

SOME THOUGHTS AND OBSERVATIONS ON HARASSMENT AND BIGHORN SHEEP

By

Brian Horejsi

Department of Biology and Environmental Sciences Center
University of Calgary
Calgary, Alberta

Harassment has been defined as any activity which precipitates excitement in an animal, causes it to prepare itself, physiologically, for flight, and may lead to flight, panic, exertion, and consequent damage to or death of the animal (Geist 1975).

Animals function most effectively in a stable, predictable environment. An animal reduces indecision by attaining an appropriate response for each stimulus with which it is faced. It acts to avoid unpleasant stimuli. When it encounters one, it (1) becomes excited and moves to neutralize the stimuli, usually by flight (it may remain excited for a considerable period of time after the object has disappeared); (2) avoids the area where the disturbance took place; and (3) generalizes to similar objects and localities, and perhaps situations, and avoids them or becomes disturbed when it encounters them (Geist 1971a).

Harassment takes two general forms which I have termed active and passive. Active harassment causes an obvious change in activity and results in flight. Passive harassment does not cause flight and its effects on activity are usually subtle. Examples of these two kinds of harassment will be presented later.

Sheep appear to associate disturbance, first with a particular stimulus and second, with a particular site. Man is not inherently considered an unpleasant stimulus, as evidenced by the variety of his relationships with wild sheep throughout their range. In areas such as national parks, where sheep have never or rarely been hunted, they have no cause to associate man with unpleasant experiences. In those vast areas of North America where sheep have been hunted, they have every reason to fear man. The contrast between these two situations was brought home to me vividly when working with Dall sheep in Canada's Mackenzie Mountains in 1971. I first encountered rams which had been hunted. Although hunting parties were as infrequent as one per year, these rams would not allow an approach to within 300-500 yards. Only 36 km (30 mi) away, rams had never been hunted, in fact, they may never have seen a man before I appeared. After stalking to within 75 yards of two large bedded rams, I finally stood up. They looked. I dislodged rocks. After several minutes, they stood. To my amazement, they came up the slope toward me, approaching so closely I had to back away in order to focus my telephoto lens. They then proceeded to feed, completely ignoring me. I was to experience a number of similar events that summer.

What does this mean? Obviously it means that sheep learn to fear man because of unpleasant interaction with him. Once individuals in a population have learned to fear man, the reaction of flight at his appearance may persist in the population for generations because it is passed on to the young. When a ewe runs from a man, its lamb runs and so it starts to associate withdrawal with the presence of man. In the Sheep River area of southwest Alberta, lambs up to 4 or 5 months of age did not run from me when they were alone. However, in the presence of adults, they always accompanied the latter. Yearlings do not react as decisively as adults.

The question to ponder now is whether a sheep can distinguish between a hunter, a hiker, and a coal geologist? The answer, of course, is no. As I indicated earlier, sheep generalize within a class of stimuli (Geist 1971a). With very few exceptions, a man is a man. What this means is that sheep are now being faced with hunters throughout the year in the form of skiers, hikers, surveyors, and personnel of mineral exploration and development crews.

It appears that behavior may be site specific. I have observed for a number of years, individually known (marked) sheep on both summer and winter ranges. Invariably ewes react more strongly to the human presence on their summer range than on their winter range. The reason probably lies, first, in the frequency of human-sheep encounters and second, in the nature of the encounters. In Alberta, sheep see fewer people on summer ranges than on winter ranges. On the former, when a human appears it becomes a new unexpected part of the summer environment. The situation is unpredictable. On the other hand, winter ranges tend to be in lower elevation areas with better access and, predictably, more human beings. Equally as important, most hunting takes place when sheep are still on summer or non-winter ranges. The odds are that man-sheep encounters will be unfavorable on summer range because of this. There are strong indications that this kind of pressure will alter sheep movements and distribution. Any sheep hunter will tell you how "the rams go down into the timber" when hunting season starts. Geist (1971a) has stressed that sheep will abandon those areas where they are harassed. Light (1971) has inferred that heavy use by hikers has resulted in bighorns abandoning parts of their historic range in California. In the Sheep River region of Alberta, sheep, particularly rams, appear to be making earlier and more consistent use of a semi-protected winter range than they did before the area was given hunting sanctuary status.

Batcheler (1968) noted that with heavy hunting pressure, red deer (Cervus elaphus) and chamois (Rupicapra rupicapra) became "extremely wary" and "were forced to occupy habitats which formerly they did not prefer". They both made extensive use of dense timber-scrub and fed in the open only at night. Two years after hunting had ceased in this particular part of New Zealand, red deer were again utilizing open areas during the day (Douglas 1971), although sightings/hr of observation generally continued to increase through the last year of the study, 6 years after the hunting ceased.

When one becomes familiar with individuals in any population of animals, differences in disposition can be observed. Hansen (1970) notes that pink-tongued sheep are much more wary and nervous than sheep with

black tongues and the latter were in the majority amongst hunter kills. He stresses that hunting could produce more wary sheep. These animals are more likely to respond to harassment through changes in behavior such as I have outlined. Will these activities increase hunter success? Causing sheep to abandon preferred parts of their range forces them to spend more time in peripheral areas, where in all probability, they are less familiar with the environment. It is less predictable. The animals will be less sure of themselves, more excitable, and burn more energy. They may be more susceptible to predation, accidents, and hunters. Although it may be considered stretching the point to compare sheep to mice (Peromyscus leucopus), the principle involved is the same and it has been demonstrated that transient mice suffer a higher incidence of predation, that is, a mouse in familiar terrain is less vulnerable (Metzgar 1967). On the basis of my conversations with sheep hunters, the majority of kills are made accidentally, meaning the sheep walk into the hunter or the hunter stumbles onto the sheep. This is far from the ideal hunting experience of spotting and stalking your game. To me it means too many hunters.

The response of sheep to harassment brings up several management questions. How long should hunting seasons be? Should we allow hunting for elk and deer on sheep range when sheep season is closed? Under ideal forage conditions bighorns probably continue to gain body condition until the rut (Hebert 1973) but what about when they are forced out of that part of the range they prefer? What about the increased reliance on suboptimal areas, the increased nervousness, the broken activity patterns, the running they do to avoid people? These activities increase energy expenditure and reduce intake. Do they mean reduced breeding activity and lower over-winter weights? We don't have the answers but I fail to see an alternative.

And what about harassment on the winter range? In Alberta it is increasing at a phenomenal rate, largely because of the recent trend to year-round recreation, specifically the rise of snowmobiling and the discovery of cross-country skiing, but also because of improved access and more leisure time. There can be no doubt that activities such as those mentioned, along with hiking, photographing, and exercising the family dog, are harmful to sheep.

In the Sheep River region of southwest Alberta, the winter range is traversed by an excellent secondary road. In winter it leads nowhere, being plowed only to a point in the heart of the winter range. The slopes are strongly south facing and sun and wind action keep them snow free and often dry for most of the winter. They are extremely inviting to hikers and sightseers. Largely through the efforts of one individual, most people stay on the road, whether it be the plowed or the unplowed section. The sheep are continually exposed to people on the road and usually give only a long stare to even the most extravagant efforts to get their attention. They have become habituated to the presence of people and vehicles along the road, that is the sheep exhibit a decrease in behavioral response (Hinde 1970) to these stimuli. This is possible because the people and vehicles do not (usually) threaten the sheep by approaching and following, that is the large majority of human activities take place on the road, they are very frequent, and they thus allow some degree of predictability. These are, in effect, neutral stimuli. It is of interest that although

the road and human activities have been present longer than any of the sheep, behavioral response to these stimuli has not disappeared.

Should we conclude that these animals are not excited? No, not until it can be demonstrated that they are not experiencing some form of physiological stress. In experimental work, with domestic sheep and goats, Liddell (1961) and Moore (1968) exposed confined animals to selected stimuli followed by electric shocks. Although all animals initially attempted to escape, they all quickly learned to control their motor reactions. This state is referred to as active inhibition (Pavlov 1928 in Moore 1968). It develops because of anxiety regarding the meaning of a particular stimulus and inability to avoid it. This condition is characterized by elevated heart and respiratory rates, grinding of teeth, and licking of the rhinarium. The animals become neurotic. It can result in reduced rates of body and horn growth, social dysfunction, ineffective maternal response, and in young kids and lambs, death. It could happen in wild populations of sheep if disturbance is frequent and severe and cannot be avoided.

The occurrence of people off the road elicits an entirely different response compared to that observed when people remain on the road. It is unpredictable both in the time people are active and in the kind of activities people undertake.

Sheep react to human presence in these areas with alertness, urination, pacing, and prolonged staring if the intruders are distant, and with alarm and flight if they are close. Both result in broken activity patterns, altered distribution, increased energy expenditure, and probably increased predation.

It might be suggested that human activities substitute for the activities of predators with which the sheep have historically had to deal, but which may now be absent or reduced. Not so, because man behaves quite unlike a canid or felid predator. Equally as important in the Sheep River area, coyotes (Canis latrans) are present and they do hunt sheep. The human influence thus becomes additive.

Human-sheep encounters differ in three possible ways from that of canid-sheep interaction: First, man's approach may be noisy and direct, whereas a coyote is usually quiet and often passes in the vicinity of the sheep. Second, people very often try to stalk sheep whereas a coyote usually approaches in the open, although ambushes are not uncommon. Third, the coyote-sheep interaction is almost invariably short in duration, as is the cougar-sheep event, whereas humans persist in approaching and following.

A healthy sheep can easily outrun a coyote and usually a wolf. It need only show a short burst of running, reach relatively rough terrain, and it is safe, but with humans such is not the case. I have observed a number of events in which sheep stood quietly within 3-4 m (10-12 ft) of a coyote, and in one instance, a wolf, apparently well aware of their secure position. On the other hand, I have seen many instances where humans have entered escape terrain and forced sheep out, in some instances repeatedly.

At this point, I should mention the effects of aircraft harassment, particularly helicopter harassment. In a recent study (Horejsi 1975) I observed that sheep reacted explosively to the sight and sound of a helicopter. They often ran when the machine was 1.6 km (1 mi) away, they ran long distances even after they appeared to be exhausted, and groups often broke up with animals scattering in every direction. In the particular part of Alberta where the study was conducted, the search for minerals and coal has escalated, and the helicopter has become an every day method of travel. The reaction I observed was probably a result of helicopter chases stemming from exploration work and its sightseeing and photographing diversions, as well as from game surveys. Helicopter flights are normally at low altitudes, greatly increasing the chances that wild animals, particularly those that frequent the alpine, will be encountered. Like the sheep dealing with the man on foot, these sheep have not been able to escape the predator with a short dash to the cliff because the helicopter comes right in behind them. The cost of such incidents, energy wise, is phenomenal (Gelst 1971b, Hammel 1962 in Moen 1973). But it doesn't end there. Accidents increase - a lame lamb is destined to fall prey to coyotes. Lambs are separated from their mothers, and one need only watch hunting coyotes to see how they zero in on such an unusual animal. They usually attempt to isolate an animal, most often a lamb that, for example, makes a wrong or slow turn or is slowed by the snow and thus becomes separated from the group. Murie (1944) observed wolves doing the same thing with Dall sheep. What, then, of aerial surveys? Continue them for distribution and total count data, but then back off, land, and do your composition counts from on foot.

I have one more subject I want to expand on, that is the passive harassment I spoke of earlier. It results from the mere presence of human beings within an animal's home range. It rarely results in flight by an animal, that is, its affects are usually very subtle. Some examples I have observed are (1) obvious alarm exhibited by a group of mule deer does when they encountered human tracks in the snow (They reversed direction, returning from whence they had come); (2) immediate assumption of an alert posture by a cow moose at the sound of explosives being detonated (She had been feeding in a shrub stand at the time and seconds after the blast, moved at a determined pace directly into a stand of conifers); and (3) the difficult to document changes in the movements of a band of sheep at the sight of people on a slope upon which the sheep consistently feed and bed and towards which I felt the sheep were moving. What does this type of human interference mean? Obviously, in each case the animals have altered their pattern of activity. In many cases overt indications of excitement are seen, suggesting increased energy expenditure, and in every instance the animal is prevented from exploiting its environment in the manner in which it would have, had people, or their signs or sounds, not been present.

What are the net results of harassment? I have repeatedly mentioned the energy cost of increased excitement and activity. In winter, when most ungulates in temperate regions are at or close to maintenance, any factor which increases energy expenditure and/or decreases intake can be expected to have a debilitating effect. In reindeer, running requires 8 times as much energy as walking (Hammel 1962 in Moen 1973) and walking

uphill is about 11 times as costly for domestic sheep as walking on a similar horizontal surface (Graham 1966). Geist (1971b) has calculated that a 90 kg caribou chased for 10 minutes, walking for an hour, and remaining excited for another hour requires 21 percent more energy to maintain itself over a 24-hour period. If quality forage is available and the animal is allowed to exploit the range without interference, one might postulate no energy detriment, but of course, that is never the case.

Every event I have spoken of detracts from an animal's ability to achieve optimal use of its environment and it seems safe to say that in sheep, like in caribou (Lent 1976), optimal use depends upon being in the right place at the right time. This is extremely important for it allows an animal to (1) take advantage of the temporal and spatial complexity of plant phenology, (2) be in the right place for breeding and the bearing of young, and (3) minimize physical and social environmental stress.

In summary, harassment has a significant impact on individuals and the population: (1) it may result in death through predation, accidents, and increased hunting mortality; (2) it may affect growth and development of individuals; (3) it may cause abandonment of some ranges or parts of them; and (4) it alters activity patterns and distribution on occupied areas. All these conditions lead to reduced fitness.

With the accelerated exploration for and development of coal deposits, sometimes accompanied by the growth of new towns, the impending development of large scale ski resorts, and a sharp increase in leisure outdoor activities, not only in winter but throughout the year, bighorns require immediate and stringent protection. In areas of intense development and/or high population, recreational use and hunting in their present unregulated form cannot continue. Two areas within the home range of each population should be singled out for protection, specifically for the benefit of the animals, these being the lambing and wintering areas. If we wish to maintain the integrity of our sheep populations, top priority must be given to research and regulations aimed at minimizing, preferably eliminating, harassment.

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