

BEAR-HUMAN INTERACTIONS AT PACK CREEK, ALASKA

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Abstract: Brown bears (*Ursus arctos*) and humans come into close proximity and interact at Pack Creek, Admiralty Island, Alaska, a long-established site for recreational brown bear viewing. We conducted direct behavioral observations of bear-human interactions at Pack Creek using ad-lib sampling methods supplemented by fine-grained videotape analysis. Our observations yielded a behavioral classification of common types of human-bear interactions. We defined 3 distinct interaction types a priori and confirmed these classes by statistical analysis of behavioral frequencies. Analysis of bear-human interactions can contribute to the scientific basis for managing human activity in brown bear habitat.

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We observed behavior of 20 individually known, habituated brown bears in 55 bear-human interactions at Pack Creek, Alaska, 1989-90, a site whose recent history of human visitation spans over 50 years. From a sandspit overlooking open grassflat and tideflat areas near the creek, visitors view and photograph bears attracted by natural salmon runs and by natural plant foods.

Our long-term behavioral studies at Pack Creek, conducted yearly since 1985, identified 3 general situations that bring people and bears into close proximity. We tested the hypothesis that elements of bear behavior do in fact differ in relative frequency among the 3 proposed types of interactions. During incidental interactions bears came close to people when fishing, traveling, or grazing in the area. Bears could choose to continue their path of travel or to avoid the viewing area. Sometimes a social interaction with another bear or human activity "forced" bears close to people. We called these interactions contingent interactions. Bears had fewer options in contingent interactions than in incidental interactions. On rare occasions bears seemed to approach people purposively. These interactions had no apparent cause. The bear had not been in the area foraging or grazing and was not interacting with another bear or another human in a way that forced it near people. The bear's attention was focused on people. We called this a direct approach interaction.

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STUDY AREA

Pack Creek is a small Admiralty Island salmon stream in old-growth Sitka spruce (*Picea sitchensis*) and western hemlock (*Tsuga heterophylla*) forest. The area attracts 25-30 brown bears during chum (*Oncorhynchus keta*) and pink (*O. gorbuscha*) salmon spawning runs. Pack Creek attracted wildlife viewers and part of the watershed (54 km²) was closed to brown bear hunting in 1934 (Warner 1987). The original closure was expanded in 1984 and in 1990 the tidal area was designated the Stan Price State Wildlife Sanctuary. The 246 km² Pack Creek Cooperative Management Area (PCCMA) is jointly managed by Alaska Department of Fish and Game (ADF&G) and USDA Forest Service Admiralty National Monument. Pack Creek was made a Research Natural Area in 1951. Studies at the site from 1980 to 1984 monitored human use and bear activity (Post 1982, Warner 1987). In 1979 approximately 106 people visited the area (Post 1982). In 1989 and 1990 there were 584 and 1,020 visitors, respectively (USDA Admiralty National Monument and ADF&G, unpubl. data). Due to an increase in the number of people visiting the area and several undesirable bear-human interactions, human visitation to the Pack Creek viewing spit and intertidal area was restricted in 1988 to the hours between 900 and 2100 from June to mid-August. Fishing is not allowed. Food is cached near the boat anchor. All access is by float plane or boat. Activity is concentrated in this area, along the beach where people travel to and from the viewing spit (Fig. 1). A forest viewing platform and trail first built in the 1930s that had fallen into disrepair was improved during the course of the study. Some interactions occur in these areas that we do not see.

Agency personnel enforce regulations designed to

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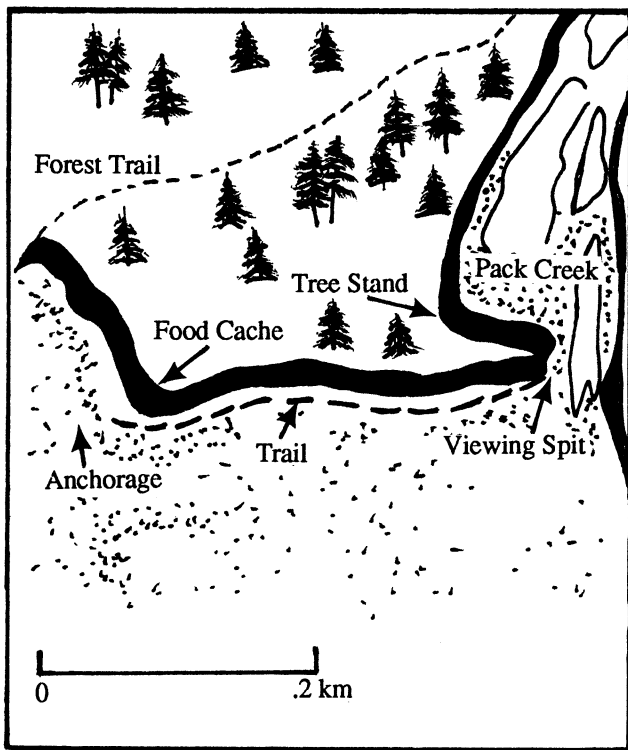


Fig. 1. Areas of concentrated human activity at Pack Creek, Alaska.

minimize bear-human conflicts and prevent bears from having access to human food. Before 1988, at least 2 bears obtained food from people or campsites. At least 2 bears were sprayed with a commercial repellent by agency personnel during 1989 or 1990 when they approached people.

METHODS

We recorded behavior of bears that were within 50 feet of the viewing spit or overtly reacting to human presence, with videotape, checksheets, and notebooks. We noted bear identity, who initiated the interaction (bear or human), general category of bear behavior, date, time of day, and general travel route of the bear. We observed interactions from a tree stand 180 m from the viewing spit.

General categories of behavior included forage or fish, graze, rest, travel, bear-bear social interaction, direct approach by the bear toward people, and other (including human approach). Each interaction was sorted into 1 of 3 categories, contingent, incidental, and direct approach, using the criteria defined in the introduction. We described and measured 34 point

events and behavioral states (Appendix, Masatomi 1964, Stonorov and Stokes 1972, Pruitt 1976, Egbert and Stokes 1976, Jordan 1976, Egbert 1978, Manville 1983, Tate and Pelton 1983, Bledsoe 1987).

To determine possible differences between the proportions of different types of behaviors in the 3 types of interactions, loglinear models assuming equal proportions for each interaction type (null hypothesis of independence) were fit to each year's data and tested using G-squared goodness-of-fit statistics (Fienberg 1981). Fits were further assessed and indications of possible outlying observations obtained by constructing stem-and-leaf plots of standardized residuals, (observed - expected)/(square root of expected) (Fienberg 1981). Because of differences between years in the size of the salmon run, the number of visitors, and the number of individual bears we analyzed each year's data separately.

RESULTS

Numbers of each type of interaction for 1989 and 1990 are reported in Table 1. The 3 types of interactions had significantly different behavioral proportions within each year ($G\text{-squared} = 246.6, P > 0.001, df = 64$ for 1989. $G\text{-squared} = 215.2, P < 0.001, df = 56$ for 1990. Degrees of freedom differ because not all 34 possible behavioral types were observed each given year.) The 6 highest observed frequencies for each interaction type are reported in Tables 2 and 3. Frequencies of all acts are reported in the Appendix.

Glance, look around, headshake, and sniff were the 4 most frequently observed behaviors. Common in all types of interactions, these acts varied in frequency according to type of interaction and year. During incidental interactions, bears were more likely to look around and to glance. Headshake was most frequently seen during direct approaches but was moderately frequent in contingent interactions and less frequent in incidental interactions in 1989 and 1990. Sniff is common in all types of interactions but

Table 1. Types of bear-human interaction, 1989-90.

Year	Incidental	Contingent	Direct approach	Total
1989	10	7	7	24
1990	24	5	2	31
Total	34	12	9	55

Table 2. Most frequent behaviors observed during 3 types of interactions, 1989.

Incidental (<i>n</i> = 341)			Contingent (<i>n</i> = 307)			Direct approach (<i>n</i> = 158)		
<i>n</i>	%	Behavior	<i>n</i>	%	Behavior	<i>n</i>	%	Behavior
49	14.4	look around	40	13.0	headshake	35	22.2	headshake
34	10.0	sniff	32	10.4	glance	14	8.9	sniff
33	10.0	glance	31	10.1	sniff	13	8.2	stare
24	7.0	headshake	27	8.8	look back at people	12	7.6	swagger
17	5.0	eat	22	7.2	stare	12	7.6	pant, salivate
14	4.1	paw	15	4.9	avert gaze	10	6.3	paw

disproportionately so in contingent interactions. Bears look back at people more often in contingent interactions, stare, and jaw more than in incidental interactions. During direct approaches bears stare, swagger, pant, jaw, and paw more frequently than in other types of interactions.

DISCUSSION AND MANAGEMENT IMPLICATIONS

Visual cues and head movements are important constituents of brown bear behavior in close proximity to people. Behaviors similar to sniff, look around, glance, stare, and headshake have been observed in human-black bear encounters (Pruitt 1976) and in brown bear social interactions (Masatomi 1964, Egbert 1978, Bledsoe 1987).

Bears were observed sniffing the air or ground when near people and were observed to sniff the areas where people had recently been. In black bears, sniffing is a common behavior with many contexts and functions, not only an offensive threat behavior that indicates an attack is possible (Jordan 1976). Sniffing conveys information about the identity of individuals. Natural

and artificial scents associated with humans may convey complex messages about individual human identities.

At Pack Creek bears visually monitor human behavior when they look around or glance at people. Acts such as look around, avert gaze, and headshake also make eye contact difficult to maintain. Such "cut off" or severing behaviors may help animals control the outcomes of intense social interactions with conspecifics (Chance 1962). "Cut off" behaviors may make fight or flee responses less likely in bear-human encounters because eye contact that might precipitate such a response is avoided.

By contrast, staring may be an attempt to influence behavior of the conspecific stared at and may enhance the status of the animal that stares (Ewer 1973). Staring may be answered with a reciprocal stare and challenge, or by looking around. Staring frequently initiates juvenile or subadult brown bear interactions in which 1 bear may approach and follow or move another (Masatomi 1964, Stonorov and Stokes 1972, Bledsoe 1987). Although we observed people who seemed unaware of many other bear behavioral acts, they were often aware that a bear was staring at them (pers. obs.) Bears may be attempting to make people move

Table 3. Most frequent behaviors observed during 3 types of interactions, 1990.

Incidental (<i>n</i> = 816)			Contingent (<i>n</i> = 212)			Direct approach (<i>n</i> = 388)		
<i>n</i>	%	Behavior	<i>n</i>	%	Behavior	<i>n</i>	%	Behavior
153	18.8	glance	42	19.8	sniff	73	18.8	look around
120	14.7	look around	39	18.4	glance	68	17.5	headshake
96	11.8	headshake	29	13.7	headshake	52	13.4	sniff
91	11.2	sniff	24	11.3	look around	50	12.9	glance
57	7.0	avert gaze	14	6.6	jaw, chop	29	7.5	paw
36	1.0	cubs run to mother	12	5.7	look back at people	19	4.9	jaw, chop

from the spit.

Although staring occurred in all types of interactions and was performed by all age classes, it was most frequent during direct approaches in 1989. Most direct approaches were by juveniles and subadults (bears independent of their mothers but who had not yet had cubs) and food-conditioned bears.

Two subadult food-conditioned females performed all the direct approaches analyzed in 1989. Each of these bears were sprayed with a red pepper-based repellent at least twice when their approaches persisted despite yelling and arm waving. Both bears had obtained human food before 1989 but not during 1989 or 1990. However, nonfood contents of a dilapidated cabin may have provided some stimuli.

Both staring and headshaking occurred at higher frequencies in 1989 than expected from a chance model. In 1990, there were only 2 direct approaches, one by a nonfood-conditioned subadult and one by one of the food-conditioned females with a history of direct approaches. In 1990, direct approaches differed from 1989 approaches because staring was less frequently observed. Curiosity appeared to be a factor in the nonfood-conditioned subadult's direct approach. Bears that both stare and headshake during a direct approach may be showing signs of ambivalence, a desire to approach people and obtain food and a desire to maintain some critical distance from people. Further

observation and analysis of direct approaches by nonfood-conditioned bears are necessary to conclude that such behavioral differences are characteristic of either food-conditioned bears or subadults.

There are differences between years in frequency of behaviors observed between 1989 and 1990. These differences may be due to differences in individual bears involved in the interactions, their past experiences with people, participation of dependent cubs in interactions, maturation of bears, waning of previous food conditioning, and aversion conditioning with spray. At wildlife viewing sites, minimal interaction is best for bears and people. Wildlife watchers may be tolerated by bears as long as bears are able to monitor human activity and limit the intensity of interactions with people.

At Pack Creek, bears are demonstrably tolerant, as indicated by information presented above. We have shown that bears look around, look back at people, and behave in other ways consistent with a hypothesis of active monitoring. Our data further indicate that bears modify their behavior, based on information they receive as a result of monitoring humans, so as to reduce the chance of an undesirable interaction. For example, bears in proximity to people avert their gaze and in so doing reduce the impression of a direct threat. Headshaking may well serve a similar function.

APPENDIX. DEFINITIONS OF BEHAVIORS AND BEHAVIORAL STATES AND FREQUENCIES.

Behaviors	<i>n</i>	Definition
alert	43	ears forward, head up, may be sitting or standing
approach	14	travel towards people
avert gaze	116	look away, avoiding eye contact, after having looked in the direction of people
avoid	35	notice people and change travel route so to travel away from them, some level of interaction may continue
broadside	46	posture with lateral orientation so as to enhance size, mother may stand with rear leg extended with cub behind
bipedal	38	standing on hind legs only
circle	66	bear passes area and then turns back and retraces route or returns to same area
cubs to mother	42	cubs walk or run towards mother
cubs wait	0	cubs stop traveling until mother decreases distance between them
defecate	3	bear evacuates bowel
fish charge	12	pursuing fish at high speed and running in direction of people, often not catching fish, in close proximity to people
forage	7	attempting to catch fish

Behaviors	<i>n</i>	Definition
glance	312	a quick look in direction of people <3 sec.
graze	24	eat grasses or sedges
headshake	292	lateral head movement in medial plane, left-right
jaw	82	open and close mouth, may make popping sound
leave	19	move away from people and end interaction
lick lips	4	licks lips with tongue
look around	293	directing gaze in one area and then another but without eye contact, not focused on an object
look back at cubs	54	mother looks back at her cubs
look back at people	99	quick glance at people after passing them
mother goes to cubs	6	mother runs or walks to cubs
mother waits	6	mother stops traveling until cubs decrease distance between them
pant	28	open and close mouth rapidly, may salivate
paw	89	paw face or leg, ground or object
play wrestle	19	cubs or mother in contact, one or both manipulate partner's body
play chase	7	cub pursues other cub or mother in play
reassure	20	cubs or mother seek contact, may be naso-nasal sniff or parts of mother and cub are touching
slmp	10	solo locomotor rotational movement, head or body twist while moving in solo play
sneer	1	lips withdrawn showing gum or teeth, nose wrinkled
sniff	264	sniff air, ground or object when people are present or where people had been
stare	83	direct look at people lasting more than 3 seconds
swagger	59	an exaggerated, stiff-legged, slow gait with the limbs extended laterally as the animal walks
wait	9	bear stops traveling until human or conspecific moves

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