

# Coyote Attacks on Humans in the United States and Canada

LYNSEY A. WHITE AND STANLEY D. GEHRT

School of Environmental and Natural Resources, Ohio State University,  
Columbus, Ohio, USA

*Coyotes (Canis latrans) have expanded their range across much of North America and are now established in many metropolitan areas. Their presence in urban areas has often elicited concern from the public, although the actual risk that they pose to human populations is unclear. We conducted an analysis of coyote attacks on humans in the United States and Canada, including 142 reported incidents of coyote attacks resulting in 159 victims. Most attacks were classified as predatory (37%) or investigative (22%) in nature. The number of reported attacks was nearly equal between adults and children, although child victims were more ( $p < .001$ ) prevalent in predatory attacks. Future coyote attacks could be reduced or prevented through modification of human behavior and public education designed to prevent the habituation of coyotes. A standardized reporting system for coyote attack incidents would be beneficial for further investigating characteristics of coyote attack incidents.*

**Keywords** attack, carnivore, conflict, coyote, habituation

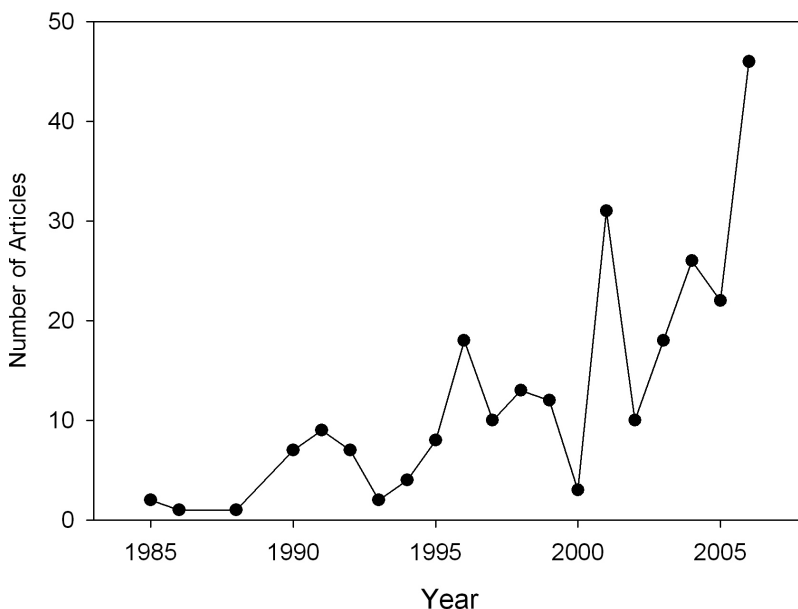
Conflicts between large carnivores and people have occurred throughout human history, including attacks by carnivores on people resulting in injury and death. Lion (*Panthera leo*) attacks in Tanzania, tiger (*Panthera tigris*) attacks in the Sundarbans, and brown bear (*Ursus arctos*) attacks in North America and Asia are causes of concern and are well documented (Jackson, 1985; McDougal, 1987; Sanyal, 1987; Løe & Røskoft, 2004; Packer, Ikanda, Kissui, & Kushnir, 2005). With the extirpation of wolves (*Canis lupus*), bears, and other large carnivores from many portions of the United States, however, large carnivores have been absent in most urban landscapes in the United States until relatively recently. Today, changing landscapes and the ability of some carnivores to adapt to urbanization has led to the establishment of certain medium-to-large carnivores, such as coyotes (*Canis latrans*), in urban and suburban areas (Gompper, 2002). Increasingly, humans in many urban and suburban areas are living in close proximity to coyotes. What is unclear, however, is the level of threat that these carnivores pose to human health and safety.

This research was supported by Cook County Animal and Rabies Control, directed by Donna Alexander, and the Max McGraw Wildlife Foundation. We thank the many wildlife officials that assisted in our research, and extend a special thank you to B. Henry, W. Bradford, R. Fink, and R. Worcester for providing records of attacks. The article benefited from the comments of Jeremy Bruskotter and two anonymous reviewers. We are especially thankful for the support by Dan Parmer, deceased.

Address correspondence to Lynsey A. White, School of Environment and Natural Resources, 210 Kottman Hall, Ohio State University, 2021 Coffey Road, Columbus, OH 43210, USA.  
E-mail: lywhite@gmail.com

Coyotes have dramatically expanded their range, and are now found in more metropolitan areas across North America than ever before (Gompper, 2002). In many of these areas they are the largest (12–15 kg) resident carnivores, and their relatively new presence often elicits strong reactions from the general public. Sightings of coyotes in residential neighborhoods and occasional attacks on domestic pets by coyotes are frequently reported by the media and create or reflect escalating concern from the public. For example, in the Chicago metropolitan area, which has recently been populated by a growing number of coyotes (Gehrt, 2004), newspaper articles concerning human–coyote conflicts have increased over twenty-fold since the 1990s (Figure 1). Perhaps as a result, homeowners in the Chicago metropolitan area have ranked coyotes as the wildlife species perceived as the greatest threat to human health and safety (Miller, Campbell, Yeagle, & Colligan, 2001), despite that there have not been any verified coyote attacks on humans within the Chicago metropolitan area to date. The situation in the Chicago area is probably typical of most metropolitan areas with recently established coyote populations.

Previous reviews of coyote attacks on people have suggested that the frequency of coyote attacks on people has increased in recent years (Baker & Timm, 1998; Timm, Baker, Bennett, & Coolahan, 2004). Although these reviews have provided useful information regarding human–coyote conflicts, they have been limited in scope and analysis. Past reviews of coyote attacks have focused on attacks in California (Howell, 1982; Baker & Timm, 1998; Timm et al., 2004) or within national parks in Canada and the northwestern United States (Carbyn, 1989; Hsu & Hallagan, 1996). These reviews have provided few analyses of victim demographics, seasonality of attacks, and none concerning the behavior of both the victims and coyotes prior to, during, and after the attack. Identifying patterns in the details of coyote attacks is essential for developing effective methods to reduce human–coyote conflicts.



**Figure 1.** Annual number of articles published ( $n = 292$ ) in major Chicago-area newspapers concerning human–coyote conflicts during 1985–2006.

In this analysis, we quantified coyote attacks on people to ascertain characteristics of coyote attacks and to determine victim demographics in relation to types of attacks. We also categorized the nature of coyote attacks and assessed whether important patterns occur (regarding seasonality, type of victim, time of day, etc.) among types of attacks. We believe this contextual approach provides a better understanding of the nature of coyote attacks on people and sheds more light on the relationship between coyotes and people in urban areas than currently exists.

Our specific objectives included determining whether attacks varied by season and type of attack, quantifying victim demographics, and determining possible relationships between attack types and victim classes. In addition, we determined the types of locations where attacks took place, and additional circumstances associated with incidents (e.g., wildlife feeding).

## **Methods**

Identifying an attack by a coyote can be problematic. The word “attack” is used by the public, popular press, and wildlife professionals to include a wide variety of interactions between people and coyotes, including incidents such as a close-range coyote sighting in a residential neighborhood or the attack of a domestic pet in the presence of its owner (Fox, 2006). Previous reviews of coyote attacks have used broad definitions of the word “attack” to include incidents in which victims were either not injured by a coyote (e.g., stalking) or injured themselves while trying to rescue a pet from a coyote (*sensu* Baker & Timm, 1998; Timm et al., 2004). We chose to use a relatively conservative definition of a coyote attack for the following analyses. We define a coyote attack as an incident between a coyote and a person that results in a bite to the victim. We recognize that this conservative definition may exclude aggressive incidents that did not result in a bite, but our experience is that non-bite incidents are difficult to interpret, particularly when reported by a general public not familiar with coyote behavior. In these instances, it is difficult to determine the intent of the coyote and the true threat to the human involved. By only classifying incidents resulting in a bite to the victim, we feel that we are using the least subjective interpretation of events regarding the most extreme type of conflict between coyotes and humans.

We initially collected reports of coyote attack incidents by surveying databases of newspaper articles. We located most reports through the newspaper database LexisNexis Academic, but also used the databases America’s Newspapers and Newspaper Source. A Web search (Google News Archives) was effective for identifying the names and location of additional articles on coyote attacks, especially for older incidents. Newspaper articles containing coyote attack records that were identified by Google News Archives were then obtained through LexisNexis Academic or the local library of the newspaper source. We experimented with a variety of keywords when searching, including: “coyote attack,” “coyote bite,” and even simply “coyote.” After determining that the phrase “coyote attack” was most effective for finding incidents resulting in bites, we used this word combination in all searches.

Although surveys of media accounts have been useful for evaluating wildlife attacks on people for other predators (e.g. Beier, 1991; Langley, 2005), we acknowledge that the use of media articles presents limitations. We were limited by the availability of newspaper articles within newspaper databases (especially among articles older than 10 years), as well as the amount and quality of details in the articles that we located.

We also collected reports from published literature with listings of coyote attacks in California (Howell, 1982; Timm et al., 2004) and in national parks in the northwestern

United States and Canada (Carbyn, 1989; Hsu & Hallagan, 1996). We attempted to verify media reports not present in professional papers by contacting representatives from state wildlife agencies and USDA-APHIS Wildlife Services for each state in which a coyote attack incident was reported. We asked representatives from these agencies to both verify the details of incident reports that we had located and to provide details of additional attacks in their state, if possible. In addition, we inquired about the health of the coyote and the presence of wildlife feeding in the neighborhood of the attack. However, a lack of standardized record-taking of attack incidents in many states hindered our ability to gather this information.

For each reported attack incident, we attempted to record the following characteristics: location, date, time of day (day or night), age and sex of victim, type of area in which the attack occurred (residence, park, etc.), and results of rabies tests. We classified victims as children if they were 10 years old or younger. When available, we also recorded descriptions of the activities that victims were engaged in prior to the attack, as well as their actions during the attack. This information in particular may be helpful for both preventing attacks in the future and for identifying effective human responses to interactions with coyotes when they do occur (Löe & Röskaft, 2004; Langley, 2005). Although not used in analyses, we also recorded severity of the injury because in some cases this helped interpret the nature of the attack.

To determine if coyote attacks varied in frequency during the year, we pooled data across years and partitioned the annual period into three seasons corresponding to major biological phases: breeding (January through April), pup-rearing (May through August), and dispersal (September through December) seasons (adapted from Laundré & Keller, 1981). Similarly, we partitioned data into diurnal and nocturnal periods to determine if frequency of attack varied with time of day. We classified incidents as “daytime” attacks if they occurred during morning or afternoon hours (prior to 1,700 h local time) and as “nighttime” attacks if they occurred during evening hours (after 1,700 h local time) and early morning hours prior to sunrise. In some cases, specific times were not reported for incidents, but were described as occurring during morning or afternoon (classified as daytime) or evening (classified as nighttime).

For incidents with sufficient information, we classified each attack into 1 of 5 categories: rabid, predatory, investigative, defensive, and pet-related. These categories were adapted from Linnell et al. (2002) and were based on factors associated with the actions of both the victim and coyote prior to and during the attack, as well as the extent and type of injuries sustained by the victim.

In the rabid category, we only included cases that reported the offending coyote tested positive for rabies. Thus, this category includes only incidents in which the coyote responsible for the attack was successfully identified, captured, and tested positive for rabies, and the lab result was reported in the record (or subsequent media articles).

We defined predatory attacks as instances in which a coyote directly and aggressively pursued and bit a victim, causing multiple or serious injuries (often to the head and/or neck). These cases were typified by coyotes running straight to the victim and maintaining an attack even after being discovered by the victim. Cases in which the coyote bit the victim in the head or neck and attempted to drag them away were classified as predatory attacks. Predatory attacks also included those in which a victim was attacked by a pair or a pack of coyotes. In predatory attacks, injuries were usually more severe than other cases and the victims and/or bystanders had to exert considerable effort to stop the attack.

Investigative attacks were defined as those in which a particular coyote has become accustomed to people and “tests” the victim as a possible prey source. This category

includes incidents in which the victim was immobile, either sleeping or resting, and was bitten on an extremity. Investigative attacks also include incidents in which a coyote attempted to steal an item from a person (such as a lunch pail or sleeping bag) and was startled when the victim responded or awakened from sleep. In these instances, injuries usually consisted of minor wounds to the extremities, and the offending coyote was usually scared away by the victim or bystanders with little effort.

We defined defensive attacks as those in which a coyote was cornered by a person (either accidentally or advertently) or was defending pups and/or a den. These attacks were typically provoked by the victim and injuries to the victim were generally minor.

Pet-related attacks were defined as those in which a person was bitten while a domestic pet was present. In these instances, the pet may have been involved in attracting the coyote to the victim. In some cases, the victim may have been trying to rescue a domestic pet from a coyote attack when he or she was bitten.

When relating victim demographics to type of attack, it was necessary to combine attack type categories for certain analyses because some categories had small sample sizes. For these comparisons, we pooled all categories except predatory and rabid attacks into a non-predatory category, consisting of investigative, defensive, and pet-related attacks. We excluded attacks in the rabid category from victim comparisons because the disease alters animal behavior. For analysis, we then compared the predatory attack category to the pooled non-predatory attack category. This allowed us to compare the characteristics of attacks driven by a predatory nature with those that may have precipitated from other factors (such as the protection of pups or attraction to pets or food sources). Comparisons were made with contingency tests or binomial tests, with  $p < .05$  considered statistically significant. Given that attack reports contained variable amounts of information, sample sizes varied by category and level of analysis.

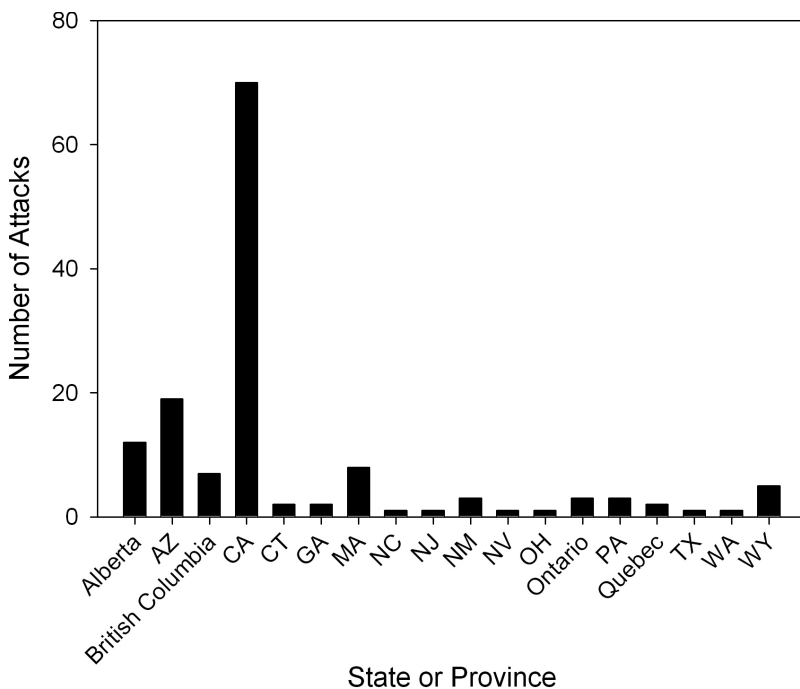
## **Results**

We collected 46% of the attack reports from newspaper databases. We also retrieved several records from published articles on coyote attacks: 23% were collected from Timm et al.'s (2004) review of attacks in California, 1% from Carbyn's review of attacks in national parks in Canada and the northwestern United States (Carbyn, 1989), 6% from Howell's review of attacks in Los Angeles County (Howell, 1982), and one record from Hsu and Hallagan's report of an attack in Yellowstone National Park (1996). We obtained 19% of records from wildlife agencies and 5% from online news sources.

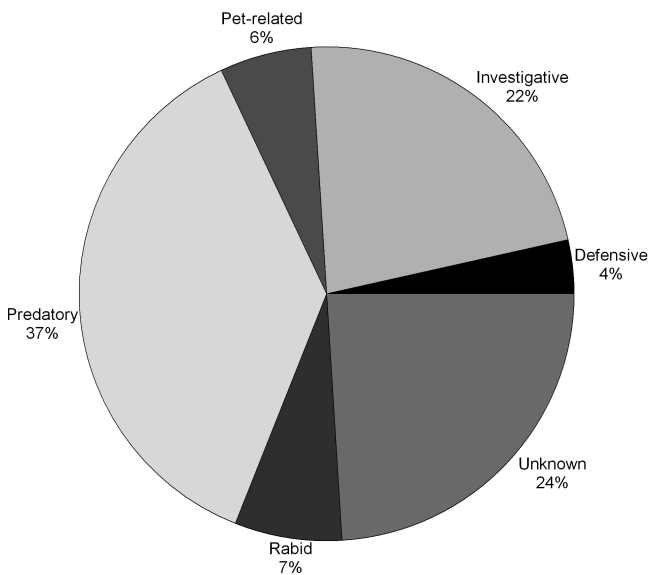
### ***General Attack Patterns***

We tabulated 142 reported attack incidents resulting in 159 victims bitten by coyotes during 1960–2006. Attacks were reported from a wide geographic area, including four provinces and 14 states (Figure 2). However, most attacks occurred within the western portion of the United States, with 49% of attacks occurring in California and 13% in Arizona.

We were able to classify 108 of 142 (76%) reported attack incidents by behavioral category (Figure 3). The greatest number of attacks was classified as predatory (37%), followed by investigative (22%). Attacks were classified as pet-related in 6% of the cases and defensive in 4% of the cases. In 7% of attack incidents the coyote was verified as rabid.



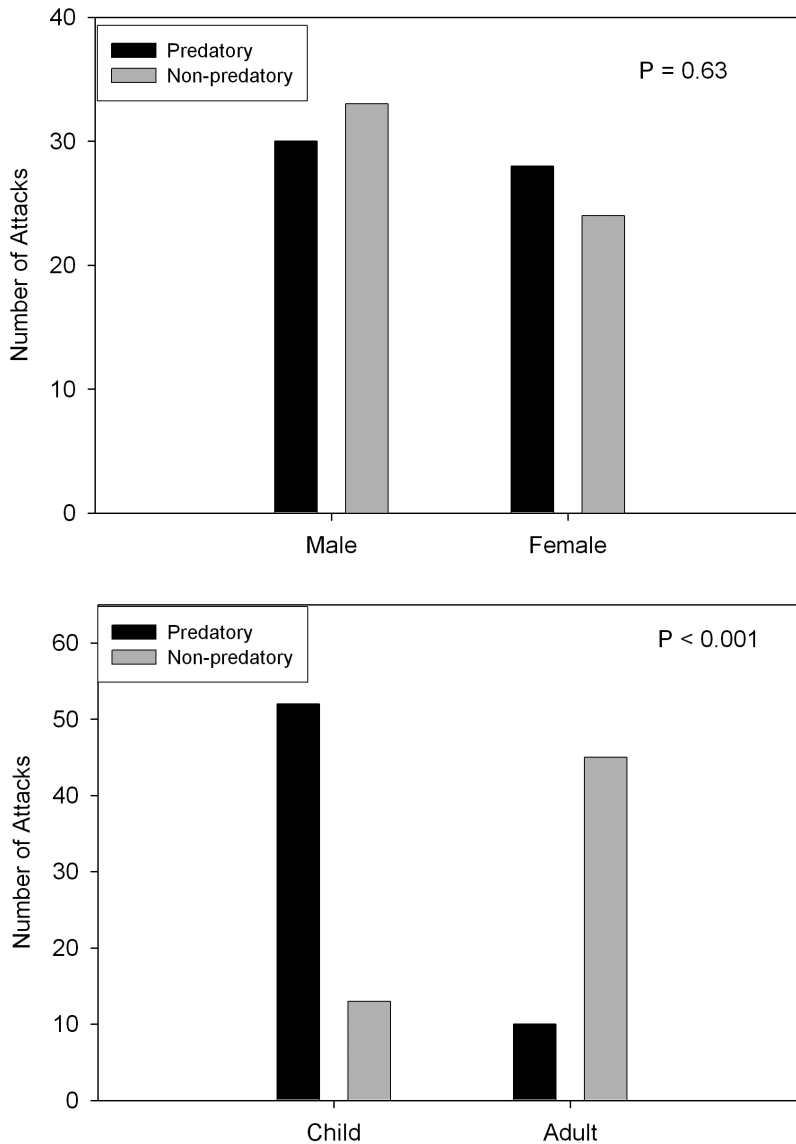
**Figure 2.** Geographic distribution of coyote attacks ( $n = 142$ ) in the United States and Canada during 1960–2006.



**Figure 3.** Percentage of coyote attacks on people ( $n = 142$ ) in the United States and Canada classified by attack category during 1960–2006.

### Demographics of Victims

One hundred fifty-nine victims were associated with the 142 reported attack incidents, of which it was possible to assign age groups to 145. Overall, there were a slightly higher number of coyote attacks on children than adults. In attacks classified as predatory, however, the majority of victims were children and significantly ( $\chi^2 = 43.15$ ,  $df = 1$ ,  $p < .001$ ) more children were associated with predatory than non-predatory attacks (Figure 4).



**Figure 4.** Distribution of coyote attack victims during 1960–2006 in the United States and Canada, by gender ( $n = 115$ ) and age group ( $n = 120$ ) of victim. Attacks were classified into predatory and non-predatory types, and victims 10 years old or younger were classified as children.

**Table 1**

Victim demographics by attack category for coyote attacks on humans ( $n = 159$ ) during 1960–2006 in the United States and Canada. Victims 10 years old or younger were classified as children

Attack types	Demographic characteristics of victims									Total
	Adult male	Adult female	Adult unknown sex	Child male	Child female	Child unknown sex	Male unknown age	Female unknown age	Unknown	
Defensive	3	1	0	1	0	0	0	0	0	5
Investigative	13	7	1	3	6	0	1	0	1	32
Pet-related	1	6	0	1	0	0	0	0	0	8
Predatory	7	3	0	22	25	5	1	0	0	63
Rabid	9	3	1	1	1	0	0	0	0	15
Unknown	6	8	3	10	5	1	0	1	2	36

In each of the other categories of attacks, adults were represented more often than children, especially in investigative attacks (Table 1).

Overall, there was no difference ( $z = -0.167$ ,  $p = .87$ ) from an even sex ratio among victims (Figure 4). Although there was a trend for a higher frequency of adult males as victims compared to adult females (Table 1), this was not significant ( $z = -0.28$ ,  $p = .78$ ). Among the predatory and non-predatory categories, there also was no significant difference in sex ratios for adults (Fisher's exact test  $p = .72$ ). For child victims, there was no difference from an even sex ratio both overall ( $z = -0.26$ ,  $p = .80$ ) and between the predatory and non-predatory attack categories ( $\chi^2 = 0.07$ ,  $df = 1$ ,  $p = .78$ ).

### *Seasonality of Attacks*

We were able to determine season for 139 reported incidents, of which 23% occurred during coyote breeding season, 45% during the pup rearing season, and 32% during the dispersal season. The seasonal variation in attacks was non-significant ( $\chi^2 = 4.94$ ,  $df = 2$ ,  $p = .08$ ).

Classified attacks appeared to vary among categories in seasonality (Table 2), although small sample sizes precluded analyses. There was no clear pattern in the frequency of attacks per month for attacks classified as rabid, defensive, or pet-related. Predatory and non-predatory attacks had similar ( $\chi^2 = 1.82$ ,  $df = 2$ ,  $p = .40$ ) seasonal patterns of occurrence, with increases during the pup-rearing season (Figure 5). Although the peak of occurrence during the pup-rearing season was most evident by the predatory category, this was non-significant ( $\chi^2 = 3.28$ ,  $df = 2$ ,  $p = .19$ ).

### *Temporal Pattern of Attacks*

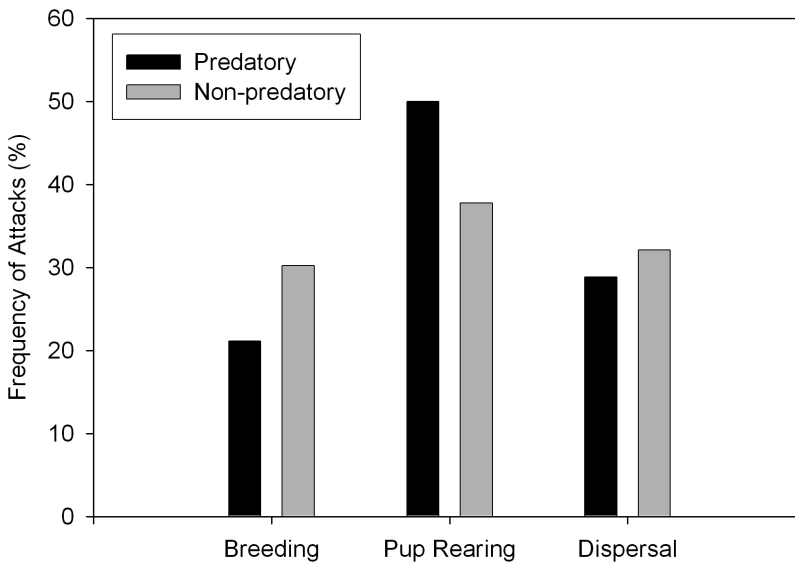
For attack incidents in which the time of attack was reported ( $n = 80$ ), there was no difference ( $z = -0.224$ ;  $p = .82$ ) in frequency between daytime (50%) and nighttime (50%) periods. Similarly, there was no difference ( $\chi^2 = 0.16$ ,  $df = 1$ ,  $p = .69$ ) in time of day between predatory and non-predatory attacks.



**Table 2**

Seasonal distribution of coyote attacks ( $n = 142$ ) in the United States and Canada during 1960–2006, partitioned by attack category. The breeding season includes January–April, pup-rearing season includes May–August, and dispersal season includes September–December

Attack types	Biological seasons			Unknown	Total
	Breeding	Pup rearing	Dispersal		
Defensive	3	2	0	0	5
Investigative	7	12	12	1	32
Pet-related	2	4	1	1	8
Predatory	11	26	15	1	53
Rabid	4	2	4	0	10
Unknown	3	16	13	2	34



**Figure 5.** Seasonal frequencies of coyote attacks on people ( $n = 108$ ) in the United States and Canada during 1960–2006, by attack type.

### *Location of Attacks*

Information on the type of attack site was available for 121 of the attack incidents. Most of these incidents (70%) occurred on or immediately adjacent to the victim's residence. One quarter of attacks (25%) occurred in parks. Smaller numbers of attacks occurred in commercial areas (such as restaurant parking lots) (4%) and golf courses (1%).

### *Activities of Victims Prior to Attack*

For 111 of the attack incidents, information regarding the activity of the victim preceding the attack was available. Most commonly, attack victims were engaged in some type of

recreational activity (47%). Examples of these recreational activities include: jogging, hiking, bicycling, horseback riding, or playing golf. The majority of child victims (75%) were playing outside in their yard or driveway prior to the attack. The next most common type of activity of victims prior to attack was resting or sleeping outside (19%). Many of these victims were sleeping outside in sleeping bags at the time of attack or were sitting in a chair outside their residence. Other types of activities prior to attack included: trying to save a pet from a coyote attack (6%), performing yard work or utility work (6%), cooking or eating outside (5%), standing outside a commercial area (4%), hunting (2%), or walking a pet (2%). One victim (1%) was feeding a coyote prior to being attacked.

### ***Actions of Victims or Bystanders during Attack***

In half (53%) of the reported attack incidents, the actions of the victim and/or bystanders used to counter the offending coyote were detailed. In two-thirds (65%) of these, the victim was able to escape from the attack without using physical force on the coyote. These victims and/or bystanders stopped the attack by running away, yelling, and/or throwing objects at the coyote. Physical force was necessary to stop the attack in 35% of the cases. Victims and/or bystanders hit or kicked the coyote, restrained it until further help arrived, used mace, or shot the coyote.

### ***Effect of Feeding***

It was reported in 42 of the 142 (30%) incidents that coyotes were either intentionally or accidentally being fed by residents near the attack site prior to the incident. This figure includes the incident in which a victim was hand-feeding the coyote that subsequently bit him.

## **Discussion**

### ***Victim Demographics and Attack Types***

A previous review of coyote attacks on humans reported children as the primary victims of the most serious coyote attacks (Carbyn, 1989). Although we did not find a significant difference in the age group of victims overall, we did find that children are the primary targets of predatory attacks, which result in the most serious injuries. Coyotes may view small children as potential prey (Carbyn, 1989). It has also been suggested that coyotes may be stimulated to attack children that are running or engaged in playful behavior (Lehner, 1976), which is supported by reports in our study of the activities of children preceding attacks; the majority of children were outside playing when they were attacked by a coyote.

The relative frequency of predatory attacks that we located may have been affected by our use of media articles for attack accounts. Attacks of a more serious nature, especially involving children, may be more likely to be reported and appear in the media.

### ***Role of Rabies in Attacks***

Previous reviews of coyote attacks have not identified attacks by rabid coyotes (Carbyn, 1989; Baker & Timm, 1998; Timm et al., 2004). We recorded 10 cases of confirmed rabid coyote attacks, which resulted in 15 bite victims. This is possibly an underestimate of the true number of victims of rabid coyote attacks, as it only includes cases in which the offending coyote was identified, captured, and tested positive for rabies. Other

victims may have been bitten by rabid coyotes that were not successfully trapped and tested. Nonetheless, it does not appear that rabies plays a critical role in the occurrence of coyote attacks on humans at this time. This is in contrast to wolf attacks in North America, Europe, and Asia, for which rabies appears to be a major factor (Linnell et al., 2002).

### ***Seasonality of Attacks***

We suspect that more investigative and predatory attacks occurred during spring and summer than during colder months because victims were outside engaged in recreational activities, sleeping, or resting. Attacks on children playing outside may have also been more frequent during the summer because they were on vacation from school.

### ***Role of Wildlife Feeding and Habituation in Attacks***

We suspect that the number of cases in which coyotes were being fed (either intentionally or accidentally) was higher than that reflected in the media and attack reports we located. This is partially supported by the large number of attacks that occurred during daytime hours and on residential property, suggesting that the offending coyotes were habituated to humans. Studies of coyote ecology in metropolitan areas have reported a preference by coyotes for natural or forested areas over urban or otherwise disturbed areas (Quinn, 1997; Atwood et al., 2004) and a shift to nocturnal activity in urbanized areas of high human use (Grinder & Krausman, 2001; McClennen, Wigglesworth, Anderson, & Wachob, 2001; Riley et al., 2003; Atwood, Weeks, & Gehring, 2004). This nocturnal behavior of coyotes has generally been attributed to an effort to avoid confrontations with people (Atwood et al., 2004; George & Crooks, 2006; Grinder & Krausman, 2001; Kitchen, Gese, & Schauster, 2000; McClennen et al., 2001). The large number of attacks occurring within daytime hours suggests that in some cases the offending coyotes were no longer avoiding humans, and may have become habituated to human activity, likely due to intentional or accidental wildlife feeding.

Although there is little in the literature attributing wildlife feeding to incidents of coyote attacks on people, analyses of coyote diet have been beneficial for revealing links between wildlife feeding and human–coyote conflicts. For example, in the Chicago metropolitan area, an area with a large population of coyotes but no incidents of coyote attacks to date, human-related food was found in less than 2% of coyote scats analyzed (Morey, Gese, & Gehrt, 2007). In contrast, a study in southern California, an area with the highest concentration of coyote attack incidents in the United States, found that human-related food constituted as much as 25% of coyote diets in areas with high human population densities (Fedriani, Fuller, & Sauvajot, 2001). A study of human–coyote conflicts in U.S. national parks also found that aggressive behavior by coyotes was exhibited more often in areas where park visitors were feeding coyotes than in areas where wildlife feeding occurred less frequently (Bounds & Shaw, 1994). Finally, wildlife feeding was implicated in the habituation of coyotes during a radiotelemetry study of coyotes in the Chicago metropolitan area (Gehrt, 2006).

The habituation of coyotes to humans has been likened to the habituation of bears to humans (Carbyn, 1989; Timm et al., 2004) which, in the case of bears, has been caused by feeding of bears by people (Leopold, 1970; Cole, 1971, 1973). This includes both intentional and accidental wildlife feeding. Restricting wildlife feeding has been found to be the most important step for resolving human–bear conflicts (McCullough, 1982), and is likely an important step for reducing human–coyote conflicts as well.

### ***Prevention of Future Attacks***

Homeowners likely play a large role in preventing future coyote attacks, as the majority of attacks that we found took place immediately outside the residences of victims. Homeowners have control over several factors in their own yards that could potentially attract nuisance coyotes and increase the risk of attacks in their neighborhood. These factors include leaving food outside for pets, intentionally feeding wildlife, and leaving pets outside unattended (especially cats and small dogs) (Timm et al., 2004).

We also located several accounts of coyote attacks in parks, playgrounds, and campsites. At these locations, a ban on feeding coyotes and other wildlife is particularly important for preventing future attacks (Carbyn, 1989; Fox, 2006). Enforcement of a leash law for pets could also help to prevent pet-related attacks (Bounds & Shaw, 1994). Several attacks occurred while campers slept in sleeping bags on the open ground; sleeping in closed tents could help to prevent these types of attacks, especially in camp grounds or parks with a known history of wildlife feeding. Caution should be encouraged in parks and recreational areas where coyotes are frequently sighted, especially when walking a pet (Timm et al., 2004).

Educational programs, especially in areas reporting coyote sightings, are important for informing the public of the relationship between wildlife feeding and coyote attacks (Fox, 2006; Gehrt, 2006). These programs should stress the importance of properly storing household refuse, not leaving pet food outdoors, and securing small domestic pets (Baker & Timm, 1998; Timm et al., 2004). These programs should also inform the public about the appropriate behavior to exhibit when encountering a habituated coyote. Waving one's arms, yelling, and throwing objects may help to reestablish the avoidance behavior typically lacking in a habituated coyote (Gehrt, 2006). For some habituated coyotes, however, control programs may be necessary.

### ***Need for Standardized Reporting of Coyote Attacks***

During our research, we discovered that many state wildlife agencies do not maintain records of coyote attacks on people. Of those that do maintain records, they are often inaccessible and incomplete. More importantly, the details captured in these records are largely inconsistent among states and regions. This lack of a standardized reporting system has also been identified in reviews of attacks by various large mammalian carnivores (Löe & Röskaf, 2004) and alligators (Langley, 2005). Although we have revealed useful patterns in the characteristics of coyote attacks, our results must be considered with caution given the limited availability of attack reports and the details in these reports. A standardized reporting program of coyote attacks would be beneficial for accurately assessing characteristics of coyote attacks throughout the United States and Canada. Because coyote attacks are infrequent resulting in small sample sizes, standardizing information at the national level would be most beneficial.

We suggest reports of coyote attacks should include several details concerning both the coyote and the victim. The following details should be included: date, time, location, number of victims, age and sex of victim(s), the activity of the victim(s) prior to the attack, the activity of the coyote(s) prior to the attack, a description of the confrontation, the action that the victim(s) or bystander(s) took to ward off the offending coyote(s), injuries sustained from the attack, and whether a domestic pet was involved in the incident. Efforts should be made to determine that the offending animal was indeed a coyote and to determine if wildlife feeding (accidental or intentional) was occurring near the site prior to the attack.

It is also imperative that the offending coyote, if captured and euthanized, is tested for rabies and that a necropsy is performed. Information obtained from necropsies is essential for determining the health of the coyote and can reveal if the diet of the coyote included food from human sources. This information should be included in attack reports and will be valuable for further investigating the relationship between wildlife feeding, habituation, and coyote attacks on people in the future.

## References

- Atwood, T. C., Weeks, H. P., & Gehring, T. M. (2004). Spatial ecology of coyotes along a suburban-to-rural gradient. *Journal of Wildlife Management*, 68, 1000–1009.
- Baker, R. O., & Timm, R. M. (1998). Management of conflicts between urban coyotes and humans in southern California. *Proceedings of the Vertebrate Pest Conference*, 18, 299–312.
- Beier, P. (1991). Cougar attacks on humans in the United States and Canada. *Wildlife Society Bulletin*, 19, 403–412.
- Bounds, D. L., & Shaw, W. W. (1994). Managing coyotes in U.S. national parks: Human-coyote interactions. *Natural Areas Journal*, 14, 280–284.
- Carbyn, L. N. (1989). Coyote attacks on children in western North America. *Wildlife Society Bulletin*, 17, 444–446.
- Cole, G. F. (1971). Preservation and management of grizzly bears in Yellowstone National Park. *BioScience*, 21, 858–864.
- Cole, G. F. (1973). Management involving grizzly bears in Yellowstone National Park 1970–1972. U.S. Department of the Interior, *National Park Service Natural Resources Report*, 7.
- Fedriani, J. M., Fuller, T. K., & Sauvajot, R. M. (2001). Does availability of anthropogenic food enhance densities of omnivorous mammals? An example with coyotes in southern California. *Ecography*, 24, 325–331.
- Fox, C. H. (2006). Coyote and humans: Can we coexist? *Proceedings of the Vertebrate Pest Conference*, 22, 287–293.
- George, S. L., & Crooks, K. R. (2006). Recreation and large mammal activity in an urban nature reserve. *Biological Conservation*, 133, 107–117.
- Gehrt, S. D. (2004). Ecology and management of striped skunks, raccoons, and coyotes in urban landscapes. In N. Fascione, A. Delach, & M. Smith (Eds.), *People and predators: From conflict to coexistence* (pp. 81–104). Washington, DC: Island Press.
- Gehrt, S. D. (2006). Urban coyote ecology and management: The Cook County, Illinois, coyote project. *Ohio State University Extension Bulletin*, 929.
- Gompper, M. E. (2002). Top carnivores in the suburbs? Ecological and conservation issues raised by colonization of north-eastern North America by coyotes. *Bioscience*, 52, 185–190.
- Grinder, M. I., & Krausman, P. R. (2001). Home range, habitat use, and nocturnal activity of coyotes in an urban environment. *Journal of Wildlife Management*, 65, 887–898.
- Howell, R. G. (1982). The urban coyote problem in Los Angeles County. *Proceedings of the Vertebrate Pest Conference*, 10, 21–23.
- Hsu, S. S., & Hallagan, L. F. (1996). Case report of a coyote attack in Yellowstone National Park. *Wilderness and Environmental Medicine*, 2, 170–172.
- Jackson, P. (1985). Deaths as a result of tiger attacks. *Cat News*, 2, 9.
- Kitchen, A. M., Gese, E. M., & Schauster, E. R. (2000). Changes in coyote activity patterns due to reduced exposure to human persecution. *Canadian Journal of Zoology*, 78, 853–857.
- Langley, R. L. (2005). Alligator attacks on humans in the United States. *Wilderness and Environmental Medicine*, 16, 119–124.
- Laundré, J. W., & Keller, B. L. (1981). Home range use by coyotes in Idaho. *Animal Behaviour*, 29, 449–461.
- Lehner, P. N. (1976). Coyote behavior: Implications for management. *Wildlife Society Bulletin*, 4, 120–126.

- Leopold, A. S. (1970). Weaning grizzly bears. *Natural History*, 79, 94–101.
- Linnell, J. D. C., Andersen, R., Andersone, Z., Balciuskas, L., Blanco, J. C., Boitani, L. et al. (2002). The fear of wolves: A review of wolf attacks on humans. *Norsk Institutt for Naturforskning Oppdragsmelding*, 731, 1–65.
- Löe, J., & Röskaft, E. (2004). Large carnivores and human safety: A review. *Ambio*, 33, 283–288.
- McClennen, N., Wigglesworth, R. R., Anderson, S. H., & Wachob, D. G. (2001). The effect of suburban and agricultural development on the activities of coyotes (*Canis latrans*). *American Midland Naturalist*, 146, 27–36.
- McCullough, D. R. (1982). Behavior, bears, and humans. *Wildlife Society Bulletin*, 10, 27–33.
- McDougal, C. (1987). The man-eating tiger in geographical and historical perspective. In R. L. Tilson & U. S. Seal (Eds.), *Tigers of the world: The biology, biopolitics, management, and conservation of an endangered species* (pp. 425–448). Park Ridge, NJ: Noyes Press.
- Miller, C. A., Campbell, L. K., Yeagle, J. A., & Colligan, C. B. (2001). Attitudes of homeowners in the greater Chicago Metropolitan Region toward nuisance wildlife. *Human dimensions program report, SR-00-02*. Champaign: Illinois Natural History Survey.
- Morey, P. S., Gese, E. M., & Gehrt, S. (2007). Spatial and temporal variation in the diet of coyotes in the Chicago metropolitan area. *American Midland Naturalist*, 158, 147–161.
- Packer, C., Ikanda, D., Kissui, B., & Kushnir, H. (2005). Lion attacks on humans in Tanzania. *Nature*, 436, 927–928.
- Quinn, T. (1997). Coyote (*Canis latrans*) habitat selection in urban areas of western Washington via analysis of routine movements. *Northwest Science*, 71, 289–297.
- Riley, S. P. D., Savajot, R. M., Fuller, T. K., York, E. C., Kamradt, D. A., Bromely, C. et al. (2003). Effects of urbanization and habitat fragmentation on bobcats and coyotes in southern California. *Conservation Biology*, 17, 566–576.
- Sanyal, P. (1987). Managing the man-eaters in the Sunderban tiger reserve in India: A case study. In R. L. Tilson & U. S. Seal (Eds.), *Tigers of the world: The biology, biopolitics, management, and conservation of an endangered species* (pp. 427–434). Park Ridge, NJ: Noyes Press.
- Timm, R. M., Baker, R. O., Bennett, J. R., & Coolahan, C. C. (2004). Coyote attacks: An increasing suburban problem. *Transactions of the North American Wildlife and Natural Resources Conference*, 69, 67–88.