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# Animal Ethology Reflected in the Rock Art of Nine Mile Canyon, Utah

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*This study of the rock art of Nine Mile Canyon, in central eastern Utah, focuses on scenes depicting bighorn sheep and other large game animals, important resources to Great Basin Native American groups. Much of the rock art discussed is thought to have been created by members of the Fremont culture, although some was created by later Numic people. The results of this study suggest that the Native American artists who created the rock art scenes depicting bighorn sheep throughout Nine Mile Canyon had a detailed understanding of bighorn sheep behavior.*

**T**HE abundant Native American rock art found in many areas of the western United States presents numerous challenges to archaeologists and other specialists who attempt to investigate it. Few regions have been intensively surveyed for rock art, and at those sites where it has been recorded, illustrations and photographs are often inadequate for study. Dating rock art remains difficult and imprecise. Interpretation of rock art is an even more complex procedure, but recent efforts have begun to produce important results. For example, the identification of summer and winter solstice markers, medicine wheels, and other seasonal markers left by both hunter-gatherers and agriculturalists demonstrates that Native Americans were keen observers of natural phenomena (e.g., Preston and Preston 1983). In creating rock art for their own purposes (whether related to shamanistic endeavors and/or other matters), Native Americans produced a record of their knowledge in an enduring form. In this article, we suggest that portrayals of animals in rock art reflect the ample knowledge of Native Americans concerning ethology or animal behavior. That basic observation may be carried further in some cases to a discussion of

the exploitation of animals by humans as reflected in the rock art.

The present study focuses on portrayals of animals, chiefly bighorn sheep (*Ovis canadensis*), in the rock art of Nine Mile Canyon in central eastern Utah (Fig. 1). The choice of Nine Mile Canyon as the nucleus of this study was based on its great wealth of rock art and on the authors' familiarity with the canyon and its archaeology. Investigations in the canyon have shown that it was inhabited from at least the Archaic Period, followed by an apparent peak of occupation by Fremont peoples dating from approximately A.D. 700 to 1250, with a later occupation by Numic groups.<sup>1</sup> During historical times, Nine Mile Canyon, as well as being settled for farming and ranching, was on the freight road that ran between Price and the Uintah Basin during the final years of the nineteenth century and the early years of the twentieth century (Geary 1981a, 1981b).

Although considerable rock art was produced in the canyon during late prehistoric and historical times, the greatest amount and most famous examples pertain to the period of Fremont occupation. Many Fremont and Numic rock art pan-

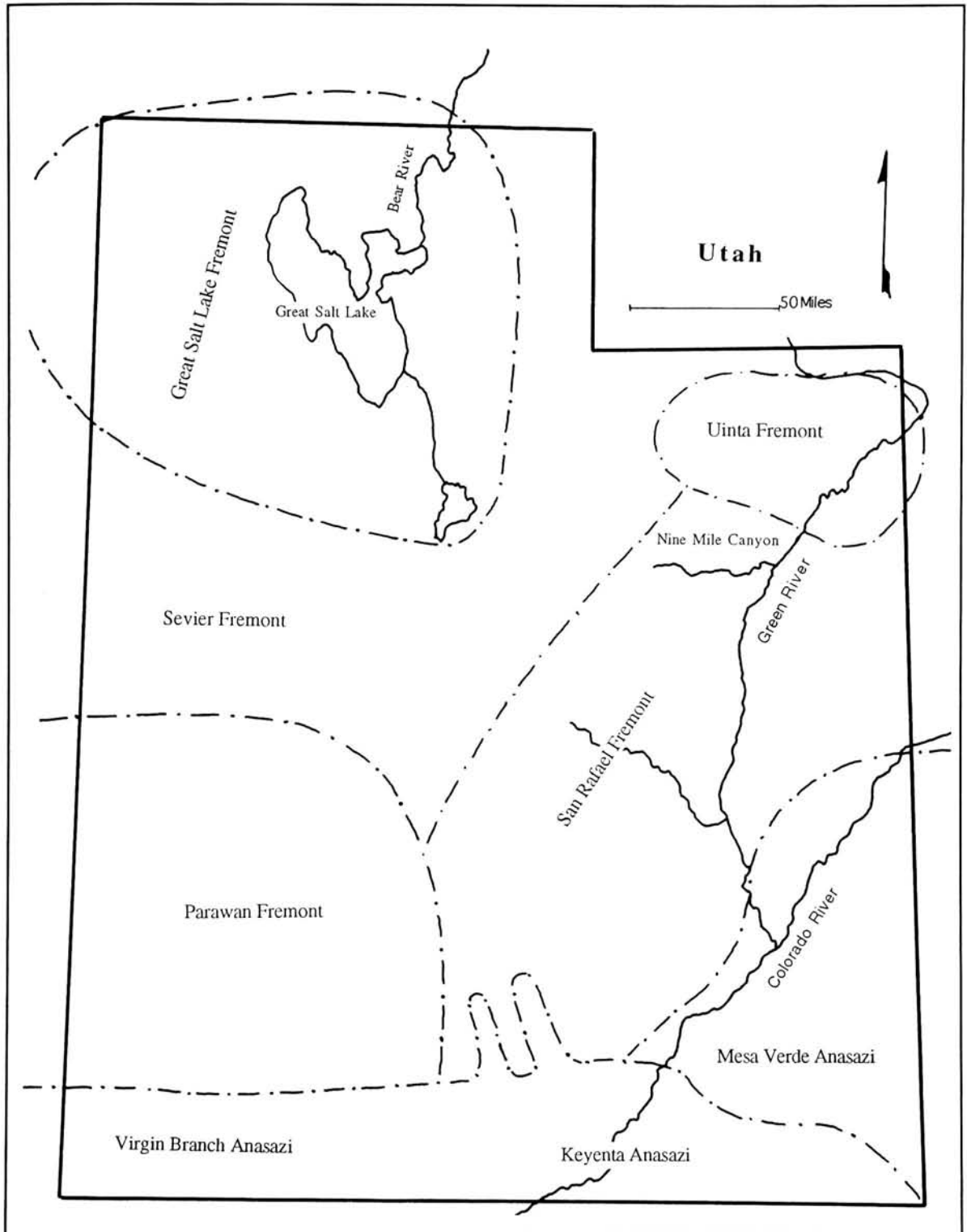


Fig. 1. Map showing the boundaries of the Fremont variants proposed by Berry (1975) and others, placing Nine Mile Canyon within the San Rafael Fremont zone (adapted from Berry 1975).

els contain depictions of bighorn sheep, suggesting their importance in the lives of the Native Americans who inhabited the canyon. Records from the period of contact with Europeans and later offer insight concerning the hunting practices of Native American groups in the Great Basin. Although there are no such records specifically dealing with Nine Mile Canyon, they are available from areas nearby. These records sometimes indicate how groups of Native Americans made use of the various parts of large mammals, thereby deepening our understanding of relationships between Native Americans and bighorn sheep (*Ovis canadensis* and *O. c. nelsoni*), elk (*Cervus elaphus*) and mule deer (*Odocoileus hemionus*).

### HUNTING BIGHORN SHEEP

Bighorn sheep hunting practices among the Ute and Southern Paiute of Utah and northern Arizona (Stewart 1942), the Western Shoshone of eastern Idaho and northern Utah (Steward 1943), and the Northern Paiute groups located in Nevada and adjacent areas of Idaho, Oregon, and California (Stewart 1941:367) included surrounding sheep, constructing pitfalls, ambushing sheep on a trail near a salt lick, driving sheep to a peak or into an enclosure or V-fence, guiding sheep with fire or dogs, and running sheep past hidden hunters (Stewart 1942:242). In addition to hunting parties, individual hunters stalked sheep.<sup>2</sup> Hunters in some groups attempted to attract the sheep by pounding objects together to simulate the sound of rams' horns clashing. Several groups used fire to signal hunters during the sheep hunt. Hunting disguises were employed by some groups. The head and horns were used as a hunting disguise, as well as the entire skin among some groups (Stewart 1942:242; Steward 1943:294). Among the Ute and Southern Paiute, only the skin of a female mountain sheep was used for this purpose (Stewart 1942:242).

Of course, meat obtained from a successful hunt was a primary resource and many groups butchered large mammals into quarters at the kill site (Janetski 1991:38). Meat was not the only source of food from the kill. Smith (1974:48-49) noted that among the Utes, deer bones were ground and boiled, the grease skimmed off and mixed with dried and pounded meat. Bighorn skins, horns, and other body parts were used for various purposes. In describing one group of Utes, Jedediah Smith (1977:43), who made a journey through Ute territory in 1826-1827, wrote:

The Uta's [Timp] are cleanly quiet and active and make a nearer approach to civilized life than any Indians I have seen in the Interior. Their leggings and shirts which are made of the skins of the Deer Mt Sheep or Antelope are kept quite clean.

Of the San Pitch Indians, a group he met shortly thereafter on the Sevier River, Smith (1977:43) recorded that their leggings and shirts were made of skins of mule deer, pronghorn (*Antilocapra americana*) and mountain sheep.

William H. Ashley, another early nineteenth century explorer of the west, visited the Utes of the Uintah Basin in what is now eastern Utah. He made the following observations concerning the Utes and their dress:

I was much surprised at the appearance of these people, I expected to find them a poor lifeless set of beings, destitute of the means or disposition to defend themselves; alarmed at the sight of a white man but to the contrary. They met me with great familiarity and Ease of manner and were clothed in mountain sheep skin buffaloe robes superior to any band of Indians in my knowledg[e] west of Council B[l]uffs . . . [Morgan 1964:20].

Steward's (1943:323-324, 378) informants among the Northern and Gosiute Shoshone noted that mountain sheep skins were used in making robes (of skins sewed together), shirts, dresses, skirts, and mittens. Similar use of skins for clothing was reported for the Northern Paiute (Stewart 1941:393-394) and the Northern Shoshone (Steward 1941:299-300).

Jedediah Smith (1977:43) related that the Utes had bows made of both mountain sheep horn and elk horn. The Utes also had both single- and double-curved wooden bows. Bows were made from the horns of mountain sheep by heating and splitting the horn. The two pieces of horn were then spliced into a single curve with sinew wrapping (see Janetski 1991:48). Steward's (1943:313) informants among the Northern Shoshone and Gosiute Shoshone of eastern Idaho and northern Utah all reported that mountain sheep horn bows had been used among them; for all groups but one the bows were sinew-backed (also see Steward 1943:370).

Other documented uses of bighorn sheep products included horn used to make a perforated wrench for straightening arrows (Steward 1943:315), as well as dippers made of ewe's horn and spoons made of mountain sheep horn (Steward 1943:310) among the Northern Shoshone and Gosiute Shoshone. Similar uses of horn were reported among the Northern Paiute (Stewart 1941:382, 385), the Northern Shoshone (Stewart 1941:287, 290), and the Ute and Southern Paiute (Stewart 1942:263, 268). In addition, mountain sheep horn rattles and hoof rattles are mentioned among the Northern Paiute (Stewart 1941:403), the Ute, and the Southern Paiute (Stewart 1942:294), as well as the Northern Shoshone (Stewart 1941:309). A number of groups among the Ute and Southern Paiute mentioned the use of a mountain sheep horn sickle (Stewart 1942:252).

An interesting use of a bighorn cranium and horns is demonstrated in a headdress discovered in Canyonlands National Park, Utah (Fig. 2). The horns were cut in half to reduce their weight, then drilled around the edges and sewn to the cranium with an unidentified cordage so that they would not become detached once the tissues dried. The cranium was drilled and *Olivella* shells were attached to it using sinew. It appears likely that there was another piece to the headdress, such as an attached hood or tie, be-

cause it would have been difficult to keep it balanced on a human head in its current form. Although the headdress probably pertains to the Anasazi rather than Fremont culture, it has not been dated and may be from as early as Basket-maker times. The elaborate preparation of the headdress suggests it was used in a ceremonial context rather than as a hunting disguise of the type mentioned above.

The above discussion is not intended to be exhaustive but merely illustrative of the uses of the bighorn sheep by the Ute, Paiute, Shoshone, and other Great Basin groups (also see Grant 1980). Although we know less about the uses of bighorn sheep by Fremont groups, we assume that many were similar to those observed among the historic groups. During our work in Nine Mile Canyon, we discovered two cached bighorn crania at a single site from which the horn cores had been removed and, at another site, a cached piece of bighorn skin which may date from the Fremont Period. In order to understand how Native Americans in Nine Mile Canyon exploited bighorn sheep and how they may have depicted aspects of their relationship with sheep in rock art, it is necessary to understand a few basics about the life cycle and habits of the sheep.

### BIGHORN SHEEP ECOLOGY

Two species of mountain sheep, bighorns and thinhorns, occur in North America. The two subspecies, or races, of thinhorns include Dall's sheep (*Ovis dalli dalli*) and Stone's sheep (*O. d. stonei*), both of which inhabit mountainous terrain in northern Canada and Alaska. There are seven subspecies of bighorns of which two, the Rocky Mountain bighorn (*Ovis canadensis*) and the Desert (or Nelson's) bighorn (*O. c. nelsoni*) (Fig. 3), ranged in or near the Nine Mile Canyon area.<sup>3</sup> Desert bighorn sheep are morphologically smaller, sleeker, and lankier than Rocky Mountain bighorn sheep. Generally, Desert bighorn rams do not exceed 250 pounds, while

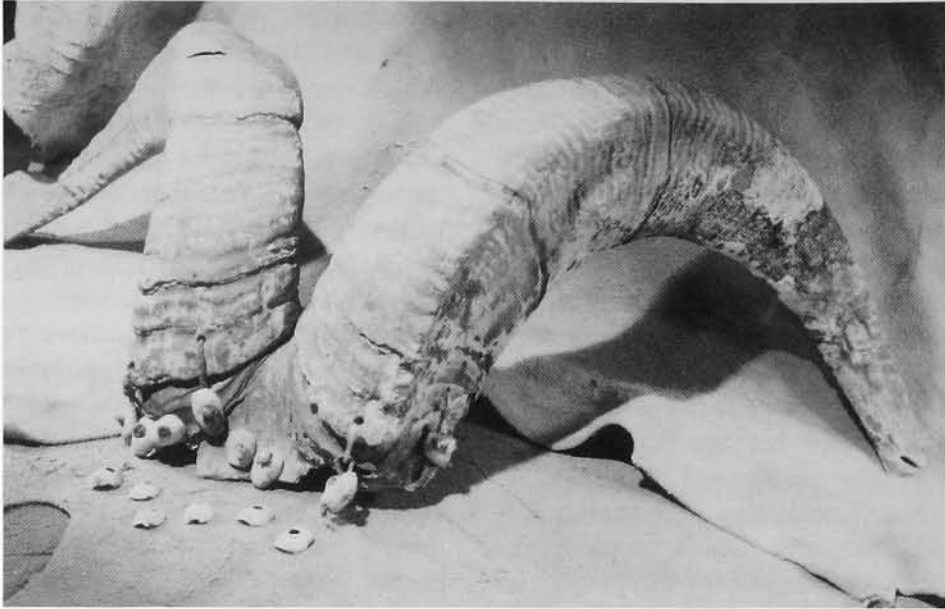


Fig. 2. Bighorn sheep horn headdress found in the Canyonlands National Park area. The back sides of the horns have been removed to reduce weight; the bottom edges were drilled and sewn to a small piece of the cranium. *Olivella* shells were attached to the horns and cranium with an unidentified cordage. In its reconstructed state, the horn spread is 53 cm.

some Rocky Mountain rams are known to have weighed as much as 375 pounds (Valdez 1988: 17). Rams of both Rocky Mountain and Desert bighorn races have massive horns, although those of Rocky Mountain rams are generally larger.

By early 1900, native populations of bighorn sheep in the Nine Mile Canyon area had been eliminated through the cumulative impacts of hunting, range deterioration, introduction of exotic diseases via Eurasian livestock, and competition for range resources with those livestock (Goodson 1982). Literature on bighorns does not give a clear indication as to which of the two races of bighorns may have inhabited the Nine Mile Canyon region. Monson (1980) suggested that the race found in the Green River drainage was Desert bighorn, but others disagree. For instance, Buechner (1960:42) noted that most bighorn specimens from Utah fall within the range of variation typical of the Rocky Mountain

race. In an effort to determine which race of bighorn sheep inhabited Nine Mile Canyon, we performed DNA analysis of bighorn remains, including crania and hide fragments recovered during archaeological investigations in the canyon. Our results confirmed that these fragments are from bighorn sheep but did not provide information concerning race. However, the distribution of bighorn sheep ranging from Mexico to Alaska represents a geographical cline where, arranged on the basis of external similarities, the closer they live together the more alike they are, the farther apart the more disparate they are. So, the question concerning which race of bighorn sheep formerly inhabited the Nine Mile Canyon area may be merely academic. Most likely the sheep that existed there were an intergradation of Rocky Mountain races from the north and Desert races from the south (John 1975).

Bighorn sheep co-evolved in open, mountain-

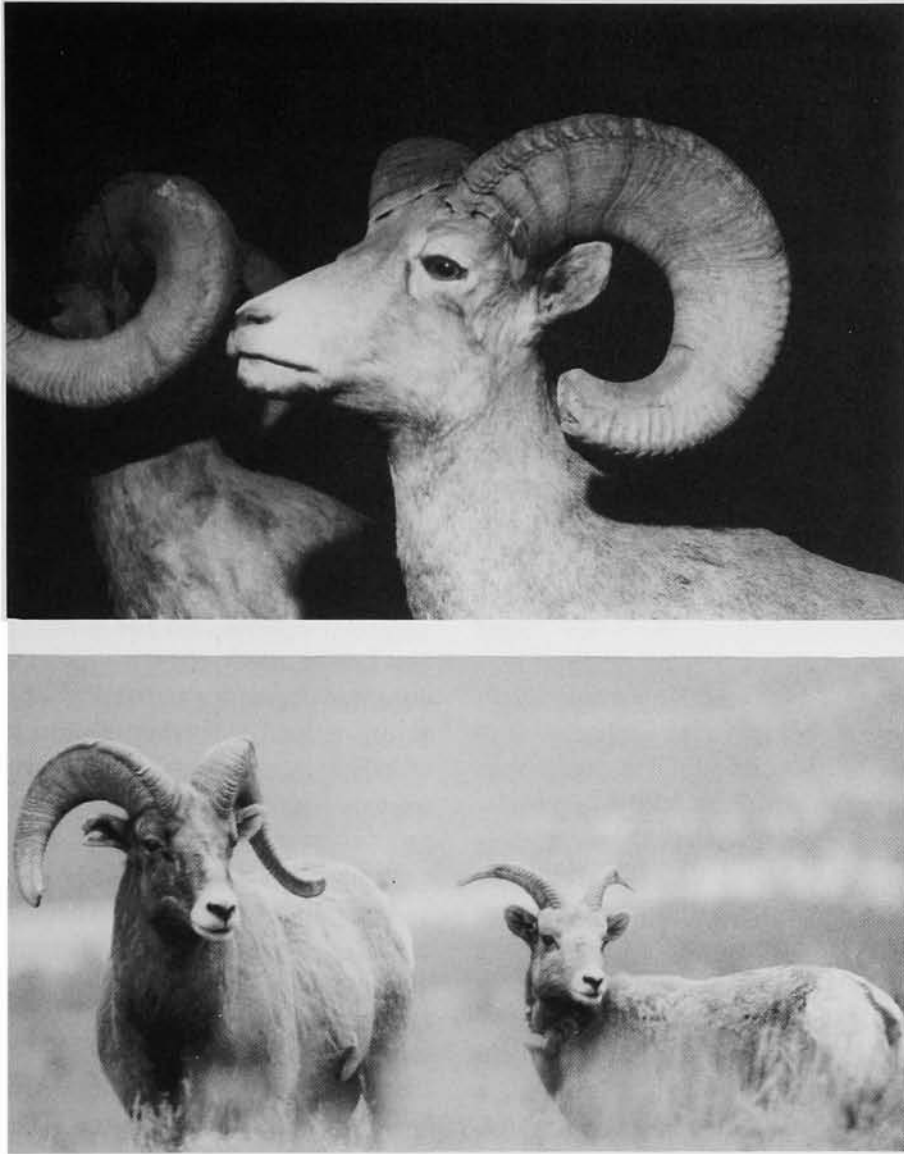


Fig. 3. Top: Desert bighorn ram (*Ovis canadensis nelsoni*). (Photograph courtesy of the College of Eastern Utah Prehistoric Museum, Price, Utah.); Bottom: Rocky Mountain bighorn ram and ewe (*O. canadensis*) during the rut.

ous habitats, along with several predators, including representatives of the Felidae, Ursidae, and Canidae families (Geist 1971; Risenhoover 1981). Under continual predator pressure, bighorns have evolved to select open areas near escape cover, where they can more effectively detect and outmaneuver their predators. Open

habitats provide good visibility, which enables improved predator detection and more effective visual communication of alarm postures to conspecifics (Risenhoover 1981). As a result, the two characteristics most consistently associated with bighorn habitats are rockiness (escape terrain) and openness, regardless of race or geo-

graphic location (Geist 1971; Risenhoover 1981). Bighorns tend not to forage until they have selected an area close to (or within) cliffs, where there is sufficient visibility. Hence, it is well known that escape terrain constitutes core use areas of bighorn habitat (Buechner 1960; Geist 1971). Not only do bighorn utilize escape terrain as core activity areas, they rarely range far from it into the surrounding environs (Van Dyke et al. 1983; Smith 1992). In a recent study, 99% of all bighorn activity occurred within 300 meters of cliff escape terrain (Smith 1992). Because rich forage areas with high visibility commonly occur at distances greater than 300 meters from cliffs in his study area, Smith (1992) concluded that the availability of escape terrain was clearly a habitat requirement of greater importance to bighorn sheep than either visibility or forage abundance and quality.

The affinity of bighorns for escape terrain most likely arises from their physiological specializations for leaping and climbing, rather than running on flat terrain (Geist 1971). Powerful leg muscles and specially adapted hooves provide excellent traction on rock surfaces, enabling bighorn sheep to successfully utilize precipitous cliff areas. These morphological adaptations result in sheep having bodies built for climbing rather than running, bodies which are stocky rather than sleek. Consequently, a human could run down a bighorn sheep on level ground, a circumstance that would not be possible with mule deer, elk, or pronghorn. In rocky terrain, bighorn sheep can quickly outmaneuver most predators. In one instance, one of us (TS) observed six bighorn sheep essentially "toying" with a mountain lion as they bounded from boulder to boulder, leaving the bewildered cat behind, hopelessly attempting to catch up.

Since predator detection and avoidance is the predominant concern of wild sheep, it is predictable that habitats with poor visibility would be avoided, and indeed they are. Even in regions of steep escape terrain, bighorn sheep consistent-

ly avoid any areas capable of concealing a potential predator (Smith 1992). Again, evidence supports the notion that the ability to detect and avoid predators is of greater importance to bighorn sheep than nutrient availability, as they have been observed to avoid brushy areas or those with poor visibility on a consistent basis, even if such areas support rich understories of key forage species. Smith (1992) often noted sheep grazing in sparsely vegetated talus slopes, while areas of forage abundance in adjacent poor visibility areas went unused. Thus, the lives of bighorn sheep are inextricably tied very closely to rough terrain such as rocky cliffs and steep-walled canyons.

### Seasonal Cycles of Bighorn Sheep

Group composition and exploitation of various habitat areas change seasonally. This is due, in part, to the seasonality of forage availability, as well as the reproductive status and age of individual sheep. As a result, there is a gradual movement between seasonal ranges by many groups, or cohorts, of sheep. These seasonal cycles are discussed below.

**Fall.** Fall is the season when sheep are conceived, and so is the true beginning of their life cycle. Fall is the only season of the year when rams, ewes, yearlings, and lambs persistently range together (Geist and Petocz 1977). During the remainder of the year, rams and ewes seek separate and different habitats. There has been much speculation about why ewes and rams segregate their range usage. It is likely that differing parental investment in offspring is a major factor influencing habitat choices. Once breeding has occurred, rams take no part in protecting the gravid ewes or in rearing newborn lambs. Ewes, on the other hand, protect their lambs until they are able to fend for themselves. As a result of these different life histories, rams and ewes seek habitats best suited for their seasonally varying needs.

The bighorns' future hangs, in part, on the



ability to synchronize rutting activities in the fall so as to optimize the new lamb crop's chances for long-term survival. Successful bighorn reproduction is dependent on at least three interdependent factors: parturition date, weather patterns, and plant phenology, all of which are a function of the timing of breeding activities in the fall. A fourth factor, length of the gestation period, is not variable, but does play an important role as well. Research has shown that nearly all bighorn sheep require 175 days for gestation, with a variation of only a few days (Geist 1971). For this reason, the timing of the rut in fall is critical to the timing of the arrival of newborns in spring.

To highlight the importance of a consistently timed rut, consider that ewes who breed early in the fall bear lambs early in the spring, who often fall victim to hypothermia resulting from the cold, wet weather typical of that time of year. These early lambs also receive less milk because their mothers are less able to locate quantities of high-quality forage essential for lactation. On the other hand, ewes who breed later in the fall bear lambs later in the summer. These lambs nurse adequately and enjoy milder weather, but they enter the harsh fall/winter conditions with smaller body sizes. Smaller lambs are less able to withstand cold and are less mobile in snow, often falling victim to predation. Because of its importance to the long-term survival of the species, the timing for optimal breeding has been fine-tuned by natural selection at each location where bighorn herds occur.

In general, it has been observed that "the further south and the lower the elevation bighorns are found on the North American continent, the earlier and longer is the rutting season" (Simmons 1980:125). It is not possible, of course, to determine specifically when the bighorn rutting season took place in the area of Nine Mile Canyon, but modern observations of bighorn behavior in other areas can provide some clues. For example, Bear Mountain in

northeastern Utah is about 7,400 feet above sea level, which makes it comparable to the upper reaches of Nine Mile Canyon, but several thousand feet higher than the middle and lower sections of the canyon. Bear Mountain is not much farther north in latitude than Nine Mile Canyon and, based on the timing of the rut on Bear Mountain, it is most likely that the rutting season in Nine Mile Canyon occurred in late November or early December. Wilson (1968) provided further support for this estimate, reporting that Desert bighorn sheep in southeastern Utah rutted throughout November.

Undoubtedly, Native Americans were aware of the annual and highly predictable bighorn rut. This is a time when the normally segregated rams commingle with ewes, yearlings, and lambs. It is a time of chaos and confusion, as rams abandon their normal wariness and wildly chase after estrous ewes. Thunderous echoes of headlong clashes resound as rams focus on competition among themselves, to the exclusion of all else, for a higher position in the herd's dominance hierarchy, and hence breeding rights. This is an optimum time for hunting bighorn sheep. Predators have learned to capitalize on the effects of the rut on bighorns. Harrison and Herbert (1988:302) reported that mountain lions preyed more successfully on rams immediately following the rut, a time when they were more vulnerable than at any other time of the year. Almost certainly, Native Americans also learned that the confusion induced by frenetic rutting activities provided the edge they needed to successfully hunt what was otherwise wary and elusive prey. Hence, an intimate knowledge of bighorn ecology was not just a by-product of living close with nature, but it was also a prerequisite for obtaining necessary resources such as meat, hide, sinew, horn, and bone to be used for many purposes.

As fall progresses and the rut approaches, ram groups gradually move onto ranges used by ewes and their offspring. Level areas supporting

abundant quantities of high-quality vegetation and with visibility suitable for adequate predator detection typify the fall range for ewes and lambs. As evening falls, sheep move to nearby rough escape terrain, where they may bed down safely for the night. At dawn, all arise and return again to feed at high-quality feed sites of abundant forage and suitable visibility. The rutting season begins as daylight shortens, and external photoperiod cues trigger estrus in the ewes.

Bighorn rams have a keen ability to sense ewes in estrus, and groups comprised of all age classes assemble as rams join ewes, lambs, and yearlings. This is not a period of tranquility for the herd, as the rams begin to spar for breeding rights. Violent confrontations are a constant occurrence. Ewes in estrus are continually guarded by dominant rams and are mounted several times. Always on the periphery of breeding activity are less dominant rams, who attempt to sneak in to copulate with ewes when more dominant rams are distracted. Unbred ewes cycle into estrus again, often by as short as two weeks. As the rut comes to a close, rams depart to separate feeding areas. Ewes, lambs, and yearlings generally remain where they are, feeding and preparing for winter.

**Winter.** Until snow accumulates in quantity, it exerts little influence on sheep distributions on their ranges. Studies have revealed that when snow accumulations exceed 25 cm. (10 in.), sheep seek areas with shallower snowpack (e.g., Smith 1992). Deep snows make feeding costly and movement difficult, thereby increasing the risk of predation. In the Nine Mile Canyon area, it is likely that bighorn sheep would have moved to steep-walled canyons during periods of heavy snow in the uplands. Cliff areas support meager vegetation, but their steep slopes and southerly aspects provide much greater access to forage while providing security from predators as well. Although lambs have grown to over ten times their birth weights by this time,

ewes still closely tend them and appear concerned for their safety with regard to predators. Obviously, the short-legged lambs are easily hampered in their movements by even shallow snowfall accumulations, so ewes and lambs seek cliff cover much more readily than do rams.

Unconcerned with raising lambs, rams graze in these areas for a short period of time, and when the thaws occur, they immediately move to adjacent, more level areas where south-facing exposures melt off. Initially, ewes also move to more level areas, but as winter progresses toward spring, their developing fetuses become heavier and encumber movement significantly. Then, perhaps because they are less mobile, the ewes stay in areas of cliffs and steep rocky terraces, gradually moving to what will become their lambing areas (Geist 1971).

**Spring.** As the snowpack lessens and spring approaches, rams abandon the rugged escape terrain and return to use it only intermittently. Bearing no developing fetuses, rams can afford to maximize nutritional intake by roaming meadows and other productive feed sites in search of new spring growth, focusing on ephemeral forbs with high protein content. Gravid, and hence less mobile, ewes remain in the security provided by steep terrain, seeking the sparse plants available, all the while keeping careful watch for predators. As parturition approaches, ewes move into the roughest accessible terrain, perhaps sensing that it is dangerous not to be in rough country. Ledges with only one or two routes of approach provide the greatest security. There, ewes need not attempt to outmaneuver predators, such as mountain lions, but will merely lower their heads and threaten to pitch the predator into the abyss should an attack come.

An additional safety feature of this vertical world of broken cliffs and loose rock is that no animal can move about without dislodging debris, thereby betraying its presence. Therefore, the rocky talus and towering cliffs provide optimal predator detection. This security is costly,

however, as moving about in cliff terrain is not only energetically expensive, but available food resources are scarce. It is during spring that bighorn sheep begin molting their winter wool, which hangs in tatters from their quarters, and they attempt to rub it off on trees and rocks.

**Summer.** In the summer, rams continue grazing, moving in ever-widening circles across familiar "home" ranges. Ewes give birth to tiny, eight-pound lambs, whose wobbly legs initially prevent them from much movement beyond that of their birth sites. Living entirely on their mother's milk for their first months of life, lambs rapidly gain weight. As the lambs' ability to cope with their environment improves, their mothers lead them progressively away from the rough terrain birthing sites to those with better foraging opportunities. This process begins with short forays out of the cliffs into adjacent level areas. As the summer advances, groups of ewes and lambs venture farther out into areas of high-quality forage, but their lives are still centered around cliffs and are entirely separate from groups of rams. Over the summer, bighorn sheep diet shifts from transitory forbs to maturing grasses. As summer turns to fall, sheep begin an intensive feeding period that precedes the rutting season.

#### **THE ECOLOGY OF OTHER UNGULATE SPECIES IN UTAH**

Unlike bighorn sheep, mule deer and elk engage in annual migrations that may encompass hundreds of miles. These movements appear to be triggered by photoperiod and other external cues, such as plant phenology, ambient temperature, and snowfall. Like bighorns, the seasonal movements of mule deer and elk are temporally and spatially predictable to a degree. Mule deer seek high, cool areas during the summer, feeding among aspen and shrub communities. Eventually, their search for forage in the fall leads them to lower elevations, but it is often the first snowfalls that precipitate the move. Again, ob-

servations at Bear Mountain, Utah, are interesting in this regard, because it is a transitional area for mule deer in the fall. During one summer, one of us (TS) observed very few mule deer in the area, but in late October, immediately following the first snows in the nearby Uintah Mountains, mule deer began to arrive in large numbers. As many as 300 arrived in one week's time after swimming across Flaming Gorge Reservoir to reach the area. These mule deer stayed in the area, feeding on shrubs, until the snow accumulated on Bear Mountain, which resulted in yet another move to areas of lower elevation. Mule deer have no ties to cliffs and rugged terrain, as they depend on speed for protection from predators. In spring, mule deer reappear at Bear Mountain and feed for several weeks before moving up onto the lush meadows of the Uintah Mountains.

Like the mule deer, elk inhabit extensive ranges and are not tied to the rugged terrain frequented by bighorn sheep. Elk are swifter than bighorn sheep and their much greater size provides considerable advantage in confrontations with predators. Elk ecology at Bear Mountain is typical of the species. Smith (1992) reported few elk present in the summer but suddenly, in September, the number rose from 20 to over 250. These elk congregated in large groups and spent several weeks feeding in grassy meadows, away from cliffs and rocky terrain. At this time of year, bighorn activity is focused on highly productive meadows as well. Since elk and bighorns are primarily grazers, the potential exists for competition between the species, although it was rarely observed at Bear Mountain (Smith 1992). Elk move on to lower elevations even before snows fall, probably in response to changes in plant phenology and photoperiod. Naturally, lower elevation areas are warmer and support green plants longer. The environment of Nine Mile Canyon provides excellent wintering grounds for mule deer and elk, and it formerly provided such for bighorn sheep.

### ANIMAL ETHOLOGY REFLECTED IN ROCK ART PORTRAYALS

The remainder of this article focuses on a study of the portrayal of bighorn sheep and, to a lesser extent, elk in the rock art of Nine Mile Canyon.<sup>4</sup> In many cases, the date and cultural affiliation of rock art elements or panels in Nine Mile Canyon remain to be determined. However, many depictions appear to have been produced by the Fremont peoples who inhabited the area from about A.D. 700 to 1250. Rock art discussed herein pertains to the Fremont and later Numic groups. An Archaic occupation in Nine Mile Canyon may date from the end of the first millennium B.C. to the early centuries A.D. Post-Fremont occupation appears to have continued, with interruptions, until Euroamerican settlers arrived in the late nineteenth century. Only in a few instances in this article do we attempt to analyze rock art by taking possible cultural affiliation into account.

Nine Mile Canyon extends essentially east and west for most of its length. It is joined by numerous steep-walled side canyons before reaching its confluence with the Green River in Desolation Canyon (see Fig. 4). As noted above, Nine Mile Canyon is well-known for its wealth of rock art and is considered the type site area for the Northern San Rafael Style (Schaafsma 1971:28-38; also see Spangler 1993a:140-146). The condition of rock art panels in Nine Mile Canyon varies greatly; some are in a state of near-pristine preservation, while others have been heavily damaged by erosion or vandalism. Vandalism, in the form of bullet holes, repecting, and graffiti, has impacted many rock art panels that are easily visible from roads. In some cases, complete panels (or portions of panels) have actually been removed. The rock art of Nine Mile Canyon is in urgent need of protection as visitor numbers increase greatly each year. In spite of the damage to some rock art, much remains to be studied and preserved.

Schaafsma (1971:31) noted the importance of animal portrayals, particularly of bighorn sheep, in the rock art of the Northern San Rafael zone. Clearly, bighorn sheep are one of the most frequently represented elements in the rock art of Nine Mile Canyon, which may be a reflection, at least in part, of their economic importance to the Native Americans who produced the rock art.<sup>5</sup> A review of information concerning the approximately 670 sites recorded in Nine Mile Canyon during the Hurst and Louthan (1979) survey, four seasons<sup>6</sup> (1989, 1990, 1991, and 1992) of the Carbon County Historic Preservation survey (Matheny and Matheny 1990, 1993; Matheny et al. 1991, 1992), and the three seasons of the Brigham Young University Field School of Archaeology survey (Spangler 1993b) indicates that 378 sites contain rock art, not including those with only historic signatures. Over half of these sites have depictions of bighorn sheep. These figures do not include some of the rock art sites recorded during several other projects in Nine Mile Canyon.

Although no formal analysis has been made of the distribution of depictions of bighorn sheep on rock art panels in Nine Mile Canyon, we have observed that they are found throughout the surveyed portions of the canyon and in many of its side canyons. We have noted that some of the more complex rock art panels occur near the mouths of side canyons. The number of sheep shown in the rock art panels throughout Nine Mile Canyon and its side canyons, as well as the context in which they are portrayed, varies greatly. Some panels consist of a single sheep, while others contain numerous sheep and additional elements. Sheep are sometimes depicted with anthropomorphs, other zoomorphs, abstract or geometric elements, and rarely with plants. Other animals portrayed in the rock art of Nine Mile Canyon include elk, snakes, canids (coyotes or dogs), mule deer, bears, birds, horses, and in one instance, possibly a mountain lion.

Size is another variable in the portrayal of

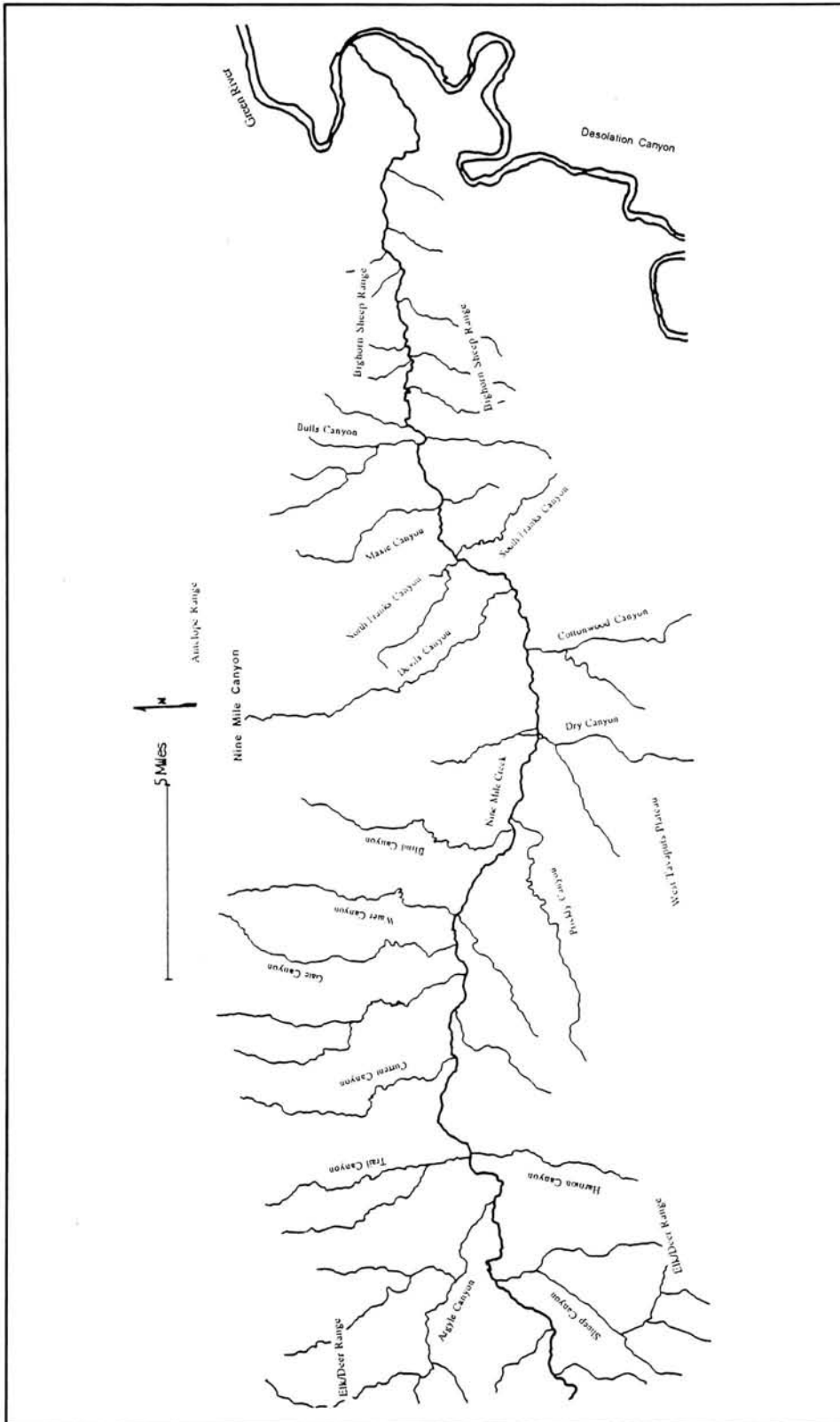


Fig. 4. Map of Nine Mile Canyon and associated canyons.

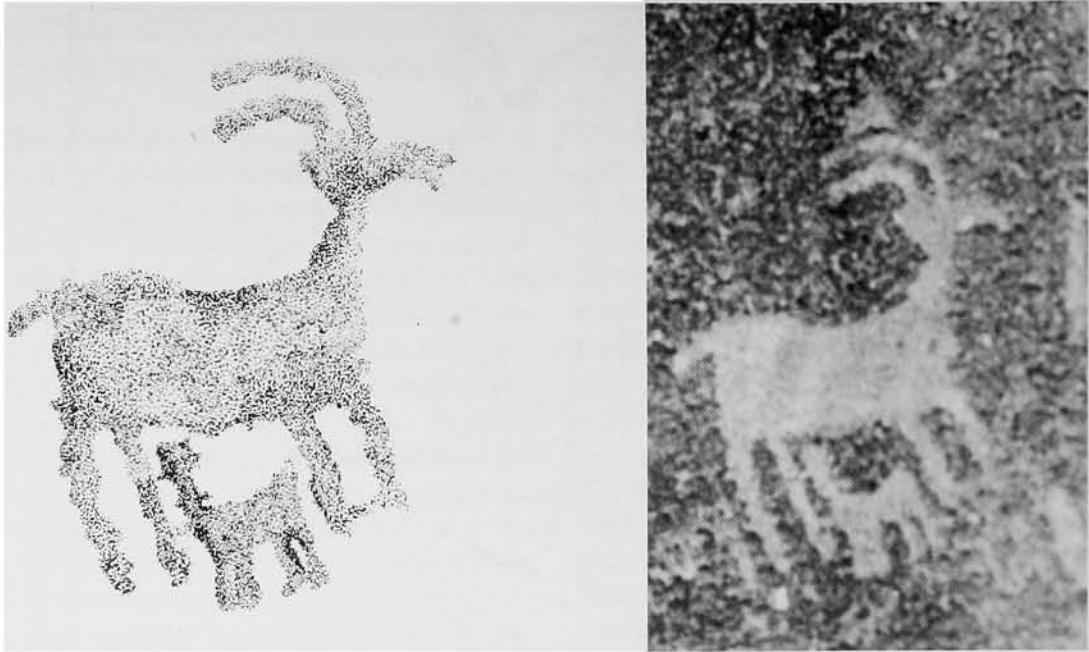


Fig. 5. Petroglyph of a lamb in a nursing posture (site 42Cb139). The figure is 35 x 45 cm.

bighorn sheep in the rock art of Nine Mile Canyon. The size of bighorn sheep portrayals ranges from minuscule to life-sized or even larger. The typological variation within the known corpus of sheep depictions from Nine Mile Canyon is not specifically dealt with in this study (but see Castleton 1979:XXX, Plate 1). Sheep are generally shown completely in profile, though rarely their heads may be facing forward. Schaafsma (1971: 33) noted that some sheep, elk, and mule deer drawings in Nine Mile Canyon and nearby areas have a "surprising degree of naturalism." This naturalism often includes careful portrayal of the salient identifying features of sheep, including accurately proportioned bodies, tails, horns, and cloven hooves. Differences between rams, ewes, and lambs are clearly depicted on some panels (see below). Beyond realistic portrayals of bighorn sheep bodies, we suggest that many of the depictions also accurately portray behavior of bighorn sheep. One such depiction is found at site 42Cb139 (Matheny et al. 1992); on Panel 4, a ewe and a lamb are shown with the lamb in

the typical posture assumed during nursing (see Fig. 5).<sup>7</sup>

Another typical form of bighorn behavior is reflected at site 42Cb745 (Matheny et al. 1992), where two adult sheep are shown positioned nose-to-nose (Fig. 6). Geist (1971:Plate 62, 1975:62) noted that such nose-to-nose contact between rams often involves dominance activities. He reported that scent recognition follows imprinting of the preorbital gland scent through nose rubbing. Two rams of nearly equal rank lick and sniff each other and in the process, one ram "imprints" as dominant over the other. We do not know what the pecked dots associated with the rock art representation are intended to convey. A panel from site 42Cb834 (Matheny and Matheny 1993) also appears to illustrate dominance-related activities among rams, with two rams apparently in the midst of a dominance contest (Fig. 7).

Sheep, like other animals, are subject to infestation by mites and ticks. Birds, most often magpies (*Pica pica*), sometimes ride on the

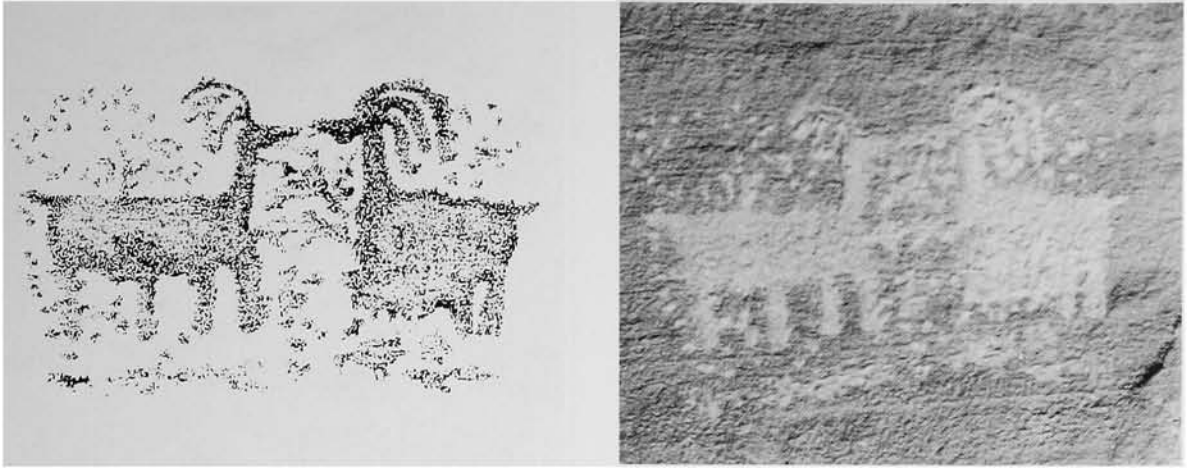


Fig. 6. Petroglyph of two bighorn rams nose-to-nose at site 42Cb745 that may reflect a dominance scene where scent recognition follows imprinting of the preorbital gland scent through nose rubbing. The figure is 30 x 23 cm.

backs of bighorn sheep, elk, and mule deer to feed on the ticks and mites that infest them.<sup>8</sup> On Panel B of site 42Cb822 (Matheny and Matheny 1993), a sheep is depicted with a bird standing on its back (Fig. 8). Geist (1971:276) reported that loss of hair on the withers of bighorn sheep during their spring molt is probably accelerated by the tick *Dermacentor andersonii*. Geist (1971:276) noted that

[t]he molt in spring is a striking event. The hair comes off in matted bunches and may hang in towel-like bunches on the sheep. The first signs of molt, usually on the withers, appear in March, but the shedding is not complete until July.

Geist's observations involved bighorn sheep dwelling at a northern latitude, but Hansen (1980:55) noted that Desert bighorns take about one month, from June to July, to shed their winter coat. Mid-latitude populations, such as those at Bear Mountain and formerly at Nine Mile Canyon, most likely molted in a similar fashion to those of the north. Sheep employ numerous tactics to accelerate the removal of their winter coat. They scratch their withers with their horn tips, and rub against rocks and tree branches, leaving a trail of wool strips as they move about. The distinctive pattern of a sheep's

pelage during molt appears to have been depicted in several petroglyphs in Nine Mile Canyon, including those from sites 42Cb826 and 42Cb832 (Matheny and Matheny 1993) (Fig. 9).

Although many rock art depictions of bighorn sheep in Nine Mile Canyon can be said to be "realistic" as to the features of the animals that are portrayed, there are some that show features that are clearly not meant to be so. For example, in one style, bighorn sheep are shown with greatly inflated bodies, well beyond what would be seen in nature (see, for example, Hurst and Louthan [1979:152, Fig. 162]). This style has not been dated and is classified as Style D (Hurst and Louthan 1979:12). Other "nonrealistic" depictions of bighorn sheep include sheep portrayed with very long necks) and two-headed sheep, although in the latter instance, it is possible that the artists may have been attempting to depict two sheep standing side-by-side while facing opposite directions. There is also a zoomorph with the head of a bighorn sheep and the body of a snake. Most depictions of bighorn sheep in Nine Mile Canyon discovered thus far appear to be of the "realistic" or natural type.

Having briefly discussed some of the individual behaviors and biological features of big-

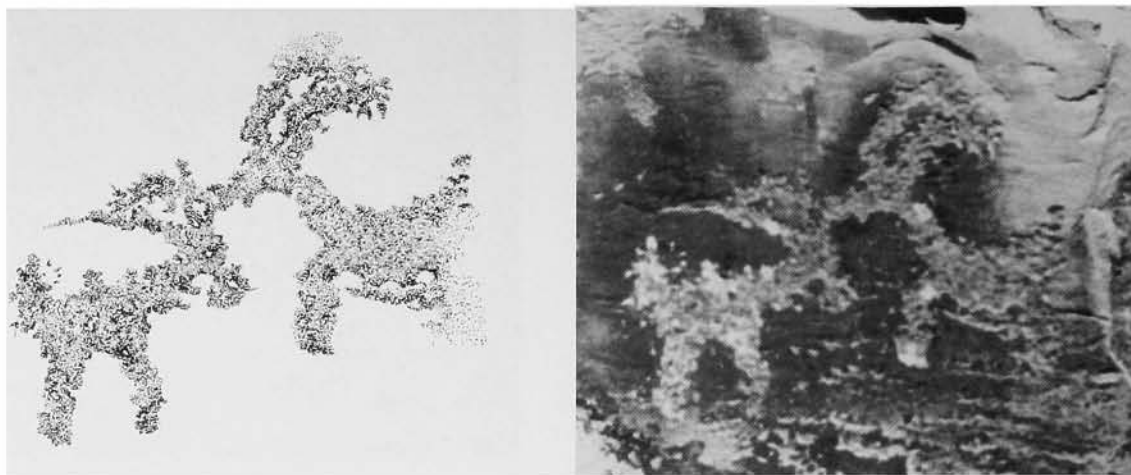


Fig. 7. Petroglyph of two bighorn rams apparently in a dominance contest (site 42Cb834).

horn sheep that appear to have been depicted in the rock art of Nine Mile Canyon, we will now examine some examples of more complex scenes, including depictions of bighorn sheep.

### Narrative Scenes

Cole (1990:188) noted that one of the “distinctive characteristics of Fremont style rock art is the organization of subject matter that is frequently visible at sites,” adding that “at some sites, entire panels appear to be composed of intentionally grouped and thematically related elements” and that “some panels have strong narrative qualities, particularly those with hunting and fertility scenes.” Cole noted that such narrative panels are found in Nine Mile Canyon; a well-known example is described below.

**The Cottonwood Panel.** A beautiful rock art panel, sometimes known as the Cottonwood Panel or the Bighorn Sheep Hunt Panel (site 42Cb339) (Matheny et al. 1991), is often ascribed to Nine Mile Canyon but is actually found in Cottonwood Canyon, not far from its confluence with Nine Mile Canyon (see Fig. 4). The Cottonwood Panel has a hunting theme and contains depictions of bighorn sheep, anthropomorphs, and shield figures arranged in specific configurations (see Fig. 10). The beauty and ar-

tistry of the panel alone make it worthy of study (see Ferris 1989; Bush et al. 1991:Section 13:5-7), but after reviewing the panel from an ethological perspective, we suggest that the panel reveals a good deal about the artist’s (or artists’) knowledge of animal behavior and hunting practices. Schaafsma (1980:179) suggested that actual hunting scenes occur in the Northern San Rafael rock art style. Schaafsma (1986:226) further maintained that

[i]n the rock art of the San Rafael and Sevier regions, the association of horned anthropomorphs or shamans with mountain sheep and the presence of actual hunting scenes in which horned men participate suggest a specific function for some Fremont rock art. It would appear that, as in the central and western Basin province, these petroglyphs are involved with rituals associated with hunting large game. In spite of the horticultural adaptation of the Fremont culture, archeological remains confirm that large game hunting was an important aspect of Fremont economy. . . . Rock art connected to shamanic ritual with hunting associations would be consistent with this observation.

Cole (1990:188) suggested that the Cottonwood Panel could represent a scene denoting a particular hunt and includes elements relating to shamanic ritual. It could also represent a symbolic hunt but, if so, the artist or artists appear to have used “real” herd and hunt imagery.





Fig. 8. Petroglyph of sheep at site 42Cb822, one of which has a bird perched on its back (approximate center of panel). Magpies (*Pica pica*) sometimes ride on the backs of bighorn sheep, elk, and mule deer to feed on ticks and mites that infest them. The panel is 70 x 170 cm.

The Cottonwood Panel contains 36 zoomorphs that are clearly bighorn sheep.<sup>9</sup> In this case, the sheep are not "generic" bighorn sheep, but are carefully depicted rams, ewes, and lambs, as well as what may be yearlings. In this panel, a typical gathering of bighorns during the fall has been depicted, and a realistic ratio of the animals has been shown with adult rams making up about one quarter of the herd, which is typical of natural herds.

Bighorn rams have long, curvilinear horns, whereas ewes have short, nearly straight, or slightly curved horns. Young rams begin sporting large horns and other features of sexual dimorphism by the age of 26 months (Geist 1971: 53-56). A side view of a ram's head shows horns that curve around behind the head and down before arching up past the lower jaw before terminating near the nose ridge line. A ram at this stage of horn development is known as a "full curl" ram. In the Cottonwood Panel, as in many other depictions of rams in Nine Mile

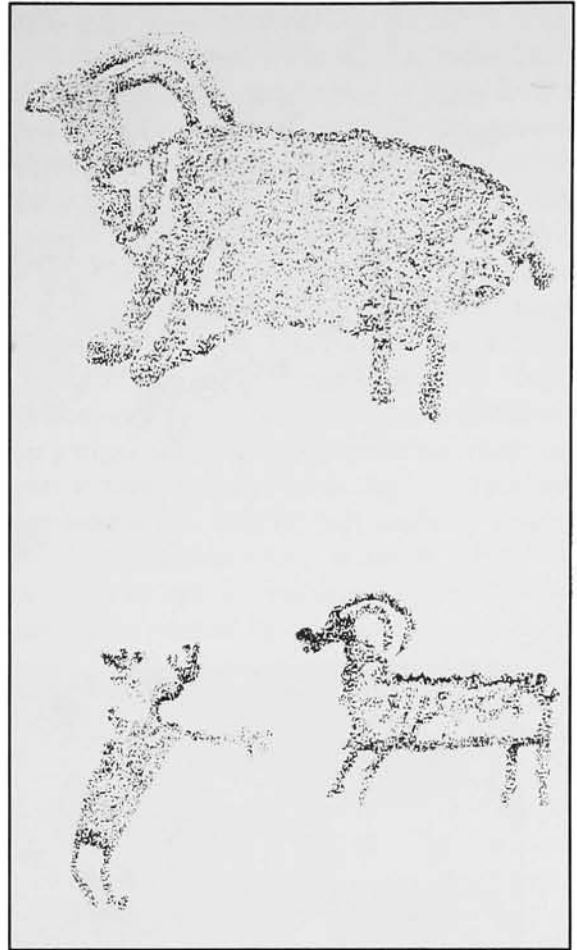


Fig. 9. Petroglyphs of bighorn rams apparently molting their winter coats (sites 42Cb826 and 42Cb832, respectively).

Canyon and the surrounding area, the artist generally chose not to depict the full curl perhaps because the horns would appear to reenter the body at the shoulder. Instead, rams are depicted as having long, nearly shoulder-touching horns, which is something a ewe's horns would never do. One ram near the bottom center of the panel does appear to show the full curl horns. Another feature which distinguishes rams from ewes in the Cottonwood Panel is the hindquarters, which for the rams are depicted as flat while those of the ewes are rounded (P. Miller, personal communication 1993). To further dis-

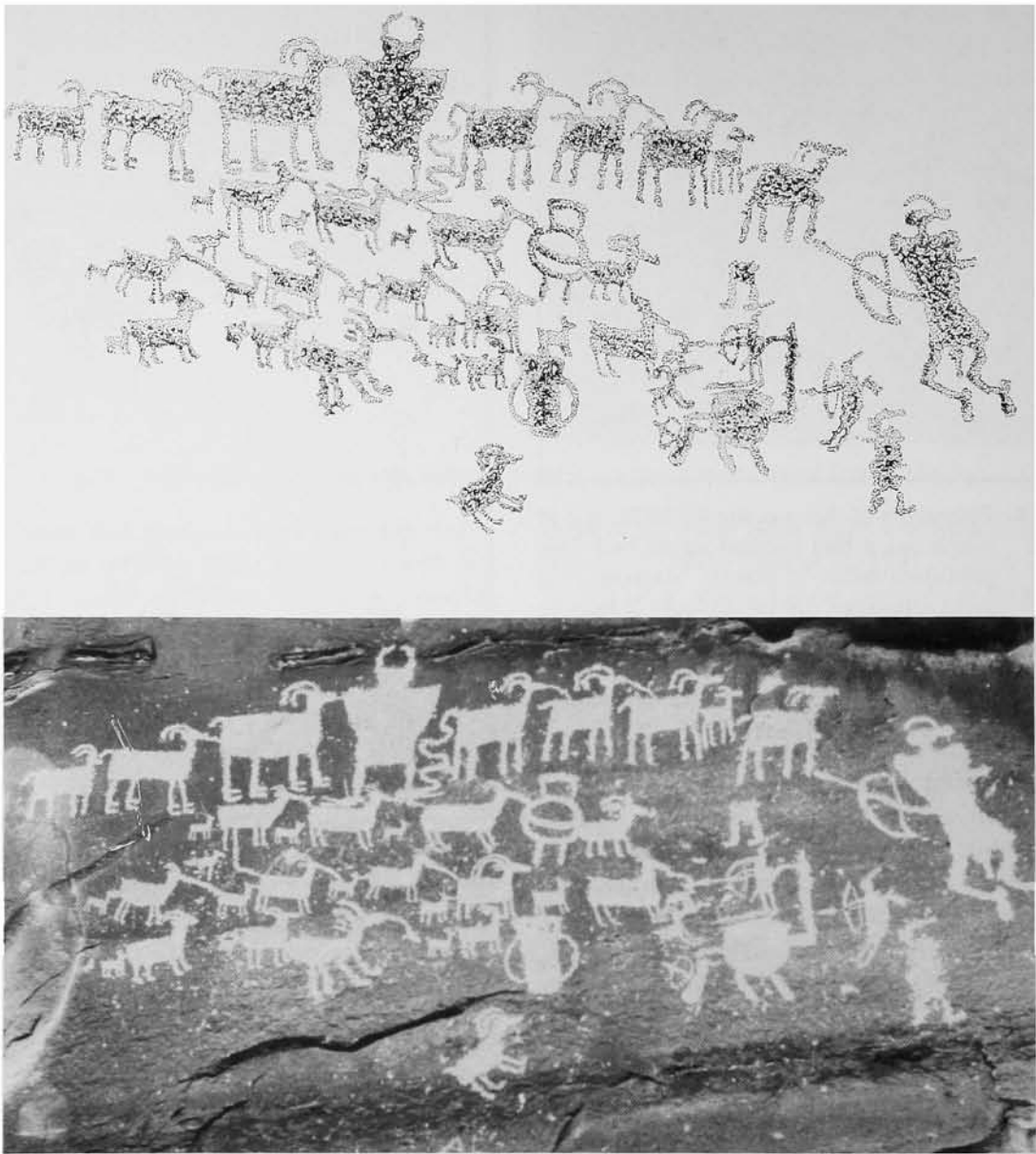


Fig. 10. Petroglyph of a narrative hunting scene at site 42Cb339 (Cottonwood Canyon) close to its confluence with Nine Mile Canyon. The scene shows rams, ewes, and lambs that reflect the beginning of the rut in late November or early December when these animals congregate. Hunters are part of this late fall/early winter scene, taking advantage of the distraction of the sheep during the rutting period. The panel is 195 cm. x 70 cm.

tinguish rams, ewes, and lambs, the artist depicted them correctly in terms of body proportions. The weight of rams often exceeds twice that of ewes and four times that of lambs (during

the fall), which is reflected on a row-by-row basis among the animals in the panel. Additionally, the characteristic split hooves of bighorn sheep are depicted on two of the largest rams.

We suggest that the Cottonwood Panel narrates a scene that could have occurred only during the late fall or early winter, because that is the only time when rams, ewes, and lambs predictably commingle.<sup>10</sup> In this panel, bighorn sheep are shown all facing the same direction in a series of linear arrangements, which is an accurate representation as sheep often move in single file fashion with a dominant animal leading. Bighorn sheep have a complex social organization which is based on dominance hierarchies perhaps related to size and agility, as well as other factors. Rams clash with their horns, challenging each other's position in the dominance hierarchy. Interestingly, it is not only rams who clash horns; ewes occasionally butt their smaller horns together to establish dominance hierarchies among themselves. It appears that these dominance relationships were portrayed by the Native American artist who created the Cottonwood Panel. The top row of sheep is made up of adult rams, with one exception which may represent a yearling male. These are the largest animals on the panel and, on the left side of the anthropomorphic figure in the top row, rams are clearly shown in a line with the largest ram first, followed by a smaller ram who, in turn, is followed by an even smaller ram. Such linear arrangements of dominance are realistic in social and physical terms, when rams mingle and move throughout the landscape.

Other relationships among the sheep may have been reflected by the Native American artist in the connection of one sheep to another with a line running from the nose of one to the tail or back of another in some cases. Ritter and Ritter (1976:160-161, Fig. 13) suggested that these lines are "consanguinity lines" indicating a "close relationship of kinship." It is commonly the case that ewe groups are comprised of related individuals, which is consistent with this interpretation of these drawings. Also on the Cottonwood Panel, there are lines connecting an anthropomorph that stands in the middle of the

herd and two of the sheep.

A further indication that the Cottonwood Panel is a realistic portrayal of a bighorn herd is that the relative proportion of rams-to-ewes-to-lambs is representative of what one would observe in nature. Another factor related to herd composition is that ewes normally give birth to a single lamb, with twins being extremely rare. Natural selection apparently has favored single births because one large lamb has a better chance of survival than two small ones. In the Cottonwood Panel, all of the ewes are followed by a single lamb, with one exception where one ewe is being trailed by two lambs. This may represent a rare case of twin lambs or perhaps an adopted orphan lamb. In nature, when ewes succumb to age or predation, orphaned lambs are readily adopted by other ewes in the group, hence occasionally a ewe will be observed with two lambs in tow. Also, there is one instance in the third row of sheep where a lamb appears to be following a ram. This row of sheep is led by a ewe, which sometimes occurs during migration, where ewes lead other ewes and lambs, as well as an occasional ram (T. Smith, personal observation 1992).

Although we have suggested that the Cottonwood Panel depicts a late fall or early winter scene when the entire herd is gathered for the rut, it does not show the other activities of the rut. As noted above, the rut is a time of confusion for the sheep, with rams clashing in dominance disputes and pursuing ewes in estrus. During the rut, attention normally focused on predator detection is directed towards conspecifics instead. Dominance disputes between rams result in the violent clashing of horns, producing an audible report which can be heard up to a mile away in some cases. This tremendous impact often causes horns to be broken or chipped; sometimes noses are broken and skins are torn. Crania of rams that could not tolerate the battering have been found literally split in half on rutting grounds. Sometimes a ram caught from be-

hind in an attack by another ram may have a leg snapped off. As well as fending off attacks from competitors, rams must monitor available ewes and breed them as soon as they come into estrus or risk losing the opportunity to other rams.

All of this activity, plus the need to continue feeding, means that predator awareness is decreased.<sup>11</sup> Sheep depicted in the Cottonwood Panel appear to be moving, perhaps to the rutting ground. This is indicated by their alignment and general separation into ewe and ram segments. This would be a good time for hunters to approach them, as they would be preoccupied by the upcoming rut, at least to some extent. In this panel, hunters are depicted on the far right side, facing the sheep. With bows drawn and arrows ready, four hunters are prepared to meet the sheep. The largest of these hunters has a trapezoidal body and what appears to be male genitalia. The knees are shown flexed with the rather large feet raised behind. This hunter is wearing what may be a conical headdress, with his long hair gathered into a bun, or perhaps may have an artificially deformed head with a single long feather or other element projecting from it down toward the face.<sup>12</sup> Three other hunters with bows and arrows appear to wear similar headdresses, as does a fifth figure without a bow and arrow found just below the largest hunter.

Another element appears to be a partially pecked anthropomorph, including the legs and lower body. This may have been the intended appearance of the element, or the artist(s) may have miscalculated the space available. Two shield figures are found in the second and fourth rows of sheep.<sup>13</sup> Near the center of the top row of sheep is a large anthropomorph wearing a horned headdress. This figure appears to be connected at the shoulder to the nose of the largest ram in the panel and perhaps at the ankle to a ram on the opposite side, as indicated by an undulating line that runs from the tail of the

ram. This large anthropomorph also has large feet with two or three long segments or toes. Schaafsma (1980:179) suggested that this anthropomorph may represent a hunt shaman. What may be a third shield figure is surrounded by the smaller hunters poised near the lower right side of the scene.

Bighorn rams in the top row of sheep do not appear to be alarmed by the hunters, although the ram on the far right side has its head raised in a posture that may indicate that its full attention is focused ahead. A head-raised, eyes-forward posture is typical of sheep ready to bolt upon being alarmed; however, one would need more detail than what is portrayed here to conclude that these sheep are frightened. In this depiction, the rams' tails are down in the normal (unalarmed) position rather than upraised. Sheep in the lower rows, however, do appear to have their tails raised, perhaps indicating an alarm response to the waiting hunters.<sup>14</sup>

Hunters are shown very near the moving sheep, which could depict an actual circumstance, as it is possible in some cases for humans to approach very near to them, particularly during the rut when the sheep are preoccupied. Geist (1971:42ff) reported several occasions where northern bighorn sheep followed him and allowed him to approach them closely, even to the extent of reading ear tags or touching their faces. They would not allow him to touch their bodies, however. It should be noted that these instances involved bighorns from herds under very light hunting pressure and, in some cases, salt was used to entice the sheep to allow the close approach. A hallmark trait of bighorns is their innate curiosity and fearlessness of humans, which often draws them into close contact. Bighorns are not unduly alarmed by humans unless they perceive a threat from them. Geist (1993: 150-151) mentioned that the rams with which he had worked closely for some time occasionally charged him and gave him a blow. Certainly, a human could be killed or severely injured by

blows from a mature ram. Perhaps such an event is depicted in a petroglyph from site 42Cb827 (Matheny and Matheny 1993) in Nine Mile Canyon, which shows a ram standing over an anthropomorph which is in a horizontal position (Fig. 11).

Although the composition of the bighorn herd in the Cottonwood Panel suggests a particular season, we do not claim that the scene commemorates any particular hunt; however, it is a possibility.<sup>15</sup> It is clear that elements of the scene, specifically some of the anthropomorphs, may relate to shamanistic/supernatural entities rather than portraying specific humans who took part in a bighorn hunt.

As noted above, the Cottonwood Panel is located a short distance above the mouth of Cottonwood Canyon as it joins Nine Mile Canyon, a point about 15 miles from the confluence of Nine Mile Canyon and Green River. Cottonwood Canyon is a major avenue from the southern mountains and the nearly treeless, high canyon terraces and plateau to Nine Mile Canyon, where considerable winter forage would have been available for bighorn sheep. It seems likely that the bighorn sheep moved down Cottonwood Canyon during the late fall at the beginning of the rut. There are other sheep hunting scenes near the mouth of Cottonwood Canyon, but none are as large, complex, or completely devoted to the hunting theme as the Cottonwood Panel. Dry Canyon, another tributary of Nine Mile Canyon located just upstream from Cottonwood Canyon, is another avenue of passage from the mountains to the lower canyon areas. Our survey of rock art at the mouth of Dry Canyon, and for a short distance upstream, revealed rock art sites with scenes including bighorn sheep and sheep hunting. We suggest that the positioning of these scenes at the mouths of these important travel corridors for bighorn sheep are not haphazard and in some way perhaps memorialize the annual, predictable interception of bighorn sheep at these junctions.

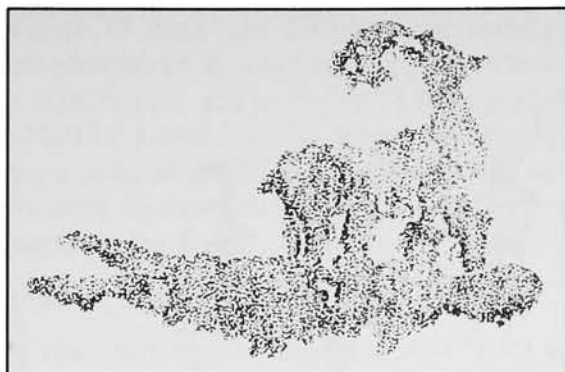


Fig. 11. Petroglyph of a bighorn sheep ram standing triumphant over the prostrate form of an anthropomorph, possibly an unfortunate hunter (site 42Cb827).

**Other Narrative Scenes Involving Bighorn Sheep Hunting.** There are other recorded rock art panels in Nine Mile Canyon and its side canyons that have a narrative character and focus on a hunting theme. One such scene is found on the north side of Nine Mile Canyon less than a mile upstream from the confluence of Nine Mile Canyon and Cottonwood Canyon (at site 42Cb891 [Matheny and Matheny 1993]; see Fig. 12). It was carved on a large boulder and the scene is somewhat difficult to discern. On top of the boulder are the remains of a small stone structure. Although not identical to the Cottonwood Panel, the rock art scene found on the boulder, named the Sheep Hunter's House Panel, shows a similar confrontation between sheep and anthropomorphs with drawn bows.

Less complex than the Cottonwood Panel, the Sheep Hunter's House Panel does not appear to have included any shield figures. There are at least five anthropomorphic hunters with bows and arrows on the panel, and at least 17 bighorn sheep. The bighorn sheep depicted in the Sheep Hunter's House Panel are apparently another rut season herd consisting of rams, ewes, and lambs, although there are few lambs. These sheep appear to be reacting strongly to the presence of the hunters; their front feet are shown slightly raised and extended, giving them the ap-

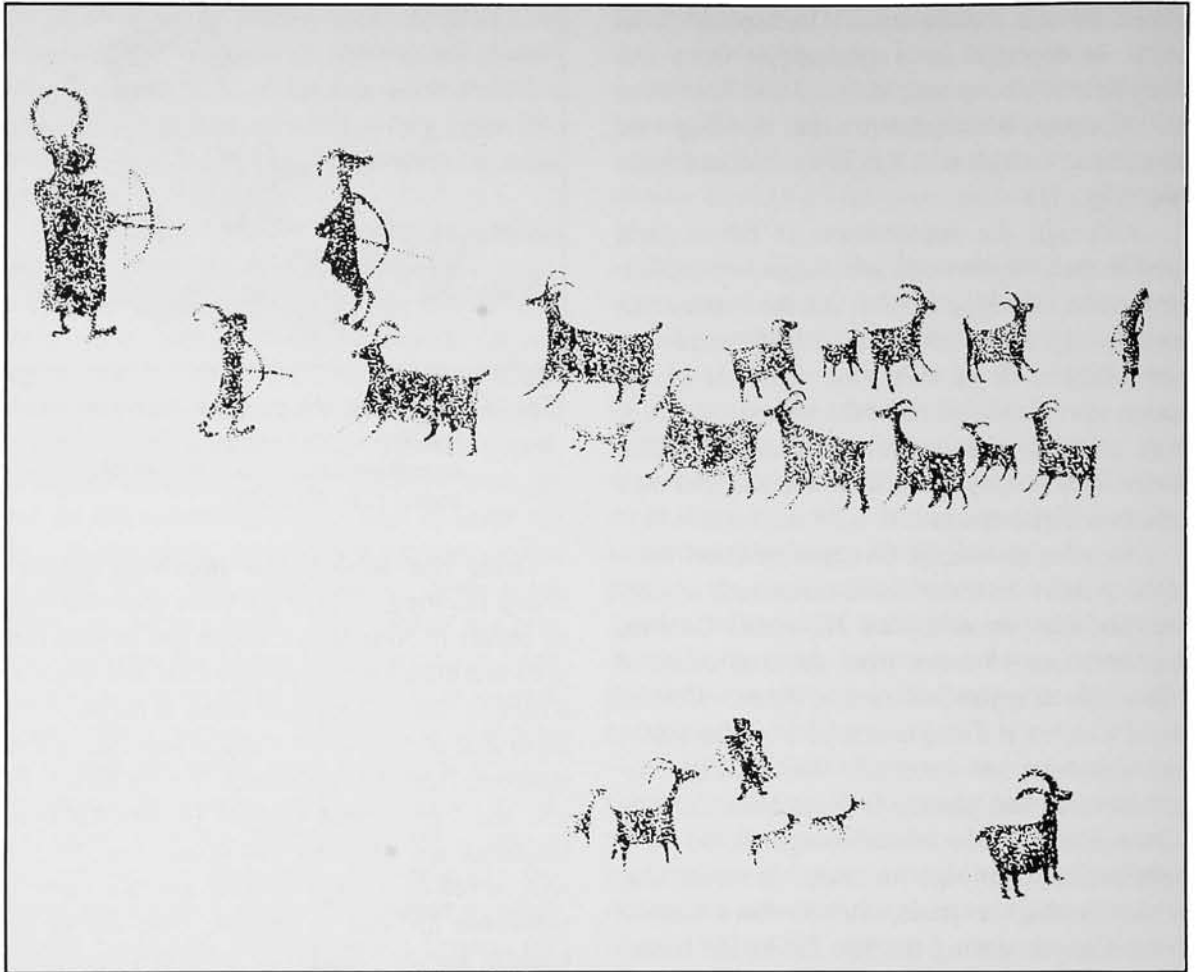


Fig. 12. "Sheep Hunter's House" (site 42Cb891) shows a confrontation between strategically placed hunters with drawn bows and arrows and bighorn sheep.

pearance of shrinking back from the hunters who are confronting some of the larger sheep in the herd. Additionally, the sheep show other signs of being in an alert mode, as their heads and their tails are raised. There are no lines connecting these sheep, as in the Cottonwood Panel.

The hunting tactics shown on the Sheep Hunter's House Panel are much the same as those depicted on the Cottonwood Panel, with several minor differences. Here, three hunters confront the sheep while a single hunter confronts them from the opposite side. A lone hunter faces several sheep that appear to be separated from the main herd. Interestingly, sever-

al of the anthropomorphs depicted in the Sheep Hunter's House Panel are similar in form to those on the Cottonwood Panel but, on this panel, the largest one appears to play a different role, as he is wearing what appears to be a horned headdress. In general form, the anthropomorph is similar to the horned anthropomorph which stands among the sheep on the Cottonwood Panel. Just below and in front of the horned anthropomorph is another anthropomorphic figure with a long, narrow head (perhaps representing a headdress or long hair pulled up in a bun) and a long, projecting element which may represent a feather. A comparison of this

figure with that of the largest anthropomorph on the Cottonwood Panel shows that they are very similar.

The style of the Cottonwood Panel and the Sheep Hunter's House Panel places them in the Fremont cultural tradition. Later examples of bighorn sheep hunting scenes have been found in Nine Mile Canyon. One example is located in the eastern portion of the canyon near the former Pace/Nordell Ranch (site 42Dc639; Spangler 1993b:226). This panel includes seven mounted anthropomorphs that almost surround four bighorn sheep that appear to be rams. The horses and anthropomorphs are executed in a rather nondescript style, with the exception of the largest mounted anthropomorph and horse. This anthropomorph, wearing a large bison-like horned headdress, faces the other mounted anthropomorphs and the bighorn sheep as if it is somehow directing the action.<sup>16</sup> No weapons are depicted in this scene.

It is interesting to note that in the three panels described above, none of the sheep show signs of having been wounded by arrows. The moment captured by the rock art scene in each case is the brief confrontation when the prey recognizes the predator just before blood is spilled. There are other less complex hunting displays in Nine Mile Canyon which depict similar scenes, and yet others showing hunters and wounded sheep with arrows or spears protruding from them. One such scene shows an anthropomorphic hunter that has apparently just released an arrow that is about to pierce or is in the process of piercing the chest of a sheep (Hurst and Louthan 1979:64, Fig. 10). The anthropomorph in that scene has large feet and hands, as well as what appears to be a headdress with a single long feather.

The bow and arrow is the most common weapon seen in the sheep hunting scenes recorded in the rock art of Nine Mile Canyon thus far, but there are several examples of hunting scenes with anthropomorphs carrying atlatls. In

Figure 13 (top) (site 42Cb795), an anthropomorph holds an atlatl in throwing position before a bighorn ram, and in Figure 13 (bottom) (site 42Cb17), a round-headed figure has what appears to be an atlatl next to its body. The style of these figures wielding atlatls is thought to pertain to the Archaic Period.

### Hunting Scenes Involving Other Animals

Some rock panels recorded in Nine Mile Canyon near the area of its confluence with Dry Canyon (located on the south side of the canyon) include depictions of elk as well as bighorn sheep. Dry Canyon's closer proximity to the thickly wooded mountain summer habitat of elk may indicate that elk used it more frequently as a corridor for their rounds of migration, thus the Native American artists may have portrayed the elk more frequently in that area. Figure 14, representing Panel 1 of Component C at site 42Cb834 (Matheny and Matheny 1993), shows a line of elk and sheep perhaps depicted in the act of migrating to more favorable winter grounds in the bottomlands of Nine Mile Canyon. The lead sheep is shown attached to an anthropomorph just in front of it by a line which may represent a rope. The anthropomorph has circled arms and a headdress that seems to include feathers.

Another depiction of bighorn sheep and elk in a line that may indicate winter migration is found at site 42Cb902 (Matheny and Matheny 1993; Fig. 15). In this panel, seven sheep and two elk are followed by two anthropomorphs. One anthropomorph, with a trapezoidal body and well-defined extremities, has a horned headdress and holds a circular element in its right hand. The second anthropomorph is larger and also has a trapezoidal body. It has long arms with large hands and fingers spread widely apart, but no visible feet. It has a single-element headdress that may represent a feather. Other elements found in this scene include a large snake above the two elk and circles above three of the bighorn sheep.



Fig. 13. Top: Petroglyph of a hunter wielding what appears to be an atlatl poised to strike at a bighorn ram (site 42Cb795); Bottom: Pictograph of an anthropomorph at Rasmussen Cave (site 42Cb17) is associated with what is thought to be an atlatl.

Studies of the behavior of bighorn sheep and elk seem to indicate that both species do not observe the same annual cycles of rut, birthing, and migration. There are, however, instances in which the ranges of elk and bighorn sheep overlap. In the Yellowstone Park area, Murie (1940: 115) noted that in the winter bighorn sheep were in direct competition with elk for almost all food plants, as well as with mule deer and pronghorn for browse where the ranges overlapped. The competition for food during the winter was severe, and in the latter part of the season the big-

horn sheep often subsisted on a range so heavily utilized that the elk had abandoned it. Similarly, although Smith (1992) did not observe conflicts between mule deer, elk, pronghorn, or bighorn sheep, he noted that such potential existed, attributing the lack of it to the relatively low densities of animals and projecting that increases in those densities would result in conflicts. This competition for food during winter may indicate that elk and bighorn could have ranged in close proximity in the Nine Mile Canyon area during prehistoric times. Thus, the rock art scenes





Fig. 14. Petroglyph of a line of elk and bighorn sheep (site 42Cb834).

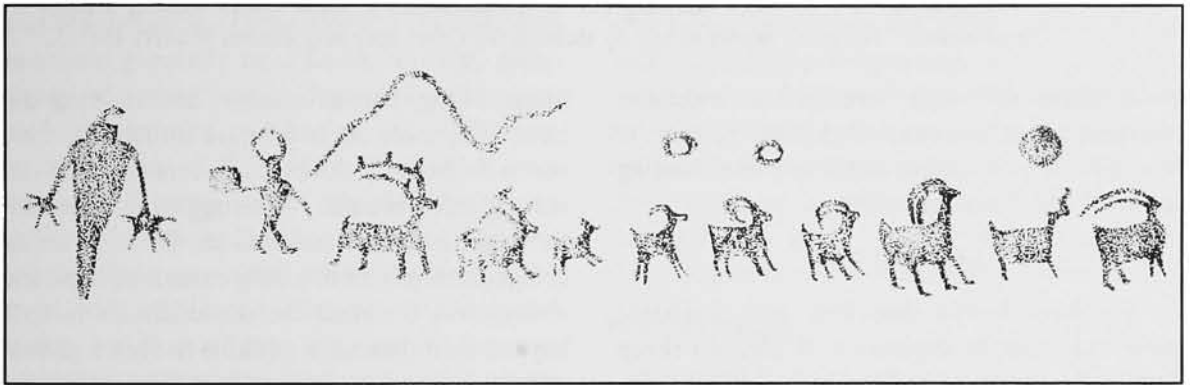


Fig. 15. Petroglyph of two anthropomorphs without weapons following a line of sheep and two elk (site 42Cb902).

portraying the animals together may reflect a winter situation.

Hunting scenes involving elk as prey are less frequent than those involving sheep. It is interesting that most of the anthropomorphs are mounted on horses in the elk hunting scenes that have thus far been recorded, indicating that those panels date to the later occupation of the canyon by Native Americans. Elk or deer appear in scenes that apparently pertain to the Fremont culture, but these are not obvious hunting scenes. An interesting hunting scene with elk (Fig. 16) is located at site 42Cb808 (Matheny and Matheny 1993) in Nine Mile Canyon, not far from Gate Canyon. Four mounted anthropomorphs are shown apparently in pursuit of five

elk. These anthropomorphs have long head-dresses trailing out behind them. A line probably representing a rope connects two riders to spare mounts. No weapons are depicted in the scene.

A final example is a bird hunting scene depicted on a small panel at a site located not far from the Cottonwood Panel. Two anthropomorphic hunters with bows and arrows are shown stalking two large birds that may be sandhill cranes. The birds are depicted as being about the same size as the anthropomorphs. The hunters are shown in a position that seems to indicate that they are lying on their backs or perhaps reclining back to shoot at the birds. The posture of the birds does not seem to indicate that they



Fig. 16. Petroglyph at site 42Cb808 showing elk being pursued by horse riders trailing feather headdresses. The spare horses in tow by three of the riders may be intended to carry the elk.

are in flight. Although there has been a number of depictions of birds recorded in the rock art of Nine Mile Canyon, this is the only bird hunting scene of which we are aware.

### DISCUSSION

We have herein described and illustrated some examples of depictions of bighorn sheep from rock art panels in Nine Mile Canyon, central eastern Utah. We suggest that important aspects of bighorn sheep ecology are reflected in these works of Native American artists. While it is often assumed that native peoples were intimately familiar with wildlife species, these artistic renderings provide clear evidence that this was the case. Even if we never discover the intent of the creators of these art works, multiple correlations with sheep ethology strengthen the argument that they did, in fact, convey knowledge of a species with which they had intimate dealings. If only one or two features of the bighorn sheep as depicted in the rock art of Nine Mile Canyon correlated with biology and ethology, we could question whether such was the case; however, as there are multiple instances of rams being depicted with long, curved horns, the largest bodies, as trailing behind each other in a

hierarchically correct manner, and as being isolated from ewes (as is the case in nature), there seems to be little doubt that observed behavior was captured in stone. We suggest that the multidisciplinary approach taken in this article brings fresh insight to a long-examined topic and underscores the need for professionals to look beyond their own suite of skills to seek a greater understanding of the past. It will be interesting to see if the rock art in other areas shows similar potential to reflect the creators' extensive knowledge of their environment.

The descriptions of some of the rock art sites in the Coso Range of southern California (Grant 1968) is reminiscent of those found in Nine Mile Canyon, and these sites may provide a useful comparison with the Nine Mile Canyon sites in further investigating our suggestions concerning the portrayal of animal ethology. Desert bighorn sheep were found in the Coso area. Grant (1968:29) noted that the Coso Range depictions include "thousands of mountain sheep, often together with hunters wielding atlatls or bows." According to Grant (1968:30), these depictions are concentrated in four categories of topological localities, including: (1) at entrances to gorges with hunting blinds (including the majority of

rock art sites); (2) on rocky points that dominate saddles between watersheds; (3) on rocks near springs; and (4) on rocky crags near Coso and Silver peaks. In some areas, not only piled-rock hunting blinds were found, but also dummy hunters made of piled rocks (Grant 1968:31-32).<sup>17</sup> In the case of the Coso rock art, Grant suggested that there is a viable connection between the rock art sites and other archaeological sites related to hunting.

The depictions of bighorn sheep in the Coso Range provide an interesting comparison with the depictions from Nine Mile Canyon.<sup>18</sup> Like much of the Nine Mile Canyon art involving sheep and hunting scenes, the Coso sheep depictions are dynamic. Grant (1968:115) described the scenes generally as, "Sheep running, sheep leaping, sheep pursued by dogs, sheep dead, impaled with darts or arrows—all are vividly portrayed on the walls of the long-silent lava gorges." Hunting scenes are plentiful among the Coso depictions, and like the Nine Mile depictions, there are scenes where the hunters are armed with atlatls and other scenes where the hunters are shown using the bow and arrow. Depictions of the atlatl both in hunting scenes and in other rock art scenes are much more frequent in the Coso region than we have observed in Nine Mile Canyon.<sup>19</sup> In Coso art, sheep are sometimes shown impaled by arrows or spears with the shaft protruding from the back of the sheep (Grant 1968:22, 82), although it is noted that in a greater number of renderings the arrow is shown still attached to the bow being held by a hunter. In some cases, the point of the arrow was either touching or near a sheep, which is also the case in some of the Nine Mile Canyon hunting scenes. Another detail of some Coso hunting scenes is the depiction of dogs attacking sheep (Grant 1968: 22). We have recorded depictions of dogs in a few bighorn sheep hunting scenes in Nine Mile Canyon.

Without access to adequate photographs and drawings of Coso rock art, it is difficult to de-

termine how much sheep ethology might be portrayed in it and whether the Coso peoples used narrative scenes as did the peoples of Nine Mile Canyon. In the available illustrations of Coso rock art, we have noted that herds of sheep are shown, which in some cases apparently include at least rams and ewes (Grant 1968:74), and sheep are sometimes depicted on the same panels with deer. We have observed that in some panels containing multiple representations of sheep there are lines running from the nose of one sheep to the tail of the sheep in front of it, which also occurs on the Cottonwood Panel in Nine Mile Canyon. Additionally, we have seen a photograph of a Coso panel depicting a sheep herd where one sheep has a bird sitting on its back. These observations suggest that Coso Native American artists, like the Native American artists of Nine Mile Canyon, may have been revealing considerable knowledge about bighorn sheep behavior in their depictions of the animals. Further study of the Coso rock art with these factors in mind would prove interesting.

### Hunting Magic

Thus far in this study, we have not delved into the topic of what any rock art representation "meant" to its creators or "why" it was made from the point of view of its creators. We have focused on the depiction of large mammals, particularly bighorn sheep, and the manner in which their ethology is reflected in some of those depictions. However, a number of prior rock art studies have dealt specifically with hunting imagery in western American rock art. We briefly review several of these studies here and comment on their possible applicability to this study.

In the concluding remarks to their classic study of the rock art of Nevada and Eastern California, Heizer and Baumhoff (1962:239) suggested that the petroglyphs are a "part of the economic pursuit of hunting large game (deer, antelope, and mountain sheep)." This hypothesis that the rock art was related to big game

hunting and constituted a sort of "hunting magic" was based upon Heizer and Baumhoff's study of the distribution of the rock art sites, many of which are located along migratory game trails, in narrow draws leading to watering places, and near hunting blinds. They noted that "nearly all southern Nevada petroglyph sites are placed at spots where animals coming to drink could be ambushed" (Heizer and Baumhoff 1962:223), and they suggested that the animals being ambushed were bighorn sheep. In northern Nevada, in addition to rock art sites found in draws leading to watering places, they were also located on known or probable game trails where animals could have been hunted during annual migrations. In his report on the rock art of the Coso Range in southern California, Grant (1968: 29) stated that his analysis of the rock art of that area, particularly the rock art in the Petroglyph and Renegade canyon regions, afforded support for the hunting magic theory of Heizer and Baumhoff.

More recently, however, the hunting magic theory has been questioned or rejected by a growing number of scholars, at least as a monolithic explanation of those rock art depictions which appear to represent hunting scenes. Rector (1985) pointed out that the study of paleolithic cave art in Europe was the context where the hypothesis of rock art as an element of sympathetic magic associated with hunting developed. In examining the work of other scholars (e.g., Laming-Emperaire 1962; Leroi-Gourhan 1965; Ucko and Rosenfeld 1967; Conkey 1981) concerning paleolithic cave art and Australian rock art, Rector (1985) argued that the content, context, and ethnographic comparisons do not support any monolithic interpretation of rock art. She asserted that no convincing evidence for a hunting magic hypothesis has been put forward and that "hunting magic must be regarded with skepticism whenever it is invoked as the function of rock art anywhere in the world" (Rector 1985:131).<sup>20</sup>

Based on his innovative work focusing on the rock art of the Coso Range, Whitley (1994:356) suggested that rock art has a fundamental metaphoric intent, and he offered an explanation as to why "people who principally ate seeds and nuts made art that emphasized mountain sheep and bows and arrows." Whitley suggested that rock art depictions of bighorn sheep being hunted and killed were produced by rain shamans. Based upon the archaeological record, Whitley tied the production of these depictions to a shift at ca. A.D. 1200 from a mobile generalized hunting and gathering subsistence strategy to one which was less mobile and more focused on seed gathering. He suggested that such a shift likely threatened social relations, with more emphasis placed on food gathered by females than game hunted by males.

One solution to this situation was the growth of weather control shamanism, which was dominated by males (Whitley 1994:362-363). The imagery used in such shamanism, including hunting and weapons, related to males. According to this hypothesis, when a shaman "killed" a bighorn sheep he did so metaphorically in a vision while in an altered state of consciousness. The shaman did this to bring rain, because it was believed that rain fell when a bighorn sheep was killed and that the dream of killing a bighorn sheep was a source of power (weather control) (Whitley 1994:362). The shaman recorded his metaphorical kill as rock art. Whitley (1994: 367-369) argued that the increased activity of male shamans caused the nature of the social relationships between males and females to be maintained during the shift to a new subsistence strategy, but that it provided the opportunity for the emergence of "asymmetrical relationships" between men.

In putting forward this explanation for the creation of bighorn sheep "hunting" scenes in the Coso Range, Whitley joined a growing number of scholars who link rock art to shamanism.<sup>21</sup> While we find Whitley's hypothesis in-

triguing and admit that it may account for the origin of some rock art, we do not believe that it can account for all (or even most) of the bighorn sheep "hunting" depictions in Nine Mile Canyon. Most of the Nine Mile Canyon depictions described herein appear to be considerably earlier than those (recently redated) Coso Range depictions upon which Whitley based his argument and, as we have discussed, there are many nonhunting-related portrayals of bighorn sheep in Nine Mile Canyon which depict aspects of their ethology. Given the range of bighorn sheep depictions, we do not believe it is reasonable to conclude that all of them originated in visions resulting from shamanistic activity related to weather control or from initiation rituals.

Of course, bighorn sheep are not the only animals which are depicted in hunting scenes in Nine Mile Canyon; as mentioned earlier, elk, bison, and birds are also included in such scenes. In hunting scene depictions from the Columbia Plateau, Keyser (1992:79-80) noted that hunting was a chancy pursuit requiring strong religious rituals and spirit helpers, before and after the hunt, as well as the leadership of a hunt chief. Keyser (1992) suggested that the magic of rock art would have played some part in the close association of the hunt and the supernatural. He discussed depictions of the hunting of various animals, including deer, bighorn sheep, bison, and, in one case, an anthropomorph spearing a sturgeon. There are scenes that depict communal hunts, which were complex activities requiring the coordinated efforts of men, women, and dogs. A story related to James Teit (1928, as cited in Keyser 1992:79) by an Okanagan informant illustrates the complexities of a bighorn sheep hunt during the winter:

A great many [people] came . . . and proceeded to the hunting ground. Many women joined the party to act as drivers, and all were provided with snowshoes. . . . The hunting chief took off his cap, made of the skin of a ewe's head, and waving it toward the . . . sheep, prayed to them. . . . He then sent many men around to sit at the

heads of two gulches on top of the mountain and shot the sheep with arrows as they came up. The men picked were the best shots. . . . A woman [with] . . . shamanistic powers . . . approached the sheep . . . gave a sharp call . . . and [her] dog rushed off and drove the sheep fiercely. . . . The men in waiting killed a great number.

Whitley's (1992) interpretation does not seem particularly helpful in explaining the origin of communal hunt depictions. The Cottonwood Panel and other rock art panels in Nine Mile Canyon could be considered communal hunt depictions. Is it not reasonable to leave the door open to interpretations that at least some rock art depictions may involve hunt-related shamanism?

We do not dispute the importance of shamanism in rock art depictions; in fact, we believe that there are shamanistic elements present in the Cottonwood Panel and other depictions in Nine Mile Canyon. However, we do suggest that it is important to remain open to multiple interpretations of rock art, rather than allow the monolithic hunting magic interpretation to be replaced by an equally monolithic interpretation involving a particular shamanistic practice. Additionally, we should remember that other approaches to the study of rock art, on levels other than that of "meaning" to the creators of the art, may produce important information about the art of Nine Mile Canyon and other areas (e.g., Hartley 1992; Bradley et al. 1994).

## CONCLUSION

Although studies of the meaning and interpretation of rock art are fascinating and are advancing rapidly, we believe that our observations concerning the ethology portrayed in the rock art of Nine Mile Canyon are valid and useful regardless of what interpretation may be advanced about their meaning. For example, whether the rock art scenes depict mythical events, actual hunts, or were a kind of visual metaphor for shamans' rainmaking activities, the Native American artists chose to depict the bighorn sheep and their behavior as they had observed it

in nature. No matter what the "meaning" of scenes that portray hunting, it is likely that the hunting techniques shown are those in use by the peoples who produced the rock art. This suggests to us that even if rock art "hunting" scenes were not produced in relation to shamanism involving the hunt, it is possible to learn about Native American knowledge of the ethology of bighorn sheep and other large mammals, as well as their hunting techniques, from these depictions. We believe that an understanding of the ecological and ethological knowledge embedded in rock art can contribute to the advancement of our understanding of rock art on a number of levels.

### NOTES

1. For further information about investigations in Nine Mile Canyon, see Gillen (1938), Gunnerson (1962, 1969), Hurst and Louthan (1979), Miller and Matheny (1990), Morss (1931), Reagan (1931a and 1931b), Spangler (1993a), and Thompson (1993). The most comprehensive discussion of investigations to date in Nine Mile Canyon is found in Spangler (1993b, 1995).

2. A somewhat different mixture of these techniques was reported for each separate group discussed by informants in each area.

3. The other subspecies are *Ovis canadensis californiana*, *O. c. auduboni*, *O. c. mexicana*, *O. c. cremnobates*, and *O. c. weemsi* (Manville 1980:4-5).

4. Bison are also depicted in the rock art of Nine Mile Canyon. Several such depictions appear to be hunting scenes. Deer are also depicted in the canyon, but much less frequently than elk or bighorn sheep.

5. Pippin (1979:333) maintained that "Faunal records from dated archaeological sites indicate bighorn sheep were an important and consistent Great Basin prehistoric resource. Bighorn were the preferred game resource by the occupants of Humboldt Cave, Wagon Jack Shelter, South Fork Shelter, Weston Canyon Rockshelter, Deer Creek Cave, Snake Rock Village and Catlow Cave No. 1. This evidence contrasts with the occasional and haphazard sheep utilization attributed by ethnographers to Great Basin Numic speakers."

6. The results of the 1993 and 1994 surveys have not been included here, although the results of all surveys in Nine Mile Canyon were summarized in

Matheny and Matheny (1994). During those surveys, rock art panels containing depictions of bighorn sheep and hunting scenes were recorded.

7. Several of the rock art panels in this article do not have scales or dimensions because many of them are located in difficult or inaccessible places and were sketched using binoculars, making it impossible to measure properly. However, no individual figure is larger than about 50 by 50 cm.

8. Murie (1940:112-113) discussed bighorn-magpie relationships in the Yellowstone Park area, noting that bighorns generally seem oblivious to the presence of the birds, but occasionally resent it. He reported that in one instance, a young ram turned suddenly and tried to butt a magpie. In addition, Murie suggested that if the magpies consistently seek out the ear mites which are very troubling to the bighorns, they perform an important service.

9. We do not agree with Patterson-Rudolph (1993:29) that the quadrupeds depicted in the Cottonwood Panel are not identifiable to species.

10. Norman (1985) suggested that the Cottonwood Panel site was an equinox watch station and that the scene depicted on the Cottonwood Panel itself occurred in the spring. Based on those factors of sheep ecology discussed in this article, we do not agree with Norman's assessment that the scene depicted occurred in the spring. We have not evaluated his suggestion that the site was an equinox watch station.

11. Geist (1971:206-216) described rather chaotic behavior among bighorns during several days of the rut, which would make them more vulnerable to predators.

12. What appears to be a very similar anthropomorph, apparently without a bow and arrow, is found in a tributary of Cane Creek Canyon in the Moab, Utah, area. The body form, head, flexed knees, and large feet are very similar to the anthropomorph in the Cottonwood Panel. The anthropomorph in the Cane Creek panel is depicted facing a bighorn ram. Other members of a bighorn herd are depicted, as is at least one other dissimilar anthropomorph (Barnes 1982:255, bottom figure).

13. Grant (1981:60-65) provided a useful discussion of the shield figure, noting that it has a wide distribution, with major concentrations in Montana, northern Wyoming, and eastern Utah. According to Grant (1981:61), "the most common version consists of a circular shape, usually decorated with heraldic-like partitions and devices. Protruding from this circular design are a head and legs, and often a spear, feathered stick, or lance appears obliquely above the circle a two o'clock or ten o'clock. In other versions, there are one or more arms showing, which

hold weapons such as a spear, stone club or bow." Cole (1990:192-194) noted that Fremont shield figures are frequently depicted in the rock art of the Uintah Basin of Utah. In a discussion of shields and shield figures, Schaafsma (1980:171) suggested that the Fremont shield may have been the model for late Anasazi shield designs.

14. Geist (personal communication to Thomas Smith, 1991) reported that bighorn sheep raise their tails when alerted to or faced with danger. Normally, the tail lies flat against the rump.

15. Ethnographic information about communal hunts/drives was recorded for a number of Great Basin groups. An interesting example from the Columbia Plateau was reported by Teit (1928, as cited in Keyser 1992:79-80).

16. One of Smith's (1974:57) Northern Ute informants noted that Utes sometimes hunted bighorn sheep by surrounding them on horseback.

17. Muir (1898:320-322) described the use of such dummy hunters by bands of Native Americans in hunting bighorn sheep on Mount Grant on the Wassuck Range to the west of Walker Lake in California.

18. Grant (1968:34) postulated the gradual development of the sheep cult in the Coso region, focusing on veneration of the sheep. He suggested that many of the rock art depictions were "made in relation to a sheep hunting cult similar in intent to the salmon and buffalo motivated cults in the Northwest and on the Great Plains." Grant (1968:113-114) further suggested that the bow and arrow brought about a revolution in big game hunting, which, along with other advanced hunting techniques, including the use of dogs to drive game, made possible the killing of game on a large scale. This, it is postulated, led to a reduction in the great bighorn sheep herds in the area, with the remnants fleeing. The maximum period of ceremonialism involving game and the rock art associated with it, Grant (1968:114) suggested, involved an attempt to ritually bring the game back for the hunt.

19. Grant (1968:55) provided totals for the number of atlatl depictions in several portions of the Coso area as follows: 261 in Renegade Canyon, 21 in Petroglyph Canyon, and 28 in Sheep Canyon. Figures for bowmen in the same area are: 61 in Renegade Canyon, 118 in Petroglyph Canyon, and 40 in Sheep Canyon. Three types of atlatls were depicted in the Coso area rock art (Grant 1968:49).

20. Also see Bahn (1991) for a critique of the hunting magic hypothesis illustrated by the case of Montespan Cave and its modeled clay bear, which has often been used in support of the hypothesis. Bahn's discussion, which includes information from

the recent reanalysis of some features of the bear and its placement within the cave, makes it clear that hunting magic is far from the compelling hypothesis it was once believed to be, and should not be employed as an all-embracing explanation.

21. See Whitley (1992) for an analysis of Late Prehistoric/Historic rock art of hunter-gatherers in California and the Great Basin based on ethnographic data. According to his analysis, the only two origins suggested by such data for rock art are production by shamans and production by initiates in cult rituals, who in both cases appear to have been portraying visions or hallucinations they experienced during altered states of consciousness. Whitley (1992) stated that the "shamanistic rock art" of California and the Great Basin provides further support for Lewis-Williams and Dowson's (1988) neuropsychological model of altered states imagery. Although the Lewis-Williams and Dowson interpretation of Upper Paleolithic art has been fairly widely discussed, it does not appear to have gained general acceptance.

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