Public Perceptions and Priorities on Human-Coyote Conflict in Vancouver, BC

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1. ABSTRACT

The presence of urban coyotes *(Canis latrans*) in urban environments has created many opportunities for human-coyote conflict, as habituation to humans and human food sources can lead to aggressive and threatening coyote behaviour. Effective management practices are fundamentally dependant on public attitudes towards coyotes, therefore it is important to research the human dimensions of coyote conflict. We created a survey to gauge public perceptions and priorities on urban coyotes in the Greater Vancouver Regional District, with the goal of obtaining recent public opinion data. Our survey findings highlight specific trends in public perceptions and priorities regarding coyotes in the Vancouver area, which may be used to inform CwC program directives as well as urban wildlife conservation management strategies. Survey results suggest a broader trend of increasing public support for management strategies that aim for coexistence with coyotes. Public awareness and education on coyotes has increased since 1997, and management strategies that focus on public education are well supported. Continued public outreach efforts that involve educating people on community-level hazing methods are recommended.

2. INTRODUCTION

2.1. Background on Urban Coyotes

The urban coyote *(Canis latrans)* is a highly adaptable, social and intelligent species that is well adapted to urban environments, despite frequent attempts of eradication by humans (Gehrt, 2004). They typically weigh around 9-16 kilograms and wear thick fur that varies from brown, black and grey. Coyotes were historically restricted to western and central regions of North America, but have managed to increase their range over time (Bozarth et al. 2011), and are now present throughout North America (Hody and Kays, 2018). Contrary to the popular belief that coyotes are 'urban pests', they have been shown to limit invasive species populations (Kays et al. 2015) and increase native species diversity (Silverstein, 2005), playing a significant role in local ecosystem function. Rapid urban expansion has inadvertently created widespread and suitable coyote habitat; ecological factors such as behavioural flexibility, generalist diet and social structure have allowed them to succeed in urban environments (Bekoff and Gese, 2003). The coyote's diet mainly consists of small rodents, with pets being very rarely eaten (Gehrt, 2006). Despite their ability to utilize urban areas while generally avoiding humans (Gehrt, 2006), the coyote's presence in a human-dominated environment presents many opportunities for conflict (Bateman and Fleming, 2012; Poessel et al. 2013). In fact, coyotes are usually very abundant in urban areas and go rarely noticed by humans; it is only when they are intentionally or unintentionally fed, that they become the 'urban pests' that are most often portrayed in news media (Gehrt, 2006).

When coyotes become habituated to humans and/or adapted to eating human food, they tend to show bold or aggressive behaviour towards humans and pets, such as stalking/following or

physical contact (Gehrt, 2006). The human-wildlife conflict, as defined in this paper, will refer to these negative interactions between coyotes and humans due to habituation.

2.2. Public Perception of Coyotes

It is important to research the human dimensions of coyote conflict because human food sources are sought after by coyotes (i.e. feeding directly, garbage, pets) and urban spaces can serve as coyote habitat (i.e. green spaces, clearing forested areas for development) (Webber, 1997). Effective wildlife conservation efforts are fundamentally dependant on acceptable management practices, which largely depend on public attitudes toward the particular wildlife species (Kellert et al. 1996; König et al. 2020).

Management strategies that focus on public education have been shown to be effective in preventing coyote-human conflicts (Gehrt, 2006). For example, education programs that inform residents of how to properly haze coyotes (i.e. condition them to fear or respond negatively to humans) can be an effective short-term technique to reduce coyote conflict in urban areas (Bonnell and Breck, 2017). However, urgent and recognizable threats to human safety - such as conflicts with habituated or aggressive coyotes - may warrant the need for lethal removal programs (Draheim et al. 2019; Gehrt, 2006). Lethal removal (i.e. killing coyotes, euthanasia) is often controversial and is generally an undesirable response to human-coyote conflict in terms of public opinion (Gehrt, 2006). In areas where coyotes are very well established, research has shown that lethal removal tends to result in population increases over time by limiting competition between remaining individuals (Crabtree, 1997). In addition, lethal traps, shooting and poisoning wildlife within urban areas, poses significant hazards to pets and children (SPES, 2009).

2.3. Study area / CwC program:

This study takes place in the Greater Vancouver Regional District (GVRD); an area that encompasses the Metropolitan Vancouver area and surrounding municipalities in the Lower Mainland, British Columbia, Canada. In the 1980's, the coyote's arrival in the GVRD began to create conflict as they adapted to the urban spaces, resulting in the attacks of pets and children (SPES, 2009). As a result of these public safety concerns, the Provincial government felt the need to deal with 'problem coyotes' in Vancouver. UBC Masters Student Kristine Webber, conducted a research survey in 1997 in the GVRD. Webber's survey was distributed with the goal of studying public perceptions of coyotes and other urban wildlife (SPES, 2009). Webber (1997) found that most people felt the desire to coexist with urban coyotes and that reliable and accurate information on coyotes was needed to inform management strategies. In 2001 the Co-existing with Coyotes (CwC) program was implemented by the Stanley Park Ecology Society (SPES). The program was created to develop a long-term approach to managing conflict between human, pets and coyotes. (SPES, 2009).

3. METHODS

3.1. Survey Objectives

The goal of our survey was to gauge public perceptions on coyotes in the GVRD, in order to inform management strategies and CwC program directives based on recent public data. Survey objectives were defined by the CwC program. Our survey was split into 4 main objectives: (1) revisit the results of Kristine Webber's 1997 survey that most inform the approaches of the CwC program, to see if and how public perceptions and priorities have changed; (2) analyse the

effectiveness of the implementation of CwC since 1997, and see if awareness and education has led to changes public perceptions and priorities; (3) see if pet owners have adapted their pet care routines with co-existence in mind; (4) assess public comfort, implementation and effectiveness of hazing coyotes. For objectives (1) and (2), perceptions and priorities were categorized into 6 different aspects: attitude towards coyotes and willingness to modify personal lifestyle or habits for co-existence; preferences between lethal or non-lethal methods to address "problem wildlife"; knowledge about agencies involved for wildlife response; nature of concerns towards coyotes; and the level of knowledge the public has about coyotes.

3.2. Survey Design

Our survey was designed and published using Qualtrics Survey Software. Survey design was directly informed by Webber's 1997 survey, as some questions were fully replicated in order to gauge differences in responses over time. Our survey consisted of 41 questions, which were divided into 5 blocks that reflected the 4 survey objectives and a separate block for demographic questions. The survey was anonymous and took around 10 minutes to complete. Most survey questions were either (yes/no) or used a 5-point Likert scale to measure subjective responses (i.e. levels of concern or agreement), and some questions contained a skip-logic that would defer questions based on certain responses. We generally avoided the use of open-ended questions, which resulted in the majority our data in a quantitative format. This was done to simplify the analysis of survey results.

3.3. Sampling and Distribution

Our survey distribution plan involved using online resources to spread the survey to GVRD residents. We chose to send our survey out to UBC faculties, share using social media platforms, contact relevant non-profit organizations to post the survey on their websites and respective social media, as well as contact all GVRD community centers to send the survey via email or online newsletter. We hypothesized that online distribution which centered social media sharing, would help maximize response rates, and that distribution through community centers would limit sample biases towards people who are educated and/or affiliated with wildlife conservation organizations. We designed a short summary paragraph that contained relevant survey information and the Qualtrics survey link, that could be shared on social media and other online formats which third-parties could easily share and distribute. As a result, our survey was posted in UBC email newsletters of the faculty of Land and Food Systems and the faculty of Forestry. We created Facebook and Instagram social media pages designed specifically to advertise the survey, and created posts which were then shared. 4 non-profit organizations shared our survey on social media and posted the survey on their website/blog. (The Furbearers, BC Wildlife Federation, Vancouver's The Wildlife Society, and Stanley Park Ecology Society). Unfortunately, we did not receive any responses from any GVRD community centers about survey distribution, therefore our survey did not reach any GVRD community centers.

The survey was published on March 22nd and closed on April 7th, 2021. A total of 306 responses were received and the resulting data was compiled and summarized using Qualtrics software and Microsoft Excel. Statistical summaries for survey data was collected using Qualtrics automatic data reports. Figures were generated using Qualtrics and Google Sheets.

4. RESULTS

4.1. Demographics

Our sample population (n=306) was evenly distributed by age, with 87% (n=260) of respondents being between the ages of 18-64. The majority of respondents had a bachelor's degree (39%, n=116) as their highest level of education. Most of our respondents self-identified as *Female* (74%, n=220), 23% (n=69) as *Male*, and 1% (n=4) as *Genderqueer/Non-Binary*. In terms of residency, 84% (n=248) of respondents have lived in Canada for more than 7 years.

4.2. Changes since Webber (1997)

Our first survey objective was to revisit the results of Webber's 1997 survey that most inform CwC program directives, to see if and how public perceptions and priorities have changed. In Table 1, we compared the results of specific questions taken directly from Webber (1997) to gauge differences between 1997 and 2021. We found that 99% (n=270) of our respondents were aware that there are coyotes in the Vancouver area, compared to 82% (n=184) in 1997. There was no meaningful change in willingness to modify lifestyles to maintain or enhance wildlife activity within the city, from 90% (n=68) in 1997, to 88% (n=239) in 2021. When respondents were asked what they believed to be the best method for addressing human-coyote conflicts, 16% (n=43) said relocation, 4% (n=12) lethal removal, 69% (n=185) said public education. Compared to 1997, where those choices were 44% (n=92), 8% (n=17) and 39% (n=82) respectively. The majority of comments we received regarding management methods were specific to Stanley Park, and some respondents felt passionately about removing coyotes entirely from this area.

In order to see how the public feels about using lethal control methods on coyotes and if public opinion changed since 1997, we asked if respondents would agree that the lethal

removal/killing of a coyote is an appropriate management strategy, for three different coyote encounters (Figure 1). We plotted respondent's level of agreement for each scenario on a 5-point Likert scale, ranging from *Strongly agree* to *Strongly disagree*. In general, we see that respondents tended to somewhat or strongly disagree with using lethal control methods for all of three coyote encounters mentioned.

We asked respondents to rate their level of concern regarding coyotes, for 4 different categories in regard to coyotes: personal safety, pet safety, children's safety, and property damage. We then plotted respondent's level of concern for each scenario on a 5-point Likert scale, ranging from *Very concerned* to *Not at all concerned* (Figure 2). Looking at the responses, we see for the most part, respondents were much less concerned with property damage, as 86.94% (n=233) were not very, or not at all concerned. We also see that respondents showed the highest levels of concern towards Pet Safety, where 61.11% (n=165) were very or somewhat concerned. In comparison: the 1997 survey did not find any significant differences in levels concern between the same 4 categories.

Table 1. Summary table comparing survey results for select questions, between the Webber 1997 survey and our 2021 survey. Results are shown in percentages.

Survey Question	1997 Survey	2021 Survey
Q7 - Are you aware that there are coyotes in the Greater Vancouver Regional District?	Yes = 82% (n=184)	Yes = 98.5% (n=270) No = 1.46% (n=4)
Q10 - Are you willing to modify or further modify your lifestyle to maintain or enhance wildlife activity within the city?	Yes = 90% (n=68)	Yes = 88.19% (n=239) No = 11.81% (n=32)

Q26 - Have you ever left food outside for your animal/pet?	Yes = 20% (n=74)	Yes = 5.38% (n=5) No = 94.62% (n=88)
Q19 - What do you believe is the best method for addressing human-coyote conflicts?	Relocation = 44% (n=92) Lethally Remove = 8% (n=17) Education = 39% (n=82) Other / Combination = 9% (n=20)	Relocation = 15.93% (n=43) Lethally Remove = 4.44% (n=12) Public Education = 68.52% (n=185) Other = 11.11% (n=30)

Would you agree that the lethal removal/killing of a coyote is an appropriate management strategy for each of the following encounters?

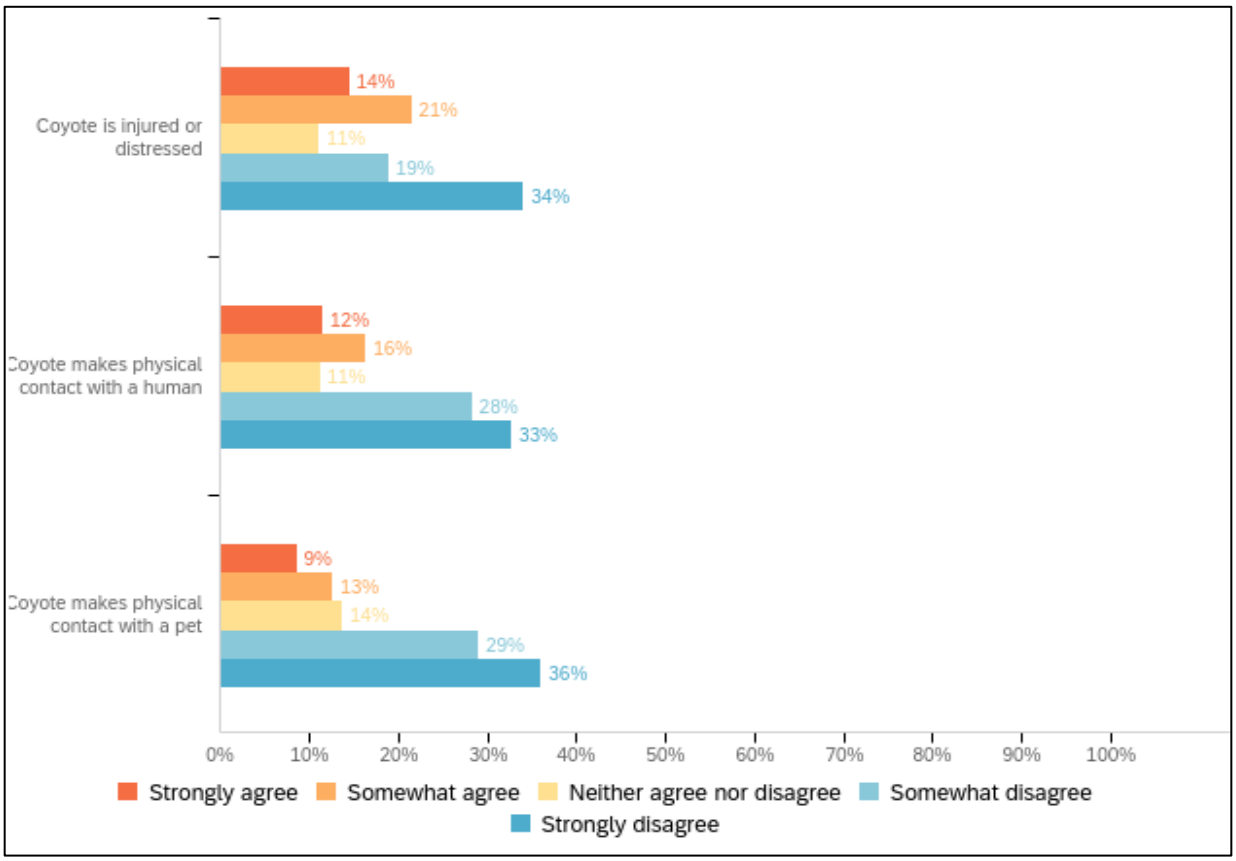

Figure 1. Responses from survey question #20: Levels of agreement with the statement: "lethal removal/killing of coyotes is an appropriate management strategy" for encounters of coyotes that are injured or distressed, coyotes that have physical contact with humans and coyotes that have physical contact with a pet. Agreement levels were rated on a 5-point Likert scale: 'Strongly agree, 'somewhat agree', 'neither agree nor disagree', 'Somewhat disagree' and 'Strongly disagree'.

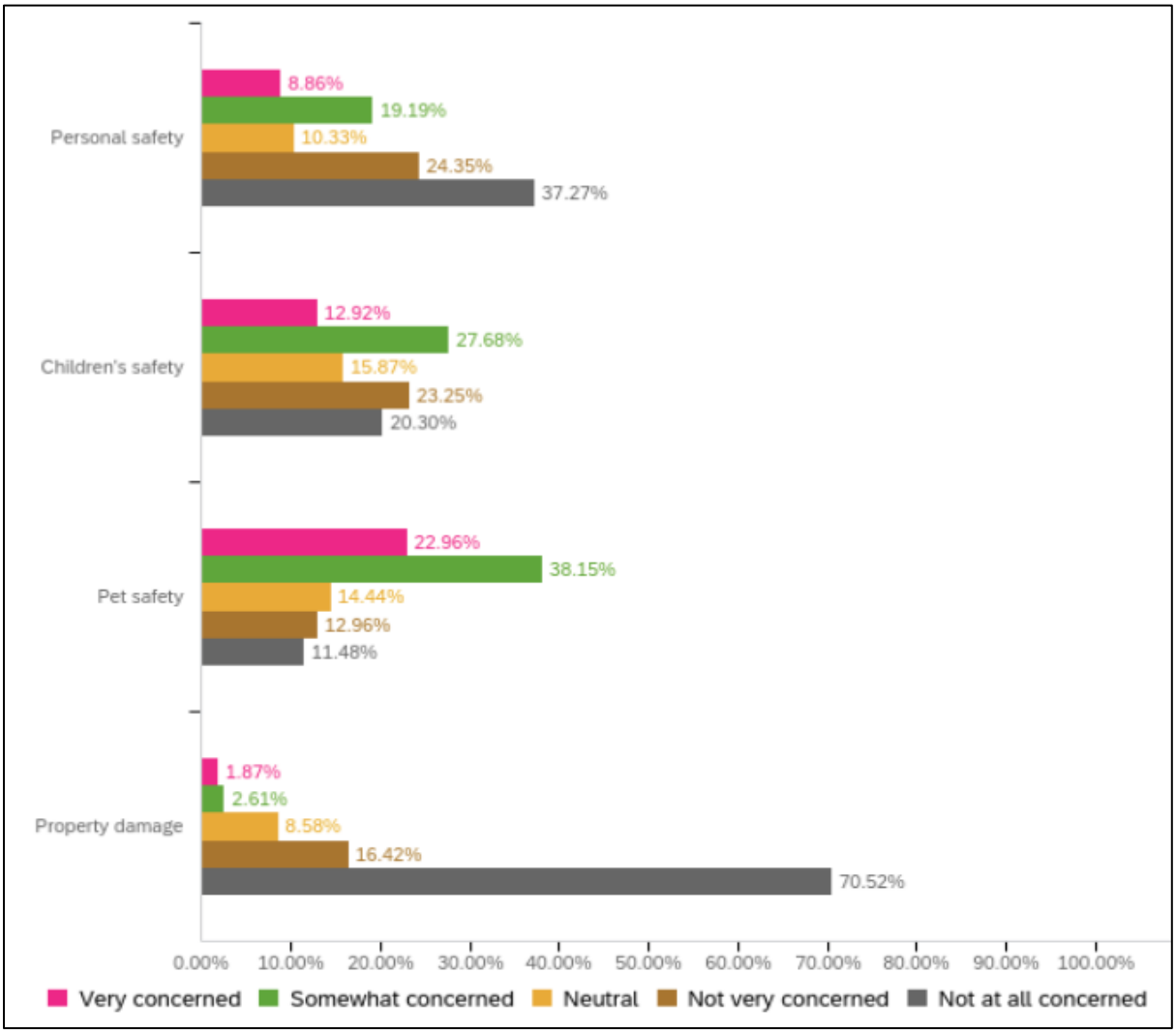

Figure 2. Responses from survey question #9: levels of concern towards coyotes, in regard to 'Personal safety', 'Children's safety', 'Pet safety', and 'Property damage'. Concern levels were rated on a 5-point Likert scale: 'very concerned', 'somewhat concerned', 'neutral', 'not very concerned' and 'not at all concerned'.

4.3. Effectiveness and Implementation of CwC

Our second survey objective was to analyse the effectiveness of the implementation of the CwC program since 1997, to see if education has led to changes public perceptions and priorities. We asked respondents questions that would gauge awareness and education in terms of CwC program information. 57.51% (n=255) of respondents said they had gained information or education from social media (28%, n=120) or the CwC program (29%, n=125) on how to coexist

with coyotes and/or act during coyote encounters. When asked, hypothetically, if they were to see a coyote in the GVRD, most respondents said that they either do not report coyote sightings (57%, n=153) or were unsure of how to report sightings (26%, n=70). In addition, 73% (n=198) of respondents have received information or education on how to coexist with coyotes and/or act during coyote encounters. Roughly half (54%, n=27) of respondents said they always or mostly keep their garbage locked/inaccessible to wildlife once placed outside. The vast majority of respondents (97%, n=261) said they never directly feed or leave food outside for urban wildlife. In terms of agencies to which they would report wildlife sightings, half of respondents (50%, n=34) said the CwC program. Choices such as the City of Vancouver (18%, n=12) and the Report all Poachers and Polluters (RAPP) line (16%, n=11) were also noteworthy.

4.4. Pet Owners

Our third survey objective was to see if pet owners have adapted their pet care routines with co-existence in mind. Of the 93 respondents that said they have pets: most people (72%, n=67) reported to have made adaptations to their pet routines in consideration of urban coyotes. The majority (73%, n=68) of respondents don't allow their pets to go outside without supervision, and also don't leave food outside for their pets (95%, n=88). During the day, 50% (n=46) of respondents let their pets off leash during walks. On the other hand, at night, only 9% (n=8) of pet owners that walk their pets let them off leash.

4.5. Coyote Hazing

Our fourth and final objective was to assess public comfort, implementation and effectiveness of hazing coyotes. Most respondents (66.0%, n=186). said they have never tried to

scare off a coyote (i.e. hazing). Of the respondents that said they have hazed a coyote, 85% (n=82) of respondents said that the coyote left the premises afterwards. Only 11% (n=11) did not leave and 4% (n=4) answered that the coyote left, but for reasons other than hazing. 80% (n=227) of respondents said they would be somewhat or extremely comfortable practicing hazing methods on coyotes.

If you saw a coyote, how comfortable would you feel practicing hazing methods?

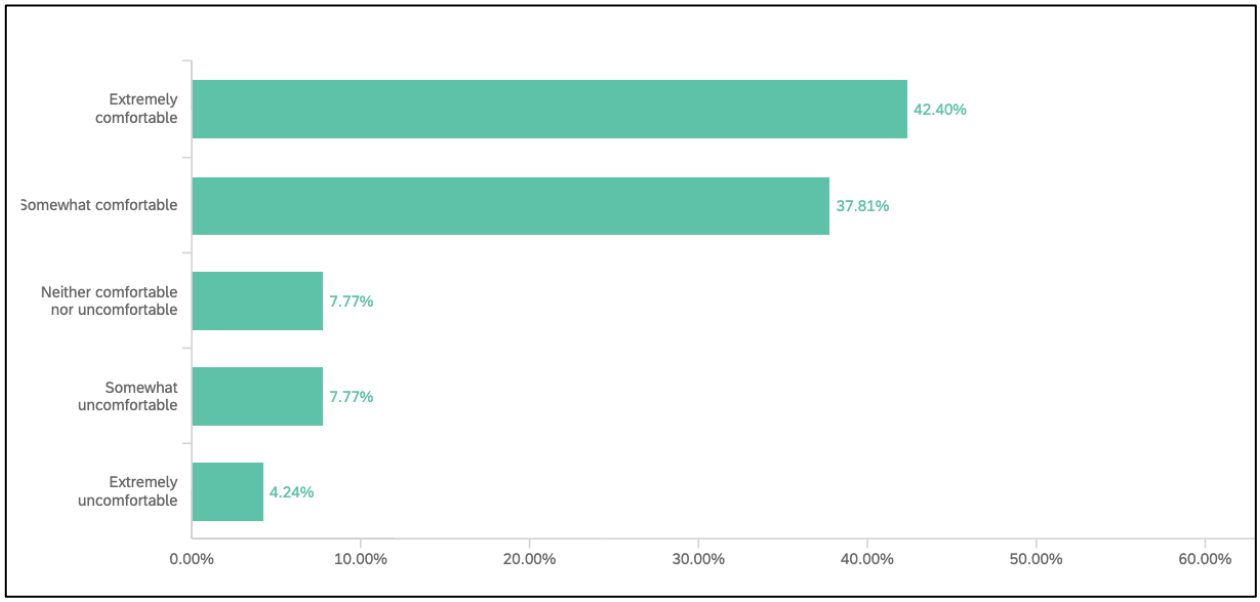

Figure 3. Responses from survey question #27 Levels of respondents' comfort in using hazing methods on coyotes. Comfort levels are on a 5-point Likert scale: 'Extremely comfortable' (42%, n= 120), 'Somewhat comfortable' (38%, n=107), 'Neutral' (8%, n=22), 'Somewhat uncomfortable' (8%, n=22), and 'Extremely uncomfortable' (4%, n=12).

5. DISCUSSION

5.1. Revisiting Survey Objectives

In comparing our results to the 1997 survey, it looks like there is broader trend of public support for management strategies that aim for coexistence. Perceptions of coyotes in the GVRD may have

changed, since nearly all respondents we surveyed were aware of coyotes within the Vancouver area; a noteworthy increase from 1997. This may have been the result of a combination of recent news media coverage of coyotes as well as public outreach from the CwC program. Since 1997, there was a notable shift in GVRD residents preferred management methods for dealing with aggressive coyotes, from relocation to public education. This indicates that management strategies that have a specific focus on creating coexistence between coyotes and GVRD residents may be more preferential in terms of public opinion, which fits into the broader trend of the public support for management methods that avoid lethal control (Gehrt, 2006; Webber, 1997). Our survey results also highlighted a small shift in priorities since 1997, regarding the nature of concerns towards coyotes, as more people showed concerns about pet safety and less about property damage. This change was supported in survey comments, where respondents frequently mentioned safety concerns regarding their pets, specifically when walking dogs in parks and forested areas. In terms of future research, it would be helpful to know how public education initiatives could better address pet safety concerns in particular, and tailor information specifically to pet owners.

It caught our interest to see that most respondents said they were getting information on coyotes through social media or from the CwC program directly. It makes logical sense that social media would play a big role in how people are getting information on coyotes, and it is good to see that social outreach is having a significant impact; GVRD residents seem to be well informed about how they can modify their habits and lifestyles with coyotes in mind. If CwC program information is reaching the public directly, an increased social media presence could help distribute information to a larger audience and therefore increase public awareness (Cockerill et al. 2013; Wu et al. 2018). However, increasing social media presence may not prove to be effective in reaching an audience that is more representative of the GVRD population. Therefore, alternative

methods for public outreach may need to be explored. Yet it is important to note that the majority of respondents said they do not report or do not know how to report coyote sightings, which tells us that people may not be acting upon this information. In other words, people may receiving information, but may not necessarily be using it to inform their actions.

Most of the pet owners that took our survey were generally aware that there are coyotes in GVRD. For the most part, it looks like GVRD residents have adapted their pet routines accordingly. Most pet owners are taking specific actions to ensure pet safety with coyotes in mind, such as: only allowing pets to go outside with supervision, not leaving food outside for their pets and rarely letting pets off leash while walking at night. Since our results highlight a general trend of awareness and education among pet owners in the GVRD, management strategies may want to focus on enforcing proper pet safety routines in areas such as Stanley park, rather than educating pet owners.

In terms of public comfort and implementation of hazing, broad support for hazing education initiatives and willingness to partake in hazing education suggests that more social outreach which focuses on hazing education could be well received by the public. Of the respondents that had reported using a hazing method on coyotes, the results were predominantly effective. These findings exceeded our expectations in a very positive way. If there is broad public comfort with hazing and support for hazing education, future public outreach initiatives from the CwC program could focus on the use of specific hazing methods to use in coyote encounters.

5.2. Study Limitations

Like with any survey, there are always going limitations to what we can definitively say about trends in public opinion highlighted in our survey. We took a small sample (306 respondents) of

the GVRD population, and that sample is not necessarily representative of the entire population. Since we distributed the survey mostly through UBC, SPEC, and other non-profit organizations in wildlife conservation, our sample was likely pretty well educated on coyotes. Furthermore, our survey contained questions required respondents to how they would act in hypothetical scenarios and used Likert scales for responses, which meant that some answers were entirely subjective. Despite the survey being anonymous, it is still possible for respondents to answer dishonestly to some questions. Therefore, the discussion of our survey results are mostly speculative. Future research could test statistical significance of our survey results, especially in comparison to Webber (1997) survey findings.

5.3. Management Implications

Our survey results highlight specific trends in public perceptions and priorities regarding coyotes in the GVRD, which may help inform future coyote management strategies and CwC program directives. Given our results, we suggest that general management strategies should avoid lethal control and relocation methods whenever possible, as there is growing public support for education initiatives as an alternative. In terms of public education initiatives, we suggest that an increase of CwC program information on social media may be effective at reaching a larger audience, as social media was shown to be the source of most information received by our survey respondents. In addition, alternative methods for public outreach such as more signage in the Vancouver area, especially Stanley Park - which specifically addresses the actions and precautions pet owners need to take when in these areas – may help reach GVRD residents who do not receive information online or through social media. Moreover, public educational material that focuses on hazing methods would likely be effective in educating GVRD residents on how to act during

coyote encounters. This could be implemented through social media or signage as well. Lastly, we suggest that creating policies or enforcement that holds people accountable for their actions regarding coyotes may help ensure that public outreach from the CwC program and other sources is leading to changes in the way people interact with the city in consideration of coyotes and other urban wildlife.

6. CONCLUSION

We created a survey to gauge public perceptions on coyotes in the GVRD, with the goal of obtaining recent public opinion data following the implementation of Kristine Webber's 1997 survey. The results of our survey highlight specific trends in public perceptions and priorities regarding coyotes in the GVRD, which may be used to inform CwC program directives as well as urban wildlife conservation management strategies within the GVRD. We found that public awareness and education on coyotes has increased since 1997, and priorities are becoming more focused on management strategies that involve public education. Public outreach that focuses on pet owners and involved educating people on community-level hazing methods is recommended. The CwC program has been effective at increasing public awareness of coyotes in the GVRD, and should continue with public outreach efforts.

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