Montana Fish, Wildlife & Parks
Region 2 Wildlife Quarterly

November 2018

Petty Creek Bighorns

Bighorn rams along Petty Creek, November 11, 2018

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Find the Quarterly online at fwp.mt.gov/regions/r2/WildlifeQuarterly

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The Region 2 Wildlife Quarterly is a product of Montana Fish, Wildlife & Parks; 3201 Spurgin Road; Missoula 59804. Its intent is to provide an outlet for a depth of technical information that normally cannot be accommodated by commercial media, yet we hope to retain a readable product for a wide audience. While we strive for accuracy and integrity, this is not a peer-refereed outlet for original scientific research, and results are preliminary. October 2015 was the inaugural issue.

Veteran's Day

A person can visit Montana's sheep ranges on a lot of days for a lot of years, as we have, without witnessing the intensity and accessibility of rutting activity that we've seen this year. The scene in Lower Rock Creek in late October and early November was enough to last a lifetime and we commemorated it in a special edition of the Region 2 Wildlife Quarterly, barely a week ago, thinking that the rut couldn't possibly top itself.

Then we made the "mistake" of visiting Petty Creek on November 11, and the exciting displays of bighorn rams that we observed could not be ignored. Out came the camera and here comes the Petty Creek Edition of Quarterly #17.

For posterity, and enjoy!

First of Fifteen Rams

Only a silhouette on the distant skyline betrayed the presence of bighorn rams above Madison Gulch, a tributary of Petty Creek. Five sheep appeared in this group: a 3 or 4-1/2-year-old on the skyline, along with a 2-1/2-year-old (above). On the slope below the skyline ambled a 5 or 6-1/2-year-old, a 2-1/2-year-old and a 1-1/2-year-old ram (facing page). These ages are estimates, using horn rings as indicators, and the horn rings are not as apparent as we might like when attempting to estimate ages from images taken at long range.

Lower on the slope we located two additional groups of rams, for a total of 15. We saw no ewes or lambs in these groups or elsewhere within our view.

We were inspired to type "rutting behavior in bighorn sheep" in our Internet browser while preparing this issue of the Quarterly, and were rewarded with reacquaintances and new discoveries of a fascinating scientific literature. For example, from Geist (1966):

> *In proportion to body size, North American wild sheep carry the largest horns among ruminants. Their horns have been recorded as exceeding 51 inches in length and 16 inches in circumference at the base. Old males may bear 8 to 12% of their body weight as horns. The horns of rams grow substantially in length and mass each year. This increase is greatest in the early years of life and smallest in later years.*
>
> -Geist, V. 1966. The Evolutionary Significance of Mountain Sheep Horns. Evolution 20:558-566.

Second Group of Five

Below the horizon and slightly south of the first group roamed a second group of five rams (above, and facing page). With the benefit of the original images and a computer for zooming-in and adjusting brightness and contrast, we guessed the ram on the left (above) to be 4-1/2 years old, though false rings and poor definition in the true growth rings complicated the matter. By the same method and with equal difficulty, the next ram to the right of the first is also 4-1/2 years old. The next one to the right of the second one looks 3-1/2, the fourth one presents as 4-1/2, and the trailer is most confidently 3-1/2.

While the rams in the top picture on the facing page are definitely of this same group of five, the rams in the bottom picture of the facing page are likely from the first group that we spotted on and near the horizon, judging by the age composition of rams in that picture.

Geist (1966) offered the hypothesis that rams interact with each other on the basis of horn size. In order to test this hypothesis, he proposed size classes of rams that biologists use to categorize rams to this day, in part because aging rams in the field is difficult and can be unreliable.

> [*Rams] were divided into four horn-size classes. Class I—Rams with short horns, less than two years old, smallest in body size. Class II—Rams with horns forming half an arc, age 3-6 years, larger in body than Class I rams. Class III—Rams with horns forming three-fourths of an arc, age 5-7 years, usually stockier than Class II rams. Class IV—Rams with horns forming a complete arc or nearly so, age rarely 7, usually 8-17 years, not noticeably different from Class III rams in body size.*
>
> -Geist, V. 1966. The Evolutionary Significance of Mountain Sheep Horns. Evolution 20:558-566.

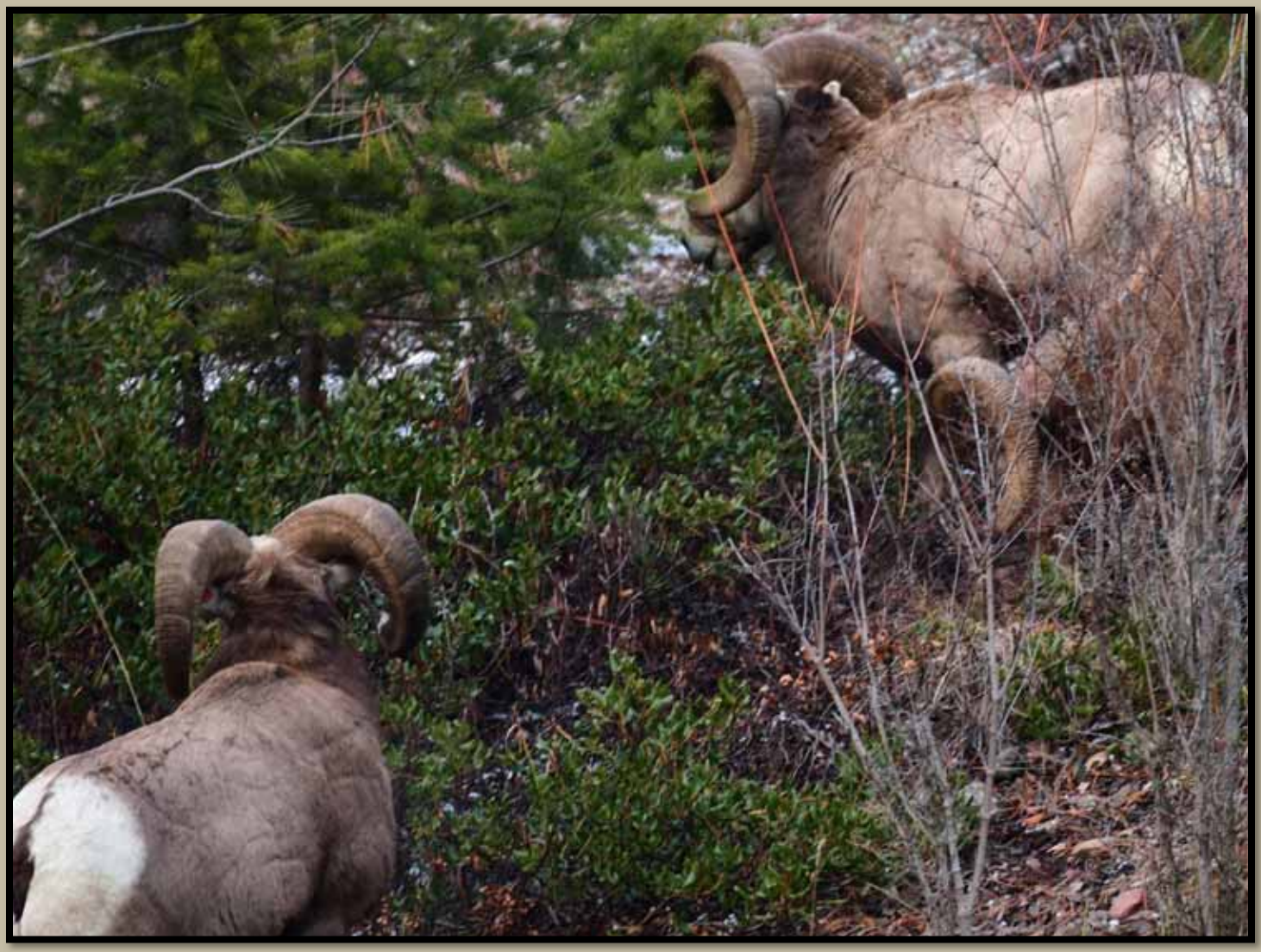
Third Group of Five

Closest to the base of the mountain roamed the last of three groups of 5 rams that we observed. From left to right (pictured above), the left-most ram looks like 5-1/2 years old. Note that its right horn tip is broomed (broken). The ram standing highest on the mountain appears 4-1/2, with thinner horns than the first one. The next ram from the left is 5-1/2 and the next one is probably 4-1/2 years. The ram with a bad attitude at the far right (above) may be 5, 6 or 7-1/2 years old, by our reckoning with original images on the computer. It looks like this ram is also shown in the bottom picture on the facing page, where the presence and absence of true and false growth rings in their expected sequence on the horn illustrate the challenge in aging Petty Creek rams in particular. Our experience over many years has been that harvested Petty Creek rams "in-hand" tend to present the most difficult challenges for assigning ages compared with other bighorn populations in Region 2.

We're prompted by Geist (1966) to observe that the three groups of rams that we watched in Petty Creek had sorted themselves, more or less, by horn size. The first group contained the youngest rams, the second group the next oldest rams overall, and the third group the oldest rams, generally speaking. The average age in Group 1 was 3.5, in Group 2 was 4.5, and in Group 3 was 5.5.

> *[Class IV rams] preferred their own horn-size class to interact with socially. Preference [by Class IV rams] for other horn-size classes decreased in order of decreasing horn size. Among all rams the preferred horn-size class is the one the interacting ram belongs to.*
>
> -Geist, V. 1966. The Evolutionary Significance of Mountain Sheep Horns. Evolution 20:558-566.

Ear-tagged Ram



The Petty Creek bighorn sheep population is included among 14 sheep populations across Montana in a statewide investigation of population performance and health by researchers with Montana State University and FWP. Project annual reports may be found online at *http://fwp.mt.gov/fishAndWildlife/diseasesAndResearch/research/bighornSheep/population/default.html* and the project is entitled: *The Role of Disease, Habitat, Individual Condition, and Herd Attributes on Bighorn Sheep Recruitment and Population Dynamics in Montana.*

In February 2016, 17 adult ewes in the Petty Creek population were captured using a netgun fired from a helicopter. All were sampled for health assessment, and 15 were instrumented with GPS collars.

The process was repeated in November 2017, resulting in the capture of 21 Petty Creek sheep and the deployment of GPS collars on an additional 9 adult ewes. Rams were included as part of the herd health assessment in 2017, which explains the red ear tag that's visible in the left ear of this ram (above and facing page). This looks like the ram in the "third group of five" that may be 5, 6 or 7-1/2 years old.

As of March 2018, a total of 48,316 GPS locations have been obtained from the collared ewes along Petty Creek. A map of locations obtained so far can be found at the online address provided earlier on this page. Locations range from Petty Mountain to nearly Huson, with no locations detected north of the Clark Fork River or Interstate-90. Locations of GPS-collared sheep are well represnted on both sides of Petty Creek, which suggests a reasonably representative distribution of collared sheep across the population.

Of the 24 ewes that were collared in the Petty Creek population, all but 2 were alive as of March 2018. One died on January 3, 2017 and the other on January 7, 2018, both from unknown causes.

The ear-tagged ram seemed to be in good flesh and form when we saw it, one-year after meeting FWP up close.

Combatants

Three particular rams were engaged in most, if not all, of the horn-butting that we witnessed. They were members of the "third group of five" and, much to our pleasure, they butted their way ever closer to our position in a vehicle alongside the Petty Creek Road.

The combatants included the ear-tagged "elder," of perhaps 6-1/2 years, and the two 5-year-olds; i.e., the oldest and largest in the "third group of five." Not only did Geist (1966) predict that older rams prefer to socialize with rams of the same large size, but he also demonstrated in his study that older rams prefer to perform rut displays toward and with rams of their size than with smaller rams.

On the facing page, we see the 4-year-old ram (in front of the older ram) extract itself from the proceedings, recognizing its lower rank in the hierarchy of rutting rams. Meanwhile, the ram it exposed by leaving becomes noticeably alert and prepares to engage.

The engagement unfolds on the following two-page spread. The two lower-elevation rams face-off and collide in Photos 1, 2 and 3. Surprisingly, in Photo 4, the lowest of the rams hardly regains its footing before squaring to face a horn-butt from the ram at the apex of the ram triangle. Thus, one ram delivered and absorbed two strikes, while two rams each delivered and absorbed only one strike each.

What do we know about the ram that struck twice? It is the 5-1/2-year-old ram with the broomed right horn, which was identified as such in the earlier description of the "third group of five." We also know that it is not the ear-tagged ram.

1.

2.


3.

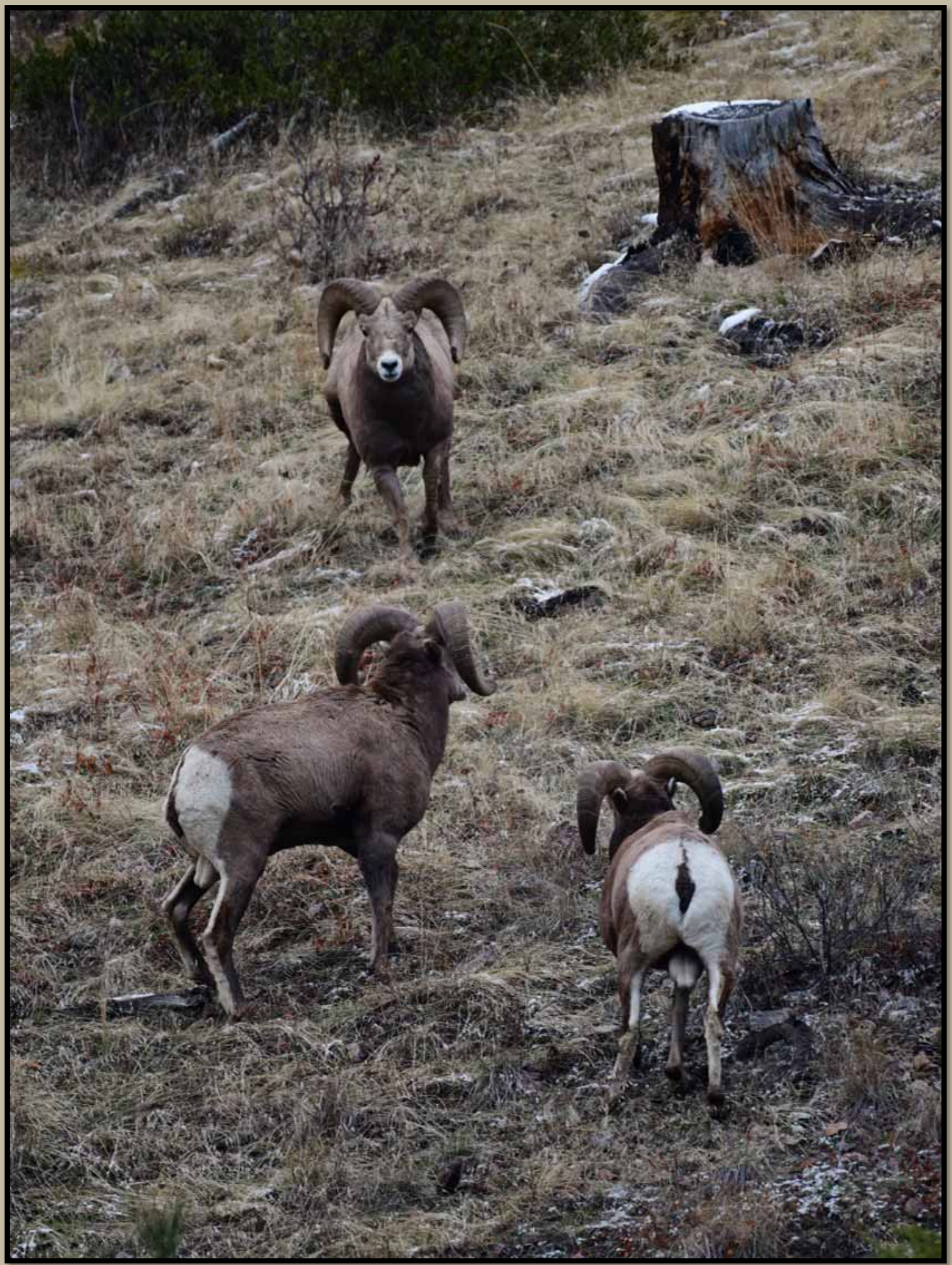

4.

Social Dynamics

The three combatants continued in an array of intense social interactions, conveying messages that we can only imagine. For a few minutes, the three rams formed a tight group, with one of the group seeming to pick a fight with repeated front-leg kicks to the belly of the ram upon which it leaned and rubbed its head and horns (pictured above).

Once grouped so tightly, the social perils of disengagement were displayed. We've noticed this in other sheep in previous years—that once engaged and posturing in close proximity, rams are reluctant to give any signals that might be misinterpreted as submission, such as backing up or turning around. To us, it seems that it's important for rams that they not be the first one to disengage. Sometimes we've seen rams stand tightly together, resting their heads on each others' backs, kicking at each other, lifting their heads as high as possible, for minutes that approach hours in length. On the following two-page spreads, we see that disengagement, in this case, was a prelude to another bout of horn-butting where, once again, the 5-1/2-year-old ram with the broomed right horn delivered and absorbed multiple hits—the target and/or the instigator toward each of the other two rams. We did not see the other two rams butt horns with each other; they butted horns only with the ram with the broomed right horn. Over and over as dusk fell.

Occasionally, a false charge was displayed. In such cases the displaying ram raised up and "walked" forward on its hind legs, as if beginning the classic charge toward delivering a blow; however, a blow was not delivered. This behavior is pictured on later pages of this Quarterly, and is demonstrated by the ear-tagged ram, which has a characteristic chip at the tip of its right horn.



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Aftermath

Which ram wins? The winner, in an evolutionary sense, is the one that sires the most and best-surviving offspring. A fascinating body of literature on the topic can be found by typing "rutting behavior in bighorn sheep" into an Internet browser, as we did. One body of genetic work suggests that dominant and subdominant rams achieve somewhat comparable levels of reproductive success, despite widely varying rutting tactics, though other lines of research leave the door open to further investigation.

Back in 1966, Geist summed it up this way:

> *Generally large-horned rams dominate smaller-horned rams. They breed during any rutting season almost all ewes but exclude small-horned rams. Their dominance rank is recognized by smaller-horned rams, be they strangers or not. Rams with vigorous horn growth dominate older rams with smaller horns. Former enter active participation in breeding and rutting earlier than latter, but do not live on the average as long as rams with poor horn growth. Large horn size is selected for on all but one count. Rams with vigorous horn growth have a shorter life expectancy. This crucial factor hampers selection for ultra large horns. Rams with great horn growth will probably be restricted to one year of breeding and rarely more. Rams with very poor horns will breed estrus ewes rarely. Rams leaving most progeny are probably of neither extreme in horn growth. Over long time spans, however, larger horns will probably evolve since "large-horn" rams will leave a few progeny whereas the converse is not likely.*
>
> -Geist, V. 1966. The Evolutionary Significance of Mountain Sheep Horns. Evolution 20:558-566.

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