Citizen research of Chicago coyotes: a model program

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ABSTRACT

Urban coyote management is often a controversial issue. The recent increase in coyote density in metropolitan Chicago, Illinois, offered the opportunity to address this controversy by involving citizens in coyote research. To involve citizens, a total of 30 adult volunteers were recruited and trained. These volunteers then conducted of coyote diet research and population indexing, resulting in a scientific coyote diet study and improved indexing techniques. Changes in volunteer knowledge and opinions about coyotes and coyote management attributable to participation in the research were then measured. The results of the diet, indexing, knowledge and opinion research will be discussed in the context of evaluating the usefulness of citizen-based research as a conflict management tool in the field of urban wildlife management.

INTRODUCTION

In the mid-1970's, coyote (*Canis latrans*) density began to rise in Illinois (Hoffmeister 1989) and unconfirmed reports of coyote sightings in the Chicago area began at that time. Over the next 2 decades, a period when coyotes became established in many metropolitan areas in the United States and Canada (e.g. MacCracken 1982, Atkinson and Shackleton 1991), coyotes recolonized the Chicago metropolitan area. Today the Chicago area, coyotes are the subject of media attention, and a source of controversy.

Despite the challenges, ensuring that stakeholders are supplied with accurate, trustworthy information is especially important for Chicago area coyote management. First, there are many populations of endangered and threatened species in the area (Herkert 1994), as well as high quality remnants of rare natural communities such as tall grass prairie and oak savanna. The overabundance of whitetail deer (*Odicoileus virginianus*) is a threat to these populations and communities (Jones and Witham 1995). Since it has been demonstrated that coyote populations can reduce the population growth rate of whitetail deer (Teer et al. 1991), coyotes may be reducing the need for deer culling, and providing a safety cushion when culling is ineffective or partially effective.

In addition, the human/coyote interactions and coyote management decision processes will likely set a precedent for addressing controversy with other native predators that may eventually recolonized the Chicago area. And finally, the coyote is native to the Chicago area (Voigt and Berg 1987), and thus has intrinsic value to the natural communities and their restoration.

Recognizing the opportunity to address both the human dimension and the need to collect data, a three-pronged research project was undertaken. It entailed volunteer-based coyote diet research, volunteer-based population indexing, and a knowledge and attitude survey.

METHOD

Volunteer research assistants were recruited from The Nature Conservancy (TNC) volunteer pool, 2 local community colleges, and by word of mouth. The

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study sites were 13 publicly-owned natural areas and 1 TNC preserve in the 6-county metropolitan Chicago area.

Diet Study

Coyote diet was determined through scat analysis. Volunteers collected the scat from set trails at least once a month. Scat was stored frozen or refrigerated until analysis began, which was performed by the lead author. Total volume of each scat sample was measured by placing the scat in a plastic bag and measuring water displacement. Scat samples were placed in individual tight-weave stockings and washed in a dedicated clothes washer (Shargo 1988, Litvaitis et al. 1994) and dried in dedicated clothes dryer. Food items were then identified through macroscopic an microscopic examination and identification of the remaining hair, teeth, and bones using reference hair slides and skull keys, and the relative volume of each food item was estimated after washing (Gese et. Al. 1988; Atkinson and Shackleton 1991) using a graduated cylinder.

Population Indexing

Two methods were concurrently used. Both methods were based on standard methods and modified according to volunteer feedback and field experience. Surveys occurred in the fall (September and October) of 1995 and 1996, and the spring (March and April) of 1996 and 1997.

Scent Station Survey. The scent station survey followed the standard method (Linhart and Knowlton 1975; Berg 1985) with some notable exceptions. Scent stations were located 0.43 km apart alongside trails rather than roads. The number of scent stations was 1 – 4 per study site; starting in the fall of 1996, each scent station was given a "shadow station" with the shadow station placed within 30 meters of each original station. Station microlocations were restricted to relatively degraded areas to minimize disturbance to high quality vegetation. Modifications to the standard method were based on the small size of the study areas and volunteer time constraints, and to minimize volunteer and coyote roadside activity.

Volunteers were trained at their respective study sites for approximately 1 hour. Subsequent modifications and refinements to the method were communicated on printed instruction sheets and via telephone conversations. Volunteers built the scent stations and operated them for 2 consecutive days, and identified all animal tracks present at the station with the help of field guides.

Vocal Response Survey. The coyote vocal response survey was based on a combination of the coyote siren survey (Wenger and Cringan 1978; Okoniewski and Chambers 1984, Pyrah 1984) and the gray wolf (*Canis lupus*) howling survey (Harrington and Mech 1982; Fuller and Sampson 1988). Volunteers performed the vocal response surveys at their respective study sites using taped coyote lone howls broadcast by a wildlife-caller type cassette player as the stimulus. Volunteers were trained on the technique either at a group training session or at their respective study sites, and became familiar with the various coyote vocalizations. They recorded presence/absence of a response, categorized the number of coyotes responding, and identified the type of coyote vocalization (e.g. lone howl, bark, group howl) with the aid of a written guide.

Knowledge and Attitude Survey

To determine the effects of research participation on knowledge and attitudes, questionnaire surveys were mailed to 3 different groups (n = 210). The first group (n = 30) consisted of the volunteer coyote researchers (VCR). The second group (n = 90) consisted of a random block sample, weighted by location, of local TNC ecosystem restoration volunteers with a leadership role (TNCV). The third group (n = 90) considered of a random block sample, weighted by location, of the general public listed in the telephone directory (RGP).

A mail survey was chosen over telephone and face-to-face interviews to ensure the greatest anonymity and to increase the likelihood that social desirability bias, interviewer distortion, and subversion were avoided (Dillman 1978 pp. 63, 75). The total design method (Dillman 1978) was followed, including expert review. Several measures were undertaken to encourage a high response rate in the survey, including rewarding the recipient, reducing the costs and discomfort to the respondents, establishing trust, and follow-up with non-respondents (Dillman 1978 p.18; U.S. General Accounting Office 1993).

The survey included questions about coyote ecology and behavior, attitudes, and opinions concerning various coyote management options, and demographics including those factors identified by Kellert (1984) as important predictors of natural resource knowledge and attitudes.

RESULTS

Diet Study

An absolute pre-washing volume for each food item was calculated by multiplying the total scat volume with the measured post-washing relative volume; this assumes the post-washing volume is equal to the pre-washing relative volume. From this method, a total aggregate volume of each food item was determined. In terms of total aggregate volume,

the eastern cottontail rabbit (*Sylvilagus floridanus*) was the most common food item in the coyote diet, followed by whitetail deer and raccoon (*Procyon lotor*) (see Table 1). Several small mammals, birds, invertebrates, and vegetation were also found in the diet. Cat (*Felis catus*) comprised a portion of 1 scat sample, the aggregate volume of which was negligible.

Analysis of the seasonal variation of deer in the diet was made. Logistic regression analysis, weighted by volume, was used to test for significant differences ($p<0.05$) between seasons (see Table 2).

The amount of deer in diet was lowest in the fall (September, October, and November) and highest in the winter. All seasonal differences were significant.

Population Indexing

Population indices were calculated by multiplying the percentage of positive responses by 1000 (Linhart and Knowlton 1975; Berg 1985) (see Table 3). Indices can be compared within the same season and within the same method only. Both methods indicate the same population trends, but none of the changes were found to be significant. Chi-squared tests were conducted to compare the spring scent station indices; cell counts were insufficient to conduct tests on the remaining 3 sets.

Knowledge and Attitude Survey

Sample sizes were reduced by the number of recipients who could not be contacted by mail and follow-up phone call (Dillman 1978). Recipients who returned the survey blank or nearly blank, were considered non-respondents (see Table 4). Both the VCR and TNCV groups were at or above the typical 60 – 75% for mail surveys (Dillman 1978 pp.50-51).However, the RGP response rate was too low to accurately represent the general public; therefore, the RGP group is considered a sample of the responding general public only.

One-way ANOVA was used to test for differences in the level of coyote knowledge between groups. The effects of education, income, and size of resident municipality, which have been shown to have a significant effect on natural resource knowledge (Kellert 1984), were removed by including these factors as covariates in the ANOVA. Although Kellert (1984) also found significant differences between 2 races (black/African-American and white/Caucasian), differences between additional races were not tested for significance, Since there were more than the 2 races responding tot his survey, the effect on race on knowledge was not included as a covariate. Subjects who did not answer the covariate questions, and 2 subjects who appeared to accidentally leave 2 pages blank, were not included in the analysis.

The VCR group knew significantly more about coyotes than the other group (see Table 5). To determine the effect of the research participation on this knowledge, the VCR group was asked to self-rate "How much of the change in knowledge level (if any) is due to your participation in the coyote project?" The mean, median, and modal response was "a significant amount;" no subjects rated it lass than having a small effect.

Several attitude questions were asked in the survey. One-way ANOVA was used to test for significant differences. Because age, education, and size of municipality have been shown to have an important effect on natural resource attitudes (Kellert 1984) any linear effects of these factors plus gender were removed by including them as covariates prior to testing for significant differences.

When asked to rate the importance of various factors in making a coyote management decision, the VCR group rated "minimizing coyote suffering" significantly higher than the TNCV group (see Table 6). The VCR group rated "protecting coyote right" significantly higher than both TNCV and RGP.

Subjects were also asked to self-rate their change over the previous 5 years in attitudes toward coyotes and hypothetical management decisions. The VCR group did not have a significantly different change in the level of fear of coyotes than any other group (see Table 7). The VCR group did have a significantly higher change in the level of enjoyment of coyotes than both the TNCV and RGP groups. The VCR group had a significantly lower level of relative agreement to lethal management of a pet-killing coyote than RGP.

DISCUSSION

Diet Study

The fact that a lagomorph is the most prevalent food item in the diet of the Chicago area coyotes is found in other urban and non-urban coyote diet studies. The presence of deer in the diet at a similar percentage has also been found in other coyote diet studies in the Midwest (Ozoga and Harger 1966, Berg and Chesness 1978). In this study, the seasonal variation of deer in the diet suggests that the coyotes are primarily consuming winter-killed and winter-weakened deer, and fawns.

The amount of cat in the diet is low compared to other urban diet studies (Shargo 1988; Quinn 1992). This may indicate a lower free-roaming and feral cat population in the study area, which could be a result of earlier predation resulting in different behavior by cat owners or selection of indoor cats, and/or perhaps more severe winters than urban areas where cats are more prevalent in the diet.

Based on this study, scat can be collected and stored in a scientific manner by volunteer researchers. Volunteer recruitment and maintenance was relatively easy compared to population indexing.

Population Indexing

Based on experience from this study, volunteer researchers have greater need than professionals for flexibility as to when they can be active, and have additional time constraints in a given day or week. Also, volunteer interest waned without positive responses. Volunteers often interpreted a non-response as a flaw in the method or their delivery, despite assurances to the contrary. Furthermore, volunteers' time limits for a given survey, which could not be conducted at convenient times of the day, were apparent. Urban challenges include close neighbors who may not appreciate loud broadcast howls, and sites heavily used by stakeholders and their pets. These challenges and difficulties are reflected in the low number of data points collected.

The data indicate that the vocal response method has the highest indices in the fall, and the scent station method has the highest indices in the spring. One improvement to the current method is to use only the vocal response survey in the fall and only the scent station survey in the spring, since the data indicate this will maximize the positive responses. The use of camera traps and/or hair snares in combination with the scent disks might also be useful in maintaining volunteer interest and collecting more data for the same effort.

Knowledge and Attitude Survey

Several conclusions can be drawn from the information presented here. First, volunteer researchers do learn about coyotes and enjoy coyotes more through participation in research, without necessarily losing whatever fear of coyotes they had prior to participation. Volunteer researchers may be more supportive of "animal rights" and do not appear to moderate their opinions nor adopt the values of the lead researcher through shared research. In this care, however, the lead researchers and volunteer researchers were able to maintain a working relationship, despite differences in opinions and values. Consequently, shared research endeavors are oneway resource managers and non-traditional stakeholders can work together for a shared goal and in the process build relationships, and collect and distribute data prior to intense conflict.

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Table 1 - Chicago Area Coyote Diet

Food Item	Percent by Volume
Deer (Odicoileus virginianus)	19%
Rabbit (Sylvilagus floridanus)	43%
Vole (Microtus sp.)	5%
Mouse (Muridae)	1%
Woodchuck (Marmota monax)	1%
Squirrel (Sciuridae)	2%
Raccoon (Procyon lotor)	10%
Cat (Felis catus)	< 1%
Birds	2%
Insects	< 1%
Fruit	4%
Vegetation	4%
Other	< 1%
Unidentified	7%

Table 2 - Percent of Deer in Coyote Diet by Season

Season	Percent Deer
Winter[a]	23% (A)[b]
Spring	21% (B)
Summer	17% (C)
Fall	7% (D)

[a] December, January, and February; all seasons 3 months long.

[b] Letters indicate whether or not difference are3 significant ($p < .05$).

Table 3 – Summary of Population Indices (n)

	Vocal Response	Scent Station
Fall 1995	133 (15)	0 (20)
Fall 1996	250 (12)	50 (20)
Spring 1996	43 (23)	257 (35)
Spring 1997	32 (31)	120 (50)

Table 4 - Summary of Response Rates

	VCR	TNCV	RGP
No. of Responses	20	75	24
Modified n	29	88	73
Response Rate	69%	85%	33%

Table 5 – Number of Coyote Knowledge. Questions Answered Correctly [a]

Group	Mean (n)
VCR	8.35 (17) A [b]
TNCV	7.30 (64) B
RGP	5.47 (19) C

[a] Twelve possible.
[b] Linear effects of education, income, and size of municipality accounted for as covariates prior to testing for significant differences.

Table 6 – Importance of Factors in making a local coyote management decision.[a]

Minimize Coyote Suffering	
Group	Mean (n) [b]
VCR	4.47 (19) A [b]
TNCV	3.71 (68) B
RGP	4.00 (22) AB
All groups	3.90 (109)
Protect Rights of Coyotes	
Group	Mean (n) b
VCR	4.53 (19) A
TNCV	3.18 (66) B
RGP	2.82 (22) B
All Groups	3.35 (107)

[a] On a 5 point Liekert scale (1 is lowest, 5 is highest).
[b] Linear effects of age, education, size of municipality, and gender accounted for as covariates prior to testing for significant differences.

Table 7 – Self-rated attitude changes over the past 5 years[a]

Fear of Coyotes	
Group	Mean (n) a
VCR	3.00 (19) ABb
TNCV	3.04 (67) A
RGP	3.86 (22) B
All Groups	3.20 (108)
Enjoyment of Coyotes	
Group	Mean (n) a
VCR	6.33 (18) A
TNCV	5.31 (67) B
RGP	2.82 (22) b
All Groups	5.37 (105)
Level of agreement to Pet-Killing Coyotes	lethal management
Group	Mean (n) c
VCR	2.14 (19) A
TNCV	2.43 (68) A
RGP	3.24 (21) B
All Groups	2.54 (108)

[a] On a 7-point Liekert scale (1 is lowest, 7 is highest).
[b] Linear effects of age, education, size of municipality, and gender accounted for as covariates prior to testing for significant differences.
[c] On a 5-point Liekert scale (1 is lowest, 5 is highest).