

Paper 5

Threat behavior of the Black Bear (*Ursus americanus*)

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INTRODUCTION

The elements of threat occur in black bears in a stereotyped manner in reliable sequences. In this paper I will present representative descriptions in different contexts. Then the most common elements of offensive and defensive threat will be described in more detail.

European ethologists have contributed to the understanding of bear behavior in general and European brown bears (*Ursus arctos*) in particular. Direct observational studies of captive and wild North American black bears which equal the methodological sophistication and depth of the European ethologists are only beginning to appear in the United States and Canada. Pruitt, Bacon & Burghardt, and Ludlow (Papers 8, 1 and 2, and 6 in this volume), Henry & Herrero (1974), Burghardt & Burghardt (1972), and Burghardt (1975), have made detailed observations of behavior of wild and captive black bears and performed some well-controlled experiments. In the case of the first three authors, agonistic behavior, including threat, has been studied. Some recent detailed observations of Alaskan brown bears competing for salmon on the McNeil River (Stonorov, Stonorov & Stokes 1972b, and Egbert & Stokes, this volume Paper 4) will aid in putting black bear agonistic behavior in comparative perspective.

Ewer (1968, p. 154) has characterized threat as follows:

'A threat may be defined as a signal denoting that, contingent upon some act or failure to act on the part of the recipient of the signal, hostile action will be taken. One may distinguish an offensive from a defensive threat: the former carries a message whose equivalent is "If you do not retreat, I will attack you"; the latter means "I am not about to launch an attack, but if you take the offensive, I will retaliate." The function of the threat is to deter the opponent; to drive him away in the first case, to prevent him from making an attack in the second.'

Ewer's definition also can be stated in terms of probabilities of the withdrawal of the opponent and the non-occurrence of attack following threat.

SUBJECTS AND METHODS

Over a two-year period many black bears in a variety of contexts were observed. These include two pairs of captive adults (a male-female pair and a female-female pair, all of whom were yearling cubs at the beginning of the study); three captive cubs; and many free-roaming bears in the Great Smoky Mountains National Park (hereafter referred to as GSMNP). Videotapes, films and taped recordings, in addition to systematic and adventitious written accounts, were used to record behavior. The descriptions in this paper were

drawn primarily from single-frame analysis of super-8 mm ciné films and field notes.

The male-female pair was enclosed in a 15 × 87 m grassy space. The female-female pair was kept in an enclosure 18.3 × 18.3 m² erected in a wooded setting in the GSMNP. Most of the trees were preserved intact (see also Burghardt 1975, and Bacon & Burghardt, Paper 1 above). Observations of free-roaming bears in the GSMNP were conducted primarily on the grassy bald and in the woods of a saddle-back ridge called Spence Field.

THREATENING BEHAVIOR BY ADULTS AND CUBS

Throughout this paper reference will be made to the following vocalizations:

- (1) Huffing—a single rapid, highly audible, exhalation of a breath of air through the open lips, produced both by cubs and adults.
- (2) In-out huffing—a rapid, highly audible, inhalation and exhalation produced in a manner similar to simple huffing and repeated in rapid succession. It is nearly always produced by a cub threatening defensively.
- (3) Bellowing—a hoarse, pulsing sound, resembling the sound of the starter of a balky automobile that won't start.
- (4) Grunting—a short 'uh' or 'kuh' sound produced deep in the throat with the mouth closed.
- (5) Jaw-popping—rapid, hollow-sounding, snapping of the jaws and popping of the lips.

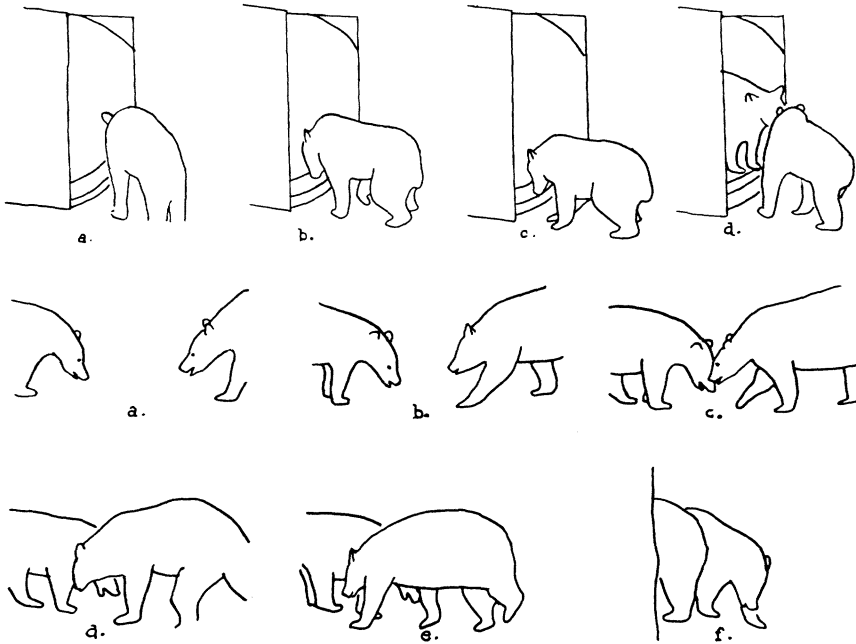
Threat by a free-roaming wild bear directed towards a conspecific.

A sow with her cub at a distance of 30 m was eating from a discarded can. A second, slightly smaller bear of unknown sex approached. The sow looked up, walked to the edge of the woods, stood up grunting towards her cubs, then returned to sniffing the ground. The second bear approached slowly through the woods to within six meters of the sow, slapped the vegetation sharply with its front paw and huffed. The sow rose quickly and huffed back. The second bear turned and ran off bellowing. The sow walked, then ran, after it.

Threat by captive bears directed toward conspecifics.

Example 1 (Fig. 1). A newly introduced wild adult male was standing inside a cement culvert cage which opened out on a large enclosure. Another adult, 2-year-old male was standing in front of the culvert. His muzzle was pointed down at a 45 degree angle, but his gaze was directed to the other bear (Frame a). He crouched slightly, shifted his weight, raised his right front paw (Frame b), then brought it down hard on the ground in the front of the cage, huffing loudly as he slapped (Frame c). Finally he raised his head and turned it to the side (Frame d). During all this his ears were laid partially back. The male inside the culvert bellowed loudly and the jaw-popped.

Example 2 (Fig. 2). Female A (3 years) with head and neck lowered and mouth open, ears slightly back, approached and passed female B (also 3 years) who stood in place, head and neck lowered more than A's, mouth opened widely bellowing (Frames a, b, and c). A turned her head towards B as she passed but B stood without turning (Frames d, e, and f).



Figs. 1 and 2 Threat by captive black bears directed towards a conspecific.

Threat by a free-roaming wild bear directed towards a human (offensive threat).

A sow with cubs nearby was eating berries in an open field as we approached and disturbed her. She lifted her muzzle high, sniffed the air, and looked in the direction of her cubs who were standing almost hidden in high grass. She turned her head, then body towards us, charged, stopped suddenly, slapped and huffed. She turned away and walked back to her cubs sniffing the air and grunting to them.

There were variations in this threat. Sometimes bears simply pant loudly as they charge without slapping and huffing, sometimes slapping the limbs with an even louder effect than slapping the ground.

Threat by a captive bear directed towards a human.

A female bear (Kate) had been raised from age 2 months to adulthood in our care. We were able to enter the enclosure although she threatened most humans. (Kate's littermate, Kit, was also present in the cage at the time these observations were made).

Example 1 (Fig.3). Kate occasionally threatened humans who were inside the cage. In a typical instance, she eyed her target steadily, but without her head directly towards him as she circled slowly behind. Then she charged (Frame a and b), slapped and huffed at him (Frame c). Finally, she turned her head away and walked off (Frame d). More common was a lower intensity threat which consisted of running or walking quickly while panting heavily, stopping, then panting or jaw-popping.

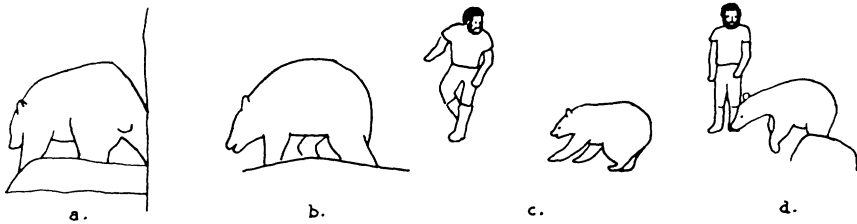


Fig. 3 Threat by a captive black bear directed towards a human also inside the enclosure.



Fig. 4 Threat by a captive black bear directed towards a human outside the enclosure.

Example 2 (Fig. 4). The above female was much more likely to threaten humans who were standing outside her cage than inside. In a typical instance she would sit with her head down, sniffing the fence of the ground close to the observer. Then, with her head still pointed down, she looked directly at the observer for one to several seconds (Frame a) before standing to her full height (Frame b), raising her paws as she stood, and slapping them hard against the fence, huffing as she slapped (Frame c). Sometimes in a threat of high intensity the huff/slap was followed by jaw-popping. Then she sat or stood down on all four feet, turning away as she did so, and resumed sniffing or walked away (Frame d and e).

Stiff-legged walking

Stiff-legged walking behavior was observed in wild and captive black bears. It has also been reported in the Alaskan brown bear (Stonorov 1972a). One instance by the captive 4-year-old, Kate, will be described, since my urinating on the fence of her enclosure evoked the behavior; this was done prior to the following events. Kate approached, sniffed and licked the urine, then walked away in normal fashion for a few steps until reaching a point near the center of the enclosure, whereupon she walked with her front legs locked stiffly and extended out in front of her farther than normal. The paws of her extended front legs slipped forward with each step. Her rear legs seemed stiffer than normal as well, though perhaps not locked. Urine dribbled down her hind legs as she walked. Her body shook noticeably each time she took a step. She stopped and looked around before resuming a normal walk. Often she performed this behavior at a considerable distance from someone or something that might be disturbing. Also she was as likely to be facing away from as towards the source of possibly disturbing stimuli. Because of this seemingly random orientation, the behavior might not properly be called a threat display. However, it may well serve to mark the environment visually and chemically, thus serving indirectly as a threat.

Threatening behavior by cubs.

Threat in both captive and free-roaming cubs seems identical whether directed towards humans or other bears. While in the GSMNP I approached a yearling cub standing on the ground. The cub walked, then ran to the nearest tree and hopped swiftly up the tree huffing in and out as it climbed. It reached a perch, looked at the person standing below, and slapped the side of the tree, huffing simultaneously. Then it jaw-popped, and after a short pause, huffed in and out and jaw-popped again. Finally, after several repetitions of in-out huffing and jaw-popping, it looked away and moaned.

DISCUSSION AND CONCLUSIONS

Simple threats, both offensive and defensive, towards humans and other bears were remarkably similar. Threats by captive bears (including hand-reared animals) were identical to those of wild bears at least in terms of the elements present, if not in rate. Females and males threatened in the same way, although my sample of male threat behavior was too small to be certain of this.

An offensive threat by an adult might occur in the following sequence:

- (1) Sniffing the air or objects with unfamiliar odors.
- (2) Looking directly at the individual to be threatened (heavy panting may occur before or during looking directly),
- (3) Charging at the individual or veering slightly into bushes or trees (sometimes panting while charging) and stopping suddenly.
- (4) At the moment of stopping, slapping one or both feet down on the ground or to the side against any object such as a tree or bush which would produce a sudden surprising sound. Concurrent with the slap, air is expelled from the mouth with a startling rush (i.e. huffing). (The charging bear may stand on its hind feet as it stops and slaps; or the bear may not charge at all but simply slap or stand up in place and slap).
- (5) Opening and closing the mouth rapidly to produce a series of loud pops (i.e. jaw-popping).
- (6) Turning the head away and averting the eyes, often accompanied by licking the lips and panting.
- (7) Standing, walking, or running away.

Depending on the intensity of the threat, the types of elements that occur, the repetition of elements within the sequence and, to a limited extent, the order of the elements vary. A high intensity threat generally contains more elements and repetitions of elements than one of low intensity. None of the elements always occurs. However, given the occurrence of one element, the likelihood of the occurrence of the one that follows it may be very high. For example, charging and stopping suddenly is very likely to be followed by slapping or huffing. Detailed film analysis will be needed to characterize these behavioral sequences more clearly.

What I call defensive threat usually occurs after, or in response to, offensive threat. That is not to say that it is a response elicited only by the offensive threat of another bear, since, I have been able to elicit defensive threat by running towards bears while shouting and brandishing a stick. A defensive threat might include lowering the head and neck, sidelong glances, sitting,

bellowing, and jaw-popping. Because the elements and sequence of defensive threat seem more variable than those of offensive threat they are not represented in sequential tabular form. This variability derives in part from the necessity of constantly readjusting one's behavior to the other.

Elements 5, 6, and 7 of offensive threat are similar to those just described for defensive threat. The threat behavior of many species consists of elements that would be conflicting in another context (e.g. flight and fight behaviors occurring simultaneously or consecutively). Perhaps elements 5, 6, and 7 occurring at the end of offensive threat actually represent a shift from offensive to defensive threat.

The primary difference between threat behavior of the cubs and adults was that cubs usually threatened from the safety of trees and that in-out huffing usually preceded or followed huffing/slapping and jaw-popping. The moan probably doesn't occur in the context of agonistic behavior but only after threats have failed.

Yearling cubs are known to bellow and jaw-pop in a manner similar to adults threatening defensively. I would classify both types of threat by cubs as defensive since they occur in response to threat by others.

Stiff-legged walking in black bears may or may not be threat behavior; it has been designated as such by Stonorov (1972a) in brown bears. In any case it may serve as a way of marking ground visually or chemically since sliding marks are produced by the front paws on the ground and urine trickles down the rear legs when this behavior is occurring.

Bears often sniffed odors on surfaces within the cage and airborne from the outside before threatening. Often they sniffed places where our hands or feet had been within the cage. When they sniffed human urine they were especially likely to threaten. Wild free-roaming bears frequently sniff the air before threatening.

Results of this study support the contention of many ethologists that the behavior of captive animals can tell us much about that species' behavior in a natural context as well. The threat behavior of the captive bears I observed was remarkably similar to the behavior of bears in the wild. It is likely that the environment, especially the social environment, exerts great pressure on the species to evolve highly specific signals. These signals, which are pre-disposed genetically, maintain their integrity even under the unusual circumstances of captivity.

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