SOME THOUGHTS ON THE CONSEQUENCES OF NON-TROPHY SHEEP HUNTING IN THE WIND RIVER MOUNTAINS OF WYOMING

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INTRODUCTION

The Whiskey Mountain wintering bighorn sheep (Ovis canadensis canadensis)population has recently been shown to consist of two herds which total between 900 and 1,200 animals. They winter in three relatively small areas on Whiskey Mountain and Sheep Ridge which are near Dubois, Wyoming. During summer they migrate to the south and inhabit large areas on either side of the Continental Divide in the northern Wind River Mountains.

Ewes, lambs, yearlings, and 2-year olds (ewe-lamb bands) of these populations are accessible and often quite visible to human visitors throughout most of the year. Wintering populations may readily be viewed from motor vehicles and can be approached on foot. These animals are quite popular as a source of nonconsumptive wildlife recreation for many people, and during 1976 an estimated minimum of 5,350 people using motor vehicles viewed and photographed sheep on their winter range. On summer ranges the same animals are heavily exposed to fishermen, backpackers, mountaineers, and, especially, amateur photographers. The number of people who seek sheep is increasing rapidly. Summer ranges are almost entirely above timberline, and, although the terrain is quite precipitous and rugged, sheep and man are highly visible to each other over considerable distances. During fall, ewe-lamb bands return to areas near winter ranges which are also frequented by sheep hunters. These sheep return to the various wintering areas during the rutting period.

Mature rams from the Whiskey Mountain populations are wild and timid during all seasons as far as their reactions to humans are concerned, but there is some variation in degree of wildness with different seasons. They are readily visible only during rutting season on the winter range and again for a short period coinciding with grass green-up on winter and spring ranges. However, our experiences indicate that even during these periods not all or even most rams are readily visible. During summer and fall months, mature rams are rarely viewed by the backpacker or mountain recreationist, and our observations have demonstrated that these animals will go to great means to avoid human contact.

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RESULTS AND DISCUSSION

Beginning in the early 1900's, sheep were hunted in Wyoming by anyone possessing a combination elk-deer tag. Since the 1930's, hunting has generally been on a limited basis and usually for rams with three-quarter curl or larger horns. Either sex or one-half curl or larger ram hunting on a permit basis was allowed between 1965 and 1968, but the harvest of ewes and smaller rams was very limited. Approximately 394 mature rams have been harvested from the Whiskey Mountain populations through hunting between 1968 and 1978. The harvest of three-quarter curl or larger rams during this time period has not significantly regulated population size. Between 1958 and 1978, 847 sheep, consisting primarily of ewes, yearlings, lambs, and young rams have been removed from the population by trapping for transplant or research purposes. Trapping and transplanting, in combination with limited hunting of mature rams, has served as the primary management means of population control. Even though techniques (Schmidt 1976) adopted in recent years have greatly increased the success and efficiency of trapping, this remains an expensive means of population control. Reduction through hunting ewes and young rams (non-trophy sheep) has been adopted in some areas and has been deemed to be biologically sound and an effective management tool (Morris 1976, Nichols 1976). It has been our observation that, although hunting non-trophy sheep may be biologically sound and the management tool of choice in many situations, behaviorally it could be destructive to populations such as the one we studied. We developed the following thoughts regarding possible consequences of non-trophy sheep hunting during an intensive 3-year study of the Whiskey Mountain bighorn population. These thoughts are our own and do not necessarily reflect the philosophy of the management personnel responsible for season recommendations within the Wyoming Game and Fish Department.

All ungulates, including bighorn sheep, respond to environmental and management alterations in varying degrees ranging from imperceptible to obviously drastic changes in numbers and distribution. In speculating on the consequences of non-trophy sheep hunting, we will present what are, in our personal estimations, the more extreme responses. However, we do recognize that responses of such magnitude may not invariably occur. Also, the responses we predict could not be expected to occur rapidly and might require a number of years or sheep generations. Our observations and thoughts are limited to the Whiskey Mountain sheep populations and their habitat which we believe are rather unique as compared to most other North American ungulates and their habitats. This uniqueness is based upon the following facts: 1) these populations are utilized in both consumptive (trophy hunting and trapping for transplant) and non-consumptive (viewing, photography, etc.) ways; 2) in most of their habitat they are highly visible to human visitors over great distances; and 3) they share large portions of their habitat with numerous recreationists.

Mountain sheep are relatively intelligent animals (Geist 1975) and their response to man is largely a result of previous experiences, pleasant or unpleasant (Geist 1971a), which may have occurred over many generations. In some national parks, all members of sheep populations

including mature rams are unafraid of man (Geist 1971a). Their experience with man and those of their predecessors have been neutral or in some cases pleasant. Hence they have not learned to fear man. The fact that disturbance by man in the form of hunting will result in wild or wary sheep populations has been discussed (Horejsi 1976) and documented (Geist 1971a, 1971b) and is common knowledge to most sheep hunters. This avoidance response to humans has also been noted among other species such as elk (Cervus canadensis)controlled by hunting in national parks (Houston 1976, Schultz and Bailey 1978) and red deer (Cervus elaphus) controlled by hunting (Batcheler 1968). Discussions of wildness in hunted mountain sheep have often been generalized in the sense that ewes are expected to react much the same as rams (Horejsi 1976). However, we have observed vast behavioural and distribution differences between mature rams (the hunted segment) and immature rams, ewes, and lambs (the unhunted segment). It is recognized that behavioral and distribution differences exist among mature males, females, and juveniles in sheep and many other ungulates which are undisturbed by man, but we believe that among Whiskey Mountain sheep these differences are exaggerated due to differing degrees of unpleasantness associated with man that have resulted in differing responses to man.

Almost all sheep we encountered or that we observed encountering other people, such as backpackers, reacted in a negative way. Rams 2-3 years of age and older reacted by increased alertness, attention, and usually a strong flight response (Calef et al. 1976, Horejsi 1976). They inhabited areas right at or just below timberline where they were not visible for great distances. Those rams which ventured above timberline seemed to inhabit the most inhospitable mountain tops. Ewe-lamb bands almost always reacted to human presence, but much less strongly than rams. A number of observations indicated they reacted to man in a slightly more negative way than they did to coyotes, their chief predator. They usually responded with increased attention, sometimes walked to cover, and occasionally took flight, but flight distances were usually short. It appeared that young rams learned to react strongly to man when they joined ram bands and associated with older animals which had previously experienced unpleaseant encounters with man. This has been suggested by Geist (1971a). Very seldom are rams legally shot while in close association with ewe-lamb bands; therefore, ewes and lambs have not experienced being hunted.

Control of the Whiskey Mountain sheep population through hunting of non-trophy sheep would result in a great deal of disturbance. In the past 10 years an average of 92 permits for three-quarter curl rams have been granted with an average hunter success of approximately 40 per cent. It is probable that non-trophy hunters would initially experience a success rate approaching 100 per cent. But it could be predicted that as non-trophy sheep were hunted, they would become more wary and hunter success would drop as it did with Dall sheep ewes on Crescent Mountain, Alaska, where they are hunted rather intensively with only 25-44 per cent success (Nichols 1976). At the present time, an average minimum of 40 non-trophy sheep are being or should be removed yearly from each of the two Whiskey Mountain populations by trapping for transplant. To

effect this level of population control through hunting of non-trophy sheep at a hunter success rate of 60 per cent would require 140 hunters in addition to 92 three-quarter curl ram hunters. This could result in a great deal of disturbance especially on Whiskey Mountain and other more accessible areas. Control of hunter opportunity and access could reduce this harassment of non-trophy sheep as it might for trophy rams.

Sheep should not be expected and certainly are unable to distinguish between hunters, hikers, fishermen, biologists, geologists, and photographers (Geist 1975, Horejsi 1976). Sheep which encounter an unpleasant experience when hunted might expect the same unpleasant experience each time they encounter man and react accordingly (Geist 1971 a). Thus, for hunted sheep any form of sheep-man encounter during any time of the year might be interpreted as a form of harassment or disturbance similar to that of being hunted.

Three categories of deleterious effects which human activity may have upon caribou (Rangifer tarandus) have been described. We feel these same categories would also be applicable to Whiskey Mountain bighorns once they learned to fear man:

"1. Those causing immediate physical injury or death.
2. Those resulting in increased expenditures of energy, or changes in the physiological condition of the animals, which reduce their rate of survival or reproduction.
3. Those resulting in long-term changes in behavior, including especially, the traditional use of ranges." (Calef et al. 1976)

Probably the least important deleterious effect induced by man-sheep encounters would be immediate physical injury or death. We never witnessed the "panic response" described for caribou reacting to aircraft (Calef et al.1976), but we did witness strong escape responses among rams fleeing from people at high speed into and through extremely precipitous escape cover, but they were usually more deliberate in their actions. Rams and ewe-lamb bands both usually fled farther into precipitous escape cover when escaping man than when escaping coyotes and this was especially pronounced among rams. We did not witness any injuries or deaths as a result of these flights. However, injuries such as dislocated shoulders and broken bones of the legs were relatively common and falls have been cited as causes of sheep mortalities (Smith 1954, Geist 1971b). It is not difficult to imagine that more frequent and stronger flight reactions among hunted non-trophy sheep could result in more injuries.

A possible consequence of stronger flight reactions by ewes with young lambs would be the loss of lambs either through injury or the ewe being unable to relocate the lamb later. Ewes responded most strongly to disturbance when relatively young lambs were travelling with them and this has been observed elsewhere (Light 1971). Disturbance of a nursery band of sheep by a coyote or backpacker resulted in prolonged periods during which ewes and their lambs searched for one another. If ewes responded as strongly to human presence as do rams at this time of year, the result might be injuries among those lambs which tried to follow and

increased separation from their dam with greater susceptibility to predation among those lambs left behind.

One of the more severe consequences of human encounters among nontrophy sheep which fear man because of hunting would be increased energy expenditures. Man-sheep encounters occur most frequently during summer, when ewes are lactating and lambs and yearlings are growing, and during winter when energy demands are great.

In August, 1976, near the Continental Divide and only slightly above a very important ewe-lamb summering area, we witnessed seven rams, including one Class IV and three Class III individuals, which were disturbed by two backpackers. The backpackers never appeared to see the rams which were approximately 1.7 km (1.1 mi) distant. The sheep immediately fled from the backpackers at a run interspersed with short periods of walking or trotting. They were still running when they disappeared from our view over a glacier after fleeing for 2.6 km (1.6 mi). This seemed to be an example of an extremely strong flight reaction to man, but it may have been so only because we were in a position to observe much of their escape. It was marked in contrast to the flight of a similar group of rams fleeing a closely pursuing coyote in June, 1975. That flight covered onl 172 m. (189 yd.) and terminated once the sheep reached the edge of escape cover. We observed many other flight reactions, mostly from man, which we were unable to follow to completion.

Members of ewe-lamb bands encountered man frequently and were not observed to react as strongly. If these sheep learned to fear man as mature rams do, it would be difficult or impossible for them to utilize the larger and more productive summer and winter ranges which are places of high human contact. If they did not abandon these ranges, they would encounter and flee from man frequently, in some areas several times daily. The energy expenditure of excitement and flight would interfere with, and might prohibit, growth of lambs or winter survival of ewes, lambs, and young rams. The energy costs of this type of excitement or of a strong flight reaction are extremely high (Kleiber 1961, Coop and Hill 1962 , Blaxter 1967, Geist 1974, Geist 1975, Ledger 1977, Weiner 1977). A single incident might be of little consequence but numerous encounters would be detrimental. During summer months energy demands of lactating ewes are high and milk production would suffer with the result being impeded lamb growth and/or survival. At times during winter, sheep may be unable to consume sufficient food energy to meet body demands. Increased energy expenditure due to harassment at these times would result in greater nutritional deficiency. Nutritional deficiency and excessive weight loss have been shown to depress reproductive output in many ungulates including white-tailed deer (Odocoileus virginianus) (Verme 1965), elk (Thorne et al. 1976), and domestic sheep (Ovis aries) (Blaxter 1967) and would undoubtedly have the same influence on bighorn sheep. During severe winters or where winter ranges are especially deficient, increased energy demands induced by harassment of sheep preconditioned to strong flight tendencies might also result in increased mortalities due to malnutrition.

Frequent and excessive harassment may be expected to result in

physiologic changes which might potentially be devastating to bighorn sheep. Increased energy expenditures predicted above may result in depleted energy reserves and a breakdown in the animal's immune system (McFarlane 1976, Sinclair 1977). Although they often present a calm outward appearance, wild sheep are easily stressed and stress may lead to disease (Thorne 1971, Fulton and Rosenquist 1976, Post 1976) and birth of unhealthy offspring (Stott 1977). The occurrences of extensive bighorn sheep die-offs due to various diseases or parasites have been well documented (Honess and Frost 1942, Buechner 1960, Forrester 1971, Woodward et al. 1972, Bear and Jones 1973, Post 1976) and most major pathogens which have been implicated as responsible for bighorn sheep mortalities have been found in Whiskey Mountain sheep (Thorne 1977, upublished data). The potential for loss of a major part of both herds due to stress-induced disease or exacerbation of existing disease and parasitic conditions in individuals is great.

Long term changes in distribution among the non-trophy sheep of Whiskey Mountain could be expected to occur if they were hunted. Rams in unhunted populations inhabit differing summer and winter ranges than do ewe-lamb bands (Geist 1971b). However, it is questionable that, if free from human harassment, Whiskey Mountain rams would select and use the habitat they do now in preference to much larger and more productive but less secure locations. Aged males of many ungulate species do not participate in breeding activities and lead a relatively solitary existence, and sheep which have adopted one range may ignore what seems to be more convenient and suitable ranges. Among sheep these ranges may be preferred as ancestral, because of safety from predators, or because of other criteria which have not been identified. Our inability to account for all rams on Whiskey Mountain and Sheep Ridge winter ranges and discovery of ram skulls in distant areas which appear to be small, harsh, marginal wintering areas confirms this and also suggests that some rams have abandoned more favorable winter ranges for secure but often inadequate wintering areas. We were not able to determine the extent to which these areas are used nor if rams return to them following rut or simply do not participate in the rut. Sheep have been shown to abandon areas where unpleasant experiences take place (Geist 1971b). Rams of the Whiskey Mountain herds are hunted on their summer, fall, and winter ranges and they also are hunted on or near the spring (including lambing and nursery areas) and fall ranges of ewes and lambs. These areas are close to the rutting and winter range, and it is no wonder that some rams are reluctant to use these areas especially when they are frequented by men who were hunting them only a month or two previously. Although rams have apparently adapted to hunting with few detrimental effects, a possible exception would be the use of marginal wintering areas which must occasionally result in the death of a few individuals. A quirk of ram-only hunting as practiced in this area is that it has probably benefited ewe-lamb bands by reducing intra-specific competition.

Rams are able to survive and perhaps prosper in marginal but secure spring, summer, and fall ranges because they are the only sheep using them and because during spring and summer they have nothing to do but build energy reserves in the form of stored fat. If ewe-lamb bands a-

bandoned their vast productive summering areas because they were frequented by mountain recreationists and joined the rams or adopted similar smaller and more secretive ranges, survival potential for all members of the populations would be jeopardized by the resulting intraspecific competition. Ewe survival and productivity would be impeded because they must provide for a rapidly growing fetus, lactation, and regaining weight lost during the previous winter. All this must be done before fat reserves are restored. Rams have learned to fear man and appear to have responded to his presence by abandoning optimal ranges. Experience in other areas has suggested that ewe-lamb bands when either hunted (Nichols 1976) or subjected to excess pressure by hikers may abandon traditional ranges for more secure areas (Dunaway 1971, Light 1971, Horejsi 1976). It is predictable that ewe-lamb bands of Whiskey Mountain, if hunted as non-trophy sheep for population control, might also abandon current ranges to the detriment of the entire population. We recognize that dispersion to currently unused habitat niches might be beneficial, but the benefit would not replace abandoned habitat unless new niches were as large and productive as the abandoned habitat and were not frequented by human visitors.

The trade-off value of accepting consumptive use of non-trophy sheep in the form of hunting over nonconsumptive values warrants consideration. The nonconsumptive value of mature rams has been largely but not entirely lost. Were it not for the reproductive urge in early winter and desire for green grass in late spring, few rams would ever be enjoyed by the average nonconsumptive user. The nonconsumptive values of ewes, lambs, and the young rams which accompany them is very important. These animals are the most visible and most frequently enjoyed ungulate of the northern Wind River Mountains. We would question that the possible loss or reduced opportunity to participate in these nonconsumptive uses is justifiable in order to control the populations through non-trophy hunting when other means are available.

Geist (1975) has stated that consumptive and nonconsumptive uses of sheep are not compatible and should not be combined. We would qualify that and state that the two uses are compatible for the Whiskey Mountain sheep populations under present management policies and conditions. We recognize that these populations are rather intensely managed (three quarter curl ram hunting, trapping and transplanting, range acquisition for sheep, and habitat manipulation), that hunting is limited, and that nonconsumptive uses may not be as complete as one would wish for (unabailability of rams, especially during summer and fall), but current management practices do allow for acceptable levels of consumptive and nonconsumptive uses.

We recognize the necessity of population control and feel that the large numbers of Whiskey Mountain sheep are currently their own greatest threat. We have tried to express and support the reasons we believe these populations should be controlled by methods such as trapping, which minimize harassment and not through non-trophy sheep hunting. Our hypotheses have been suggested by some of the others we have cited, and they should also apply to other bighorn populations characterized by

relatively tame animals which occupy open habitat with high visibility that are frequented by large numbers of nonconsumptive users. In these cases we would encourage increased acceptance of man by sheep rather than management practices which increase their fear of man.

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