Wildl. Soc. Bull. 19:403–412, 1991

COUGAR ATTACKS ON HUMANS IN THE UNITED STATES AND CANADA

PAUL BEIER, *Department of Forestry and Resource Management, University of California, Berkeley, CA 94720*

Recent incidents involving cougars (*Felis concolor*) and humans in southern California, western Texas, and eastern Colorado have prompted authorities in these states to warn the public about the dangers of attacks and to offer advice that might reduce such dangers. However, only incomplete historical records of cougar attacks are presently available to help guide these efforts. I list all such attacks in the United States and Canada during the last 100 years for which I could find reports. I examined these reports for trends in the history and circumstances of cougar attacks, and for traits that typify the human victims and their attackers.

METHODS

I attempted to document all attacks from 1 January 1890 through 31 December 1990. I searched in both scientific and popular literature, including hunter's magazines and newspapers, for reports of unprovoked attacks by wild cougars on humans. During 1897–1925, the magazine *Outdoor Life* encouraged letters on this topic from readers and followed most such letters with the results of the editor's inquiries to local authorities. C. Hart Merriam of the U.S. Biological Survey prepared a file (now in Dep. For. Resour. Manage., Univ. Calif., Berkeley) of newspaper and magazine clippings on attacks during 1909–1932. I found additional leads in monographs written by Young (1946), Barnes (1960), and Anderson (1983). I also obtained information from wildlife agencies in each of 12 western states (those at least partly west of 105° west longitude) and 2 provinces (British Columbia and Alberta). In each of these states and provinces, I also contacted 1 or more biologists studying cougars.

I define an *attack* as an incident in which the cougar bit, clawed, or knocked down a human; only attacks were tabulated. I excluded maulings by captive cougars and cases in which a person (e.g., a cougar hunter) deliberately approached or harassed a wild cougar. I define a *near-attack* as a cougar advancing toward a person at close range without making contact, or crouching beside a trail as if to pounce. Reports of near-attacks were relatively common, but usually impossible to verify. It was also difficult to determine if the cougar would have attacked if the person had not taken action. Therefore they were not tabulated. However, I qualitatively evaluated credible near-attacks for human behaviors that prevented physical contact.

I include a report only if it was verified by a newspaper or other published account that included statements from medical personnel or law enforcement officers, or if it was a report of the state or provincial wildlife management agency or the National Park in which the incident occurred.

Adult cougars (≥2.0 years old) were classified as underweight if they were more than 2 standard deviations below the mean body mass for their sex and subspecies (or the nearest subspecies with data) using body masses summarized by Anderson (1983:21). In general, adults were judged underweight if males and females weighed <45 and <30 kg, respectively. Males and females recorded as 12–17 months old or simply as "yearlings" were judged underweight if they weighed <30 and <20 kg, respectively (Robinette et al. 1961). When age was estimated to be 18–23 months, cutoffs of 37 and 25 kg were used. Thus only markedly underweight animals were so classified. Percentages (e.g., the proportion of victims that were children) were computed as the proportion of individuals for which the appropriate attribute (e.g., age) was recorded.

RESULTS

Temporal and Geographic Trends

I documented 9 fatal attacks and 44 nonfatal attacks resulting in 10 human deaths and 48 nonfatal injuries (Table 1). The greater number of victims occurred because there were 2 victims in each of 5 attacks.

I believe that I discovered all fatal attacks reported since 1890 and all nonfatal attacks since 1970. During 1970–1990, there were 31 nonfatal and 5 fatal attacks (6.2:1). A lower ratio of nonfatal to fatal attacks in the period from 1890 through 1969 (3.25:1) suggests that some nonfatal attacks before 1970 escaped my attention. If the ratio of nonfatal : fatal attacks during 1890–1969 was comparable to that for 1970–1990, then I did not document about 12 nonfatal attacks during the earlier period.

Table 1. Attacks by cougars on humans in the United States and Canada, 1890–1990.

Fatal attacks

							Victim					Cougar				
Hour[a]	Day	Month	Year	Vicinity	State[b]	Surname	Sex	Age[c]	Group[d]	Pre[e]	Post[f]	Shot[g]	Sex[h]	Age[i]	Condition[j]	Reference[k]
16	19	Jun	1890	Quartz Valley	Calif.	Dangle	M	7	10.1			S	FC			Howard 1915, Storer 1923
D	6	Jul	1909	Morgan Hill	Calif.	Wilson	M	10	13	1	1	S			6	Storer 1923, Anon 1909
						Kennedy	F	Ad	22	5	1					
12	17	Dec	1924	Olema	Wash.	Fehlhaber	M	13	10	3		S	M	3	1	Hall 1925, Finley 1925, Anon 1925
D	19	Jun	1949	Kyuquot	V.I.	Taylor	M	7	11			S			3	T-C 21 Jun 1949, Prov 21 Jun 1949
D	3	Jan	1971	Lytton	B.C.	Wells	M	12	12	1		S	M	12	5	Prov and VSun 4 Jan 1971, WB files
11	20	Jan	1974	Arroyo Seco	N.M.	Nolan	M	8	12.1	1	1	S	F	3	4	Hibben 1975
15	14	Jul	1976	Gold River	V.I.	Samuel	F	7	12			S	M	2	1	VSun 15 Jul and 20 Jul 1976
16	16	May	1988	Tofino	V.I.	Bergman	M	9	10.1			S	M	4	1	T-C 19 May 1988, VSun 18–19 May 1988
16	10	Sep	1989	Evaro	Mont.	Gardipe	M	5	10.1			S	F	1.5	2	*Spokane Spokesman-Review* 14 Sep 1989 Montana DFWP files

Nonfatal attacks

							Victim					Cougar				
Hour	Day	Month	Year	Vicinity	State	Surname	Sex	Age	Group	Pre	Post	Shot	Sex	Age	Condition	Reference
13	23	Sep	1916	Cowichan Lake	B.C.	Farrer	M	8	12	1	1	S		2.5	7	Anon 1917, *London (U.K.) Field* 23 Dec 1916
						Ashburnham	F	11	12	1	1					
	4	May	1934	Holberg	V.I.	Jensen	M	Ad	20	1	1	S				WB files
		May	1935	Quatsino	V.I.	Johnson	M	Ad	21	1	1	S				WB files
21	25	Jan	1951	Kelsey Bay	V.I.	McLean	M	63	20.1	1	1	S	F	1.5	4	T-C 27 Jan 1951, VSun 27 Jan 1951
	3	Jul	1951	Squamish	B.C.	Wyssen	M	29	20	3	5	S	FC		5	VSun 4 Jul 1951, WB files
	2	Mar	1953	Port Alice	V.I.	Walters	M	43	22		1	S		2	2	VSun 3 Mar 1953, WB files
16	14	Apr	1953	Big Bend NP	Tex.		M	Ad				S				Big Bend NP files
9	10	Jun	1953	Inglewood	V.I.	Coon	F	24	21.1	1	1	S	F		5	Prov and T-C 12 Jun 1953, WB files

Table 1. Continued.

Nonfatal attacks																
							Victim					Cougar				
Hour	Day	Month	Year	Vicinity	State	Surname	Sex	Age	Group	Pre	Post	Shot	Sex	Age	Condition	Reference
	16	Mar	1962	Hinton	Alta.	Kilbreath	M	6	12.1		3	S		1.5	5	VSun 17 Mar 1962, EJ 17 and 19 Mar 1962
	15	Jun	1963	Prince George	B.C.	Moore	M	6	12	1	3	S	M	Ad	5	VSun 18 Jun 1963, WB files
	5	Mar	1965	Clinton	B.C.	Simpkins	M	15	13	1	1	S	F	Ad	5	VSun 6 Mar and 9 Mar 1965, WB files
		Oct	1966	Chilcotin	B.C.		M	Ad				S	M	Ad	5	WB files
18	12	Sep	1969	Port Alberni	V.I.	Zimmerman	M	13	10	2	1	S				T-C 14 Sep 1969
D	2	Jun	1970	Lewis	Colo.	Imel	M	2	11.1		1	S	M	Ad	2	*Rocky Mountain News* 3 Jun 1970
D	15	Jun	1970	Kootenay NP	B.C.	Smith	F	50	20	2	4	NS				VSun 16 Jun 1970, Prov 16 Jun 1970
8	22	Dec	1970	Harrison Lake	B.C.	Collie	M	29	20.1	1	1	S	F	2	3	VSun 23 Dec 1970
D	8	Jul	1971	Eureka County	Nev.	Bird	M	Ad	21	1		S	F	Ad	3	Nev. Dep. Wildl. files
		Jun	1972	Strathcona Park	V.I.			1	13			NS				WB files
N		Jun	1972	Strathcona Park	V.I.	Hurford	M	25	22	1	1	NS				WB files, VSun 28 Jul 1972
14	26	Jul	1972	Campbell Lake	V.I.	Kelly	M	8	14	1	2	NS				Prov 27 Jul 1972, Sun 27 Jul 1972
10	1	Jun	1975	Coquitlam	B.C.	Jones	M	8	12			S	M	2	1	VSun and Prov 2 Jun 1975, WB files
12	22	Dec	1976	Rye	Colo.	Morgan	M	14	10		1	S	F	1.5		*Denver Post* 23 Dec 1976
15	25	Jun	1977	Enumclaw	Wash.	O'Neal	F	28	22	2	1	S	M	1.7	4	*Seattle Times* 27 Jun 1977, Wash Dep. of Wildl. Files
						O'Neal	F	4	13							
N	22	Nov	1978	Big Bend NP	Tex.			C	13	1		NS				Big Bend NP files
17	19	Feb	1979	Boston Bar	B.C.	Fife	F	9	12.1	1	1	S	F	5	4	*Hope Standard* 21 Feb 1979
18	7	Aug	1979	Port Hardy	V.I.	Walkus	F	4	14.1			S	F		5	VSun 10 Aug 1979, WB files
11	27	May	1981	Waterton Lks NP	Alta.	Orchard	M	C	11			NS	FC			WLNP files
			1981	Oyster River	V.I.		M	Ad				S	F	1.5		WB files
7	20	Aug	1982	Waterton Lks NP	Alta.	Bisby	M	9	11			S	M	0.5	2	WLNP files
			1983	Esperanza	V.I.		M	Ad				S				WB files
15	24	Apr	1983	Port Alice	V.I.		M	10	12	3		S				WB files
							M	11	12							WB files
			1983	Holberg	V.I.		M	16	10			S	M	3		WB files

Table 1. Continued.

Nonfatal attacks																
							Victim					Cougar				
Hour	Day	Month	Year	Vicinity	State	Surname	Sex	Age	Group	Pre	Post	Shot	Sex	Age	Condition	Reference
19	4	Apr	1984	Big Bend NP	Tex.	Roe	F	Ad	20	1	6	NS		1		Big Bend NP files
18	2	Aug	1984	Big Bend NP	Tex.	Vaught	M	9	13	1		S	M	1.8	4	Big Bend NP files
						Brown	M	Ad	22	5	1					
19	28	May	1985	Pacific Rim NP	V.I.	Wilson	M	12	11	1	1	NS				VSun 29 May 1985, T-C 30 May 1985
19	3	Aug	1985	Sooke	V.I.	Parker	F	10	14.1	3	3	S	M	1.5	2	Prov 6 Aug 1985, VSun 6–7 Aug 1985
14	23	Mar	1986	Orange County	Calif.	Small	F	5	13	1	1	S	M	2	1	OCR 24–25 Mar 1986, LAT 25 Mar 1986
12	19	Oct	1986	Orange County	Calif.	Mellon	M	6	11	1	1	NS				OCR 20–22 Oct 1986
12	19	Apr	1987	Big Bend NP	Tex.	Burt	F	31	22	3	1	S	M	1.2	4	Big Bend NP files
	28	May	1988	Payson	Ariz.	Fuller	F	6	14.1		1	S	F	1.5	4	*Arizona Republic* 9 Jun 1988
22	11	Jan	1989	Tofino	V.I.	Lucas	M	28	21.1	1	1	S	F	2	4	Prov 13 Jan 1989
19	29	Apr	1989	Canyon Lake	Ariz.	Walsh	M	5	13		3	NS				*Phoenix Gazette* 1 May 1989
18	2	Jun	1990	Boulder	Colo.	Walters	F	28	20	6	1	NS	FC			Colo. Div. Wildl. files
12	23	Jul	1990	Glacier NP	Mont.	O'Hare	M	9	14.1	1	2	S	M	1.3	4	Glacier NP files

[a] Nearest hour on 24-hour clock, except D = daylight hours and N = dark hours.
[b] State or Canadian province or V.I. = Vancouver Island (B.C.).
[c] Age in years, except C = child of unknown age and Ad = adult of unknown age.
[d] Groups: 10 = child victim alone and out of earshot of other humans; 11 = child alone but within earshot of an adult; 12 = child in group of children; 13 = child in group with adult; 14 = child in child group within earshot of adult; 20 = adult alone and out of earshot of others; 21 = adult alone but within earshot of others; 22 = adult in group. A "1" suffix indicates attack occurred within view of a human dwelling or of a motor home in a developed recreation area.
[e] Pre-attack behavior of the victim after seeing the cougar approach: 1 = no time to react; 2 = watched quietly; 3 = ran away; 4 = stood ground and shouted or threw rocks, etc.; 5 = pulled cougar off first victim; 6 = shouted and stood ground, then climbed tree.
[f] Postattack behavior of the victim: 1 = fought back; 2 = played dead; 3 = victim's head was held in cougar's mouth, perhaps in shock; 4 = talked quietly to cougar; 5 = drove away on bulldozer; 6 = cougar fled at once.
[g] S = cougar was shot; NS = cougar was not shot.
[h] FC = female with cub.
[i] Age in years; Ad = adult of unknown age.
[j] Condition of cougar: 1 = good health and normal body mass; 2 = mass (measured) was normal for age; 3 = mass (estimated) was normal for age; 4 = mass (measured) was below normal for age; 5 = mass (estimated) was below normal for age; 6 = rabid; 7 = cataracts.
[k] DFWP = Dep. Fish Wildlife and Parks; EJ = *Edmonton Journal*; LAT = *Los Angeles Times*; NP = National Park; OCR = *Orange County Register*; Prov = *The Vancouver Province*; T-C = *Victoria Times-Colonist* (*Daily Colonist* until 1976); VSun = *The Vancouver Sun*; WB = Wildlife Branch of the Province of British Columbia; WLNP = Waterton Lakes National Park.

Cougar attacks have clearly increased during the last 2 decades, despite some possibly undocumented nonfatal attacks during the early years. There were more fatal attacks during the last 20 years (5) than during the previous 80 years (4). Also, C. Hart Merriam documented only 3 attacks (1 nonfatal, 2 fatal) in the 23 years from 1909 to 1932 versus 36 attacks (31 nonfatal, 5 fatal) reported during the last 21 years.

There were 8 attacks during December–February, 15 attacks during March–May, 21 attacks during June–August, 6 attacks during September–November, and 3 with no month recorded. This seasonal pattern of attacks may reflect increased human activity in wildlands in warmer months. The diel pattern of attacks also resembles the diurnal activity pattern of humans rather than the nocturnal activity pattern of cougars (Beier, unpubl. data). For the 32 cases in which hour of day could be determined, there were 6 attacks during 0630–1130, 15 attacks during 1130–1630, 11 attacks during 1630–2130, and no attacks during the remaining 9 hours. Of the other 21 attacks, 2 occurred at night, 6 occurred during daylight, and in 13 cases the records do not indicate time.

Twenty of the 53 attacks (38%) occurred on Vancouver Island (British Columbia), a 30,000-km² island with 300,000 human residents. There were 10 attacks in mainland British Columbia, 5 in Texas, 4 in California, 3 each in Alberta and Colorado, 2 each in Arizona, Montana, and Washington, and 1 each in New Mexico and Nevada.

Victims

Thirty-seven of 58 victims (64%) were children (≤16 years old); the other 21 (36%) were ≥24 years old. Using 5-year age classes, the modal age class of known-age victims was 5–9 years (19 victims). Group associations were known for 54 victims. Of 37 children, 35% were alone, 43% were in groups of children, and 22% were accompanied by adults. Eleven of 17 adult victims were alone at the time of attack. Of those victims classified as alone (i.e., out of sight of other humans), 6 of 13 children and 4 of 11 adults were within earshot of other humans. Except for 1 adult and 1 child who died of probable rabies resulting from a single attack (Table 1: Morgan Hill, Calif., 1909), all fatalities were children unaccompanied by adults.

Fifteen of 54 victims (28%) were attacked close to a house or cabin, or just outside a motor home within a developed recreational area. These attacks would have been visible if someone had been watching from the home or vehicle. In several cases the house was occupied but the occupants were unaware of the attack occurring outside. The 3 most intrusive cases involved a cougar crashing through the window of an isolated cabin to attack a telephone lineman (Table 1: Kelsey Bay, B.C., 1951), a cougar who attacked a 2-year-old boy in the garage of his home in a village of 250 persons (Table 1: Lewis, Colo., 1970), and a cougar attack on a 6-year-old boy in a residential area (Table 1: Hinton, Alta., 1962). Not included in these 15 cases were 2 attacks on persons in tents or sleeping bags (Table 1: Big Bend, Tex., 1978; Strathcona Park, B.C., 1972: Hurford case); the records do not indicate whether the campsites were within developed campgrounds. In yet another case a boy was attacked while riding a bicycle (Table 1: Holberg, B.C., 1983).

Behaviors That Might Prevent an Imminent Attack

Most victims (24 of 32 for which data exist, excluding 2 who were injured after they came to the assistance of a companion) did not see the cougar before being clawed or bitten; thus, no preventive action was taken. The other 8 victims, by definition, failed to prevent the attack. In all near-attacks, actual attack was averted, presumably because the person had time to react. In some near-attacks, the cougar was shot as it approached. In most other near-

attacks, aggressive responses by the human (shouting, swinging a stick, waving arms above the head, throwing rocks) clearly deterred the cougar from carrying out an attack. I discovered only 1 credible near-attack in which the intended victim escaped by a panicked flight. In that case, a 16-year-old boy fled after encountering a cougar at 25 feet. The cougar was gaining ground rapidly when the boy's boot fell off and the cougar attacked and ate the boot. This story was supported by the presence of boot fragments in the stomach of the cougar when it was shot an hour later (*Vancouver Province*: 18 Jun 1966).

Behaviors That Did Not Avert Attacks

Eight victims did have at least a few seconds between seeing the animal and physical contact. Three of these victims watched the cougar quietly, apparently uncertain of its intentions or too surprised to act. Four victims attempted to run away, but only 1 appeared to benefit from this response. In that case a man who had stopped to repair his bulldozer was rushed by a cougar; he had to run only a few steps to mount his rig and was lightly clawed as he did so (Table 1: Squamish, B.C., 1951). In at least 2 cases, running appeared to stimulate the cougar to select the victim out of a larger group (Table 1: Sooke, B.C., 1985; Big Bend, Tex., 1987). Tracks in the snow indicate that a 13-year-old boy tried to outrun a cougar for about 100 m before being killed (Table 1: Olema, Wash., 1924). In the eighth case, the victim initially stood her ground, shouted, and waved her arms, but when the 2 cougars continued to approach her, she scrambled up an embankment and climbed a tree. The cougars climbed after her, and 1 of them raked her leg once. She then struck 1 animal with her foot and the other with a stick. The cougars immediately left the tree and abandoned the site shortly afterward (Table 1: Boulder, Colo., 1990).

Human Behavior After Attacks Began

For only 29 victims is it meaningful to examine the victim's response after physical contact occurred. In the other cases, such details were not recorded (23 victims), the child victim may have been in shock because his head was in the cougar's jaws (4), the cougar fled at once (1), or the victim was able to drive away at once (1). The 4 cases in which a child's head was in the cougar's jaws (possibly inducing shock) seem equivalent to playing dead (see below). In all such cases, the cougar continued to bite the victim's head or drag him by the head until another person came to assist. Twenty-six of the 29 remaining victims fought back with bare hands, a stick, a knife, a jacket, or a rock. These efforts usually succeeded in repelling the attack. In several cases, even children unassisted by adults were able to repel the cougar by fighting back. Most victims also shouted loudly, and loud shouts apparently did intimidate the cougar; the noise also often brought other persons to assist the victim.

I documented only 3 cases in which alternate responses were tried. Two cases involved "playing dead." A 9-year-old boy said that he had been advised to play dead if he ever encountered a wild animal. When a cougar pounced on him as he was walking out of a lake, he followed this advice. However, the cougar continued to bite him and drag him away until his father kicked gravel at the cougar. The cougar then rushed at his 7-year-old sister; she did not play dead but screamed, causing the cougar to turn and run (Table 1: Glacier Park, Mont., 1990). In the second case (Table 1: Campbell Lake, B.C., 1972), the older brother of the 8-year-old being attacked by a cougar "shouted for him to be quiet—to play dead—but the cougar started carrying him off into the bush. Then the mother came up screaming at the cougar. It dropped the boy and made off" (*Vancouver Sun*: 27 Jul 1972).

In the third case (Table 1: Kootenay Park,

B.C., 1970) a cougar attacked a 50-year-old solo hiker, clawing her arm and knocking her down. As she fell she set up her backpack as a shield, faced the cougar and (in her words) "began talking to her the way you would if you were trying to soothe a dog or cat." She continued soothing talk for 30 minutes until she heard other hikers nearby. Then she yelled for help, an approaching hiker blew a whistle, and the cougar retreated. This strategy apparently did prevent the cougar from continuing its attack. However, it was a loud shout and a loud whistle that eventually caused the cougar to retreat.

Offending Animals

Although most offending cougars were promptly shot and killed, few data on these animals were recorded. Twelve of 31 offending cougars were estimated to be 12–23 months of age; 1 was under 12 months of age. Seven of 9 attacking yearlings, 7 of 17 attacking adults, and 3 of 4 attackers of unknown age were markedly underweight.

Many age estimates were made prior to the first published criteria for age estimation (Ashman et al. 1983) and may be imprecise. Two offending cougars of normal body mass (when weighed on a scale) were initially reported as "starved" or "emaciated" by newspapers quoting conservation officers. If the initial estimates were wrong due to bias rather than to imprecision, the 8 animals reported as underweight but never weighed may have been misclassified. If all estimated body masses are excluded, 6 of 8 attacking yearlings and 3 of 10 attacking adults were underweight.

Only 2 offending cougars were documented to have had a disease or physical disability. One was probably rabid and caused the single double fatality (Table 1: Morgan Hill, Calif., 1909). This is the only documentation of apparent transmission of rabies from a cougar to humans; both victims died of the disease, not from the physical injuries (Storer 1923). The other diseased cougar (Table 1: Cowichan Lake, B.C., 1916) had cataracts.

One yearling cougar attacked and bit a person in Big Bend National Park 4 months after being chased, treed, drugged, and radio-collared (Table 1: Big Bend, 1987). Aversive conditioning was tried deliberately on another cougar; that animal, shot with rock salt at close range after a near-attack, returned to aggressive behavior (without physical attack) only 2 weeks later and had to be removed (C. M. Fleming and R. Skiles, Big Bend National Park, unpubl. data).

DISCUSSION

Temporal and Geographic Trends

Schmidt (J. E. Schmidt, Mountain lion attacks on humans, unpubl. rep., Wildl. Ext., Univ. Calif., Davis, 1986) double-counted several cases in tabulating 17 fatal attacks in North America during 1890–1986. Schmidt's 1986 list of nonfatal attacks was not comparable because it included provoked attacks and encounters lacking physical contact.

Each year in the U.S. there are about 12 human deaths resulting from over 5,000 bites by rattlesnakes (*Crotalus* spp.), 40 deaths due to bee (Hymenoptera) stings, and 3 deaths due to bites of black widow spiders (*Latrodectus* spp.) (Weiss 1990). Dogs annually kill 18–20 people and inflict suture-requiring injuries on 200,000 U.S. residents (Sacks et al. 1989). In a single recent year (1979) there were 86 U.S. deaths due to lightning strikes (Natl. Center Health Stat. 1984:33–35). Thus cougar attacks are much rarer than other hazards from animals or nature. Nonetheless, these attacks have increased in the last 2 decades, probably because of increased numbers of cougars and humans during that time. Cougar populations have increased markedly in recent years in British Columbia (Hebert 1989), California (Mansfield 1986), Colorado (Anderson and

Tully 1989), Nevada (Stiver 1989), Texas (Russ 1989), and Wyoming (Shorma 1989). Although other states have not estimated population trend (Smith 1989), cougar populations throughout the West probably increased during 1965–1980 as each state and province changed the legal status of the cougar from bountied predator to game species subject to controlled hunting or (in California) full protection. Simultaneously, human use of wildlands has grown, increasing the potential for encounters.

It is also possible that the decreased persecution of cougars, along with the establishment of large wilderness areas free of hunting, may allow cougars to habituate to humans as a nonthreatening part of their environment. However, there is no evidence that cougars are more likely to attack humans in unhunted areas. Indeed, 57% of the attacks occurred in British Columbia, where about 200 cougars are killed annually by hunters and predator control agents (Hebert 1989).

There is no compelling explanation for the striking concentration of attacks on Vancouver Island. One speculative line of reasoning (which I raise but do not advocate) stems from the observation that several prey species taken by cougars in other parts of North America are absent from Vancouver Island. The absent species include porcupine (*Erethizon dorsatum*), Virginia opossum (*Didelphis virginiana*), cottontail rabbits (*Sylvilagus* spp.), coyote (*Canis latrans*), bobcat (*Lynx rufus*), badger (*Taxidea taxus*), and spotted and striped skunks (*Spilogale putorius, Mephitis mephitis*) (Burt and Grossenheider 1976). Although large ungulates are the cougar's main prey throughout its range, porcupine are important in many areas (Russell 1978). In the Santa Ana Mountains of California, porcupine are absent but opossum, cottontail, and coyotes make up over 30% of prey items and about 8% of prey biomass (Beier, unpubl. data). Because a cougar typically hunts for several days after consuming 1 deer until killing the next deer (Beier, unpubl. data), small prey may be important in sustaining a cougar between deer kills. A lack of small prey may be especially critical for a yearling animal less proficient at taking deer, and may contribute to the increased attacks on humans on Vancouver Island.

Victims

Children are more vulnerable than adults, even though the proportion of humans in cougar habitat that are children is unknown. Children unaccompanied by adults are probably also at increased risk. The proportion of children in cougar habitat that are not supervised by adults is unknown, but is probably smaller than the 78% of child victims not in sight of adults when attacked. This increased vulnerability is especially clear when only fatal attacks are considered. Except for the adult and child who died of probable rabies, all fatalities were children who were either alone or accompanied by other children. The increased vulnerability of children to attacks can be minimized by keeping them within sight of an adult, who may not prevent but can repulse an attack.

Appropriate Human Behaviors

Aggressive responses appear to be effective in averting an imminent attack. The records do not support the notion that one should avoid loud shouting or avoid eye contact with the cougar when attack appears imminent. Running away from an aggressive cougar seems particularly futile unless one is only a few steps from the safety of a home or vehicle.

An aggressive response may also be effective in causing a cougar to retreat after it initiates physical contact. There is no empirical support for the efficacy of "playing dead" or curling up in a fetal position once a cougar attack has begun.

Offending Animals

The data suggest that underweight yearlings may have a propensity to attack humans. Ju-

veniles (0–24 months old) compose under 50% of most wild cougar populations (Seidensticker et al. 1973; Ashman et al. 1983; Hemker et al. 1984; Logan et al. 1986; Beier, unpubl. data), implying that on average yearlings (12–23 months old) are less than 25% of the population. However, nearly 40% of the attacking cougars were classified as yearlings. At this age a young cougar increasingly hunts without maternal assistance, and by 14–24 months of age it moves into a new and often unfamiliar home range (Seidensticker et al. 1973, Ashman et al. 1983). Under these stresses, some yearlings may have difficulty capturing wild prey. The low body mass of most yearling attackers suggests that this may be an important factor. Two of the underweight yearling attackers also had porcupine quills in their throats. One attacker, a 14-month-old radio-collared male, weighed 29.5 kg, 2.3 kg less than at his capture 3 months earlier; he smelled strongly of skunk odor and was not yet independent of his dam (R. Skiles and C. M. Fleming, Big Bend Natl. Park, Tex., unpubl. data).

Management Implications

Attacks by cougars are rare but increasing. It is unlikely that sport hunting will remove enough cougars to reduce the risk. The high aesthetic value of cougars may preclude reduction of cougar populations by other means (e.g., bounties, control programs). Managers of wildlands, in consultation with legal staff, might consider using information reported here to offer advice that may reduce risk to the human visitors.

In 6 of the cases tabulated here, the offending cougars were promptly killed by wildlife conservation officers but no data were recorded; in other cases data were estimated instead of measured, or necropsy records could not be located. In the future, all cougars shot after attacking humans should receive a careful postmortem examination, and the results should be filed so as to make them accessible.

SUMMARY

I examined historical records of unprovoked attacks by cougars on humans in the U.S. and Canada during the last century (1890–1990) to determine historical trends and characteristics of victims and offending cougars. There were 9 attacks resulting in 10 human deaths and at least 44 nonfatal attacks. Attacks on humans increased markedly during the last 2 decades, during which cougar numbers and human use of cougar habitats also increased. Most victims (64%) were children; the modal age class was 5–9 years. Of 37 child victims, 35% were alone, 43% in groups of children, and 22% were accompanied by adults; 11 of 17 adult victims were alone at the time of attack. The data suggest that yearlings and underweight cougars were most likely to attack humans. Aggressive responses on the part of intended victims may avert an impending attack and repel an attack in progress.

Acknowledgments.—I am most indebted to J. Bone, who provided leads to most of the Vancouver Island cases. The Orange County Chapter of Safari Club International generously defrayed the publication costs. This research was funded by the County of Orange, California, the California Department of Fish and Game, and California Agricultural Experiment Station Project 4326-MS. I thank all those persons who provided me with information I may not otherwise have gained; these include L. Fitzhugh, C. Fleming, J. Gonzales, H. Hash, D. Janz, M. Jalkotzy, P. Koepp, T. Malmsbury, D. R. McCullough, D. Pemble, J. Rieck, D. J. Spalding, M. Sanders, R. Skiles, S. J. Stiver, and D. Turner. F. Lindzey, R. C. Belden, N. Holler, and an anonymous reviewer made constructive comments on the manuscript.

LITERATURE CITED

ANDERSON, A. E. 1983. A critical review of literature on puma (*Felis concolor*). Colo. Div. Wildl. Spec. Rep. 54. 91pp.

———, AND R. J. TULLY. 1989. Status of the mountain

lion in Colorado. Proc. Mountain Lion Workshop 3:19–23.

ANONYMOUS. 1909. Further details regarding the California lion attack. Outdoor Life 30:598–600.

———. 1917. Children attacked by cougar. Outdoor Life 38:193–194.

———. 1925. An old question. Outdoor Life 46:113.

ASHMAN, D. L., G. C. CHRISTENSEN, M. L. HESS, G. K. TSUKAMOTO, AND M. S. WICKERSHAM. 1983. The mountain lion in Nevada. Nev. Dep. Wildl., Reno. 75pp.

BARNES, C. T. 1960. The cougar or mountain lion. The Ralton Co., Salt Lake City, Ut. 176pp.

BURT, W. H., AND R. P. GROSSENHEIDER. 1976. Field guide to the mammals. Third ed. Houghton Mifflin Company, Boston, Mass. 289pp.

FINLEY, W. L. 1925. Cougar kills a boy. J. Mammal. 6:197–199.

HALL, F. S. 1925. Killing of a boy by mountain lion. Murrelet 6:33–37.

HEBERT, D. 1989. The status and management of cougar in British Columbia. Proc. Mountain Lion Workshop 3:11–14.

HEMKER, T. P., F. G. LINDZEY, AND B. B. ACKERMAN. 1984. Population characteristics and movement patterns of cougars in southern Utah. J. Wildl. Manage. 48:1275–1284.

HIBBEN, F. C. 1975. Terror at Arroyo Seco. Petersen's Hunting. March 1975:22–25.

HOWARD, C. B. 1915. An instance of a mountain lion's attack upon a boy. Outdoor Life 36:162–163.

LOGAN, K. A., L. I. IRWIN, AND R. SKINNER. 1986. Characteristics of a hunted mountain lion population in Wyoming. J. Wildl. Manage. 50:648–654.

MANSFIELD, T. M. 1986. Mountain lion management in California. Trans. North Am. Wildl. and Nat. Resour. Conf. 51:178–182.

NATIONAL CENTER FOR HEALTH STATISTICS. 1984. Vital statistics of the United States 1979, Vol. 2. Mortality, Part A-5. U.S. Gov. Print. Off., Washington, D.C.

ROBINETTE, W. L., J. S. GASHWILER, AND O. W. MORRIS. 1961. Notes on cougar productivity and life history. J. Mammal. 42:204–217.

RUSS, W. B. 1989. Status of the mountain lion in Texas. Proc. Mountain Lion Workshop 3:30–31.

RUSSELL, K. R. 1978. Mountain lion. Pages 207–225 *in* J. L. Schmidt and D. L. Gilbert, eds. Big game of North America. Stackpole Books, Harrisburg, Penn. 512pp.

SACKS, J. J., R. W. SATTIN, AND S. E. BONZO. 1989. Dog-bite fatalities from 1979 through 1988. J. Am. Medical Assoc. 262:1489–1492.

SEIDENSTICKER, J. C., JR., M. G. HORNOCKER, W. V. WILES, AND J. P. MESSICK. 1973. Mountain lion social organization in the Idaho primitive area. Wildl. Monogr. 35. 60pp.

SHORMA, G. 1989. Status of the mountain lion in Wyoming. Proc. Mountain Lion Workshop 3:38–39.

SMITH, R. H., editor. 1989. Proc. Mountain Lion Workshop 3:1–88.

STIVER, S. J. 1989. Status of mountain lions in Nevada. Proc. Mountain Lion Workshop 3:26–29.

STORER, T. I. 1923. Rabies in a mountain lion. Calif. Fish and Game 9:45–48.

WEISS, R. 1990. Researchers foresee antivenin improvements. Sci. News 138:360–362.

YOUNG, S. P. 1946. History, life habits, economic status, and control. Pages 1–173 *in* S. P. Young and E. A. Goldman. The puma, mysterious American cat. The Am. Wildl. Inst., Washington, D.C. 358pp.

Received 26 September 1990.
Accepted 8 May 1991.

COUGAR ATTACKS ON HUMANS: AN UPDATE AND SOME FURTHER REFLECTIONS

PAUL BEIER, Department of Forestry and Resource Management, University of California, Berkeley, California 94720

ABSTRACT: I examined historical records of unprovoked attacks by cougars on humans in the U.S. and Canada during 101 years (1890-1990). There were 9 attacks resulting in 10 human deaths and at least 44 nonfatal attacks. In a recent paper, I listed these attacks and discussed them in considerable detail (Beier 1991). Although extremely rare, attacks on humans have increased markedly in the last 2 decades, during which cougar numbers and human use of cougar habitats have increased. There is no substantial evidence that habituation underlies this increase in attacks. The data provide weak support for the notion that an attacking cougar may be disposed to attack humans again. Warnings apparently do not deter people from visiting parks in cougar habitat.

Proc. 15th Vertebrate Pest Conf. (J.E. Borrecco & R. E. Marsh, Editors) Published at University of Calif., Davis. 1992

COUGAR ATTACKS ON HUMANS IN THE U.S. AND CANADA

I have recently provided a table listing time, date, and location for 53 cougar attacks on humans in the United States and Canada from January 1, 1890 through December 31, 1990 (101 years), along with data on the sex, age, and behavior of each victim, and the age, sex, and condition of each offending animal (Beier 1991). Interested readers should consult the earlier paper for this information. Herein I simply update that record with 3 additional cases that occurred since December 31, 1990, restate a point particularly relevant to persons working in Animal Damage Control, and add a few observations not mentioned in the earlier paper.

At about 1200 on January 14, 1991, 18-year-old Scott Lancaster was attacked and killed by a cougar as he jogged alone on a trail about 1/3 mile from his high school near Idaho Springs, Colorado. The attacking cougar was a male, about 2-3 years old, was estimated to weigh 100-110 lbs, and had no apparent disease or impediments.

At about 1100 on July 3, 1991, a woman was taking 5 toddlers and a dog along the Fraser River north of Vancouver, British Columbia. The group was sitting in a small sandy opening in the brush when a cougar walked over and clawed a 2-year-old boy and an 18-month-old girl while the woman struggled barehanded to pull the cat away. The boy's face required 50 stitches and the girl received about 15 stitches, but neither child was bitten. As of July 8, 1991, the cougar had not been caught.

At about 1430 on March 12, 1992, a 9-year old boy was attacked by a cougar in Gaviota State Park, California as he hiked with his twin brother and a 12-year old brother about 1.5 miles from the park trailhead. The boy fought back vigorously while his siblings ran 100m back down the trail and brought their father to the scene. The father hit the cougar on the head with a rock, causing the cougar to retreat. As of this writing (March 21, 1992), the boy is recovering and the offending cougar has not been taken.

WE NEED BETTER DATA ON OFFENDING ANIMALS

I obtained very few data on the attacking cougars. Some cougars were promptly shot by the victim's family or by game wardens, but no information on the offending animal was recorded. In most cases, no skilled necropsy was done and I have no way of knowing how reliable the data are, but I'm sure that many errors were made. In some cases, veterinary reports showed that wardens and animal control personnel often made gross mistakes in their initial estimates of the animal's sex, age, and weight.

A skeptical ADC professional may read the above and think "Others made mistakes but *I* certainly know how to assess an animal's sex, age, and condition without a veterinarian's help." But on 2 occasions professionals like yourself were embarrassed to discover that the "female" carcass they delivered to me was a male! And after 4 years studying cougars full-time, I still can't reliably "eyeball" cougar weights (my errors have exceeded 20 pounds). ADC personnel are rightly proud of their professional skills, but a part of being a professional is recognizing when you need to call in a professional with skills in an important related area. In the future, *all cougars shot for attacking humans should be given a post-mortem examination by a wildlife veterinarian, and the results should be filed so as to make them accessible.*

THE HABITUATION HYPOTHESIS

The popular press often speculates that cougars have become habituated to humans because they are no longer bountied predators anywhere in North America, and because in many areas (e.g., wilderness parks, all of California since 1971) cougars are no longer subject to sport hunting. The hypothesis is that as cougars learn to accept humans as a nonthreatening part of their environment, they may be more likely to treat humans as prey.

However, about 200 cougars per year are removed by hunters or on depredation permits on Vancouver Island, where the Wildlife Branch estimates that 6-10% of the population is harvested annually (Hebert 1989). This rate is probably higher than harvest rates in most western states (see references in Smith 1989). Compared to other North American populations, Vancouver's cougar population may be the least habituated to humans and the most subject to aversive conditioning. Nonetheless Vancouver Island has by far the highest concentration of cougar attacks on humans (Beier 1991). This fact seems difficult to reconcile with the habituation hypothesis.

There is no substantial evidence that habituation has played a role in any particular attack nor in the general recent increase in attacks.

Attacks have increased markedly in the 20-30 years since the end of the bounty period, and some have used this fact to support the habituation theory. But there is a far simpler explanation: perhaps the risk of attack was lower 80 years

ago because persecution kept cougar numbers very low, not because it taught cougars to avoid people. In my experience studying telemetered cougars for 3.5 years in an area of intense urbanization and no cougar hunting, I have seen no evidence that cougars are habituated to humans. Cougars do not raid garbage cans, enter suburban areas with astonishing rarity, and are generally unseen by the thousands of potential human observers in their midst.

THERE IS NO SUCH THING AS ZERO RISK

Although attacks were much rarer in the "bad old days" when deer were market hunted and cougars were shot on sight, the risk was still greater than zero. There has been at least 1 attack in every decade since 1890. It is impossible to reduce this small risk to zero without eliminating either cougars or humans from cougar habitat. Neither "solution" is acceptable.

THE "REPEAT OFFENDER" HYPOTHESIS

Removal of the offending animal provides several important benefits that amply justify such removal: (1) It allows us to learn what factors may have predisposed it to attack; (2) It helps satisfy the understandable grief of the family and the human instinct for retribution; (3) It may reduce the legal liability to the land manager in case there is a subsequent attack.

In addition, removal is often justified for a 4th reason, namely that "Once a cougar has attacked a human, it must be removed because it will probably attack again." Are there any data to support this hypothesis? A definitive test of this notion would require observing whether released attackers engage in subsequent attacks at a greater rate than a "control" group of cougars.

Clearly this is an infeasible experiment, but my data (Beier 1991) do support the "repeat offender" hypothesis, albeit weakly. There were 10 cases in which no cat was removed after an attack. In 3 of these cases there was a subsequent attack within 50 miles and 2 years of the initial attack; in the other 7 cases the offending animal apparently did not attack again. Thus when an attacking cougar was not removed, there was a 30% chance of a second attack within 50 miles and 2 years. I suspect that for a random set of dates and locations in the current range of cougars, there is a far less than a 30% chance of a cougar attack within the same time and distance. Thus it appears that leaving the offending animal in the wild may increase the risk of a future attack.

This analysis suffers several inherent defects: (1) the 30% "repeat offender" rate is based on only 10 animals; (2) the 3 "second attacks" may not have been made by the first attacker; (3) I did not actually compute the risk of attack within 2 years at randomly selected locations. Furthermore, even if my analysis is correct, a skeptic can correctly point out that there apparently is a 70% chance that an attacking cougar will never attack again. My analysis is not conclusive, but is simply my best attempt to interpret the scant data available.

PUBLIC WARNINGS

Cougar attacks are rare. The total of 11 deaths in over a *century* is far less than the *annual* total of people killed by lightning strikes, rattlesnake bites, or bee-stings (Beier 1991). Attacks are especially rare when one considers that cougars forego thousands of opportunities to attack humans. In my own work, I have documented cougars bedded for the day a few feet off of a well-used park trail. The cougar doubtless was aware of the hikers, the hikers were completely unaware of the cougar and therefore were at risk of being ambushed.

It will ultimately be up to lawyers, not biologists, to determine if wildland visitors are *required* to be warned about the danger of cougar attacks. I will not speak directly to that legal issue, but will make 2 observations:

(1) If cougars are dangerous enough to require a warning, then warnings for many other hazards — from rattlesnakes to cliffs to poison oak — will also be needed throughout thousands of square miles of wildlands, including national parks, national forests, and BLM lands. This raises the specter of wilderness areas blighted with guardrails and warning signs, or, worse yet, "wildlands" that are sanitized for the visitor's protection.

(2) Although such warnings may reduce a public agency's legal liability, it is not clear that a warning, by itself, actually reduces the risk to wildland visitors. If a visitor gets a simple warning that "There are mountain lions in this wildland; they could bite or kill you," the only risk-reducing action he can take, based solely on this warning, is not to enter the Park. Big Bend National Park (Texas) after several attacks over about a 10-year period, now attempts to warn every person entering their Visitor Center about the potential for cougar attacks. In the first year of this program, the park is unaware of a single visitor who has turned back because of this warning (P. Koepp, Big Bend NP, pers. comm., August 14, 1991). Similarly, Caspers Regional Park (Orange County, California) after 2 attacks in the late 1980s, has for several years required every visitor to sign a statement that he or she had been warned of the potential risk of cougar attacks. My conversations with Park employees indicate that fewer than 10 people in 5 years chose not to enter the Park due to this warning. In 1 case, a cougar walked through the main campground in Big Bend National Park in daylight, confronting a camper briefly before retreating. Although that camper did leave, park rangers warned everyone else in the campground about the incident, and none of them left.

PUBLIC EDUCATION

Although warnings are not legally required, it is becoming increasingly common for public entities to educate the public about cougars in a balanced way that mentions the aesthetic and ecological role of cougars, the potential risk of attack, and suggestions for how to respond if one encounters a cougar. Within the past 4 years, Colorado Division of Wildlife, Montana Department of Fish Wildlife and Parks, and Big Bend National Park have all produced helpful and accurate brochures on cougars. The first 2 agencies provide information targeted not only at wildland visitors but also at people who live in cougar habitat.

I believe such efforts are commendable; one of the reasons we preserve wild parklands is to provide the public with an education in natural history. The urban citizenry of states like California is increasingly ignorant of both the sense of place that wildlands can provide, and the dangers inherent therein. Thus such education is increasingly appropriate. A primary purpose of my recent paper (Beier 1991) was to give managers some factual basis on which to base their advice on how to react in an encounter with a cougar.

ACKNOWLEDGMENTS

The research that went into this paper was supported by California Department of Fish and Game, the County of Orange, California Agricultural Experiment Station Project 4326-MS, and the Orange County Chapter of Safari Club International. I thank Reg Barrett, Terry Mansfield, Bob Schmidt, and Bob Timm for their help and encouragement in various phases of the research and presentation of this paper.

LITERATURE CITED

BEIER, P. 1991. Cougar attacks on humans in the United States and Canada. Wildl. Soc. Bull. 19:403-412.

HEBERT, D. 1989. The status and management of cougar in British Columbia. Proc. Mountain Lion Workshop 3:11-14.

SMITH, R. H., editor. 1989. Proc. Mountain Lion Workshop 3:1-88.