A COMPARISON OF REPORTS OF FATAL GRIZZLY AND BLACK BEAR ATTACKS IN CANADA

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THUNDER BAY, ONTARIO

April 23, 2024

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An Undergraduate Thesis Submitted in

Partial Fulfilment of the Requirements for the

Degree of Honours Bachelor of Environmental Management

Faculty of Natural Resources Management

Lakehead University

September 2023

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Major Advisor Second Reader

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The reader should be aware that opinions and conclusions expressed in this document are those of the student and do not necessarily reflect the opinions of the thesis supervisor, the faculty, or Lakehead University.

ACKNOWLEDGEMENTS

I thank my supervisor, Dr. Brian McLaren, and my second reader, Dr. Mat Leitch for their support throughout the completion of this thesis project and during my undergraduate career.

I thank my dear friends and family for their continued and unconditional love and support throughout my time at Lakehead University. I appreciate you all more than I could put into words.

I acknowledge that this undergraduate thesis builds on previous undergraduate work by Kennedy Adams at Lakehead University.

ABSTRACT

Poirier, A. C. (2024). A comparison of reports of fatal grizzly and black bear attacks in Canada. 47 pages.

The purpose of this study is to determine if there has been an increase in the number of fatalities caused by grizzly and black bear attacks in Canada from 1990 to 2023, as well as to determine if the attacks were predatory or defensive in nature. The data used in this study was acquired from various news sources in Canada as well as the United States to gain a better understanding of the fatalities and events leading up to the attack. The information was separated into tables, and they were used to establish the number of fatalities caused by grizzly and black bears, province, or territory the age and gender of the victims, and the month which the attacks occurred in. Overall, the number of fatalities has remained relatively similar over the years, there was a decrease in fatalities cause by black bears in 2010 to 2019. During the years from 2020 to 2023, almost half the number of fatalities as previous decades, likely because more people were spending time outdoors due to the COVID-19 pandemic. Many reports lacked specific information about the attacks and events leading up to the encounters, and therefore it was difficult to determine if the attacks were predatory or defensive in nature.

Keywords: grizzly bear, black bear, urbanization, attacks, habitat, behaviours, fatal, habituation, *Ursus arctos*, *Usus americanus*

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INTRODUCTION AND OBJECTIVE

The grizzly bear (*Ursus arctos*) and black bear (*Usus americanus*) can pose a threat to human lives, whether it be a provoked attack or simply a case of wrong place, wrong time. It is possible, however, that the factors causing bear encounters can be avoided. These factors can include the reduction of bear habitat, human nuisance, and an increase in human population in rural areas (Herrero 2018). Interruptions of bear habitats are the most common and can range from development in forest areas where there is a higher bear population, to humans camping and hiking in bear habitats. Understanding factors that might predispose animals to becoming a nuisance and how individuals vary in susceptibility to nuisance behavior could facilitate damage prevention (Cristescu et al. 2016).

Large carnivores, such as the grizzly and black bear, may, unprovoked, prey on humans as they would other prey animals, but provocations (intentional and unintentional) from humans can also contribute to encounters that result in attacks. Apart from human behaviors intended to harm, antagonize, or threaten an animal or its young, unintentional human provocations such as food-conditioning and other forms of habituation of an animal may be a precursor to an attack. For example, failure to understand how to properly store food and other wildlife attractants when camping in bear habitat can result in an encounter with a bear. Habituation describes the process by which an individual wild animal becomes accustomed to the presence of humans (Kelly et al. 2019).

The grizzly bear, also known as the North American brown bear, or simply grizzly, is found mostly in the province of British Columbia, with the rest of its range in Canada occurring in Alberta and the three territories. It is also found in Alaska. The black bear is a well-known wildlife species with populations across North America. Black bears are found in twelve of the thirteen provinces and territories in Canada, being absent only from Prince Edward Island and from the southern farmlands of Alberta, Saskatchewan, Manitoba, Ontario, and Québec. Although there is a high population of black bears in Canada, not many attacks on humans are reported. Over the last several years, however, there have been more reports of bear encounters with humans, ranging from victims being severely injured to their death in extreme cases (Herrero 2018). Since 1990, there have been a combined total of forty-four fatalities from grizzly and black bear attacks reported throughout Canada. These incidents have led to the introduction of more caution signs near areas where bear habitat has been located, as well as in forested areas that are popular for recreational activities (Alongi 2019).

Bears normally prefer habitats such as dense heavy forested areas, but when food sources such as berry bushes and other small plants fail, bears can enter suburban areas (Lewis et al. 2015). Canada's human population has been following an upward trend over the last several years. The population of Canada in 2023 was 38,781,291, a 0.85% increase from 2022 (Macrotrends 2024). Since it is a country that receives many immigrants, Canada will experience this increase in urban and suburban areas. More bear attacks will be a result in the upcoming decades if the information is not provided on why these attacks happen and how they can be avoided (Herrero 2018). The purpose of this study is to describe the fatal grizzly and black bear attacks in Canada from reports

since the year 1990 and review factors that are causing such encounters. Questions about which types of grizzly and black bear attacks may have become more common than in previous years, such as attacks by predatory versus defensive bears, and which factors might be ultimately responsible for attacks, such as interruptions of bear habitat, can be asked. In Canada, increased signage in local bear habitats, more thorough planning of urban development, increased sharing of information on how to handle hostile bears, and overall greater education for people on signs of a defensive bear are all solutions that can lead to a decrease in the annual number of attacks.

LITERATURE REVIEW

Life histories

The grizzly bear, one of the strongest and most impressive mammals in North America, is a symbol of Canadian wilderness. Grizzlies in Canada are found in the Arctic tundra, in sub-alpine meadows, in dense forests, and closer to the Pacific, around inlets and salmon spawning grounds. Good grizzly bear habitat includes an adequate seasonal food supply, appropriate denning sites, the presence of some type of cover or shelter, access to mates, and isolation from human disturbance. Since nearly half of the mountain national parks are composed of rock and ice, habitat is fragmented (Parks Canada 2023). Consequently, concentrated seasonal food sources and other life requisites are widely dispersed in a patchy distribution that can change from year to year. Despite popular knowledge, grizzly bears (and black bears) are light hibernators and experience a milder form of "torpor" than true hibernation. Grizzly bears go into torpor from approximately October to April (Alberta Institute for Wildlife Conservation

2023). During the summer and fall prior to torpor, grizzly bears build up a layer of fat to sustain themselves while they sleep. Although grizzlies can sleep for most of the winter, they can wake up on a warmer winter day to have a snack or to protect themselves from a possible threat. Females reach sexual maturity between the ages of 4 and 7 years of age and breed in the late spring. Up to 4 (more typically, 2 or 3) cubs are born during their mother's torpor and remain with their mother for up to 4 years. Females will not breed again while in the company of their young. The grizzly bear can weigh between 200 and 880 pounds, and their diet consists of plants, berries, insects, and large mammals. The life expectancy of a grizzly bear is of about 20 to 25 years (Center for Biological Diversity n.d.).

Black bears are known to live in a variety of habitats. The habitats in which black bears can be found are deciduous forests and coniferous forests, in mountains and swampy areas. They range from the Hudson Bay coast to the north, south to roughly the edge of the continuously forested areas of Southern Ontario, including an isolated population on the Saugeen Bruce Peninsula. Black bears seek habitat in areas that possess the resources they require, such as food, water, and shelter. If any of those resources run out in the area they are currently residing in, black bears will change locations to gain back resources (Dewey and Kronk 2020). The black bear prefers areas with low populations of humans as humans pose a risk to them. As previously mentioned, like the grizzly bear, black bears experience torpor rather than a true hibernation. When it comes time to enter torpor, black bears will move to areas with denser bushes and trees, after putting on a layer of fat during autumn, so that they may build a den for the winter months. Black bears eat berries, vegetation, insects, fish, small

mammals, and birds, depending on what is available. But in areas near human settlements, where their preferred food is scarce, bears have been known to eat garbage, grain crops and even domestic livestock (Canadian Geographic 2021). Females reach sexual maturity at around 3 years old and will start looking for a mate. Mating is done between June and August, and after about 220 days, up to 5 (usually 2) cubs are born, weighing about 400 grams. Because of their bulky appearance, their weight is often over-estimated. Some individuals of up to 792 pounds have been found, but adult males average 250 pounds, and adult females average 140 pounds (Freedman et al 2003). Black bears may live from 7 to 15 years in the wild.

Bear habits

Bears are creatures of habit, which means they are large mammals that follow a daily routine (Alongi 2019). Barren ground grizzly bears lead a predominantly carnivorous lifestyle and are effective predators of caribou (*Rangifer tarandus*; Gau et al. 2001). Although adult grizzly bears are normally solitary, home ranges of adults frequently overlap. The grizzly bear is portrayed in the media as a voracious predator; however, grizzlies are normally reclusive creatures. They are intelligent, curious, and have excellent memory, particularly regarding where food sources are located. Grizzly bears are active during both the day and night but will often alter their habits to avoid humans in areas of high human use. In the heat of the day, grizzly bears will rest in day beds in dense vegetation, including willows, alders, dense forest, and tall grass. Grizzly bear females accompanied by cubs use areas near human settlements more than males and solitary females, probably to avoid potentially infanticidal males (Cristescu et al. 2016). Variables that likely influence space use behavior are learning, memory, hunger

motivation, chance encounters of rich food sources such as ungulate carcasses, or interactions with other grizzly bears, black bears, or wolves.

Black bears are solitary animals that socialize only briefly during the mating season. They have large territories, usually between 10 and 100 km^2, and resources such as food availability and shelter determine the size of territory, which a bear will mark with droppings, scratch marks, and urine sprays (Clark et al. 1993). Typically, black bears will stay in the areas they have marked for obtaining reliable food sources, mating, protecting their own safety, and protecting their cubs. Black bears also use trees that trackers and hunters call "bear trees" to define the perimeter of their range. Females and males are both quite territorial, and encounters between humans and black bears are rather uncommon unless their territory is being encroached on. If they become territorial, bears will give warnings to intruders to avoid confrontations (Herrero 2018). Black bears will claw, bite, and rub all over the bark and branches of certain trees to warn intruders.

Behaviour towards humans

Bear and human interactions are well known throughout history and have continued to be a danger to both bears and humans (Alongi 2019). It is often communicated to the public that if they do not intrude on bear territory then they are not likely to experience an attack. We are also told that bears are often more scared of us than we are of them (O'Harra 2016). Although these types of statements can be true in some cases, they do create problems if people trust them too much. Differences occur by context. For example, in portions of Glacier National Park where hiking is popular, some grizzlies have habituated to people on foot, whereas in the adjacent Flathead drainage

where hikers are rare and almost all carry guns (as hunters), bears show stronger reactions to people on foot than to any other form of human activity (McLellan 1990). Individual bears may also show different responses to the same stimuli occurring in different locations. McLellan (1990) states that people hiking or driving where they often do will elicit milder reactions in grizzly bears than the same activity where it rarely occurs, and that vegetation cover also affects a bear's reaction to people. In some areas, the age/sex class of the bear is not an important variable in predicting a reaction to humans, except for certain cases in Glacier National Park where females with young were more apt to charge at hikers (Jope 1985). The study by Jope (1985) indicates that grizzly bear habituation to hikers reduces the rate of fear-induced full-charges in heavy-use areas.

Where black bear populations are increasing, they have been known to move into more populated areas like suburbs to seek shelter, as well as to scavenge food (Lewis et al. 2015). In some areas, black bears seem to have completely lost their fear of humans. They have become more of a nuisance, if not an absolute danger (Alongi 2019). In areas such as these, or where interactions between black bears occur, the topic is more frequently studied to protect both the bears and humans. Trends in voluntary reports of attacks are commonly assumed to reflect actual trends in human-bear interactions, recent research suggests, and bias is influenced by attitudes toward the species and its management (Wilbur et al. 2018). In typical reports, the items included are the age and gender of the victim, a description of the attack, and if the bear was behaving in a predatory or defensive manner.

Bears in residential areas

It is very common for bears to be reported in residential areas. Their need to seek shelter and a reliable food source in habitat fragmented by suburban development explains an increase in risk of harmful consequences (Herrero 2018). Grizzly and black bears most often prefer to stay in areas with less human activity, but if resources are sparce, they will more into areas where they are more likely to find a food source. When bears are exposed to an easily accessible food source, it is likely that they will continue to return to this area. In many areas, negative human-bear interactions occur because bears become conditioned to human foods ("garbage-conditioned") and subsequently more tolerant of human presence ("human-habituated"; Wood and Ciarniello 2011). Over time, bears may become more confident and aggressive and therefore may pose more of a threat to humans. When this occurs, the bears are unknowingly putting themselves in danger because they are at risk of being translocated or even killed for becoming conditioned to garbage or other attractants left out by humans.

Bears are notorious for rummaging through neighborhood garbage, and when people see their garbage torn open or see a bear in the act of eating the garbage and react in certain ways, it can lead to defensive behaviour by the bear (Herrero 2018). Unsecured garbage, pet food, bird feeders, livestock and livestock feed are attractants typically identified as the cause of bear-human conflicts associated with developments (Gunther et al. 2004). As suggested by Schlaepfer et al. (2002), these areas represent evolutionary traps because the sudden anthropogenic change in the environment results in attracting bears to perceived food source, but the results are maladaptive because of the increased risk of mortality.

Urbanization

Where bear and human populations are simultaneously expanding, there is concern that increased development will reduce available habitat for bears (Bettigole et al. 2014). Habitat fragmentation, even as slight as creating footpaths through recreational areas and local parks in cities, exposes wildlife to new stressors, (Isaksson and Sumasgutner 2016). Mammalian carnivores have low densities, large home ranges, and specific dietary requirements that make them particularly vulnerable to the threats of fragmentation (Stark et al. 2019). High-quality habitats close to areas of human use are often areas of high bear mortality, thereby negatively affecting populations (Ciarniello et al. 2007). Bettigole et al. (2014) suggest that black bears are more sensitive to habitat loss than other focal species. Further, Evans et al. (2017) found that bear densities were elevated in suburban, and that more high-density bear populations may be expected to co-occur with people.

Human interactions

Jope (1985) found that grizzly bears were more likely to react aggressively (full charge) to hikers when the interaction occurred on low-use than on high-use trails, and she suggests that bears in high-use areas had habituated to people. Bears respond more strongly to ground-based human activities, such as people on foot or moving vehicles, when in the open than when in cover (McLellan 1989). Further, bears generally display stronger reactions to human activities, other than to people on foot, when they occurred <76 m away. The strongest response of grizzly bears was to people on foot, and these reactions were most extreme in areas of low human use.

Hubbard et al. (2022) suggests that black bears prioritize avoiding humans spatially, rather than temporally, except during the hunting season and when cubs are present. Further, male black bears feel more threatened by humans in their territory, and they may stalk or attack to defend it. A black bear sow (female) is more protective of her cubs, and so she may shift more of her focus from defending a territory to protecting the cubs and staying near them to ensure their safety.

Predatory versus defensive bears

Aggressive behaviour from a grizzly or black bear can be deemed or classified as being either predatory or defensive. Herrero (2018) states that:

> A grizzly bear rearing onto its hind legs, a common stance, is trying to sense what is happening. Normally this is not an aggressive posture. On its hind legs the bear sniffs, listens, and looks, trying to discover what kind of animal stands before it. Standing on its four legs a grizzly may show agitation by salivating, swaying its head from side to side, making huffing noises, or opening and closing its mouth and making clacking noises with its teeth. Running and circling, usually to get downwind, may follow so that the bear can get into a better position to sense (especially smell) the strange object. If the bear feels threatened, fleeing or a charge may follow. The seriousness of a grizzly's charge is partly indicated by the position of its ears. Like wolves and dogs, grizzly and black bears use the position of their ears as an indication of aggressive intent. Generally speaking, the farther back the ears are, the more they are flattened to the neck, the more the grizzly is aroused. In combination with this, the hair may be raised on the back of the neck and on the front portions of the back.

Predatory behaviour of grizzly bear is defined as a bear having a complete concentration on something or someone, head fully propped up, silent movements, ears erect, and with agitated movements or signs of stress. Herrero (2018) states further that the defense reaction is so much part of some mother grizzlies that they have been known to charge small groups of people, and even trucks. If a grizzly

bear is acting non-defensively, the bear will be intent on you with head and ears up (Parks Canada 2024).

When a black bear feels threatened by an individual's presence and it becomes defensive, it creates noise from its jaw and teeth, usually moans and huffs, and sometimes it will even swat the ground in a charging motion (Shaw 2020). Black bears showing defensive behaviours are more often females who are protecting their cubs. If a black bear is behaving in a predatory manner, the bear will be intensely interested, with its full attention concentrated on you because it has identified you as potential prey. A predatory bear will approach silently and persistently and may continue to approach even after bear spray is successfully deployed.

Recreation

Male and solitary female grizzly bears increasingly avoid trails with a high probability of motorized activity, as well as display increased movement rates in response to motorized recreation (Ladle et al. 2018a). Increased avoidance of trails does not occur for females with cubs, but they had the largest response to motorized activity on the trails in terms of higher movement rates. Further, the research found that for all classes (males, females, and females with cubs), selection for proximity to trail increased when probability of non-motorized activity was high, and the effect on movement was dampened relative to the motorized response. Another study by Ladle et al. (2018b) found that grizzly bears altered activity patterns when recreation was present, a behavioural change potentially aimed at reducing overlap with times of peak recreational activity. Hubbard et al. (2022) found that black bears are significantly affected by human presence across the landscape with variation in activity and occupancy observed before

and after torpor. However, there were no clear differences in black bear activity based on different types of human activity and recreation.

MATERIALS AND METHODS

In this thesis, I investigated reports of fatal grizzly and black bear attacks in all provinces and territories in Canada between the years 1990-2023. Using the search terms 'grizzly bear', 'black bear', 'human fatalities', 'Canada', 'provinces', 'territories', and 'fatal attack', I accessed 47 articles from 20 news sources across Canada and the United States (Table 1). CBC News and CTV News were chosen first, since these sources gather and share information from across all of Canada. Local news sources were then used to find additional reports. A search including news articles from the United States found a few additional reports of fatal bear attacks occurring in Canada where the victims were American. The analysis started by separately searching for attacks by grizzly bears and then by black bears. Following this separation, attacks were separated by which ones had multiple fatalities. If an attack had multiple fatalities, they were counted as one attack. If an attack had fatalities and injuries, they were still counted as one attack. Finally, the attacks were described as completely as possible with respect to the factors that caused them, although the description was limited by the extent of information included in the reporting (Appendix 1 and 2).

RESULTS

Due to a lack of information in the reporting, it was difficult to determine which factors led up to the attacks. Of the combined thirty-nine fatal bear attacks reported, seventeen were grizzly bear attacks while the other twenty-two were black bear attacks (Appendix 1 and 2, Table 1).

Table 1. News sources used to collect data on attacks

Province/Territory	News Sources
Alberta	- CBC News - CTV News - National Post - The Independent - Toronto Star - Orlando Sentinel
British Columbia	- CBC News - Los Angeles Times - Outdoor Life - The Register Guard - The Seattle Times - Vancouver Sun
Manitoba	- CTV News
Northwest Territories	- Canadian Press - CBC News - News 1 - West Central Tribune
Ontario	- CBC News - McCook Daily Gazette - MRP News - SooToday - Toronto Star
Québec	- CBC News - The Windsor Star
Saskatchewan	- CBC News
Yukon	- CBC News - Cottage Life - New York Times

The result was forty-four fatalities, twenty from grizzly bear attacks and twenty-four from black bear attacks (Table 2 and 3). Most grizzly attacks occurred in the province of Alberta with eight since 1990 (Table 2, Figure 1 and 2). Of the eight grizzly attacks in Alberta, there were nine fatalities and one reported injury (Table 2). The territory with the next highest number of fatalities was Yukon with five in three attacks, plus one injury (Table 2, Figure 1). Although Prince Edward Island is included in the list

of provinces/territories in Tables 2 and 3, there are no attacks because it is the only province in Canada where no bears occur.

Table 2. Attacks, fatalities, and injuries from grizzly bears reported in the provinces/territories

Province/Territory	Attacks	Fatalities	Injuries
Alberta	8	9	1
British Columbia	3	4	0
Manitoba	0	0	0
New Brunswick	0	0	0
Newfoundland and Labrador	0	0	0
Northwest Territories	2	2	0
Nova Scotia	0	0	0
Ontario	0	0	0
Prince Edward Island	0	0	0
Québec	0	0	0
Saskatchewan	0	0	0
Yukon	4	5	1

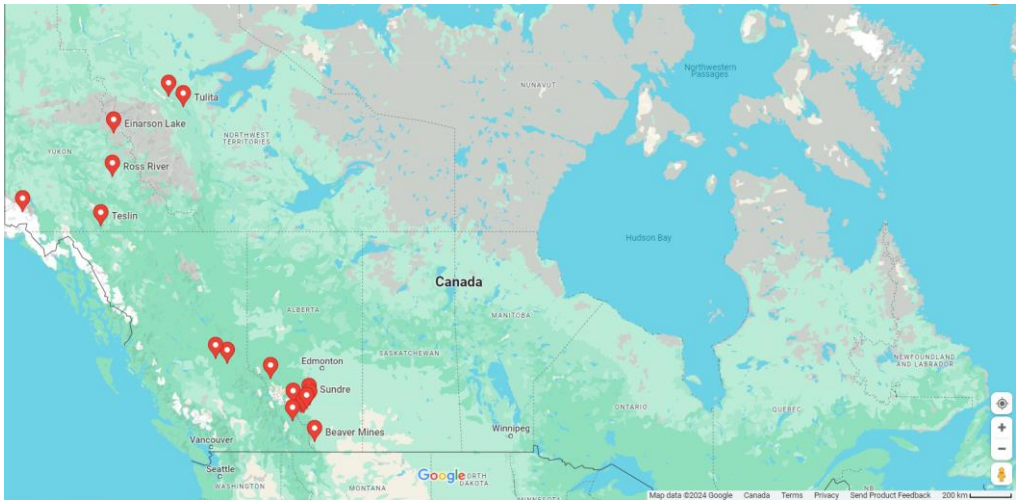

Figure 1. Locations in Canada where fatal grizzly bear attacks occurred.

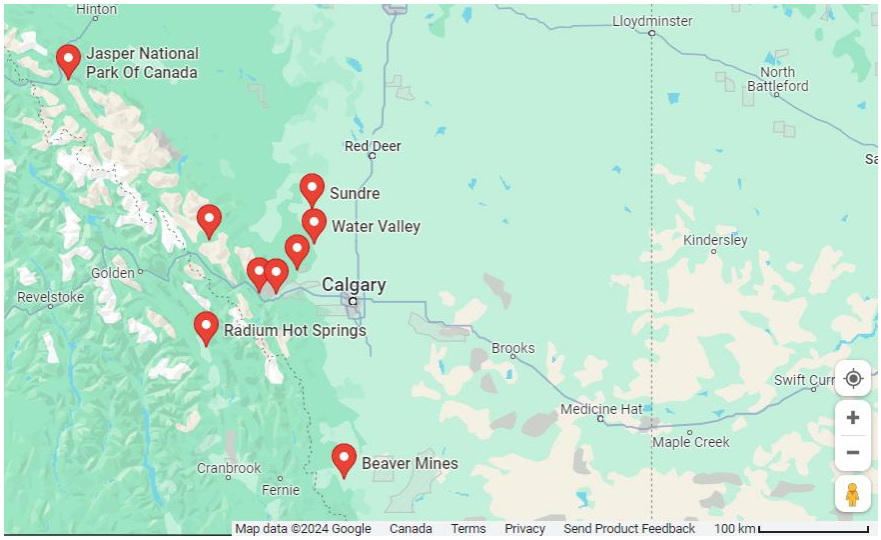

Figure 2. Locations where fatal grizzly bear attacks occurred in Alberta.

Of the twenty-four fatalities from black bear attacks, most fatalities came from the province of British Columbia with eight from seven separately reported attacks (Table 3, Figure 3). The province with the next highest number of fatalities was Ontario with six from five different attacks (Table 3).

Table 3. Attacks, fatalities, and injuries from black bears reported in the provinces/territories

Province/Territory	Attacks	Fatalities	Injuries
Alberta	3	3	0
British Columbia	7	8	1
Manitoba	1	1	0
New Brunswick	0	0	0
Newfoundland and Labrador	0	0	0
Northwest Territories	2	2	1
Nova Scotia	0	0	0
Ontario	5	6	0
Prince Edward Island	0	0	0
Québec	3	3	1
Saskatchewan	1	1	0
Yukon	0	0	0

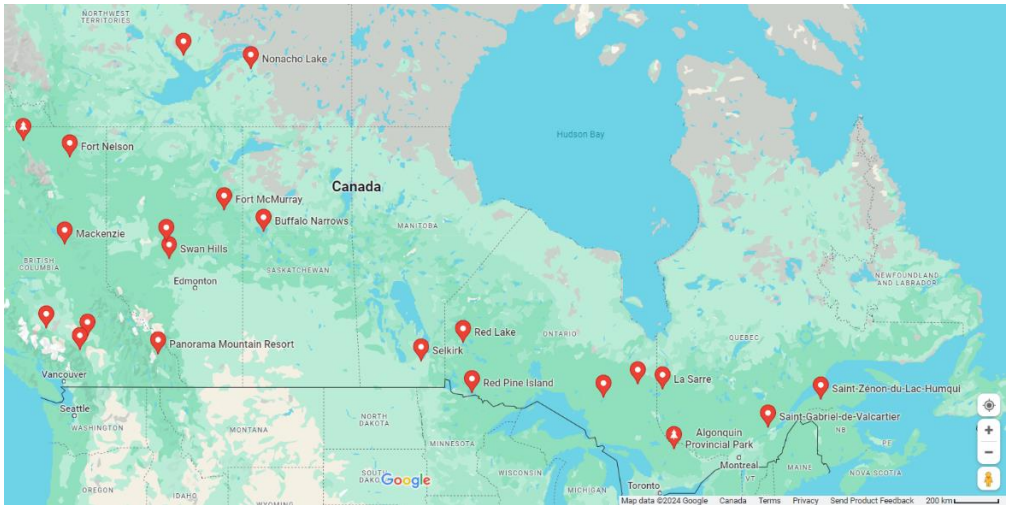

Figure 3. Locations in Canada where fatal black bear attacks occurred.

There were five injuries from the combined reported attacks from grizzly and black bears: two injuries from grizzly bears (one in Alberta and one in Yukon) and three injuries from black bears (one in British Columbia, one in the Northwest Territories, and one in Québec; Table 2 and 3). The decades with the highest number of fatalities from grizzly bear attacks were both 1990 to 1999 and 2010 to 2019, each with six fatalities (Table 4). Both decades also had the highest number of grizzly attacks. The years from 2000 to 2009 and 2020 and 2023 each had four fatalities. The decade with the highest number of fatalities from black bear attacks was 2000 to 2009 with nine fatalities (Table 5). Not far behind was 1990 to 1999 with eight fatalities. The decade with the highest number of attacks from black bears, causing at least one fatality, was 2000 to 2009 with nine attacks.

Table 4. Total attacks and fatalities from grizzly bears from 1990-2023

Decade	Total number of attacks	Total number of fatalities
1990-1999	5	6
2000-2009	4	4
2010-2019	5	6
2020-2023	3	4

Table 5. Total attacks and fatalities from black bears from 1990-2023

Decade	Total number of attacks	Total number of fatalities
1990-1999	6	8
2000-2009	9	9
2010-2019	4	4
2020-2023	3	3

The highest number of reported fatalities from grizzly bear attacks was on males between the ages of 31 to 45 and 46 to 60 years of age, each with five fatalities (Table 6). The age group with the highest number of fatalities for males from black bear attacks was 16 to 30 and 61 to 75, each with three fatalities (Table 7). The highest number of fatalities from grizzly bears for females is four, between the ages of 31 and 45. The highest number of reported fatalities from black bear attacks was on females between the ages of 31 and 45 with four.

Table 6. Total fatalities from grizzly bears by gender and age of victim

Age (years)	0-15	16-30	31-45	46-60	61-75	76+
Male	0	1	5	5	2	0
Female	1	0	4	0	2	0

Table 7. Total fatalities from black bears by gender and age of victim

Age (years)	0-15	16-30	31-45	46-60	61-75	76+
Male	2	3	2	2	3	1
Female	0	3	4	1	3	0

The month which had the highest number of fatal attacks caused by grizzly bears was September with five (Table 8). September was also the month with the highest number of fatalities, six. The months with the highest number of fatal attacks on humans

by black bears were June and September, each with five (Table 9). June and September were also the months with the highest number of fatalities, also each with five.

Table 8. Total attacks and fatalities from grizzly bears by month

Month	Total number of attacks	Total number of fatalities
April	1	1
May	2	2
June	1	1
July	1	1
August	2	2
September	5	6
October	3	4
November	2	3

Table 9. Total attacks and fatalities from black bears by month

Month	Total number of attacks	Total number of fatalities
April	0	0
May	4	4
June	5	5
July	4	4
August	3	4
September	5	5
October	1	2
November	0	0

Description of attacks

Although most of the fatal attacks included basic information such as the age and gender of the victim and a brief explanation of what occurred, most articles did not include a lot of details in terms of the events of the attacks (Appendix 1 and 2). Several articles are reports of people who were alone and walking in bear territory and initially reported missing. There were several fatal attacks reported where the person or people attacked by either a grizzly or black bear were ambushed while on their campsites. There

were two attacks on people who were out jogging with the reports stating the possibility that the bear saw them running and got aroused and gave chase. A young boy of the age of four succumbed to his injuries after being attacked by a black bear while playing in his backyard. There were two attacks where people were dragged from their tents; one was by a grizzly, and one was by a black bear. In the cases where the sole person or persons involved in the encounter were killed, it is impossible to know what behaviour the bear was displaying leading up the to the attack. For the encounters where there were survivors, the reports did not include the behaviours of the bears involved, and so it is again not known whether bears were behaving in predatory or defensive manners.

DISCUSSION

Prime time for fatal attacks?

For grizzly bears, the month with the highest number of fatal attacks was September with six. This fact can possibly be due to bears trying to build up layers of fat to sustain themselves for seasonal torpor that starts in the month following September. Similarly, September saw the highest number of fatalities from black bear attacks with five. However, the same number of fatalities caused by black bears occurred in June. In general, it can be concluded that September is the most predictable month for fatal bear attacks in Canada.

More fatal attacks?

While the data shows that the decades with the highest number of fatalities from grizzly bear attacks were both 1990-1999 and 2010-2019, each with six, there were four fatalities from 2020-2023, only a four-year. Similarly, when observing black bear attack

fatalities, the decade with the highest number of fatalities from attacks was 2000-2009, yet there were three fatalities from attacks over the four-year period from 2020-2023. Although it is not quite half the number of fatalities, it is still a significant number of fatalities over less than half of a full decade. It can be assumed that there is a potential increase in the number of fatalities from both grizzly and black bear attacks across Canada, and this was also during the prime COVID-19 years. Since the COVID-19 pandemic, people have participated more in activities like foraging, hiking, jogging, photography, walking, and watching wildlife (Morse et al. 2020). Because there were more people spending time outdoors in bear territory, the difference might account for more frequent reports of bear attack fatalities.

Bias

News outlets are constantly filtering out and selecting the coverage that they broadcast. The subjective nature of this filtering introduces biases due to, among other things, resource constraints, editorial guidelines, ideological affinities, or even the fragmented nature of the information at a journalist's disposal (Bourgeois et al. 2018). Different sections of news sources have editors who choose which articles get published, and there may be some fatal bear attacks which were not selected to be in the news.

Encounters with humans

Grizzly and black bears do not enter urban settings in search of humans. Nearly all bears wander into urban areas strictly to scavenge food (Merkle et al. 2013). When bears do enter an urban setting, such as a residential area, it is natural for humans to act in an aggressive way in an effort to frighten the bear with the hopes that it will not want to return. When we start acting aggressively toward these bears to scare them off, it

causes the bears to act defensively, which can result in physical interaction (Noyce and Garshelis 2010). Grizzly and black bears will naturally act in a more aggressive manner if they feel like a human is impeding on its territory.

Warning signage

When there are bear attacks occurring on or along trails, boardwalks, and campsites, it is natural to wonder if there is adequate information being communicated or provided to the public about being cautious when entering areas where bears live. Typically, signs are only put on trails about the potential for encountering bears in an area once a bear or bear sign has been encountered. However, since a bear's territory is so large, they are not likely to stay in a certain area unless there is a stable supply of resources (food, water, cover). Therefore, signage may not be effective in warning members of the public; the bear may have moved on to a different location along the trail, and humans may be less aware of their surroundings on a part of the trail where they may not expect to see a bear or bears because there was no sign. It is impossible to put warning signs on every trail and every part of a forest where there might be bears, so officials just ask that the public be cautious when out in forested areas and that they have all the equipment and tools to keep safe (Herrero 2018).

Solutions

Many of the fatal reports in this research involved incidents where the individual killed by either a grizzly or black bear was alone. It is not possible to know exactly when an attack is going to occur, but individuals can ensure that they have the proper equipment and tools for self-defence (such as pepper spray) and can become more familiar with how to interpret both grizzly and black bear behaviour to try to avoid an

attack. Since the population in Canada is predicted to continue to grow, it is important for developers to work alongside ecologists and wildlife biologists so that they understand the possibility of encountering bears in proposed areas of urban or suburban development. It is important for cities and towns to have appropriate plans in case a bear must be relocated. Further, it is important for local authorities in bear territories to have appropriate garbage and landfill regulations in place. These measures may be helpful in reducing the number of bears coming into residential areas in search of food, and the number of human-bear altercations.

Hikers or pedestrians who use trail systems through forests can be urged to educate themselves on recent bear sightings in the area, learn how to look for physical evidence of bear activity, to carry pepper spray, and not to walk or travel alone.

CONCLUSION

From the articles reviewed, there has not been an increase in fatalities from grizzly or black bear attacks from 1990 to 2023. It is possible, however, that fatalities from grizzly and black bear attacks have increased during this current decade (2020 to 2023) and may continue to be higher than past decades beyond 2023. More research should be done at the end of this decade. Since there was a lack of information in the reports regarding the behaviour of bears leading up to the attacks, it is impossible to know if bears involved in fatal attacks were acting in a predatory or defensive way. An increase in urbanization in Canada may contribute to an increase in fatal bear attacks, or at least human-bear interactions, as bears may be pushed out of their preferred habitats in search of more easily available resources (landfills, garbage, fruit, cover). In future,

more research should be conducted in forested areas to determine where bears are located and to determine if they will be affected by urbanization.

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Appendix 1. Information on fatal grizzly bear attacks reported in Canada

Location	Date	Victim	Fatal or nonfatal	Attack description
Jasper National Park, Alberta	September 15, 1992	40, male; unknown age, female	Fatal and nonfatal	Married couple was camping when they were surprised by a bear and tried to run away. Bear initially caught the man's wife, then he distracted the bear which then turned on him and killed him. Female survived the attack. Park wardens found the bear and shot it dead
Radium Hot Springs, British Columbia	October 9, 1995	32, male; 40, male	Both fatal	Men were securing an elk killed while hunting. Bear charged and killed the men and claimed the elk carcass
Kluane National Park, Yukon	July 5, 1996	32, female; unknown age, male	Fatal and nonfatal	Married couple was hiking on a trail when the bear attacked. Female was killed by the bear and the male survived. Park wardens later killed the bear
Beaver Mines, Alberta	August 22, 1998	40, male	Fatal	Man was fishing on the South Castle River when he was attacked and killed by a grizzly bear
Prince George, British Columbia	October 24, 1998	65, male	Fatal	Man came across a grizzly bear feeding on a moose kill about 1.0 km from his cabin. The grizzly attacked and

				bit him on the neck but did not maul or eat the man
Canmore, Alberta	June 5, 2005	35, female	Fatal	Bear was already relocated to Canmore from Banff after approaching another woman. Female killed was jogging with friends on a trail closed to the public to be used as a wildlife corridor. The same bear dragged the female from a tree and mauled her. The bear was later shot and killed
Bowron River, British Columbia	September 20, 2005	60, male	Fatal	Man was walking back to camp after his car broke down. He was attacked and dragged into the bush by a grizzly and her cubs. It is not known what happened to the bears
Ross River, Yukon	April 28, 2006	28, male	Fatal	Man was staking mining claims when he unknowingly walked within 5 m of a den with a grizzly and her cubs. Grizzly mother killed the man. Yukon Workers Compensation Board filed negligence charges

				against the mining company, blaming them for the man's death in that they failed to train him properly
Sundre, Alberta	November 25, 2007	51, male	Fatal	Man was on a hunting trip and his body was found 200 m from his parked truck. The grizzly in question was captured and killed the following April
Kananaskis Country, Alberta	September 7, 2014	54, male	Fatal	Man was walking and wandered into the area where a mother and cub were feeding on a dead deer. He accidentally got in between the sow and cub when the sow mauled him. The fate of the bears is unknown
Norman Wells, Northwest Territories	September 17, 2014	53, male	Fatal	Man had just killed a moose and was processing his kill when a grizzly attacked and killed him. Authorities later found and killed the bear
Teslin, Yukon	October 14, 2014	42, female	Fatal	Grizzly broke through the window of a couple's home and chased them outside. Female was chased and fatally attacked. Husband then fatally shot the bear
Einarson Lake, Yukon	November 26, 2018	37, female; 10 months,	Both females attacked	Family was at their cabin to manage

		female; unknown age, male	fatally, male charged nonfatally	trapping lines. When the father returned, his wife and child had been killed. The bear then charged at him, and he fatally shot the bear
Tulita, Northwest Territories	August 15, 2019	44, male	Fatal	Man was grabbed and taken away out of his tent by a grizzly. The bear ate him, and his remains were found the next day. It is unknown if the bear was found or killed
Waiparous, Alberta	May 4, 2021	59, male	Fatal	Man was out for a run not far from his home when a grizzly charged at him from behind, pushing him over a 300 m embankment
Water Valley, Alberta	May 25, 2021	68, female	Fatal	Female was walking on trails on her property when a mature grizzly attacked and killed her. The bear was captured and euthanized
Red Deer River Valley, Banff National Park, Alberta	September 29, 2023	62, male; 62, female	Both fatal	Couple was backcountry camping when attacked by a grizzly. They were highly experienced and did everything 'right'. Their dog was also killed. Parks Canada staff killed the grizzly on site who was acting aggressively when they arrived

Appendix 2. Information on fatal black bear attacks reported in Canada

Location	Date	Victim	Fatal or nonfatal	Attack description
Lesser Slave Lake, Alberta	May 26, 1991	12, male	Fatal	Boy was dragged from his tent during the night and killed. The fate of the bear is unknown
Algonquin Provincial Park, Ontario	October 11, 1991	32, male; 48, female	Both fatal	Male and female were attacked and killed while setting up camp. Bear dragged their bodies into the woods and consumed their remains. It is not known if the bear was later killed
Cochrane, Ontario	June 14, 1992	20, male	Fatal	Male was attacked and killed while collecting soil samples. Male's work partner was able to drive bear away without injury
70 Mile House, British Columbia	September 16, 1994	4, male	Fatal	Young boy was attacked by a black bear while in the backyard of his home. The bear was killed by conservation officers and the boy died on the way to hospital
Tatlayoko Lake, British Columbia	June 14, 1996	53, male	Fatal	Male was checking on his cattle and was killed after a black bear stalked him and his horse for 0.08 km
Liard River Hot Springs Provincial	August 14, 1997	56, male; 37, female; 13, male	Fatal, fatal, and nonfatal	Female died from injuries while defending her and her son from a

Park, British Columbia				black bear on a boardwalk. An older male heard the attack and was killed in a rescue attempt. The younger male survived. The bear was shot dead while standing over the victims
Valcartier, Québec	July 2, 2000	24, female	Fatal	Female was attacked and killed while on a biathlon training run in a wooded area. Bear attacked from the side and then from behind after the female initially got away. The bear was trapped and killed
Yellowknife, Northwest Territories	June 3, 2001	18, male; 14, female	Fatal and nonfatal	Male and female were attacked at a rural campsite 25 km east of Yellowknife. Male was killed, female survived. A bear was found and killed but was later determined not to be the same bear
Fort Nelson, British Columbia	September 1, 2002	31, male	Fatal	Male was killed by a black bear after going for a walk behind a trailer at a remote oil rigging site. It is not known if the bear was later killed
Saint-Zénon-du-Lac-Humqui, Québec	September 29, 2002	77, male	Fatal	Male was attacked at his campsite while his two sons went hunting. When they returned, one

				of the sons tried to fight the bear but was too late to save his father
Nonacho Lake, Northwest Territories	June 14, 2005	71, male	Fatal	Male was found dead behind the main cabin of his fishing camp. Male's son arrived a day later and shot and killed the bear in the area
Selkirk, Manitoba	August 26, 2005	69, male	Fatal	Male was fatally mauled while picking plums. The victim's family and an RCMP officer were investigating later that day and were also attacked. The officer shot and killed the bear
Missinaibi Lake Provincial Park, Ontario	September 6, 2005	Unknown age, male; 30, female	Nonfatal and fatal	Female was fatally attacked at a remote campsite. Victim's husband was also attacked and seriously injured but survived. MNR staff shot and killed the bear near the site
Panorama Mountain Resort, British Columbia	July 20, 2007	31, female	Fatal	Female was reported missing after going mountain biking. A black bear was found near her corpse the following morning. RCMP killed the bear upon arrival
La Sarre, Québec	May 30, 2008	70, female	Fatal	Female did not return to cabin after going solo fishing. Victim's husband

				went looking and found a bear dragging her body into the woods. It is believed that the bear was hunted and killed
Lillooet, British Columbia	June 2011	72, female	Fatal	Remains were found by police dogs after the female was reported missing. Evidence showed a bear tried to enter her home. Conservation officers later killed 5 bears suspected of being involved. DNA test confirmed one of the bears was the one who caused the attack
Fort McMurray, Alberta	May 7, 2014	36, female	Fatal	Female working for Suncor was attacked and killed while returning to work after using the restroom. Coworkers attempted to scare off the bear but were unsuccessful. RCMP shot and killed the bear upon arrival
Mackenzie, British Columbia	May 10, 2015	27, male	Fatal	Male fell asleep next to a firepit while camping. When his fiancé awoke in their motorhome the following morning, she followed a trail of blood and discovered his body. RCMP later

				killed the bear who was nearby as well as a lone wolf since officials were initially unsure which animal caused the attack
Red Pine Island, Ontario	September 1, 2019	62, female	Fatal	Female went to check on her dogs at her seasonal cabin and did not return. First responders found the woman's body close to an aggressive black bear and the bear was killed. Officials also shot two other yearling bears
Red Lake, Ontario	July 20, 2020	67, male	Fatal	Male went blueberry picking in the morning and did not return. OPP officers discovered his body along with a black bear in the vicinity. The bear was shot and killed at the scene
Buffalo Narrows, Saskatchewan	August 20, 2020	44, female	Fatal	Female was at a family cabin along with her husband and two children. Female was outside using the satellite phone to speak with her father. A black bear attacked her, unprovoked, and she was killed. Victim's husband pepper sprayed the bear and then shot it twice, killing it

Swan Hills, Alberta	July 31, 2021	27, female	Fatal	Female was working for a helicopter company providing transportation for tree planters when she was attacked by a black bear. She was transported to hospital but succumbed to her injuries. The bear was tracked and killed by authorities