethal) instead of taking no action.

This research note highlights the difficult decisions managers face when addressing human–wildlife conflicts, as certain decisions (e.g. lethal control) may be acceptable to certain segments of the population yet objected to by others. This distinction is further complicated by the situational aspects of human–wildlife interactions. As shown here, one-time interactions may not compare with multiple interactions, and segments of the public may change their preferred management response given repeat occurrences. Managers often try to distinguish between one-time and multiple events; our findings reinforce the need for this determination.

Further, underlying perceptions of risks from a species may influence expressed preferences for management response. We show that perceived risks from coyotes may determine an individual's decision on what management response is acceptable to them. Although it is not practical for managers to determine individuals' risk perceptions in instances of human–wildlife interactions, being aware that people may hold perceptions of a species that is not based on biological facts is an important point for managers to realize, as it may strongly influence public acceptance for management response.

We recognize that in some respects the GCMR provides a unique study site to investigate perceived human–coyote interactions, as the Cook County Coyote Project has conducted

extensive public outreach efforts to mitigate human–coyote conflict (see, for example, Gehrt 2013). Although this project focuses exclusively on Cook County and our study involved Cook County as well as surrounding counties, it is reasonable to assume that information diffused from Cook to those surrounding counties. However, it is important to consider that individuals are selective in how they accept and perceive information. Those with negative beliefs regarding coyotes may reject messaging that portrays coyotes in a more positive or neutral manner, as accepting such messages may lead to a dissonant state. Therefore, although the Cook County Project may provide such information, it is not certain that it is received by those possessing negative beliefs toward coyotes. Further investigation is needed to determine what information is accepted by whom based on existing beliefs toward coyotes.

Human–coyote interactions will increase as both populations come into greater contact with one another. By examining how humans react to sharing urban spaces with coyotes, we can perhaps gain insight into human reactions with other species finding suitable habitat in our urban regions.

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