

Findings Related to the March 2010 Fatal Wolf Attack near Chignik Lake, Alaska

Lem Butler, Wildlife Biologist, ADF&G

Bruce Dale, Wildlife Biologist, ADF&G

Kimberlee Beckmen, Wildlife Veterinarian, ADF&G

Sean Farley, Wildlife Physiologist, ADF&G



December 2011

Findings Related to the March 2010 Fatal Wolf Attack near Chignik Lake, Alaska

Lem Butler, Wildlife Biologist
Alaska Department of Fish and Game, Division of Wildlife Conservation
1800 Glenn Highway, Suite #4
Palmer, Alaska 99645
Phone: (907) 861-2100
Email: lem.butler@alaska.gov

Bruce Dale, Wildlife Biologist
Alaska Department of Fish and Game, Division of Wildlife Conservation
1800 Glenn Highway, Suite #4
Palmer, Alaska 99645
Phone: (907) 861-2100
Email: bruce.dale@alaska.gov

Kimberlee Beckmen, Wildlife Veterinarian
Alaska Department of Fish and Game, Division of Wildlife Conservation
1300 College Road
Fairbanks, Alaska 99701-1599

Sean Farley, Wildlife Physiologist
Alaska Department of Fish and Game, Division of Wildlife Conservation
333 Raspberry Road
Anchorage, Alaska 99518-1599

December 2011

ADF&G, Division of Wildlife Conservation
1800 Glenn Highway, Suite #4
Palmer, Alaska 99645



Wildlife Special Publications include reports that do not fit in other categories of division reports, such as techniques manuals, special subject reports to decision-making bodies, symposia and workshop proceedings, policy reports, and in-house course materials.

This Wildlife Special Publication was approved for publication by Corey Rossi, Director, ADF&G, Division of Wildlife Conservation.

Wildlife Special Publications are available from the Alaska Department of Fish and Game's Division of Wildlife Conservation, PO Box 115526, Juneau, Alaska 99811-5526; phone (907) 465-4190; email: dfg.dwc.publications@alaska.gov; website: www.adfg.alaska.gov. The report may also be accessed through most libraries, via interlibrary loan from the Alaska State Library or the Alaska Resources Library and Information Service (www.arlis.org)

This document should be cited as:

Butler, L., B. Dale, K. Beckmen, and S. Farley. 2011. Findings Related to the March 2010 Fatal Wolf Attack near Chignik Lake, Alaska. Wildlife Special Publication, ADF&G/DWC/WSP-2011-2. Palmer, Alaska.

The Alaska Department of Fish and Game (ADF&G) administers all programs and activities free from discrimination based on race, color, national origin, age, sex, religion, marital status, pregnancy, parenthood, or disability. The department administers all programs and activities in compliance with Title VI of the Civil Rights Act of 1964, Section 504 of the Rehabilitation Act of 1973, Title II of the Americans with Disabilities Act (ADA) of 1990, the Age Discrimination Act of 1975, and Title IX of the Education Amendments of 1972.

If you believe you have been discriminated against in any program, activity, or facility please write:

- ADF&G ADA Coordinator, P.O. Box 115526, Juneau, AK, 99811-5526
- U.S. Fish and Wildlife Service, 4401 N. Fairfax Drive, MS 2042, Arlington, VA, 22203
- Office of Equal Opportunity, U.S. Department of the Interior, 1849 C Street, NW MS 5230, Washington D.C., 20240

The department's ADA Coordinator can be reached via telephone at the following numbers:

- (VOICE) 907-465-6077
- (Statewide Telecommunication Device for the Deaf) 1-800-478-3648
- (Juneau TDD) 907-465-3646, or (FAX) 907-465-6078

For information on alternative formats and questions on this publication, please contact:

Lem Butler, ADF&G/DWC, 1800 Glenn Highway, Suite #4, Palmer, Alaska 99645;
Phone: (907) 861-2100; Email: lem.butler@alaska.gov

Summary

At approximately 6:00 p.m. on March 8, 2010 the body of Candice Berner was discovered next to a snow-covered road approximately two miles from the community of Chignik Lake, Alaska. The Alaska Departments of Public Safety (DPS) and Health and Social Services (DHSS) initially investigated the case and determined Ms. Berner's death was not the result of a criminal act. The DHSS State Medical Examiner asserted that Ms. Berner died from "multiple injuries due to animal mauling." The Alaska Department of Fish and Game (ADF&G) and the DPS Alaska State Troopers (AST) then evaluated both the physical evidence and the eyewitness testimony of Chignik Lake residents. The investigators concluded that Ms. Berner was attacked and killed by wolves. A joint action to lethally collect wolves from the immediate area was undertaken by the two departments to address public safety concerns and to investigate biological factors that may have contributed to the attack. Genetic analysis of samples taken from the victim's clothing and from wolves killed in the lethal removal action positively identified one wolf and implicated others in the attack.

Contents

Summary	i
Contents	ii
List of Tables	iii
List of Figures	iii
Introduction.....	5
Background.....	5
The Community	5
Wildlife in the Area	5
Weather	6
Description of Incident and Investigation.....	7
Alaska State Troopers Investigation	7
Alaska Department of Fish and Game Investigation	8
Site Overview.....	8
Evidence Related to Events that Occurred Prior to the Attack.....	9
Evidence Related to Events that Occurred During the Attack.....	10
Evidence Related to Events that Occurred After the Attack.....	11
Supplemental Investigation of Potential Contributing Factors	11
Alaska Department of Fish and Game Site Investigation Conclusions	12
Joint Action by the Alaska Department of Fish and Game and the Alaska State Troopers	13
Forensic Samples	15
Biological Examination of Culled Wolves	15
Two wolves killed on March 15	15
Five wolves killed on March 25.....	15
One wolf killed on March 26.....	16
Conclusions Based on the Biological Examination	16
DNA Evidence.....	16
Analysis of Contributing Factors	17
Conclusions and Recommendations	18
References.....	19
Appendix A: Necropsy reports of wolves culled in the vicinity of Chignik Lake	27
Appendix B: Abstract on DNA evidence submitted for peer review	39
Appendix C: Safety Guidelines	40

List of Tables

Table 1. Measurements of animal tracks found within 30 feet of Candice Berner’s body. Each track measurement was recorded from an independent set of tracks. Because the tracks were several days old and some had been drifted in with snow, only tracks that appeared relatively distinct were measured.....	9
Table 2. Summary of wolves culled in the vicinity of Chignik Lake during the joint action taken by the Alaska Department of Fish and Game and the Alaska State Troopers in March 2010.	16

List of Figures

Figure 1. Topographic map that includes the community of Chignik Lake (village center) and the road that connects the community to the outlet of the Chignik River.	21
Figure 2. Aerial photograph of the wolf attack location taken on March 15, 2010. The photograph presents a southwest aspect, towards the site of the attack (in the middle of the photograph) and in the general location of Chignik Lake. The community of Chignik Lake (not pictured) is located just to the right of the photograph (west). The road that Candice Berner was traveling on contours the hills in the lower half of the photograph.	22
Figure 3. Aerial photograph of the wolf attack location taken on March 15, 2010. The photograph presents a south aspect, towards the site of the attack, and was taken from an altitude of approximately 300 feet above ground level. The community of Chignik Lake (not pictured) is located to the right of the photograph (west) and Dorner Bay (not pictured) is to the left (east).	23
Figure 4. Aerial photograph of the wolf attack location taken with points identified that relate to evidence associated with events that occurred prior to the attack. A: wolves were traveling west (left to right) prior to the attack. B: Candice Berner is presumed to have been traveling east (right to left) prior to the attack. C: location identified by a resident of Chignik Lake as the point where the human tracks change direction. RP: reference point and presumed location of Candice Berner’s death.	24
Figure 5. Aerial photograph of the wolf attack location with points identified that relate to evidence associated with events that occurred during the attack. D: tracks of a single wolf moving west (left to right) along berm on south side of the road. E: tracks of a single wolf tracks running west (left to right) along outside (north) bend of the road. F: approximate location on the road where the first mitten was recovered by troopers. G: approximate location on the road where the second mitten was recovered by troopers. H: wolf tracks (D) descend the berm to the road and first depression with traces of blood is observed on south side of the road. I: second depression is observed on the north side of the road and all tracks	

associated with the attack leave the road. RP: reference point and presumed location of
Candice Berner's death. 25

Introduction

Relative to the number of daily encounters between humans and wild animals, animal attacks are rare. However, when these tragic events occur, especially when a large predator is involved, the consequences can be severe, affecting not only the victim but also the surrounding community. Attitudes and perceptions of the general public toward wildlife and wildlife management practices also can be affected. It is important to understand the circumstances under which such attacks occur to provide the public with the best available recommendations to preclude future attacks. The specific details of animal movements, victim response, predatory behaviors, feeding patterns and physical characteristics of the attacking animal need to be investigated both to help prevent future attacks and to provide future responders with information that will allow them to correctly identify the animals involved in an attack.

On March 8, 2010 a young woman, Candice Berner, was killed by wolves near the village of Chignik Lake, Alaska. This report provides documentation of the investigation and conclusions related to that fatal attack. The physical and circumstantial evidence for a fatal wolf attack in this case is convincing. Other fatal wolf attacks have been documented in North America and throughout the world (Linnell et al. 2002, McNay 2002, McNay 2007), but the validity of investigator conclusions in wolf attacks have often been questioned because of a widespread impression that wolves do not act aggressively toward people. That impression is based on the observation that, at least during the twentieth century, there were no documented cases of healthy wolves killing or seriously injuring a person in North America (Mech 1998). This report documenting the Chignik Lake attack is significant because it includes DNA analysis that positively confirms wolf involvement.

Background

THE COMMUNITY

The community of Chignik Lake is located 474 miles southwest of Anchorage on the south side of the Alaska Peninsula. Established in 1905 as a winter residence for a single family, the community grew in size when a school was built in 1950. Chignik Lake is currently a small community with 73 people (2010 U.S. Population Census). The residents, who are predominantly Alutiiq, are heavily dependent on subsistence hunting and fishing. The one school is attended by approximately 17 students.

The community of Chignik Lake is isolated from surrounding communities; the only road extends from the community, on the shore of a large lake of the same name, to the Pacific Ocean in Chignik Bay at the mouth of the Chignik River. Access to and from the community is primarily by aircraft; skiffs and all-terrain vehicles are the primary local means of transportation.

WILDLIFE IN THE AREA

Red foxes, snowshoe hares, brown bears, wolverines, lynx, moose, and wolves are commonly observed near the community. Many of those animals occupy small home ranges in the

immediate area, but wolves, bears, and wolverines occupy large home ranges and periodically travel close to the community on roads, trails, and shoreline travel corridors.

Brown bears occur at high densities (approximately 100 bears per 1,000 km², Butler 2009) and are commonly observed during the spring, summer, and autumn. Brown bears on the Alaska Peninsula traverse long distances to access seasonal resources, such as den sites, sedges, clams, salmon, berries, terrestrial mammals, and marine mammal carcasses. Local topography and large salmon runs in the Black Lake drainage are two natural factors that channel bears near the community of Chignik Lake. Bears can also be attracted to the community by garbage and human food. Bears den during winter and emerge beginning in early April.

Wolves occur throughout the Chignik Lake area at a moderate density of approximately seven wolves per 1,000 km² (USFWS, unpublished data). Moose are the primary prey species for wolves throughout the year, but caribou and salmon account for a large proportion of their diet when available. Wolves also forage on ptarmigan, snowshoe hares, and marine mammal carcasses and other carrion that wash up on the beach. Wolves also prey upon domestic dogs and cats near villages, including Chignik Lake. No pets were reported missing in Chignik Lake during the winter of 2010, although the fate of stray animals is not known. Residents of Chignik Lake reported seeing wolves periodically near the community during the weeks prior to the attack, but none of their reports indicated that wolves displayed signs of aggressive behavior toward people. Residents who encountered wolves reported observing the wolves from a distance and made no attempt to chase, harass, or harvest the wolves.

Moose occur at low densities (< 1 moose per square mile; Butler 2008) in good moose habitat. Though not abundant in the immediate vicinity of Chignik Lake, good numbers of moose can be found nearby in the vicinity of Black Lake and within 15 miles of the community (L. Butler, personal observation).

Local caribou are part of the Northern Alaska Peninsula caribou herd, which is currently at a low population size of 2,000 to 2,500 caribou (Butler 2009). Few caribou migrate near Chignik Lake; however, small groups can often be found west of Black Lake within 20 miles of the community.

Snowshoe hares represent an undetermined proportion of the diet of wolves in this area, but hares were abundant around Chignik Lake during the winter of 2010 and undoubtedly were taken by wolves.

Human use of wolves in the Chignik Lake area is low. Mandatory sealing documented the harvest of a few wolves during the last decade, but no wolves have been sealed in recent years. A few wolves are shot by nonlocal hunters incidental to hunts for brown bear or moose, and occasionally local hunters shoot wolves opportunistically (average annual reported harvest of <1 wolf per year; L. Butler, personal observation.).

WEATHER

Winter weather in the Chignik Lake area is variable and winter storms can produce heavy snow or rain. Winds from the southeast often bring warm air from the Pacific Ocean that can melt snow, particularly early in the season, while winds from the west can bring cold air that can drop

temperatures below zero degrees (F). During the months of January, February, and March, snow accumulates in the area and may be several feet deep in wind drifted areas.

On March 8, 2010 the temperature reached a high of 24 degrees (F) and a low of 17 degrees (F). The sun set at 7:23 p.m. Weather during the day was overcast; a west wind averaged 24 miles per hour (mph). The sustained wind reached a peak speed of 35 mph and a peak gust of 53 mph that day. Snow and blowing snow periodically reduced visibility to one mile.

Description of Incident and Investigation

Originally from Slippery Rock, Pennsylvania, Candice Berner was hired by the Lake and Peninsula School Borough to teach in Perryville, Alaska and surrounding communities. Candice Berner was 32 years old and weighed approximately 115 pounds. She maintained an active lifestyle and was physically fit. Ms. Berner arrived in Chignik Lake on March 8, 2010 and spent the day working with school children. She told coworkers that she planned to jog on the only road that leads from the community to the mouth of the Chignik River that evening. Ms. Berner's last known location was the school office, from where she faxed her timesheet to the district office at 5:10 p.m. Presumably, she then changed into running clothes and left the school before 6:00 p.m.

According to the Alaska State Troopers (AST) report, at approximately 6:00 p.m. on March 8 (1.5 hours before sunset), four residents of Chignik Lake were returning from Dorner Bay on snowmachines, traveling west along the road connecting Chignik Lake to Chignik Bay. The lead member of the party noticed bloody snow in the road and downhill from the road. He walked down the hill and discovered a human body. He and the other three members of the party left the body and traveled back to Chignik Lake to report what they had found (AST report). Two men from the community went to the site with the person who found the body to investigate the report. At 7:27 p.m. AST received a report that the body of an unidentified woman had been found outside of the community of Chignik Lake (AST report).

That evening three men from the community guarded the body while waiting for instructions from authorities. Two of the men returned to the village for warmer clothing, leaving only one person to guard the body. The remaining guard drove his snowmachine in circles in a clearing approximately 200 feet downhill from the body, using the snowmachine's light to search the brush. When a wolf stepped out of the brush and onto the trail, the man left the site (ADF&G interviews and AST report). When he and other residents returned the body had been dragged further down the hill and more of the body had been consumed. When this event was reported to AST, they instructed the residents to move the body to the community for safekeeping until investigators arrived (AST report).

ALASKA STATE TROOPERS INVESTIGATION

On March 9 Trooper Blizzard and Trooper Sadloske traveled to Chignik Lake to investigate the human fatality and conduct interviews. The body was identified as Candice Berner by a fellow teacher. The troopers conducted the initial site investigation, collecting clothing and other evidence at the site and noting animal tracks and other disturbances in the snow. They

interviewed Ms. Berner's coworkers and three people who found the body. The body was then transported to Anchorage for examination by a medical examiner.

ALASKA DEPARTMENT OF FISH AND GAME INVESTIGATION

The Alaska Department of Fish and Game (ADF&G) was first informed of the attack by a concerned citizen on March 9 at approximately 8:30 a.m. This person contacted ADF&G wildlife biologist Lem Butler, who was attending a meeting in Fairbanks, and informed him that a woman had been killed by wolves near Chignik Lake. Butler immediately contacted AST Sergeant Johnson of the AST in King Salmon to verify the report. Sgt. Johnson confirmed that a woman had been found dead near Chignik Lake, and that two troopers were en route to investigate the incident. Few details were available at that time, and troopers still needed to address the possibility of human involvement, but initial information indicated that her death may have been the result of an animal attack.

Butler departed Fairbanks for Chignik Lake later that morning, but weather and commercial flight delays prevented him from arriving until March 11. Upon arrival, Butler was taken to the location of Candice Berner's death to conduct a follow-up site investigation. Butler was the sole ADF&G biologist at the scene.

Even though it had been three days since the attack, care had been taken to avoid disturbing tracks in the snow. Enough evidence remained to construct a plausible sequence of events that occurred before and after the attack, and to identify the species of animal involved in the attack.

Though human activity had erased tracks in the center of the road and at the location where residents retrieved the body, human tracks leading to impressions in the snow left by the deceased during the encounter, and many animal tracks had not been disturbed. Additionally, the human and animal tracks moving away from the road to the point where her body was discovered had been carefully avoided. On the main road where tracks had been disturbed during recovery of the body, the ADF&G site investigation relied on pictures taken the night of the attack and on information gathered from interviewing people who discovered her body.

Site Overview

The attack occurred along a portion of the snow-covered road approximately two miles east of the community of Chignik Lake (Figure 2). Vegetation surrounding the site was a mixture of closed and open shrub canopy that averaged 10 feet in height, and composed approximately 60% of the vegetation cover in the area (Figure 3). The remaining vegetation type was open tundra covered in snow. At the base of the hill, in a drainage bottom, was a larger opening of frozen wet tundra. Both the road and the frozen wet tundra served as natural travel corridors for animals traveling through the brushy terrain.

The road itself follows a contour near the top of a hill before descending to cross the tundra at the base of the hill. Visibility along the road was poor (30 to 70 feet) due to the dense shrub canopy and curvature of the road. At several locations along the road small, openings in the shrub canopy afforded a limited view of the upcoming road and frozen tundra, but none offered a complete view of the travel corridors.

Animal tracks along the sides of the road and in the area of the attack were identified as wolf tracks based on the size of individual tracks (length and width; Table 1). Although some very large dog breeds leave tracks similar in size to wolves (Harris and Ream 1983), only small- to medium-sized dogs were observed in the community by Butler. No animal tracks were observed between the site of the attack and the community of Chignik Lake and no dog tracks were observed beyond the immediate perimeter of the Chignik Lake community. Additionally, none of the wolf tracks observed was of a size, stride length or stride pattern that could be confused with any other canid (dog-like) species in the area.

Table 1. Measurements of animal tracks found within 30 feet of Candice Berner’s body. Each track measurement was recorded from an independent set of tracks. Because the tracks were several days old and some had been drifted in with snow, only tracks that appeared relatively distinct were measured.

ID	Date	Length (in)	Width (in)
1	Mar 11	5.0	4.0
2	Mar 11	4.0	3.0
3	Mar 11	4.5	3.5
4	Mar 11	4.5	3.75
5	Mar 11	4.5	3.5

Evidence Related to Events that Occurred Prior to the Attack

Snowmachine and other human traffic obscured evidence of the deceased’s tracks along the center of the road. Thus ADF&G evaluation of the initial encounter with the wolves is based on tracks observed adjacent to the road, physical evidence collected by AST, and on interviews with people who observed the tracks before they were disturbed.

Two lines of evidence suggest that Ms. Berner was traveling away from the community of Chignik Lake when she encountered the wolves. First, the person who initially discovered the body did not observe human tracks in the snow as he returned from Dorner Bay as one of the party of four on the evening of March 8 (ADF&G interview). Second, a resident of Chignik Lake, who had visited the site before the area had been disturbed, stated that he had observed human tracks that made an abrupt reversal in direction at a point (Figure 4: C) 360 feet from the location where the deceased is presumed to have died (Figure 4: RP; ADF&G interview). This change in direction may be the point at which she either first noticed the wolves or became alarmed at their behavior.

Wolf tracks observed from the air by Mr. Butler on March 15 indicated that wolves were traveling from east to west using the road at times and also traveling through the openings in the vegetation. These observations suggest that Ms. Berner and the wolves were moving toward each other from opposite directions prior to the encounter. A strong wind was blowing from the west.

The wolves were traveling into the wind presenting the possibility that they may have detected the deceased by scent.

Evidence Related to Events that Occurred During the Attack

Based on tracks observed by ADF&G at the encounter location, the initial struggle occurred while she was traveling in a westward direction toward the community of Chignik Lake, in the opposite direction from her original direction of travel.

Following the tracks in the snow sequentially in the direction of the attack, the first evidence that could definitively be connected to the encounter from the ground was a set of wolf tracks running west along the edge of the road at the outside of a bend (Figure 5: E) located 250 feet east of the location of her death (Figure 5: RP). A second set of tracks was also moving west along the south side of the road at the top of a berm (Figure 5: D).

Alaska State Troopers found a mitten (Figure 5: F) approximately 200 feet east of the site where it is presumed she was killed (Figure 5: RP). The mitten and its location are the first evidence of contact between the deceased and the attacking animal(s). A second mitten (Figure 5: G) was recovered 63 feet east of the location of her death (Figure 5: RP). Because there were no wolf tracks or human footprints persisting on the road, little information was available to determine what happened as the deceased and the wolves moved west along the road. However the wolf tracks along the south side of the road and the spacing of the mittens suggest that the wolves had to run to cover the distance between themselves and the deceased. The spacing of her mittens and the fact that the thumb of one glove was torn off suggest that one or more wolves attacked her as she moved west along the road.

The first indication that the deceased had been wounded by the wolves appeared as a depression in the snow with traces of blood on the south side of the road (Figure 5: H), 40 feet east from where she was killed (Figure 5: RP). Wolf tracks running along the south side of the road descended on to it just prior to this depression in the snow. The convergence of the running tracks, the depression in the snow, and the presence of blood suggest the deceased was first knocked or fell to the ground at this location and was under attack.

A second depression on the north side of the road (Figure 5: I), 30 feet from where she died (Figure 5: RP), suggests that she was knocked down or fell a second time 10 feet from the first attack location. The tracks move downhill away from the road after this second depression. The human tracks that led away from the second roadside depression suggest that the deceased initially struggled and crawled as she moved away from the road, but during the second half of this movement the human tracks change and indicate that she was pulled downhill. The extent of blood in the snow suggests that she was severely wounded at this point. This group of tracks led to a point where it is presumed she died (Figure 5: RP) in a small clearing. This presumed location of death was marked with extensive snow melt (3 feet in diameter) and a large blood stain. Additionally, even though her body was subsequently moved by animals from this site, there were no further signs of struggle.

Evidence Related to Events that Occurred After the Attack

Tracks and depressions in the snow indicate that the body was moved at least twice by wolves after her death. Subsequent interviews with people who discovered and retrieved her body support this conclusion (ADF&G interviews and AST report).

The wolves initially moved her body downhill 83 feet from the location of her death (Figure 6: RP) to the place where her body was first discovered (Figure 6: J) by the party of four returning from Dorner Bay. This movement occurred postmortem as evidenced by a drag mark measuring two feet wide and one foot deep and without signs of a struggle. Earphones and a lycra-type garment were recovered by AST approximately 50 feet from the location of her death (Figure 6: RP) (AST report). There was very little snow melt at the site where her body was discovered, which suggests that her body had remained at the first site long enough to lose external body heat. The interviews and pictures taken the night of her death support the conclusion that wolves dragged the body downhill after she died (ADF&G interviews and AST report). The movement also explains why clothing was displaced when it was discovered, either by the action of wolves pulling on it or by resistance caused by the snow.

The body was moved a second time, after it had been discovered. Drag marks and a third depression in the snow (Figure 6: K) indicated that the body was moved north 70 feet downhill between the time it was initially discovered by the party of 4 returning from Dorner Bay (approximately 6:00 p.m.) and the time it was recovered and transported from the area by community residents. First-hand accounts from people present the night of the attack verified that her body was moved after its initial discovery (ADF&G interviews and AST report). Those witnesses also reported that a single wolf was observed at the location (Figure 6: L) that night.

Butler also observed nine sets of wolf tracks within a 30-foot radius of the location where the body was discovered. Four of the tracks traveled through the vegetation but did not lead directly to locations associated with the body. Five of the tracks (Table 1) led to, from, or past locations where the body had been at some point in time.

Supplemental Investigation of Potential Contributing Factors

When wild animals attack people, there are frequently factors that contribute to the attack that may not be immediately obvious to the investigation team. This subsection details contributing factors that were investigated by the Alaska Department of Fish and Game in the days following the attack.

1. **Defense Behavior:** No evidence was found that the wolves acted defensively during the attack. A reconnaissance of the area did not detect any animal kill sites that the wolves might have been defending.
2. **Habituation and Conditioned Behavior:** No evidence was found that the wolves were habituated to people. Residents of Chignik Lake did report encounters with wolves in the weeks preceding the attack, but none of the encounters involved direct interaction with the wolves and interactions were unremarkable. The reports commonly described a group of people seeing two to four wolves at a distance. The wolves occasionally watched the people

for a short time before moving away. No attempts were made to pursue or harass the wolves even though people were concerned by the sightings. Several residents stated that no one had attempted to feed or approach the wolves for any reason. Those types of encounters are typical of most human-wolf interactions in Alaska.

3. Food Attractants: No evidence was found that food attractants contributed to the attack. The attack occurred nearly two miles from the community of Chignik Lake and any associated attractants. There was no evidence that the deceased was carrying food with her when she was attacked. However, the community of Chignik Lake does contain several possible attractants for wolves. Domestic dogs (estimated to weigh between 20 and 70 pounds) were frequently observed in the community during the investigation, and wolves have been reported killing and eating dogs and cats in Chignik Lake in previous years; however, no reports of missing dogs or cats were noted in the weeks prior to the attack. Human garbage and food are also potential attractants. The community landfill is enclosed within a chain-link fence and garbage is incinerated. Although no evidence was found that wolves had direct access to food or garbage in the community, wolf tracks were observed around the perimeter of the landfill fence, and a dog was observed dragging a bag of garbage toward the perimeter of the community six days after the attack.

Alaska Department of Fish and Game Site Investigation Conclusions

1. The ADF&G biologist identified wolf tracks at the site where the deceased was attacked and subsequently killed.
2. Based on the number and size of wolf tracks, ADF&G concludes that four or fewer wolves were directly associated with the attack or had visited the location of the attack. It is possible that one wolf could have made all of the tracks if the wolf was repeatedly disturbed by human activity, but differences in track size suggest that two or more wolves visited locations associated with the body. Wolf tracks on the north and south side of the road during the initial stages of the attack support the conclusion that there were at least two wolves involved in the attack.
3. Based on the short amount of time that elapsed between the last known location of the deceased (fax sent from Chignik Lake School) and the discovery of her body two miles from Chignik Lake (approximately 50 minutes), and the number of events that transpired prior to the discovery of her body, it is plausible that she encountered the wolves soon after starting her run. The short time frame and the information gathered during interviews suggest that she was most likely traveling east, away from town, when she encountered wolves traveling the road in the opposite direction.
4. Tracks and markings in the snow indicate that the struggle with the wolves was brief and death occurred quickly.
5. Feral dogs were not involved in the attack, based on the size of the tracks at the site of the attack. Dogs in the community of Chignik Lake were small to medium sized and appeared well-socialized to investigators. Though often left to wander the village unattended, dogs rarely left the immediate vicinity of the community (based on the absence of dog tracks

outside of the community and subsequent observations by ADF&G), unless accompanied by humans. According to residents, dogs will periodically attempt to follow humans on snowmachines leaving the village, but they generally turn back when they cannot keep up and return directly to the community.

Joint Action by the Alaska Department of Fish and Game and the Alaska State Troopers

After concluding that wolves killed Candice Berner, ADF&G and AST made the decision to lethally remove wolves from the area. This action was taken to provide for public safety and to evaluate biological factors in the local wolf population that may have contributed to the attack. Diseases such as rabies or canine distemper can alter an animal's behavior, and ADF&G made the decision to determine their morbidity rates in local wolves.

Because wolf attacks on humans are rare and poorly understood, the probability that wolves might engage in multiple attacks on humans is unknown. Immediately after the attack, community residents expressed concern and requested assurance that it was safe to engage in normal activities without the threat of another wolf attack. The concern of the local community that a life was lost in a rare predatory wolf attack provided the impetus for culling local wolves. Culling local wolves from the local population also offered the opportunity for investigators to collect data on possible contributing factors.

Initial Response

Following the site investigation, the AST temporarily assigned one trooper to remain in the community with wildlife biologist Lem Butler to assist ADF&G with any response actions and to offer reassurance to the community. During this period, ADF&G evaluated the attempts made by residents to locate and kill any wolves that came near the community.

An impromptu public meeting was held in Chignik Lake on March 11 to talk with residents about the incident, to hear their concerns, to discuss public safety, and to review possible actions by State of Alaska officials. Residents were also given recommendations on how people should respond if they are attacked by wolves.

Through March 11 weather conditions remained poor and visibility was frequently restricted by blowing snow. Daily reports of wolf sightings or fresh tracks circulated through the community, but no wolves were killed by residents despite repeated efforts. Poor weather and thick vegetation made it nearly impossible for local residents to locate wolves by available means.

After reviewing the information collected by Mr. Butler during his site investigation and after evaluating the unsuccessful public effort to remove area wolves, ADF&G staff initiated an action to use aircraft to locate wolves and then remove them from the area. The removal effort was limited to the area within 30-miles of the community of Chignik Lake, though the search effort primarily focused on the area within 15 miles of the community. The size of the primary focus area was based on the typical territory size for wolf packs on the Alaska Peninsula.

On March 15 the weather improved enough to conduct an aerial search for wolf sign and wolves. AST dispatched a Robinson R-44 helicopter and pilot to Chignik Lake to aid in the search and

removal effort. ADF&G contracted an Aviat Husky aircraft with an experienced wolf tracking pilot. ADF&G also contracted a second skilled wolf tracker to assist with the removal operation.

On the evening of March 15, two wolves were collected within 12 miles of the location where the deceased was found. Given proximity to the site and knowledge of wolf home range size and behavior, it could be reasonably assumed that the home range of the two wolves could include the Chignik Lake area. It was also noted that the wolves matched the description of two wolves seen by a Chignik Lake resident a few days prior to the attack. The resident reported those wolves were in “poor shape” with one wolf darker than the other. The wolves (2010-19 and 2010-20) were killed using a shotgun fired from the helicopter and shipped to the ADF&G Fairbanks office for necropsy and sample collection. External examination indicated the wolves were emaciated and that one was darker in coloration than the other.

The search continued on March 16. Wolf tracks were observed 25 miles from the community of Chignik Lake moving northwest, but the wolves were not pursued because the tracks were too far from Chignik Lake to be readily associated with the wolf attack.

On March 17, after three days of searching for wolves or wolf sign and finding no evidence of wolf activity near the community, the removal effort was temporarily suspended to determine if the removal of the two wolves had successfully eliminated the public safety threat. However, biologists recognized that the wolves responsible for the attack may have not been in the area during the search based on the average territory size and travel patterns of wolves in the area and that the wolves might not return to the search area for several days. Residents were instructed to notify ADF&G if there were any more wolf sightings near the community.

Follow-up Response

On March 18, Chignik Lake residents report seeing what looked like the eyes of a wolf reflecting in the beam of a flashlight along the perimeter of the community; however, no one had a clear enough view of the animal to allow verification that it was a wolf. Residents were asked to report any additional sightings.

On March 19, ADF&G made the decision to resume the effort to take wolves near the community, and contracted two skilled wolf trappers to confirm the wolf sightings and to attempt to kill the wolves if they were present. The trappers were authorized to take wolves with traps or to shoot them from the ground or air.

On March 20 and 21, the contracted trappers prepared gear and shipped supplies to Chignik Lake. The trappers arrived in Chignik Lake on March 22. The weather remained marginal for flying, so the trappers set traps near the community and searched for wolf sign from the air when weather permitted. The trappers were instructed to focus their search for wolves and their tracks within a 15 mile radius of the community.

On March 22, the contracted trappers located a single set of wolf tracks from the air that were several days old. The tracks descended a mountain south of the community before following the Clark River drainage and were eventually lost near a mountain pass that leads toward Perryville. No recent tracks were observed near the community.

On March 25, the contracted trappers found fresh tracks of five wolves 15 miles west of the location of the attack. The wolves (2010-32, 2010-33, 2010-34, 2010-35, and 2010-36) were shot from the air and sent to the ADF&G Fairbanks office for necropsy and sample collection.

On March 26, the contracted trappers found a set of fresh wolf tracks moving from Dorner Bay toward the community of Chignik Lake. The tracks passed close to the location where Candice Berner had died and continued past the community. The trappers eventually located two wolves one mile from the community. One wolf was killed (2010-37), and the other wounded but not recovered. The fate of that wolf remains unknown. The wolf that was collected was shipped to the ADF&G Fairbanks office for necropsy and sample collection. Wolf hair and blood samples that were believed to be from the wounded wolf were collected from snow and vegetation and submitted as samples (Sample ID: CHIG11 and CHIG12).

The contracted trappers searched unsuccessfully for the wounded wolf, using aircraft when the weather permitted. There were no additional sightings of wolves or fresh wolf sign in the search area. On March 30, ADF&G and AST suspended the effort to locate and remove wolves near the community of Chignik Lake.

Forensic Samples

BIOLOGICAL EXAMINATION OF CULLED WOLVES

All wolves taken were shipped to Fairbanks for necropsies conducted by the ADF&G wildlife veterinarian, Dr. Kimberlee Beckmen. The necropsies included a thorough external and internal examination of all tissues and organs. Blood, urine and tissues were collected to test for disease or other anomalies that could be linked to abnormal wolf behavior. Tissue samples for DNA analyses were sent to the Anchorage ADF&G laboratory for additional sample preparation prior to DNA analyses conducted at the Molecular Ecology Laboratory of the U. S. Geological Survey's Alaska Science Center (ASC-MEL). Subsequent microscopic examination of appropriate tissues and testing for rabies and canine distemper virus were conducted at the Washington Animal Disease Diagnostic Laboratory. The necropsy reports are attached as Appendix A.

Two wolves killed on March 15

The two wolves killed on March 15 (female, 2010-19, and male, 2010-20) were emaciated (Table 2) despite the relative abundance of moose in the area. Given the time of year the two wolves may have been a breeding pair in search of a new territory, and, based on their age (2010-19 was 2 years of age and 2010-20 was 3 years of age), they may have been relatively inexperienced hunters. These factors combined may have contributed to their poor condition.

Five wolves killed on March 25

The five wolves killed on March 25 (female 2010-32, female 2010-33, female 2010-34, female 2010-35, and male 2010-36) were in good body condition, and one was considered fat (Table 2). No significant abnormalities were found.

One wolf killed on March 26

The female wolf (2010-37) killed on March 26 had abundant fat reserves and was in excellent overall condition (Table 2). No significant abnormalities were found.

Conclusions Based on the Biological Examination

All eight of the culled wolves tested negative for rabies and distemper. The histopathology reports from the Washington Animal Disease Diagnostic Laboratory (Washington State University, Pullman, Washington) found parasites that are considered clinically insignificant. No conditions were found that would have predisposed these animals towards aggressive behavior. When viewed as a representative sample of the wolf population in the vicinity of Chignik Lake, these findings greatly reduce the possibility that the wolves involved in the attack were in an abnormal condition that would have predisposed these wolves to an attack. Six of the eight wolves culled were in good to excellent condition (Table 2).

Table 2. Summary of wolves culled in the vicinity of Chignik Lake during the joint action taken by the Alaska Department of Fish and Game and the Alaska State Troopers in March 2010.

ID	DOK	Sex	Age	Uncorrected Weight (pounds)	Condition
2010-019	Mar 15	Female	2	60 ^a	Emaciated
2010-020	Mar 15	Male	3	75 ^a	Emaciated
2010-032	Mar 25	Female	Pup	100 ^b	Fat
2010-033	Mar 25	Female	2	87 ^b	Good
2010-034	Mar 25	Female	2	85 ^b	Good
2010-035	Mar 25	Female	4	102 ^b	Good
2010-036	Mar 25	Male	3	103	Good
2010-037	Mar 26	Female	4–6	85	Fat

^aEstimated weight.

^bWeight includes stomach content; “full of moose”.

DNA EVIDENCE

Eighty forensic samples were collected, from the clothing of the deceased by ADF&G personnel and from her body by the State Medical Examiner. These samples, samples from the culled wolves, and wolf samples from research projects conducted elsewhere in the state (for quality assurance/quality control [QA/QC] purposes) were supplied to the Molecular Ecology Laboratory of the U. S. Geological Survey’s Alaska Science Center (ASC-MEL) in Anchorage, Alaska. All samples were sent to the ASC-MEL as single blind samples and were used to determine if evidence supported the conclusion that wolves were involved in the fatality, and if so, that individual animals involved in the attack could be identified. If successful, that

information would be useful when evaluating demographic, physical, and health characteristics of the attacking animals, and would assist in evaluating the context in which the attack occurred.

Twenty forensic samples yielded DNA of sufficient quality to be used for individual identification. An additional 22 forensic samples yielded sequence data from the canid mitochondrial control region but failed to yield reliable microsatellite data for individual identification. All samples sent for QA/QC were correctly identified. Nuclear and mitochondrial DNA analyses of the 20 forensic samples that could be used for individual identification found no evidence of wolf-dog hybridization (Appendix B). Although domestic dog DNA was found in two hairs left on the victim's clothing (from among the 22 low quality samples that could not be used to determine animal identity), these two hairs were found from a location on the victim's clothing that did not imply participation in the attack. All recoverable DNA associated with samples taken from areas on the victim related to the attack were from wolves. Thus, while domestic dog DNA was recovered from hair samples taken from the victim's clothing, dogs were not associated with the attack. DNA evidence from the bite marks on the deceased was identified as wolf DNA.

At least two wolves left DNA on the body and clothing. One of these wolves (2010-037), an adult female in excellent body condition, was killed on March 26 near the location where the attack occurred. Samples from this wolf were most prevalent in the collected forensic samples. The other wolf is unknown as it was not one of the wolves culled near Chignik Lake. The DNA investigation also concluded that as many as three to four wolves may have left DNA evidence, but that conclusion is less certain due to a lack of data replication. It was also recognized that there could have been more than four wolves involved in the attack as some individuals involved may not have left adequate or recoverable DNA.

Data from six of the culled wolves had relatedness values consistent with either a first (parent or sibling) or second (grandparent, half sibling) order relationship. The wolf designated as genetic sample CHIG4 (2010-37) was identified from samples collected from the deceased. This wolf had a relatedness value that was consistent with a first order relationship with two other culled wolves (genetic samples CHIG2 and CHIG8; subadult female [2010-19] and male [2010-36], respectively). This familial relationship, the results of the investigation (tracks indicate that there may have been as many as four wolves present), and reports from residents introduce the possibility that one or more of the other wolves culled in the Chignik Lake area could have been present when the attack occurred, however no genetic information was recovered to link them to the attack.

An abstract of the genetics methods, results, and conclusions is presented in Appendix B.

Analysis of Contributing Factors

The attack occurred in full daylight about 1.5 hours before sunset. Visibility along the road was restricted by vegetation, road curvature, and possibly weather conditions. Vegetation and the curvature of the road alone prevented a view of the upcoming road (i.e., there was a "blind turn"). Those factors and the pattern of the wolf tracks traveling west toward the site of the attack suggest that the wolves did not stalk the deceased from behind prior to the attack and that the encounter may have come as a surprise to both parties. However, a strong west wind was

blowing in the general direction of the wolves so the wolves could have been aware of her presence prior to the attack. It is possible that the small body size (115 pounds, 4 feet 10 inches tall) of the deceased, the fact that she was traveling alone, and that she was running may have contributed to the attack. The close proximity of the wolves to the deceased when they first sighted each other at the curve of the road also may have contributed to the attack, but there is insufficient evidence here to evaluate the importance of these factors.

The deceased was likely listening to a portable music player with ear buds as AST found ear phones of that type at the site, but this activity is not believed to be a factor that contributed to her death. Wolves typically make little noise while traveling, and the winds reported on the night of March 8 would have masked any sounds that might have alerted her to their presence.

Her initial response to detecting the wolves is not known. The statement made by one person interviewed suggests that she reversed course and ran in the direction of Chignik Lake, but the track evidence could not confirm those actions. We do know, however, that her direction of travel was east to west, opposite the direction from her original direction of travel. A flight response, or the appearance of one, could have elicited a predatory response by the wolves.

DNA evidence and wolf tracks observed at the scene indicate that two to four wolves were likely involved in the attack. One wolf was an adult female (2010-37) in excellent body condition with no apparent health issues. DNA matching this wolf was most prevalent in the forensic samples. The fate(s) of any other wolves involved in the attack are unknown. Based on the body condition of the wolves culled and on the number of prey species (moose and snowshoe hares) observed in the area, starvation or severe hunger were probably not factors in the attack. However, the amount of time since the wolves' last meal is unknown.

Snow track evidence suggests the attack itself was brief, and the deceased was quickly incapacitated. One or two wolves pursued her down the road and attacked while another wolf approached from above the road and intercepted her. Based on evidence in the snow, she died 40 feet from that location.

Depressions in the snow and eyewitness accounts indicated that the body was dragged twice after her death, toward an area with more brush cover. It is possible that the wolves attempted to move her body out of the clearing in response to noise from approaching snowmachines. Her body was moved to its final location after the person guarding her body left the area when he saw a wolf nearby. When a group of residents returned to retrieve the body, it had been moved farther down the hill to a location with brush cover, and more of it had been consumed.

Conclusions and Recommendations

DNA, forensic evidence, and eyewitness accounts all indicate wolves killed Candice Berner on the evening of March 8, 2010 following an encounter with healthy wolves. This appears to have been an aggressive, predatory attack that was relatively short in duration. Wolf attacks on humans in North America are rare, and, as a result, poorly understood. While this is not the first incident of a wolf attacking humans (McNay 2002), this investigation is the first where DNA evidence has been collected to confirm wolf involvement. There was no evidence in this case indicating that wolves had become habituated to or began defending local food resources. We

found no evidence from the local wolf population or the culled wolves that indicated biological factors such as disease that may have predisposed the wolves to attack. The single culled wolf known to have been involved appeared healthy and in excellent condition.

Jogging alone and other solo activities in remote parts of Alaska entail inherent risk, but an attack by wolves is not considered to be a risk commensurate with bear attacks, inclement weather or personal injury. Evaluation of other human-wolf encounters (McNay 2002) suggests that threatening behavior from wolves has been averted when more than one person was involved in the encounter; however an encounter documented in Saskatchewan just prior to the attack on Kenton Carnegie documented the aggressive behavior of wolves towards two adult men (McNay 2007).

In spite of the findings in this report, wolves are no more dangerous than they were prior to this incident, and people should not be unnecessarily fearful. However people should be mindful of the potential harm that wolves and other wild animals are capable of inflicting and always try to maintain a safe distance from wolves and other wild animals they encounter.

ADF&G has safety guidelines available for those who live or travel in areas where there are wolves. In light of the tragic incident reported here, we recommend that members of the public who may encounter wolves review these guidelines. A list of information available and URL links to downloadable brochures on ADF&G's website are presented in Appendix C. While following safety guidelines provides no guarantee that a wild animal will not attack, doing so may prevent attack or injury.

References

- Butler, L. 2008. Units 9 moose management reports. Pages 116–124 *in* P. Harper, editor. Moose management report of survey and inventory activities 1 July 2005–30 June 2007. Alaska Department of Fish and Game. Project 1.0. Juneau, Alaska.
- Butler, L. 2009. Units 9 brown bear management reports. Pages 113–124 *in* P. Harper, editor. Brown bear management report of survey and inventory activities 1 July 2006–30 June 2008. Alaska Department of Fish and Game. Juneau, Alaska.
- Butler, L. 2009. Units 9C & 9E caribou management reports. Pages 32–42 *in* P. Harper, editor. Caribou management report of survey and inventory activities 1 July 2006–30 June 2008. Alaska Department of Fish and Game. Juneau, Alaska.
- Harris, R. B. and R. R. Ream. 1983. A method to aid in the discrimination of tracks from wolves and dogs. Pp. 120–124 *in* L. Carbyn, ed., *Wolf management in Canada and Alaska*. Canadian Wildlife Service report #45. Ottawa.
- Linnell, J. D. C., R. Andersen, Z/ Andersone, L. Balciauskas, J. C. Blanco, L. Boitani, S. Brainerd, U. Breitenmoser, K. Kojola, O. Liberg, J. Løe, H. Okarma, H. C. Pedersen, C. Promberger,

- H. Sand, D. J. Solberg, H. Valdemann, and P. Wabakken. 2002. The fear of wolves: A review of wolf attacks on humans. NINA Oppdragsmelding 731: 1-65
- McNay, M. E. 2002. Wolf–human interactions in Alaska and Canada: a review of the case history. *Wildlife Society Bulletin* 30:831–843.
- McNay, M. E. 2007. A Review of Evidence and Findings Related to the Death of Kenton Carnegie on 8 November 2005 Near Points North, Saskatchewan. Alaska Department of Fish and Game, Fairbanks, Alaska.
- Mech, L. D. 1998. “Who’s afraid of the big bad wolf?” Revisited. *International Wolf* 8(1):8–11.

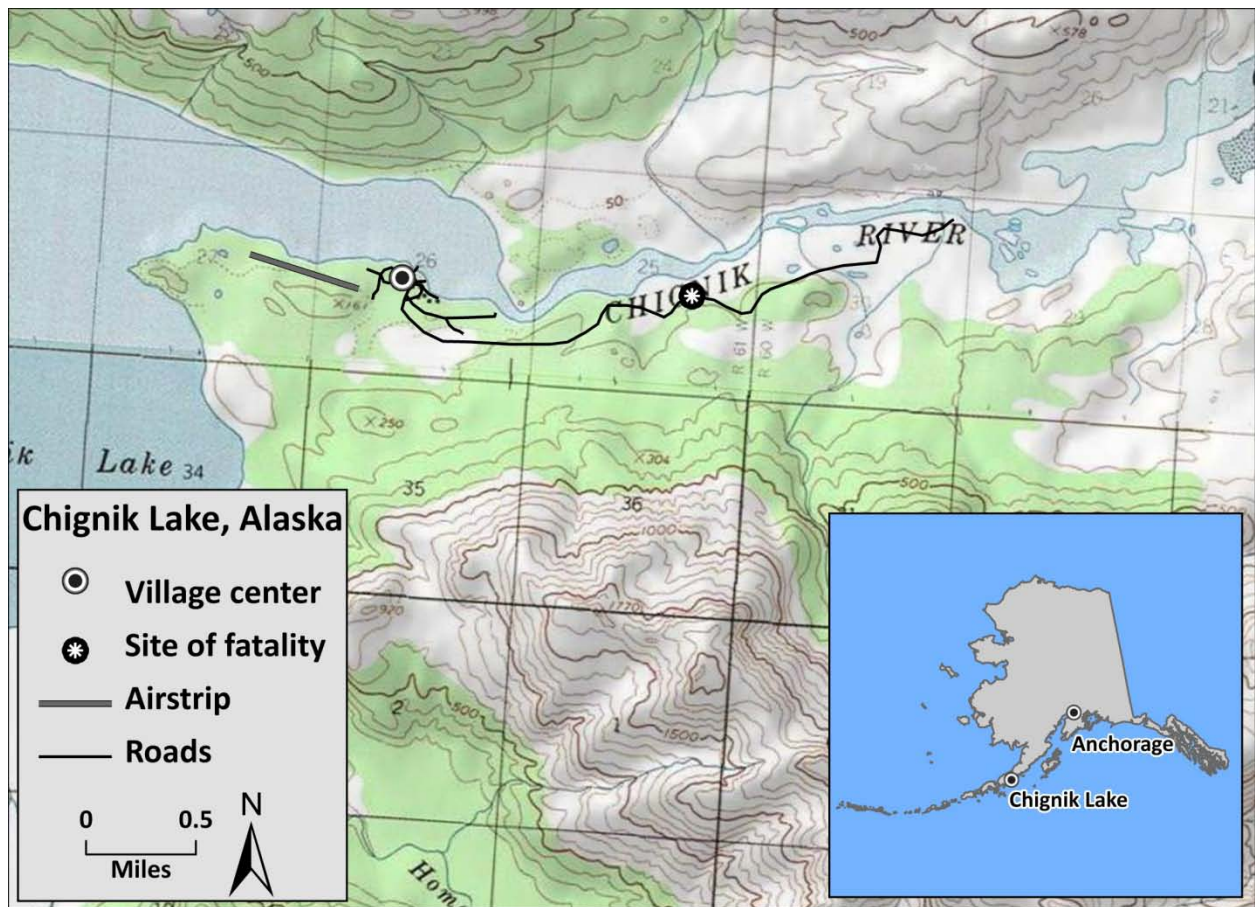


Figure 1. Topographic map that includes the community of Chignik Lake (village center) and the road that connects the community to the outlet of the Chignik River.



Figure 2. Aerial photograph of the wolf attack location taken on March 15, 2010. The photograph presents a southwest aspect, toward the site of the attack (in the middle of the photograph) and in the general location of Chignik Lake. The community of Chignik Lake (not pictured) is located just to the right of the photograph (west). The road that Candice Berner was traveling on contours the hills in the lower half of the photograph.



Figure 3. Aerial photograph of the wolf attack location taken on March 15, 2010. The photograph presents a south aspect, towards the site of the attack, and was taken from an altitude of approximately 300 feet above ground level. The community of Chignik Lake (not pictured) is located to the right of the photograph (west) and Dorner Bay (not pictured) is to the left (east).

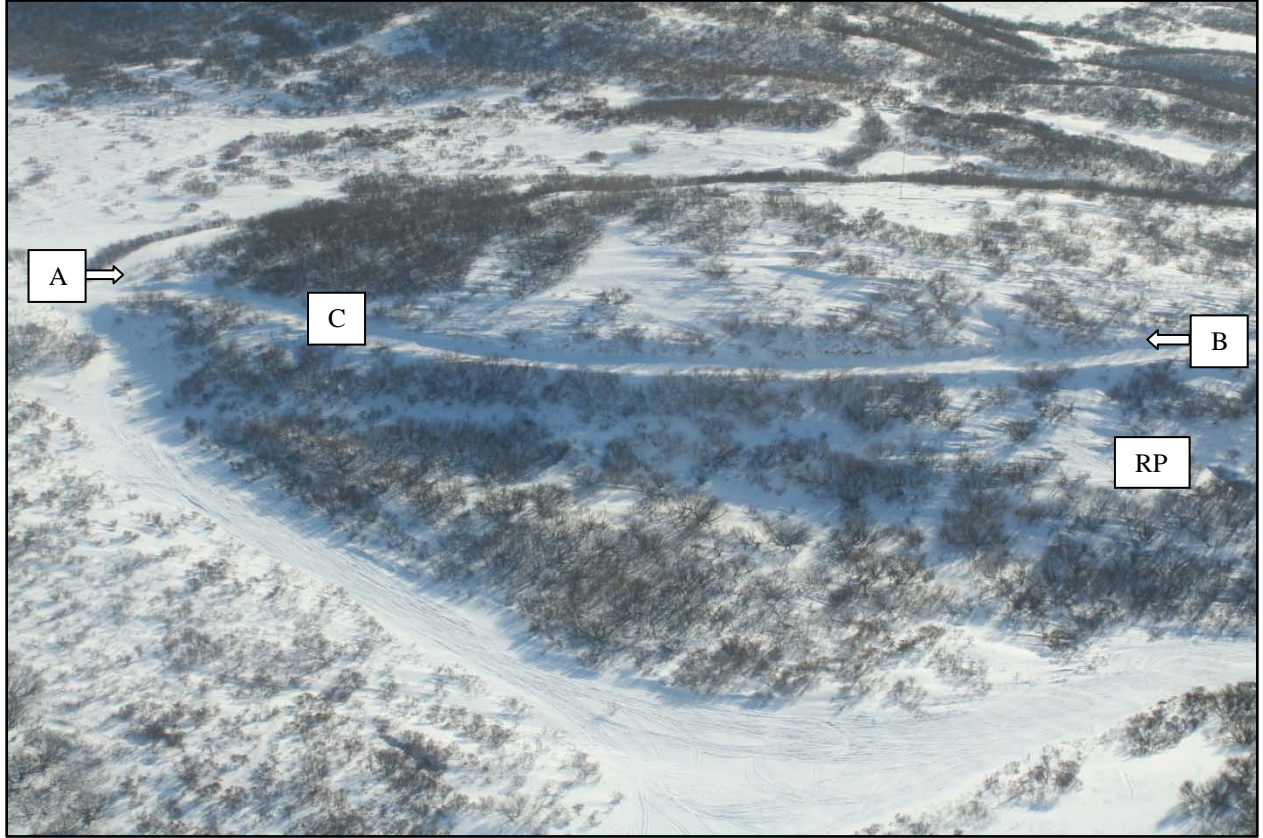


Figure 4. Aerial photograph of the wolf attack location taken with points identified that relate to evidence associated with events that occurred prior to the attack. A: wolves were traveling west (left to right) prior to the attack. B: Candice Berner is presumed to have been traveling east (right to left) prior to the attack. C: location identified by a resident of Chignik Lake as the point where the human tracks change direction. RP: reference point and presumed location of Candice Berner's death.

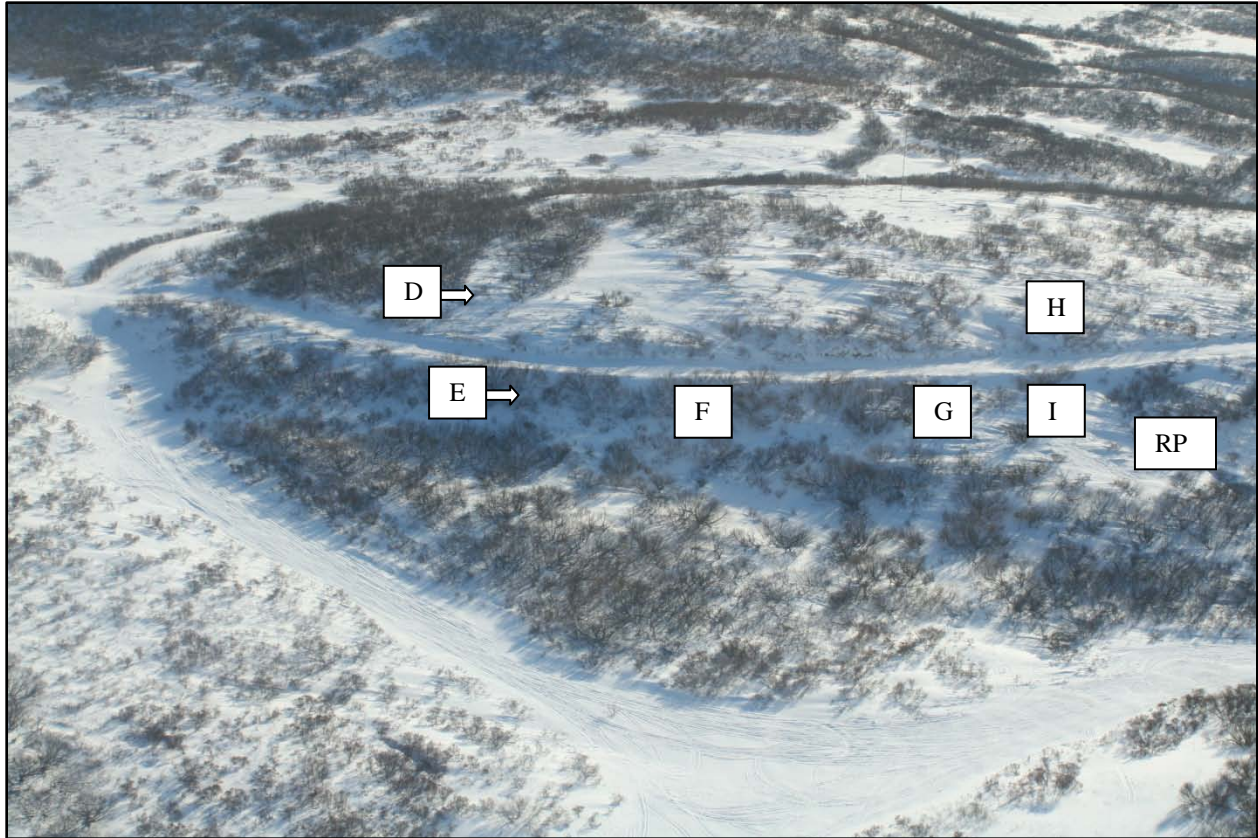


Figure 5. Aerial photograph of the wolf attack location with points identified that relate to evidence associated with events that occurred during the attack. D: tracks of a single wolf moving west (left to right) along a berm on the south side of the road. E: tracks of a single wolf tracks running west (left to right) along outside (north) bend of the road. F: approximate location on the road where the first mitten was recovered by troopers. G: approximate location on the road where the second mitten was recovered by troopers. H: wolf tracks (from D) descend the berm to the road and first depression with traces of blood is observed on the south side of the road. I: second depression is observed on the north side of the road and all tracks associated with the attack leave the road. RP: reference point and presumed location of Candice Berner's death.

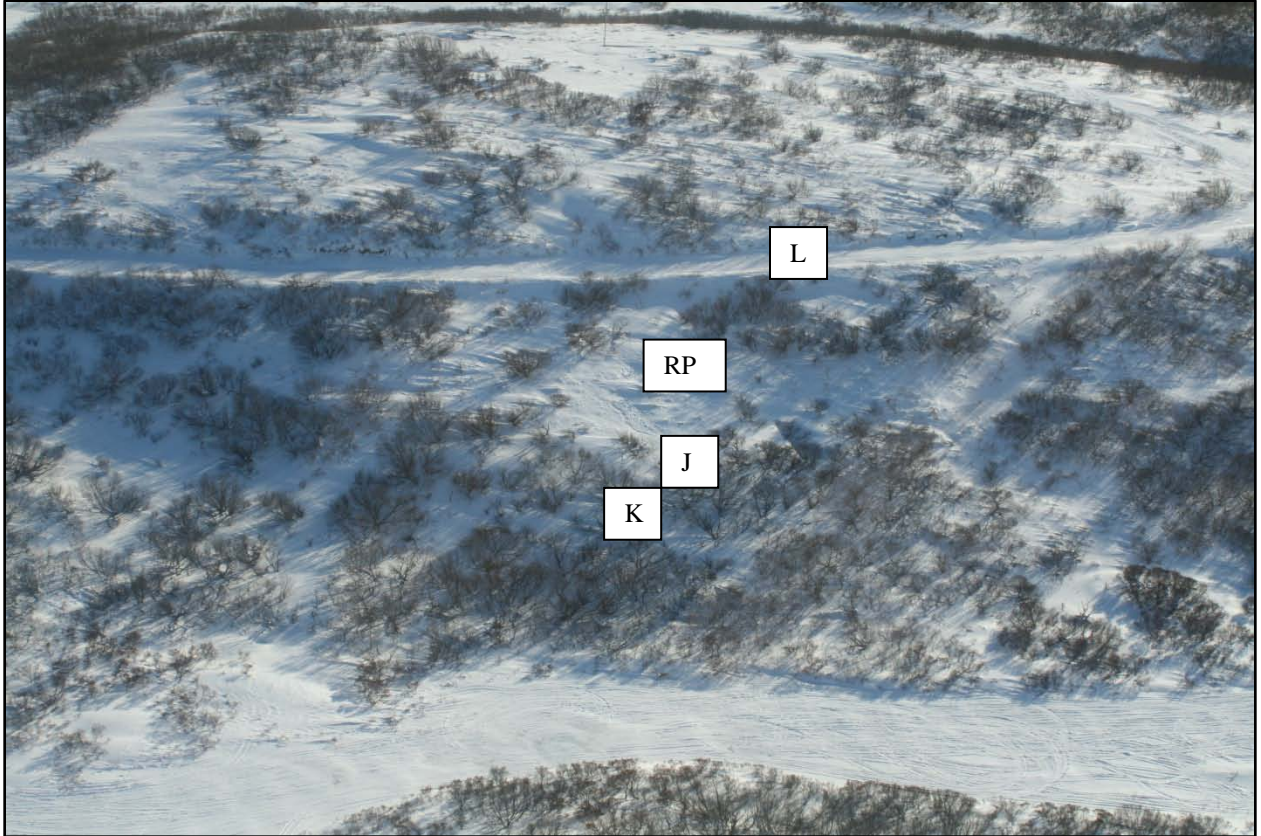


Figure 6. Aerial photograph of the wolf attack location with points identified that relate to evidence associated with events that occurred after to the attack. RP: reference point and probable location of Candice Berner's death. J: approximate location where Candice Berner's body was originally discovered after being moved by wolves. K: approximate location of where Candice Berner's body was found prior to being recovered by people after being moved a second time by wolves. L: approximate location of person guarding her body, who observed a wolf the night of the attack.

Appendix A: Necropsy reports of wolves culled in the vicinity of Chignik Lake

Diagnostic Pathology Report

Kimberlee B. Beckmen, M.S., D.V.M., Ph.D.
Alaska Dept. of Fish Game, Division of Wildlife
Conservation 1300 College Road, Fairbanks AK 99701

Office: 907-459-7257
Fax: 907-459-7332

email: kimberlee.beckmen@alaska.gov

Necropsy Number: 2010-032
Pathology ID: V10-61
Animal ID or Name: 0903097
Scientific Name: *Wolf, Gray (Canis lupus)*
Gray Wolf
Sex: Female

Date Received: 3/27/2010
Age estimate: 10
Specimens 5
Date of Necropsy: 3/27/2010
EST DOD: 3/25/2010

Submitter:

Referring Biologist: Butler

History:

killed near Chignik Lake after fatal human attack

Treatment:

Killed by shotgun

Tentative Diagnosis: DLP: suspect in fatal attack

Gross Necropsy

F, pup 99.8 lbs body condition: fat Falciform fat 16.g Skull length 269 mm Skull Width 138 mm

Curvilinear to base of tail 34 cm tail 48.5cm

Fat thickness: rump 12 mm; axillary girth 85cm

Canine (all mm) distance Upper Base: 51.03 Tips 46.35 Lower base: 48.85 Tips 44.32

R Upper Canine Length 25 width 13.2

R lower canine length 24.4 width 13.5

L Upper Canine Length 24.58 width 13.25

L lower canine length 24.4 width 13.4

Short fuzzy underfur one ventral 1/2 of thorax, abdomen, groin and tail. Ventral 1/2 of neck on both sides has no guard hair. Shotgun penetration of heart, hemothorax. PM fix of R femur. Stomach full of moose muscle. L shoulder and elbow normal. Tonsils dark and enlarged.

Pathologist/Prosector: K. Beckmen

Bacteriology:

Virology:

D. Ritter: Negative for rabies by FRA April 22, 2010

Parasitology:

Toxo to Dubey: tongue, heart, brain blood. Neospora to WTL: tongue, heart, brain. Hide strip for lice check. GI tract to WTL

Histopathology:

muscle, tongue, tonsil, thyroid, lung, LV or heart, liver, kidney, stomach, U bladder.

Skin for histo: dorsal shoulders, groin, rump, neck, tail, lateral thorax. Skeletal muscle: A myocyte is hypertrophied and contains an approximately 30 µm diameter nematodes

with a 2 µm thick eosinophilic cuticle, stichocytes, lateral chords, and coelomyarian muscle (presumptive *Trichinella* sp.).

Heart: One myocyte contains a sarcocyst. The section is diffusely autolyzed (rot).

Tongue: One bundle is composed of enlarged myocytes that lack cross striations, have multiple

internalized nuclei, and fragmented cytoplasm (myodegeneration). These myocytes are separated by increased numbers of satellite cells and moderate amounts of fibrosis.

Tissues lacking significant histologic changes include tonsil (and adjacent salivary tissue) (rot), thyroid gland (rot), parathyroid gland (rot), lung (rot), spleen (rot), kidney (rot), mesentery, adrenal gland (rot) and brain. Adipose stores are normal. No

Other Tests

Skin and muscle for archive. Forensics: skull, L femur, L front claw, hairx2, muscle x2, feces. WTL: LN, spleen, liver, kidney, muscle

Morphological Diagnosis

Alopecia of guard hair, multifocal. 1. Intramuscular *Trichinella* sp.; skeletal muscle

2. Intramuscular *Sarcocystis* sp.; heart

3. Myodegeneration, chronic, focal, minimal

Follicular Hyperkeratosis

Follicular Atrophy

Etiology

DLP shot gun. *Trichinella*, *Sarcocystis*

Definitive Diagnosis

follicular dysplasia, Killed DLP

Comments

Bossart: this wolf has microscopic changes consistent with the novel dermatopathy that we previously reported in this species. Histologically, follicular dysplasia and atrophy are present with varying degrees of orthokeratotic basket-weave hyperkeratosis, epidermal atrophy and follicular infundibular hyperkeratosis. Hair follicles are variably distorted and typically in telogen phase. Keratin of some telogen follicles is extending through the wall in a fiery pattern (flame follicles). Anagen hair follicles are uncommon.

Diagnostic Pathology Report

Kimberlee B. Beckmen, M.S., D.V.M., Ph.D.
Alaska Dept. of Fish Game, Division of Wildlife
Conservation 1300 College Road, Fairbanks AK 99701

Office: 907-459-7257
Fax: 907-459-7332

email: kimberlee.beckmen@alaska.gov

Necropsy Number: 2010-033
Pathology ID: V10-62
Animal ID or Name: 0903096
Scientific Name: *Wolf, Gray (Canis lupus)*
Gray Wolf
Sex: Female

Date Received: 3/27/2010
Age estimate: 22
Specimens 5
Date of Necropsy: 3/27/2010
EST DOD: 3/25/2010

Submitter:

Referring Biologist: Butler

History:
killed near Chignik Lake after fatal human attack

Treatment:
Killed by shotgun

Tentative Diagnosis: DLP: suspect in fatal attack

Gross Necropsy

Sex: F age: 22mos 87.2 lbs Body condition: good falciform fat: 149.9 g
Skull length 271mm Skull Width 141 mm
Curvilinear to base of tail 134.5 cm tail 45 cm
Fat thickness: rump 6 mm; axillary girth 78 cm
Canine (all mm) distance: Upper Base: 49.4 Tips: 48.98
Lower base: 36.32 Tips 43.02
R Upper Canine Length 28.08 width 14.72
R lower canine length 24.54 width 14.73
L Upper Canine Length 27.86 width 15.25
L lower canine length 35.94 width 15.0. Light blond color. Complete alopecia caudal L lateral thorax and L shoulder with skin pigmentation. Fuzzy underfur, missing guard hair on neck (mild) and antebrachium. Tail normal. Matted underfur on L rump. Small recent laceration on top of nose. Spleen enlarged, thick and meatty. Vulva swollen as just coming through heat but uterus nulliparous. Shoulder WNL. Stomach full of moose. Taenia present.

Pathologist/Prosector: K. Beckmen

Bacteriology:

Virology:

Brain for virology, slides for rabies IFA. D. Ritter: Negative for rabies by FRA April 22, 2010

Parasitology:

Toxo to Dubey: tongue, heart, brain blood. Neospora to WTL: tongue, heart, brain. Hide strip for lice check. GI tract to WTL

Histopathology:

muscle, tongue, tonsil, thyroid, lung, LV or heart, liver, kidney, stomach. U bladder.

Skin for histo: dorsal shoulders, groin, rump, neck, lateral thorax. Skeletal muscle: Three myocytes are hypertrophied and each contains a parasite similar to those described above (presumptive *Trichinella* sp.).

Tongue: Ten myocytes are hypertrophied and each contains a parasite similar to those described above presumptive *Trichinella* sp.).

Liver: A single, approximately 100 µm diameter area is disrupted by lytic necrotic debris with few

lymphocytes, macrophages, and degenerate neutrophils.

Lungs: A section is diffusely atelectic (likely a postmortem artifact).

Tissues lacking significant histologic changes include tonsil (and adjacent salivary tissue), thyroid gland, heart, spleen, kidney, adrenal gland, urinary bladder, and brain. Adipose stores are normal. No sections of stomach are found. WADDL

Other Tests

Skin and muscle for archive. Forensics: skull, L femur, L front claw, hairx2, muscle x2, feces. WTL: LN, spleen, liver, kidney, muscle

Morphological Diagnosis

Alopecia, guard hair and underfur, multifocal, chronic, moderate. Intramuscular *Trichinella* sp.; skeletal muscle and tongue

2. Hepatitis, necrotizing, focal, subacute, minimal

Follicular Hyperkeratosis, Follicular Dysplasia, Orthokeratotic Hyperkeratosis

Etiology

Taenia, gunshot, *Trichinella*

Definitive Diagnosis

DLP. Follicular dysplasia

Comments

Bossart: this wolf has microscopic changes consistent with the novel dermatopathy that we previously reported in this species. Histologically, follicular dysplasia and atrophy are present with varying degrees of orthokeratotic basket-weave hyperkeratosis, epidermal atrophy and follicular infundibular hyperkeratosis. Hair follicles are variably distorted and typically in telogen phase. Keratin of some telogen follicles is extending through the wall in a fiery pattern (flame follicles). Anagen hair follicles are uncommon.

Diagnostic Pathology Report

Kimberlee B. Beckmen, M.S., D.V.M., Ph.D.
Alaska Dept. of Fish Game, Division of Wildlife
Conservation 1300 College Road, Fairbanks AK 99701

Office: 907-459-7257
Fax: 907-459-7332

email: kimberlee.beckmen@alaska.gov

Necropsy Number: 2010-034
Pathology ID: V10-63
Animal ID or Name: 0903095
Scientific Name: *Wolf, Gray (Canis lupus)*
Gray Wolf
Sex: Female

Date Received: 3/27/2010
Age estimate: 22
Specimens 5
Date of Necropsy: 3/27/2010
EST DOD: 3/25/2010

Submitter:

Referring Biologist: Butler

History:
killed near Chignik Lake after fatal human attack

Treatment:
Killed by shotgun

Tentative Diagnosis:

Gross Necropsy

Sex:F: age:22mos 85.4 lbs Body condition: good falciform fat: 105.2 g
Skull length 260 mm Skull Width 144 mm
Curvilinear to base of tail 122.0 cm tail 47.2 cm
Fat thickness: rump 2 mm;
Canine (all mm) distance:Upper Base: 49.4 Tips: 46.45
Lower base: 37.82 Tips 43.03
R Upper Canine Length 25.15 width 14.65
R lower canine length 22.84 width 15.02
L Upper Canine Length 26.36 width 14.58
L lower canine length 22.82 width 13.33: Shot gun to L kidney. Blond hair. Fuzzy underfur inside of thigh, patch of lateral thorax with alopecia and pigmentd skin, fuzzy underfur with no guard hair ventral neck. Tail is fuzzy lacking guard hair. Stomach wights 5.6 lbs and is full of moose. Vulva enlarged, nulliparous. L shoulder WNL. Taenia present.

Pathologist/Prosector: K. Beckmen

Bacteriology:

Virology:

Brain for virology, slides for rabies IFA. D. Ritter: Negative for rabies by FRA April 22, 2010

Parasitology:

Toxo to Dubey: tongue, heart, brain blood. Neospora to WTL: tongue, heart, brain. Hide strip for lice check. GI tract to WTL, feces for Echinococcus

Histopathology:

muscle, tongue, tonsil, thyroid, lung, LV or heart, kidney, stomach. U bladder.

Skin for histo: dorsal shoulders, groin, rump, neck, tail, lateral thorax, Lungs: A focus is disrupted by acute hemorrhage.

Skeletal muscle: A myocyte is hypertrophied and contains a parasite similar to those described above (presumptive *Trichinella* sp.).

Tissues lacking significant histologic changes include tongue, tonsil (and adjacent salivary tissue), heart, spleen, kidney, urinary bladder, and brain. Adipose stores are normal. No sections of thyroid gland or stomach are found.

Other Tests

Skin and muscle for archive. Forensics: skull, L femur, L front claw, hairx2, muscle x2, feces. WTL: LN, spleen, liver, kidney, muscle

Morphological Diagnosis

alopecia, multifocal, chronic moderate. 1. Intramuscular *Trichinella* sp.; skeletal muscle
2. Pulmonary hemorrhage, acute

Etiology

Taenia, shotgun. *Trichinella*

Definitive Diagnosis

DLP. Suspect follicular dysplasia

Comments

Diagnostic Pathology Report

Kimberlee B. Beckmen, M.S., D.V.M., Ph.D.
Alaska Dept. of Fish Game, Division of Wildlife
Conservation 1300 College Road, Fairbanks AK 99701

Office: 907-459-7257
Fax: 907-459-7332

email: kimberlee.beckmen@alaska.gov

Necropsy Number: 2010-035
Pathology ID: V10-64
Animal ID or Name: 0903219
Scientific Name: *Wolf, Gray (Canis lupus)*
Gray Wolf
Sex: Female

Date Received: 3/27/2010
Age estimate: 4
Specimens 5
Date of Necropsy: 3/27/2010
EST DOD: 3/25/2010

Submitter:

Referring Biologist: Butler

History:
killed near Chignik Lake after fatal human attack

Treatment:
Killed by shotgun

Tentative Diagnosis: DLP: suspect in fatal attack

Gross Necropsy

Sex: F age: 4y mass over 102 lbs Body condition: good falciform fat: 122.8 g
Skull length 269mm Skull Width 143 mm
Curvilinear to base of tail 135 cm tail 54.8 cm
Fat thickness: rump 8 mm; axillary girth 64.8 cm
Canine (all mm) distance: Upper Base: 49.58 Tips: 49.3
Lower base: 37.62 Tips 42.62
R Upper Canine Length 25.53 width 14.63
R lower canine length 21.52 width 14.64
L Upper Canine Length 26.28 width 14.60
L lower canine length 20.98 width 12.72. Blonde fur, neck has curly underfur no guard hair, fuzzy belly, small patch of alopecia on thorax, crusty debris on rump. Shoulder WNL, very early pregnant. Stomach wt 4.8 lbs full of moose.

Pathologist/Prosector: K. Beckmen

Bacteriology:

Virology:

Brain for virology, slides for rabies IFA. D. Ritter: Negative for rabies by FRA April 22, 2010

Parasitology:

Toxo to Dubey: tongue, heart, brain blood. Neospora to WTL: tongue, heart, brain. Hide strip for lice check. GI tract to WTL, feces

Histopathology:

muscle, tongue, tonsil, thyroid, lung, LV or heart, kidney, stomach. U bladder. Submandibular LN

Skin for histo: dorsal shoulders, groin, rump, neck, ateral thorax. Skeletal muscle: Two myocytes are hypertrophied and each contains a parasite similar to those described above (presumptive *Trichinella* sp.).

Tongue: Two myocytes are hypertrophied and each contains a parasite similar to those described above (presumptive *Trichinella* sp.). Three other myocytes are similarly hypertrophied but lack nematodes (likely out of plane).

Tissues lacking significant histologic changes include tonsil (and adjacent salivary tissue), thyroid gland, lymph node (submandibular per submitter), adrenal (rot), heart, lung, spleen, kidney, urinary bladder, and brain. Adipose stores are normal. No sections of stomach are found.

Other Tests

Skin and muscle for archive. Forensics: skull, L femur, L front claw, hairx2, muscle x2, feces. WTL: LN, spleen, liver, kidney, muscle. Reprtract for Follmann

Morphological Diagnosis

Alopecia, mutlifocal, chroic, moderate. Intramuscular *Trichinella* sp.; skeletal muscle and tongue

Etiology

shotgun, *Trichinella*

Definitive Diagnosis

DLP. Suspect follicular dysplasia

Comments

Diagnostic Pathology Report

Kimberlee B. Beckmen, M.S., D.V.M., Ph.D.
Alaska Dept. of Fish Game, Division of Wildlife
Conservation 1300 College Road, Fairbanks AK 99701

Office: 907-459-7257
Fax: 907-459-7332

email: kimberlee.beckmen@alaska.gov

Necropsy Number: 2010-036
Pathology ID: V10-65
Animal ID or Name: 0903220
Scientific Name: *Wolf, Gray (Canis lupus)*
Gray Wolf
Sex: Male

Date Received: 3/27/2010
Age estimate: 3
Specimens 5
Date of Necropsy: 3/27/2010
EST DOD: 3/27/2010

Submitter:

Referring Biologist: Butler

History:
killed near Chignik Lake after fatal human attack

Treatment:
Killed by shotgun

Tentative Diagnosis: DLP: suspect in fatal attack

Gross Necropsy

Sex: M age: 3yrs, over 103 # lbs Body condition: good falciform fat: 166.4 g
Skull length 270.5 mm Skull Width 149 mm
Curvilinear to base of tail 131 cm tail 46.7 cm Baculum 137mm
Fat thickness: rump 9 mm; axillary girth 86.4 cm
Canine (all mm) distance: Upper Base: 51.31 Tips: 49.15
Lower base: 39.16 Tips 49.31
R Upper Canine Length 27.92 width 15.9
R lower canine length 23.24 width 14.68
L Upper Canine Length 27.91 width 14.08
L lower canine length 23.05 width 14.62. True gray color, not blond like the other 4. alopecia on abdomen, fuzzy very short sparse hair. Reddish in groin, abdominal skin pigmented, neck, some kinky underfur but no hair loss. Shot in retroperitoneal area. Stomach 5.1# full of moose, Shoulder WNL

Pathologist/Prosector: K. Beckmen

Bacteriology:

Virology:

Brain for virology, slides for rabies IFA. D. Ritter: Negative for rabies by FRA April 22, 2010

Parasitology:

Toxo to Dubey: tongue, heart, brain blood. Neospora to WTL: tongue, heart, brain. Hide strip for lice check. GI tract to WTL

Histopathology:

muscle, tongue, tonsil, thyroid, lung, LV of heart, , stomach. U bladder. testes

Skin for histo: dorsal shoulders, groin, rump, neck, abdomen. Tongue: Two myocytes are hypertrophied and each contains a parasite similar to those described above

(presumptive *Trichinella* sp.). Rare myocytes contain sarcocysts.

Tissues lacking significant histologic changes include tonsil (and adjacent salivary tissue), thyroid gland, lung (rot), heart (rot), testes, skeletal muscle, and brain. Adipose stores are normal. No sections of stomach or urinary bladder are found.

Other Tests

Skin and muscle for archive. Forensics: skull, L femur, baculum, L front claw, hairx2, muscle x2, feces. WTL: LN, spleen, liver, kidney, muscle

Morphological Diagnosis

Alopecia, multifocal, hyperpigmentation, chronic, moderate. Intramuscular *Trichinella* sp.; tongue
2. Intramuscular *Sarcocystis* sp.; tongue

Etiology

Gunshot. *Trichinella*, *Sarcocystis*

Definitive Diagnosis

DLP, alopecia suspect follicular dysplasia

Comments

Diagnostic Pathology Report

Kimberlee B. Beckmen, M.S., D.V.M., Ph.D.
Alaska Dept. of Fish Game, Division of Wildlife
Conservation 1300 College Road, Fairbanks AK 99701

Office: 907-459-7257
Fax: 907-459-7332

email: kimberlee.beckmen@alaska.gov

Necropsy Number: 2010-037

Pathology ID: V10-66

Animal ID or Name: 0903217

Scientific Name: *Wolf, Gray (Canis lupus)*

Gray Wolf

Sex: Female

Referring Biologist: Butler

History:

Seen in Chignik Lake after fatal human attack with a male who was not killed yet.,

Date Received: 3/30/2010

Age estimate: 4

Specimens 1

Date of Necropsy: 3/30/2010

EST DOD: 3/26/2010

Submitter:

Treatment:

Killed by shotgun

Tentative Diagnosis: DLP: suspect in fatal attack

Gross Necropsy

Sex: F age: 4-6yrs 85.1 lbs Body condition: Fat! falciform fat: 222.5 g

Skull length 256 mm Skull Width 138 mm

Curvilinear to base of tail 133 cm tail 44.5 cm

Fat thickness: rump 9 mm; axillary girth 61.0 cm

Canine (all mm) distance: Upper Base: 49.18 Tips: 46.37

Lower base: 39.0 Tips 40.98

R Upper Canine Length 23.25 width 12.092

R lower canine length 20.05 width 11.75

L Upper Canine Length 24.35 width 12.05

L lower canine length 20.12 width 12.90

White fur with gray guards hair on back. Nails short rather than the normal sharp. Fuzzy lateral thorax and ventral neck but milder than the others. Early pregnant with 8 embryos, thyroid small, Hemothorax from shot gun, very congested lungs, stomach empty. Urinary bladder full SG 1.036, wbc neg, pH 6, Azo + nitrate neg, bili +++, glu neg, ket + protein? Urobilin normal, hem 250.

Pathologist/Prosector: K. Beckmen

Bacteriology:

Virology:

Brain for virology, slides for rabies IFA. D. Ritter: Negative for rabies by FRA April 22, 2010

Parasitology:

Toxo to Dubey: tongue, heart, brain blood. Neospora to WTL: tongue, heart, brain. Hide strip for lice check. GI tract to WTL feces

for Echino

Histopathology:

muscle, tongue, tonsil, thyroid, lung, LV or heart, liver, kidney, stomach. U bladder.spleen

Skin for histo: dorsal shoulders, groin, rump, neck, tail, lateral thorax. Brain: The brainstem is disrupted by multifocal, perivascular, acute hemorrhages.

Lungs: A focus is disrupted by acute hemorrhage.

Tongue: One myocyte is expanded by a sarcocyst. Two myocytes are hypertrophied and contain parasites similar to those described above (presumptive Trichinella sp.).

Tissues lacking significant histologic changes include tonsil (and adjacent salivary tissue), thyroid gland, parathyroid gland, heart, spleen, liver (rot), stomach (rot), kidney, urinary bladder, and skeletal muscle.

Adipose stores are normal. WADDL.

Other Tests

Skin and muscle for archive. Forensics: skull, L femur, L front claw, hairx2, muscle x2, feces. WTL: LN, spleen, liver, kidney, muscle. Repro tract for Follmann.DNA from this wolf recovered on the victims body.

Morphological Diagnosis

alopecia of guard hair, multifocal, chronic mild. Hemorrhage, acute; lungs and brainstem

2. Intramuscular Trichinella sp.; tongue

3. Intramuscular Sarcocystis sp.; tongue

Etiology

Shot gun, Trichinella, Sarcocystis

Definitive Diagnosis

DLP. Suspect follicular dysplasia.DNA from this wolf recovered on the body of the victim.

Comments

Appendix B: Abstract on DNA evidence submitted for peer review

DNA evidence links wolves to fatal attack in Alaska

S. L. Talbot¹, G. K. Sage¹, S. A. Sonsthagen¹, N. G. Dawson², L. Butler², and S. Farley²

¹*Alaska Science Center, U. S. Geological Survey, 4210 University Drive, Anchorage, AK 99508*

²*Alaska Department of Fish and Game, Department of Wildlife Conservation, 333 Raspberry Rd, Anchorage, AK 99518*

Abstract

On 8 March 2010, a 32-year old woman was killed while jogging on a road near the village of Chignik Lake, Alaska. Canids, most likely wolves, were implicated in the attack and authorities subsequently killed wolves in the area in hopes of removing culpable individuals. We used nuclear and mitochondrial (mt) DNA obtained from saliva and hairs sampled from the clothes and skin of the victim to determine which species and how many individuals were involved in the attack, and if wolves, whether any of the wolves killed by authorities subsequent to the attack were involved. Twenty forensics samples yielded 17 unique genotypes that were consistent with genetic signatures of wolves. However, the likelihood of technical artifacts in many samples led us to suspect the actual number of wolves involved in the attack was lower. Based on mtDNA data, and data replication for microsatellite loci, we are certain that at least two wolves left DNA on the victim. One of these wolves was killed by authorities subsequent to the attack ($P_{ID} = 2.88 - 1.15 \times 10^{-8}$; $P_{ID_{sib}} = 2.17 \times 10^{-3}$ to 1.38×10^{-3}); the other did not share a genotype with any wolves killed by authorities, although it appeared to be related at the second-order level to two of the killed wolves.

Author for Correspondence:
Sandra L. Talbot
U.S. Geological Survey
Alaska Science Center
4210 University Drive
Anchorage, AK 99516 USA
Tel. (Office): 907-786-7188
Tel. (Lab.): 907-786-7193
FAX: 907-786-7121
stalbot@usgs.gov

Appendix C: Safety Guidelines

The Alaska Department of Fish and Game provides information about wolves and wolf behavior, and has safety guidelines available for people who may encounter or live near wolves. General information and downloadable safety brochures are available on the department's website at <http://www.adfg.alaska.gov>.

While specific locations of posted materials may change, at the time of the writing of this report, the following materials were available at the identified website addresses:

A webpage on *Living with Wolves*, including information on *Living and Camping in Wolf Country* and *Safety in Wolf Country*:

<http://www.adfg.alaska.gov/index.cfm?adfg=livewith.wolves>

That page has links to two brochures that may be downloaded:

Wolf Safety in Alaska: Living Safely in Wolf Country:

http://www.adfg.alaska.gov/static/species/livingwithwildlife/pdfs/living_in_wolf_country.pdf

Staying safe in wolf country:

http://www.adfg.alaska.gov/static/species/livingwithwildlife/pdfs/wolf_safety_brochure.pdf

In addition to information on our website, members of the public may also contact their local office of the Alaska Department of Fish and Game with questions related to wolves and safety.

